THE 15TH INTERNATIONAL CONFERENCE ON GROUP DECISION & NEGOTIATION LETTERS

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Edited by

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Preface

Group Decision and Negotiation refers to the academic and professional discipline that focuses on gaining an understanding of collective decision-making processes. It is involved with the formulation of rules, models, and procedures to improve these processes. The range of GDN research reflects the breath of the strategic and tactical; social-psychological and economic; individual and group; conflict and cooperation; and software-supported and software-conducted processes. The field encompasses theory building and testing, laboratory and online experiments as well as observations in the field. Therefore, GDN researchers are involved in the theoretical, experimental and applied studies as well as in the development, testing and implementation of support systems, decision aids, and software agents. They aim at helping decision makers, advisors, facilitators, and third parties to deal with difficult problems, make better decisions, and/or delegate certain decisions to software.

GDN meetings bring together researchers and practitioners from the fields of humanities, social sciences, economics, law, management, engineering, and computer science. These diverse areas reflect the breath of GDN research. The meetings' participants discuss and compare different paradigms, methods of inquiry, and objectives which they employ in their research. What is common to all participants is their interest in the difficult decision problems that involve conflicts and/or cooperation and the challenges that people face when they attempt to find satisficing agreements and reach consensuses.

Researchers from the Americas, Asia, Europe, Africa, and Oceania participate in GDN meetings. They have a stimulating variety of backgrounds and represent a wide range of disciplines. While many of us come from different traditions, we all share a common passion: research into complex decision making and negotiation involving multiple stakeholders, different perspectives, issues and emotions, requiring decision and negotiation support for both process and content.

The Group Decision and Negotiation (GDN) conference series started in Glasgow, Scotland, U.K. in 2000 and was hosted by Colin Eden. At that time, Mel Shakun – the founding member of the Section and its Chairperson from the 1995 until 2014 – assumed that the next conference may take place only after several years. There was so much interest, however, that the second meeting took place just one year later. It was organized by Alain Checroun and held in La Rochelle in 2001. Mohammed Quaddus organized the next meeting in Perth (2002). Then, from Western Australia we had moved to Istanbul (2003) and the following year to Banff (2004); these latter two meetings were held as a meeting-within-a-meeting at larger INFORMS-affiliated conferences.

The memorable GDN meetings that took place in Vienna and Karlsruhe were hosted by Rudolf Vetschera (2005) and Christof Weinhardt (2006), respectively. The 2007 GDN meeting was organized by Gregory Kersten at Mont Tremblant in Quebec, Canada. João Climaco and João Paulo Costa hosted GDN 2008 in Coimbra. Then, Gwendolyn Kolfschoten organized GDN 2010 in Delft.

Amer Obeidi did a lot of work on the organization of the GDN 2011 in Amman, Jordan. Unfortunately, this meeting did not take place because of the events in neighboring countries at that time. The next year, Adiel Teixeira de Almeida organized GDN 2012 in Recife, Pernambuco, Brazil. GDN 2013 was hosted by Bilyana Martinovski, in Stockholm and it was followed by the GDN 2014 meeting in Toulouse, which was hosted by Pascale Zarate.

Group Decision and Negotiation 2015 was the 15th meeting organized by the INFORMS section on Group Decision and Negotiation. The Conference was hosted by Tomasz Szapiro at the Warsaw School of Economics in Warsaw. During this meeting we revived the Young Researcher Award that was first given at the 2007 meeting. The Award was given to a student researcher who authored and presented the best paper at the Conference. In addition to this Award, young researchers also participated in the Doctoral Consortium. Ofir Turel and Rudolf Vetschera served as the Consortium's Chairs and hereby we acknowledge their contribution.

At the 2014 GDN meeting two volumes of proceedings were introduced; one volume published by Springer in the LBPIN series [1] and the second volume published by the Toulouse University [2]. The GDN 2015 proceedings are also in two volumes: the present volume and the book [3] published in Springer LBPIN series.

In both volumes we have introduced thematic streams of sessions. Researchers who participated in the organization of the streams wrote introductions to each stream. These introductions are included in the separate section "Introductions" (pp. XIII-XLV). They briefly discuss the streams' contributions published in both volumes thus making them better integrated. We hope that this will give the readers a more comprehensive overview of all contributions.

The contributions in this volume and in the book [3] reflect the richness of GDN scholarship. Using a variety of research approaches including real organizational settings and laboratory situations, they focus on the development, application and evaluation of concepts, theories, methods, and techniques.

Contemporary political landscape abounds in situations of multidimensional conflicts which mix military, economic and social dimensions. Troops and tanks, economic measures and sanctions, as well as massive violent protests may become destructive means of conflict resolution. Wisdom armed with values, knowledge and methods will assist politicians in the creation of new instruments for effective group decisions and negotiations. These widely shared expectations challenge researchers and simultaneously direct their efforts in creation and dissemination of ethically driven, knowledge based applicable findings. Multicultural and interdisciplinary GDN community presents their results on progress in this area.

"Collaboration leads to growth, which engenders accomplishment." [2, p. VIII]. The GDN 2015 Conference and its proceedings were made possible through the collaboration of many researchers, students, and support staff. Their dedication and support was exceptional. We are grateful to all of them; to those who made contributions, presented papers, prepared the proceedings, maintained the conference website, and undertook many other necessary tasks. Their contributions, including help in the organization of the streams and the sessions as well as the accompanying events was key to the success of this meeting. We thank the reviewers for their work. It is thanks to their in-depth reviews we are able to maintain the

high academic standard of the GDN meetings. The stream organizers and reviewers work is greatly appreciated, particularly because often they were given very little time. Their reviews provided the authors with much-needed feedback. Thank you:

Fran Ackerman, Yasir Aljefri, Adiel Almeida, Marek Antosiewicz, Reyhan Aydogan, Deepinder Bajwa, Martin Bichler, Réal Carbonneau, Wojciech Cellary, João Clímaco, Grazia Concilio, Ana Paula Costa, Suzana Daher, Luis Dias, Colin Eden, Verena Dorner, Liping Fang, Mario Fedrizzi, Michael Filzmoser, Florian Hawlitschek, Shawei He, Keith Hipel, Masahide Horita, Michał Jakubczyk, Marc Kilgour, Mark Klein, Grzegorz Koloch, Beata Koń, Sabine Koszegi, Kevin Li, Jan Machowski, Yasser Matbouli, Paul Meerts, Danielle Morais, José Maria Moreno-Jiménez, Hannu Nurmi, Amer Obeidi, Pierpaolo Pontrandolfo, Ewa Roszkowska, Anne Rutkowski, Mareike Schoop, Roman Słowiński, Rangaraja Sundraraj, Przemysław Szufel, David Tegarden, Timm Teubner, Ernest Thiessen, Sathyanarayanan Venkatraman, Rudolf Vetschera, Doug Vogel, Tomasz Wachowicz, Christof Weinhardt, Dariusz Witkowski, Paweł Wojtkiewicz, Shi Kui Wu, Yinping Yang, Bo Yu, Yufei Yuan, Pascale Zaraté, Mateusz Zawisza, John Zeleznikow, and Daniel Zeng.

The quality of the presentations is associated with the excellence of the papers. It is also affected by the venue and the overall organization of the meeting and its associated events. The Local Organizing Committee was responsible for these aspects of the meeting and they did everything to make the meeting pleasant and memorable. Thank you:

Przemysław Szufel, Marek Antosiewicz, Michał Jakubczyk, Grzegorz Koloch, Beata Koń, Tomasz Kuszewski, Jan Machowski, Paweł Wojtkiewicz, and Karolina Zakrzewska-Szlichtyng.

We hope that you find the contents of this volume as well as the contents of the book [3] useful and interesting. The authors' effort in clarifying complex problems and proposing innovative solutions should help you to cope with numerous challenges that are posed before researchers of group decision and negotiations. We also hope that the meeting and the contributions foster collaboration among the meeting's attendees as well as joint projects with researchers who were not able to come to Warsaw and participate in GDN 2015.

April 2015

Bogumił Kamiński
Gregory E. Kersten
Melvin F. Shakun
Tomasz Szapiro

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GDN 2015

GROUP DECISION AND NEGOTIATION

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Introductions

The Conference Streams and the Proceeding Sections

The papers submitted to GDN 2015 were organized somewhat differently than in past years. There were nine streams at the conference with each stream constituting one section of the Springer 218 LNBIP Proceedings as well as one section of the these Proceedings published by the Warsaw School of Economics.

The multidisciplinary aspect of research on group decision and negotiation processes poses challenges for organizers. These include, but are not limited to: extending invitations to renowned researchers to deliver invited lectures; approaching colleagues to review submissions; and maintaining an overview of the process.

Our colleagues who generously agreed to be the Streams Organizers succeeded in attracting many renowned scholars to the conference. They facilitated the assessment of submissions and reviewed many papers. They also wrote introductions for each stream providing unique insights into the current directions and findings in group decision and negotiations. All of this work was done under time pressure as the deadlines for preparing the proceedings were very tight.

Each of the two volumes of the GDN 2015 proceedings has nine main sections. Correspondingly, you will find here nine introductions. This volume is concluded by section containing papers presented during Doctorial Consortium. We wish to express our gratitude to the Stream Organizers as well as the authors of the introductions and Doctorial Consortium Chairs. Our thanks go to:

Fran Ackermann and Colin Eden;
Tomasz Wachowicz;
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Keith W. Hipel, D. Marc Kilgour, Liping Fang, and Amer Obeidi;
R.P. Sundarraj;
Verena Dorner, Timm Teubner, and Christof Weinhardt; and
Ofir Turel and Rudolf Vetschera.

Bogumił Kamiński and Gregory E. Kersten
Program Chairs

1. Group Problem Structuring and Negotiation

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1 Overview

Welcome to the stream focusing on group problem structuring and negotiation. We are delighted to have received so many interesting papers reflecting the vibrancy and relevance of the area. All of the papers focus, to some extent, on the behaviours within small groups: small group problem solving and decision making, managing conflict and multiple perspectives, and developing competences.

There are important emerging themes showing the research effort in this area takes a number of different but also related directions:

– Taking a 'human' approach to the topic rather than focusing only on an analytical approach to negotiation. Consequently many of the papers discuss work with groups recognising the need to attend to the socio-political aspects as well as supporting decision making. This is evident in papers where we see research being carried out which a) explores and supports the negotiation between multiple collaborators who may also be competitors; b) aims to support the management of conflict, c) recognises the importance of considering procedural justice authentically, and d) seeks to enhance the negotiation abilities of staff within organizations [1–5].

– Exploring new angles relating to problem structuring through a) use of group support systems adopting causal modelling and facilitation to ensure procedural justice is fully supported and views can be widely contributed, b) the interaction between consultant and client where the use of productive dialogue can aid the development of an effective relationship and affect the trajectory and outcomes of the workshops and c) unpacking complexity associated with the practice of problem structuring [4–5, 7–8].

– Focussing on application with papers discussing work in the area of disaster management planning involving community groups, in strategy making in relation to the use of artefacts to support effective sense-making, in supporting etc., in health care planning of an aging population where group support systems are used to ensure a more effective use of data, in encouraging organizations to view negotiation as a corporate competence, with UK clinical strategy making groups helping to improve outcomes, and in social housing in relation to the assessment of which housing projects to fund to meet the technical and social conditions [1, 8, 9–10].

Notably the papers reflect work being done in different locations: UK, Italy, Sweden, Australia, China; and within different types of organization from public sector (health and housing) to private sector (conflict management, competence development).

We hope that you will find the themes of interest and consequently join us at the conference.

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2. Negotiation and Group Processes Support

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1 Overview

Negotiation and group processes are complex interactions among the parties conducted in an effort to arrive at a decision that they accept and are willing to implement. These interactions are based on communication, both verbal and nonverbal, that aims at educating the participants about ones needs, preferences, and limitations. The communication is framed by the negotiation strategies and tactics, including promises, assurances, and threats. In addition, third parties and other stakeholders as well as a broader context and external events, are likely to affect the discourse between the parties.

Negotiation and group processes are decision making processes that require that the participants assess the alternatives and evaluate offers made by other participants. Often, the participants need to make concession while searching for potential improvements of the negotiation results. These processes exhibit both socio-psychological, economic, and decision--analytic aspects making them difficult to organize and manage.

Both behavioural and formal approaches to negotiations and group decisions resulted in numerous studies. Behavioural approaches use methodologies and test models formulated in anthropology, psychology, sociology, communication, and organization science. They often focus on such aspects of negotiation and group processes as the context, the stages of the process of conflict solving, the relationship between parties, the parties' reputation, behaviour, strategies and tactics. They examine the influences of the participants' personal, demographic, cultural, or professional traits on their actions and the outcomes. Some studies aim to build theories and to formulate procedures for effective management of conflicts and for the construction of checklists that are to help the parties organize their tasks.

Formal approaches have been developed within the fields of economics, management science, decisions science, game theory, and econometrics. They assume that the participants are rational or at least logical decision-makers with a value-seeking perspective on the process. They rely on formal models of the processes and develop methods for aiding and supporting decision-making in both individual and collaborative settings. These models can be used to facilitate the analysis of the problem and the participants prior to their interactions. They also can be used during the process, in order to analyze one's own and the counterparts' decisions and to provide alternative courses of action.

Many formal methods rely on the game-theoretical concepts and formulate normative recommendations for negotiators who are efficient and rational. They suggest solutions that allow the negotiators to achieve optimal outcomes. They also provide the tools for formal statistical analysis of the experimental results.

Studies that aim at presenting a more comprehensive view include both approaches. This includes research which aims at experimental or in the field verification of formal procedures for conflict management and resolution as well as formal models embedded in software. The approaches rely on computer science, management information systems and software engineering to provide development tools and platforms for the design and construction of group support systems, negotiation and e-negotiation systems, online mediators, decision aids, and negotiation software agents.

The papers mentioned below are included in this proceedings and in Springer LNBIP 218 proceedings [1]. Their authors study the problems of how the negotiation and group process and the results can be influenced by:

- negotiation strategies and tactics which the parties employ;
- negotiators' personal and demographic characteristics and external factors; and
- the facilitation procedures, models and frameworks applied to support the negotiators' activities.

2   Negotiation Strategies and Tactics

The difficulty in defining an effective negotiation strategy that best fits the negotiation problem and context and results in most profitable outcomes is one of the most important tasks in the pre-negotiation preparation. Such a strategy determines not only the general behaviour and tactics used by the parties, but also specific moves such as opening offers, response rules, concession paths etc. In [2] the effects of using the door-in-the-face tactic is studied. The authors prove that it leads to feelings of mistreatment by the opponents, who, however, may use such an approach in future negotiation to make larger demands and achieve better outcomes. The relationship between purchasing managers' negotiation styles and tactics is examined in [3]. The authors confirm that the long-term orientation of purchasing negotiators had an impact on their applied negotiation tactics.

The following two papers analyze the effect of frames and anchors in the negotiation process. In [4] the use of language to frame the negotiation as integrative or distributive while holding the offers and payoffs constant was studied. The second paper is focused on analyzing the importance and effects of first concessions made by parties [5], being the anchors in the negotiation process. It appears that the party who submitted the first concession achieved a better individual outcome and, furthermore, that the first concession influenced the opponent's concession behavior in terms of the reward theory.

3 Personal Characteristics and External Factors

The second group of papers is focused on analyzing various factors that may influence the negotiation and group process or the participants' behavior and outcome. The influence of demographic factors, process measures, and individual and joint outcomes on the desire of the participants to negotiate again with their counterparts is studied in [6]. The interesting finding is, that post-negotiation perceptions of honesty and individual outcome had differential effects on the desire to negotiate again, depending on whether or not an agreement was reached.

The main personal traits are also studied in [7], but from the viewpoint of hindering the facilitation of cooperative negotiations in familial disputes.

The participants' creativity and their cognitive limitations, such as a need for closure, are identified in [8]; their impact on negotiation outcome is studied by using a Dynamical Negotiation Networks model.

An important issue of negotiation data collection and its relevance in negotiation research is studied in [9]. The transcribed video recordings of negotiations are compared with the negotiators' statements included in post-surveys in order to determine the negotiators' recall of their performance and to find how well they remember their negotiation.

4 Frameworks, Models, and Procedures

From the viewpoint of effective management of the negotiation and group processes as well as for the purpose of their support it is highly important to develop models, procedures and frameworks. The process formal representations can be implemented in software and provide prescriptive or normative recommendations.

Modelling may be done at the choice and decision-level as well as at the meta-choice level. The issue of a procedural meta-choice problem is discussed in [10]. Such problem may appear if a group of decision-makers cannot agree on a decision rule. The authors propose a relation--valued procedural choice rule and discuss the advantages and limitations of such a rule.

The complexities faced by the intergovernmental organizations (IGO) during post-conflict reconstruction are studied in [11]. This paper discusses the added-value of social responsibility in the context of a "comprehensive approach," to better grasp the organizational design of the latter.

The processes that involve intergovernmental organizations are also discussed in [12]. The paper addresses the effects of the International Criminal Court (ICC) interventions on negotiated peace processes. The paper offers an analytical framework which aims at the identification and assessment of the effects of the ICC on conflict and peace processes.

A conceptual model on the role and impact of cultural intelligence on conflict and its management and on negotiation behaviors in culturally diverse environments is presented in [13]. A general process model focuses on the goal-oriented balancing process. It describes the necessity for negotiators to continuously balance the opposing forces in order to reach the goal. It is an interactive model that tries to incorporate all the important dimensions that exist in negotiation processes.

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3. Preference Analysis and Decision Support

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1 Overview

The outcomes the parties achieve in group decision and negotiation and the efficiency of the results they obtain are of major importance for economics and management science. To measure the quality of the negotiation agreements or the decisions made by the groups, the preferences of all parties involved in the bargaining process need to be elicited first. This requires that the negotiation problem is represented formally and the negotiation template is designed and evaluated. Based on the evaluation a scoring system can be built and used to evaluate the negotiation offers and alternatives for the agreement. Such a system allows to support the parties to analyze the negotiation progress, measure the scale of concessions made by the parties; and to visualize the negotiation history and the negotiation dance. It also allows to conduct the proactive mediation and/or arbitration and to search for a fair solution for all the parties involved.

Various formal methods, techniques and models may be used to support decision-makers to define their goals, elicit preferences and construct scoring systems. These methods are derived from the fields of multiple criteria decision-making (MCDM) and game theory. These methods, however, need to be modified and adopted to fit the decision context that is characteristic to negotiations and group decision-making, e.g. deciding under the pressure of time, and/or when the negotiation space is imprecisely defined, reservation and aspiration levels are changeable and many decision makers are involved. Moreover, the negotiators' cognitive and perceptional capabilities as well as their formal knowledge and skills for using different mechanisms and tools (for negotiation support) need to be taken into account in redesigning the existing and designing new methods and algorithms for preference elicitation and decision support in negotiation and group decision making. This often requires that new the software solutions such as the negotiation and group decision support systems be built.

The main contribution of this section is bringing together the perspectives of researchers and practitioners (in the field of group decision and negotiation analysis) on recent developments and findings in the areas of preference analysis and decision support. We have contributions on

both theoretical and empirical aspects of designing and using formal models and techniques for preference analysis and decision support in negotiation and group decision making.

The papers included in this section and in the Springer LNBIP 218 volume [1] are divided into the following four groups:

1. Methodological issues of preference analysis.
2. Application of MCDM methods in negotiation and group decision support.
3. Applications in real-world negotiations and group decision making problems.
4. Group decisions based on partial information or imprecise and vague preference.

2   Methodological Issues of Preference Analysis

The quality of results obtained in group decision processes depends on the foundations of preference analysis, so methodological issues play an important role in the area. The understanding and the use of group decision analysis model is of particular relevance. The concepts and intuitive logic for the group decision model is approached in [2], including some practical aspects of applying it. One of the issues is related to preference strength, which is considered in [3]. Surrogate weights are associated with the fact that decision-makers often possess more information regarding the relative strengths of the criteria to be incorporated in the preference analysis process.

Group preference management in social choice and in the recommended systems is considered in [4], which presents a comparative study of preference management. There are also two papers which discuss the problem of the effective usage of SAW in order to construct a negotiation offer scoring system. The issue of inaccuracy in defining preferences by the electronic negotiation system users is studied in [5]. The authors consider the elicitation of the negotiators' preferences with a simple additive weighting method. The linkages between the scale of inaccuracy and the negotiation profiles are verified [6]. The methodological differences between two alternative methods are discussed in the last paper in this grouping [7]. The authors compare MARS and GRIP from the perspective of the holistic evaluation of the negotiation template.

3   MCDM Methods

This group of articles deals with MCDM methods and their application to the negotiation and group decision contexts. An MCDM model is used to compare subjective and objective evaluation in [8], including an application to analyze the graduate's leaning ability. A well know MCDM method, ELECTRE III is considered for a group decision-making in [9], in which inference of pseudo criteria parameters are worked out. The dominance-based rough set approach is considered in [10] for an MCDM group decision model for supporting operations in intelligent electrical power grids. Using an additive weighting method is considered in [11] as a part of an algorithm for evaluation of the stakeholders in the sustainability reporting process. Finally, the issue of universal judgments in human groups and communities

concerning procedural fairness and just outcomes is discussed in [12], aiming to legitimize group decisions and outcomes and to generate group equilibria.

4 Empirical Applications

Papers in this section deal with applications of formal decision support tools to facilitate real-world negotiation and group decision making problems.

A procedure for finding compromises among the watershed communities is proposed in [13]. The algorithm described by the authors applies ELECTRE II for supporting individual choices and then aggregates them through a weighted voting system based on classification by quartile. The idea of a new model for subcontractor selection applying different support algorithms for high and low costs of hiring contracts is presented in [14].

5 Partial Information and Imprecise Preference

There are situation in which preferences cannot be precisely defined. The papers in this section deal with such situations in the group-decision making context. An approach hybridizing the notion of veto and adjusting function incorporated into the additive model, and trapezoidal fuzzy numbers to solve group decision making problems is proposed in [15]. A different approach, one that stems from linguistic fuzzy rough sets, is presented in [16]. The model is enriched by introducing the linguistic hedges with the inclusive interpretation.

The notion of hesitant fuzzy sets is applied to TOPSIS algorithm [17]. The authors recommend that the algorithm be used to determine the weights of criteria in group decision-making problems. Fuzzy environment is also considered in [18], where classic PROMETHEE is adopted for the problem of selecting a facility location.

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4. Formal Models

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1 Introduction

Decisions made by collectives constitute a major issue in our civilization. Nowadays, global governance is crucial, mainly because of economic, environmental and social challenges, such as the food shortages, the increasing inequalities worldwide, the environmental and climate changes, and security problems. Broadly speaking, the following quote characterizes the present situation: "if we accept the point that we are living in the time of changing civilization eras, and conceptual change is one of the main ingredients of the civilization change, up to the formation of a new episteme, then the need of new concepts and approaches, even new hermeneutical horizons also within group decisions and negotiation theory is evident" [1].

In these circumstances it is crucial to re-invent the global governance which implies a parallel revolution in the framework of collective decision procedures at the local and global levels. Of course, the new communication technologies, and in particular the Internet, open bright horizons enabling the interactive combination of human intervention aided by computerized decision aids. However, it must be emphasized that the analysis and support of group decisions as well as of negotiation processes are complex, multi-disciplinary tasks involving psychological, sociological, cognitive and political issues. Therefore, the real improvement of group decision and negotiation on a global scale is a major challenge in the XXI century.

Mathematically based models have been developed in the framework of operations research, systems science, game theory etc., and they are an essential part of many group decision and negotiation support systems.

2 Framework

Kilgour and Eden in the introduction to the Handbook on GDN [2] note that:

> "The use of formal procedures for reaching a collective decision-making can be 'improved' by a systematic approach or by a kind of group support. Group decision and negotiation is the academic and professional field that aims to understand, develop, and implement these ideas in order to improve collective decision processes."

In order to foresee the potential and the limitations of the use of any mathematical model in this framework it seems that some ideas must be first articulated, namely:

– The range of the field is very broad and studied from very diversified perspectives, including not only a wide type of situations involving collaboration/conflicting, tactics/ strategies, cognitive/emotional, social/cultural issues, but also the cross-fertilization of a large number of disciplinary areas, such as theory of the organizations, political science, sociology, psychology, telecommunications/internet, systems science, operations research, information systems, decision support systems etc.

– Generally speaking, the developed approaches range from the theoretical analysis of the specific types of problems to the process oriented prescriptive support tools, and also the descriptive approaches. The intended help does not consist of showing the various actors involved in the course to follow, but rather of constructing a set of coherent recommendations that contribute to the clarification of the process. Thus, the models' goals and values do not run the risk of being replaced by any calculated rationale.

– Davey and Olson [3] observe that: "Decision making groups can range from cooperative, with very similar goals and outlooks, to antagonistic, with diametrically opposed objectives. Even in cooperative groups, conflict can arise during the decision process". In order to clarify the meaning of the co-existence of *collaboration* and *conflict* in group decision and in negotiation it is recommended that contrasting characteristics of these concepts be considered [4].

In group decisions we deal mostly with common sets of alternatives and objectives, while in negotiations proposals are sequentially presented by parties, which involves making concessions. This peculiar interdependence among actors, "rather than conflict, distinguishes negotiation from other forms of decision making" [5]. Furthermore, sharing information is characteristic of group decisions, contributing to the reduction of uncertainty and ambiguity; in negotiations information, values and beliefs of the parties are hidden. In group decisions leaving a group is not usual, and, inversely, the group cohesion is promoted. Finally, negotiation involves competition, while group decisions are mostly based in deliberative processes.

3 Mathematically based models

3.1 Models and reality – Are simplifications acceptable?

A very old drawback concerning real world applications of operations research is the mistrust in mathematical models, particularly prevalent in group decisions and negotiations where the complexity and the range of scientific, cultural, social and behavioral issues are even more relevant. Rapoport [6] observed that:

"The mathematical model is a set of assumptions. We know that every assumption is false. Nevertheless we make them, for our purpose at this point is not to make true

assertions about human behavior but to investigate consequences of assumptions, as in any simulation or experimental game."

Kersten [7] noted that Rapaport presented a conundrum that is particularly troublesome when the models and systems are used by the end-users, i.e., the decision-makers rather than by the analysts and OR specialists. He commented that:

"The above quote, while controversial, suggests that formal models and support systems in which they are embedded may suffer from false assumptions or from assumptions that either seem unreasonable or are difficult to accept".

He proposed that to overcome this blocking situation an outreach strategy could be used [7]. This new strategy should pursue new hermeneutical horizons [1]. Rather than the continuation of the traditional path a new paradigm is proposed. In the outreach strategy assumptions and simplifications of mathematical models are still necessary, but they should be validated by the actors of the group decision and negotiation process; building systems integrating several complementary approaches is advisable; and those systems cannot forget social and behavioral issues etc.

In what follows the papers included in this track are discussed.

3.2 Multi-criteria Analysis

In recent years, multi-criteria models integrated in group decision and negotiation systems have undergone major development, and, in our opinion, in many cases, the most adequate are the models rooted in constructivism. The use of multi-criteria models allows us to avoid one of the problems that has followed us over time, the aggregation of the preferences of decision agents in a single criterion, which reduces everything to just one measure. Some multi-criteria approaches propose the combination of algorithmic protocols and the experience and intuition of the actors intervening in the process of preference aggregation. However, if only formalized procedures are used to aggregate preferences of criteria and decision actors, these can be interactive, and oftentimes they should not be compensatory. Furthermore, it must be remarked that aggregation always implies loss of information, therefore it means that it needs to be done carefully and the resulting simplification needs to be assessed.

Different categories of models have been used in the past, i.e. multi-attribute models, including value functions and outranking approaches; and mathematical programming models, highlighting goal programming approaches. As the lack of adequate information is particularly relevant when we integrate multi-criteria models in group decision and negotiation aiding systems, we would like to register/draw the readers' attention to the use of models using incomplete/imprecise information. See, for example, an additive model based system dedicated to using incomplete information regarding the scaling constants and integrated in a GDSS – VIP Analysis [4], and a GDSS – IRIS integrating an aggregation/disaggregation approach for the ELECTRE TRI method [8].

This track includes two papers that present different multi-criteria models.

- A cooperative group multi-attribute analysis of routing models for a telecommunication network is discussed in [9]. The proposed method is grounded in GDSS – VIP Analysis which allows for incomplete information regarding scaling constants. This method is used to support a group of experts in the evaluation of alternative options of decentralized routing models.
- An interactive evolutionary multiple objective optimization model for group decision problems is proposed in [10]. The user interacts with the model via ordinal regression in order to identify the set of Pareto-optimal alternatives. The authors propose an interactive meta-heuristic approach dedicated to a multiple objective optimization problem where preference information is provided by several decision makers and incorporated into the evolutionary search. The interaction is based on ordinal regression building value functions. In our opinion the added value of this paper is the careful experimentation with several variants of the interactive procedure exploiting conjointly the preference information provided by the decision makers.

3.3 Game Theory

Game theory is dedicated to the choice of optimal behavior of two or more rational players interacting strategically. Costs and benefits of each option for one player depend on the choices of the other players. It is clearly the most rigorous approach to dealing with conflicts. In this context it must be emphasized that this type of mathematically based models are the root of many group decision and negotiation theoretical and methodological approaches – in many cases, the analysis of the stability of outcomes is one of its key issues.

Many researchers have exploited a great number of cooperative and non-cooperative game models –some are considered in the following four papers of the GDN 2015 track. On the one hand game theory is a very important and productive field, but on the other hand it has been misused in many situations. We decided that before summarizing the papers of the track integrating Game Models we will pay attention to its limitations/weaknesses. The following two quotes depict the problem very astutely:

1. "Unfortunately, game models must usually abstract one or a few specific features from a real world situation, drastically simplifying the rest, in order to avoid problems of complexity and tractability. In most cases, realistic game models are impossible to analyze." [8]
2. "The weaknesses of game-theoretic approaches include the treatment of the process and its impact on the game itself, and strict rationality assumptions which, for numerous reasons, rarely hold (e.g., imperfect information, parties' cognitive limitations, and deception)... Thus, while game-theoretic methods have a significant role to play in the prior or posterior analysis of the group decision or negotiation problems, their usefulness as a support tool during the process is limited". [6]

We believe that the above lines give an accurate picture of the problem. The four papers which rely on game-theoretical models are briefly discussed below.

- A fiscal-monetary non-cooperative game can be studied with the use of a dynamic macroeconomic model [11]. The fiscal and monetary authorities' strategic moves and

the Nash equilibrium are analyzed. The simulation of the results enables to conclude that, as in many other situations, that in general the Nash equilibrium is not Pareto optimal. In these circumstances, looking for a Pareto optimal negotiation outcome is necessary. The paper, in general is interesting but of a particular interest are the computer simulations for various states of the economy and the discussion. As the Nash equilibrium is not Pareto optimal, the proposal to promote negotiations based on a bargaining problem which is analyzed using multi-criteria optimization tools is also interesting.

– A stochastic dynamic cooperative game which represents interaction among decision agents who control a dynamic system is discussed in [13]. The agents represent economic and financial entities such as real-estate market and regional economic, and social networks. The authors study the dependence among the characteristics of the trajectory of the aggregate outcomes, the behavior of the decision agents (namely the interaction among decision agent preferences) and the importance of the localization of the decision agents in respect to specific local centers. The usefulness of the proposed game is discussed.

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5. Voting and Collective Decision-making

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1 Overview

Voting is an important way to make group decisions. It has been used in a wide variety of contexts ranging from highly regulated and formalized – e.g. political elections – to informal ad hoc settings used in deciding leisure activities in small groups. Often the elections are considered as essential elements of democratic governance.

The specific procedures of voting, however, vary greatly, not only between countries, but also within countries. For instance, one system regulates in the election of the head of state, while another one is followed in electing the members of legislature. Or, one system is used in electing the leaders of religious communities, while another is resorted to in electing the presidents of universities. This variety of procedures has given rise to a rich literature on the desiderata associated with procedures. For example, which precise properties of procedures pertain to democratic group decision making or to collective rationality?

The theory of voting and collective decision making is based on the social choice theory. Its best-known results tend to be of negative nature; they demonstrate incompatibilities among various desirable choice-theoretic properties. Some of the incompatibilities are surprising, counterintuitive or paradoxical. While these results are unquestionably important, it is important to study their relevance in real world collective decision making. The context in which the procedures are being used as well as the plausibility of their underlying assumptions are important determinants of the relevance. Which goals are the procedures intended to serve? To what extent are these reconcilable with the goals of the participants? Are the expected outcomes of procedures likely to be welfare increasing or divisive? These are some of the issues discussed in this stream of presentations.

The papers included in this section as well as the papers included in the Springer LNBIP 218 volume [1] can be thematically divided into the following three groups:
1. The direct vs. indirect (representative) aggregation of opinions;
2. Alignments, power and bargaining; and
3. The choice of rule.

2   The Direct vs. Indirect Aggregation of Opinions

Many results in the social choice theory pertain to aggregation of opinions. One of them, the referendum paradox, is the phenomenon whereby the outcome of collective decision making involving just two alternatives (yes-no) crucially depends on the order in which the aggregation takes place. The possibility of this paradox opens new vistas for strategic behavior among participants [2]. Strategic behavior is often viewed as intentional strive for individually beneficial outcomes, but it can also be related to the more permanent personality traits of voters. It is, therefore, worthwhile to study the expected consequences of the prevalence of specific personality traits among voting population [3].

3   Alignments, Power, and Bargaining

Both voting and bargaining are the mechanisms that aim at working out universally acceptable outcomes when the interests of the participants differ. The setting where there are only two participants with different opinions regarding two options already captures the some essential differences and similarities of the two mechanisms [4]. Various procedures have obvious implications for power distribution among participants with varying resources. These have been extensively studied in dichotomous settings. However, with three or more alternatives considered simultaneously, the measurement of a priori voting power becomes more complicated [5].

4   The Choice of Rule

Historically and analytically the choice of the procedure differs from the application of the chosen procedure in determining policy or the composition of the representative body. Are there any general principles one could resort to in designing a voting rule to be applied in business decisions or in informal settings [6]? The existing – relatively rich – literature focuses on dichotomous choices (rule x *versus* rule y) and often assumes voter preferences regarding the outcomes that result from the application of rules. It is, however, also possible to address the problem via the criteria that various procedures satisfy or fail to satisfy [7]. This renders the rule choice an instance of a general MCDM problem and may seem a plausible way of augmenting the current recommendation systems [8].

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6. Conflict Resolution in Energy and Environmental Management

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1 Overview

The recent development of new technologies that can help analysts understand strategic conflicts and provide strategic support to negotiators has been a great benefit for many decision makers. New theoretical issues are being explored, and at the same time new software systems are making modeling easier and analytical results clearer. Environmental management, including energy projects, is a natural area of application of technologies for the analysis of strategic conflict, and has motivated both theoretical and practical advances. This stream collects contributions highlighting new advances in the Graph Model for Conflict Resolution (GMCR) and other methodologies that have been influenced by issues arising in environmental management, energy development and other types of disputes. More specifically, one major thrust contained in the paper is the presentation of techniques for modelling preferences within the GMCR using probability theory, fuzzy sets and grey numbers. A second set of papers deal with basic structures of conflict which can be expressed within a GMCR structure: hierarchical conflicts, misunderstanding in disputes and multi-level options. Finally, one paper is concerned with fairly allocating water among competing users employing decentralized optimization.

2 Group Decision and Negotiation

As described by authors such as Kilgour and Eden [1] and Hipel [2, 3], a rich range of formal techniques and methodologies are available for modelling controversies arising in group decision and negotiation. Of particular interest here is the Graph Model for Conflict Resolution for investigating real world disputes occurring in energy development, water resources, environmental management, international trade, industrial development and many other areas

[4, 5]. This methodology can be applied in practice to actual conflicts by using the decision support systems such as GMCR II [6, 7] or GMCR+ [8].

A GMCR model consists of three key pieces of information: decision makers (DMs), the options or courses of action under the control of each DM and the relative preferences among the feasible states or scenarios in the conflict. Because preferences are relatively difficult to obtain in practice and there may be high uncertainty contained in them a number of mathematical approaches have been proposed for capturing their uncertainty including unknown preference information [9], fuzzy sets [10], probability theory [11] and grey numbers [12]. Another approach for dealing with situations in which a DM may greatly prefer one situation (ex. peace deal is reached) over another (war breaks out) is called strength or level of preference [13, 14]. As explained in the next section papers contained within this stream contain a range of advances in modelling uncertain preferences within the GMCR paradigm. These contributions can be operationalized by including them within expanded versions of DSSs for GMCR or developing new systems. The matrix formulation of a conflict [15] can reduce computational time within a DSS for implementing GMCR.

Some basic structures could also be embedded within GMCR to further enhance its applicability. For instance, in some cases, a hierarchical structure of conflicts may be present and hence one may wish to reflect this within GMCR [16]. In situations in which misunderstanding or misperceptions are present, one may wish to take into account what is called a hypergame framework [17, 18]. For some disputes one may want to allow for levels in an option such as having a high, medium or low level of water supply available. These types of advancements are addressed in this stream of papers.

The fair allocation of resources constitutes an important problem in many fields such as fairly distributing bandwidth among broadcasting stations in the communications industry and equitably allocating water among competing users in a river basin. Based upon concepts from hydrology, economics and cooperative game theory within an overall large scale optimization problem, Wang et al. [19] developed a comprehensive model for fairly allocating water among users with application to the South Saskatchewan River Basin in the Canadian Province of Alberta and the Aral Sea.

3   Contributions Contained in this Stream of Papers

The first 19 references contained in the bibliography are additional references used in this introduction. The last ten references refer the papers contained in this stream. References 20 to 22 are full papers while references 23 to 29 are extended abstracts. The paper by Kornis et al. [20] nicely demonstrates how GMCR can be applied to study the dispute over fluctuating water levels in the Great Lakes using the DSS GMCR II [6, 7]. Next, Hou et al. [21] model how three-levels of preferences can be obtained using what is called option prioritization.

For the papers in which extended abstracts are provided, the first set of papers is mainly concerned with preference uncertainty. In particular, after defining a solution concept called symmetric sequential stability, Rego and Vieira [22] extend it for employment with uncertain,

probabilistic and fuzzy preferences. The same authors [23] then furnish matrix methods for calculating stability when preferences can be probabilistic.

The next three papers deal with different structures that can be handled within GMCR. Specifically, within a hierarchical graph model, He et al. [24] present option prioritization methods for determining preferences in a higher level conflict from lower ones. This is followed by Aljefri et al. [25] show how misperception of options by DMs can be formally handled within GMCR. Matbouli et al. [26] then explain how options can be split into levels within a graph model structure. Finally, Xiao et al. [27] develop a modified penalty based decentralized optimization method for employment in fairly allocating water among competing stakeholders.

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7. Negotiation Support Systems and Studies

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1 Introduction

Business and personal interactions increasingly take place online. Such interactions vary from personal communications (e.g. using email, twitter, skype) to formal organisational processes such as procurement, sale, or marketing. What they have in common is that they all deal with communication of different sorts. Concentrating on the business context, communication gets more structured. Mutual understanding becomes a prime goal in order to enable effective business interactions.

Electronic negotiations are an archetype of organizational communication processes that involve decision making and conflict management at the same time. Whilst negotiators in organisational e-negotiation processes might use general communication systems such as email or skype, there are also systems that are more specifically targeted at e-negotiations. They can be support tools as part of business systems or dedicated electronic support systems (NSSs). NSSs support communication, decision making, document management, and/or conflict resolution in business contexts. Over the past decades, we have seen sophisticated NSSs that provide holistic support of all of the above negotiation elements. They have been tested in various experiments and have been shown to improve both process and outcome.

The papers of this section as well as of the Springer LNBIP 218 volume [1] show the work of researchers, developers, and practitioners who design and develop NSSs, study their use in the laboratories and in the field, or incorporate NSS components into negotiation, mediation and facilitation. In particular, the papers deal with: (1) communication and language aspects, (2) behavioural aspects, (3) system and media aspects, and (4) new applications of NSSs.

2 Communication Negotiation Support Systems and Studies

Communication is the core functionality of negotiations present in any context, by any stakeholder, using any medium or system. Thus, communication support must be a core functionality of an NSS.

The keynote by Schoop [2] addresses this need for dedicated communication support. With two communication theories as a firm basis, different aspects of communication support in

electronic negotiations such as semantic and pragmatic message elements and validity claims as meta-communication are introduced. The theoretical constructs have been implemented in the negotiation support system Negoisst which is also discussed in the paper. Schoop shows the role communication support plays for electronic negotiations.

The paper by Schoop et al. [3] provides the basis for communication support in NSSs by analysing the role of ontologies in electronic negotiations. Since the overall goal of communication support is mutual understanding, ontologies can provide the means to achieve understanding on the syntactic as well as the semantic level. Combined with pragmatic support in an NSS, this would enable a complete support of negotiation communication on all semiotic levels.

The paper by Kersten [4] analyses how negotiations can contribute to the acquisition of English as a second language in a university course. The students of the course were provided with academic negotiation publications and used an NSS to try out the concepts in practice. Communication practice is of prime importance when learning a new language. Together with joint problem solving, these negotiation components helped the students in their learning tasks.

3   Behavioural Aspects in Negotiation Support Systems and Studies

Negotiations involve at least two stakeholders in interaction processes. These negotiators make decisions and concessions, show emotions, and behave in different ways during the negotiation process based on their cultural context.

The paper by Vetschera [5] addresses the interdependence of behaviour of negotiators, in particular the sequence of offers they are making. It extends the Actor-Partner Interdependence Model, which was specifically developed for the analysis of data resulting from dyadic interactions, to the specific situation of negotiations. Results from applying this model to two data sets identify some robust patterns, but also indicate that interaction processes are strongly dependent on the negotiation task.

The paper by Etezadi and Kersten [6] studies multi-bilateral negotiations, in which one buyer simultaneously negotiates with multiple sellers and analyses how the negotiation tactics of the buyer influence behaviour of the sellers. The authors estimate a simultaneous equations model using data of 229 experimental negotiations. Their findings confirm the asymmetric role of reciprocity, in that competitive tactics are reciprocated, but sellers try to exploit cooperative buyers

The paper by Sundarraj and Morais [7] raises the question how culture determines a particular behavioural issue, namely time preference. They envision testing time preference in a cross-cultural experiment with students from Brazil and India.

The paper by Gettinger and Köszegi [8] deals with aspects of affective complexity in electronic negotiations. Its management is fundamental for negotiators to reach mutual understanding in communication and a positive relationship. They propose to support electronic negotiations with communication tools that facilitate the contextualization of communication by providing emoticons.

4 Medium and System Aspects of Negotiation Support Systems

Negotiation Support Systems exploit the potential of information and communication technology to enable or to improve electronic negotiation processes and lead to better outcomes.

The paper by Moura and Costa [9] introduces an NSS called NegPlace that considers personality traits of negotiators for the support of electronic negotiation processes. The ultimate aim is to improve the negotiation by considering individual styles of the participants.

The paper by Sugimoto et al. [10] discusses a study of decision making in crisis management. Japanese and British students. The authors compare face-to-face scenarios to online scenarios in this context and analyse the differences. They show the need for dedicated ICT support.

5 New Applications of Negotiation Support Systems

The paper by Lenz et al. [11] introduces the field of requirements analysis to electronic negotiations and vice versa. Electronic requirements negotiations involve multiple stakeholders and are multi-attribute negotiations by nature. Surprisingly, the majority of previous work on such negotiations stems from the requirements engineering community. The authors discuss the particulars of requirements negotiations and show that NSSs can provide the means for support.

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8. Online Collaboration and Competition

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1 Overview

Large corporations have been leveraging the Internet for melding functional silos and for creating a ubiquitous set of inter-organizational business partners who collaborate with one another on various planning and operational activities. With the entry of social media, the scope for online collaboration and competition has expanded even further, in terms of both the geographic spread, as well as the real-time nature of the decisions that need to be taken. All of these necessitate the incorporation of newer methodologies.

One theoretical base for online technologies is rooted in the area of psychology. For example, what constructs are crucial in determining the onset and dynamics of an online interaction? Further on, how can such constructs be modeled mathematically and what techniques can be used to take real-time decisions on the basis of such models? Novel collaboration tools can be applied in a variety of contexts. The relevant question then is how can generic models be adapted to a particular known application area? Are there newer forms of applications that have arisen as a result, and if so, what models are most adaptable? Finally, there is the issue of social and customer acceptance of online systems. That is, what factors lead to the acceptance and adoption of various online technologies?

The aforementioned discussion leads us to thematically divide the papers in Section 8 of this volume and in Springer LNBIP 218 volume [1] into the following three groups:
1. Online Technology Constructs and Models
2. Applications online technologies
3. Acceptance of online technologies.

2 Models and Constructs

One common approach to developing online tools is agent-based systems. Agents are software programs that act autonomously on behalf of a user and interact with other users or agents. Robertson and Franco [2] consider the question of how knowledge can be transferred through the use of inter-group interaction, and employ an agent-based approach for this purpose. Multi-agent coordination is also the underlying mechanism in an online system for managing consumer-collectives of renewable energy. Algorithms for the demand-management of this collective, and salient computational results with the algorithms are given in [3]. Online systems today provide a unique way for organizations to elicit the participation of the public

(e.g., through crowdsourcing). Antecedents constructs for which crowdsourcing becomes useful for the organization are proposed in [4].

3 Applications

At the organizational level, collaborative technologies can be used for decision-making by multiple stakeholders. A multicriteria decision-making model for assessing cloud-computing investment decisions is given in [5]. Online collaborative technologies allow for the possibility of engaging the mass population at large. Thus, these multicriteria methods can also be employed at the end-customer level as well, especially with the prevalence of online shopping. One such application of an AHP-based approach to determine the factors that influence customer shopping can be found in [6].

4 Acceptance

Collaborative technologies offer new marketing possibilities, for example, that of attracting customer through location-based electronic coupons. A customer's intention to re-purchase electronic coupons is affected by the quality of service of both the coupon-distributor and that of the store [7]. In addition to marketing, online tools are also influencing human courtships [8]: a survey of online-dating-site users found that looks and temporary physical encounters are not important for both men and women, although men are more in hurry to find a mate.

A number of research studies have brought out how trust and its sub-constructs are important in determining the acceptance of online collaborative technologies. In the case of longitudinal use of one such group decision-support-system, one trust sub-factor, namely risk-perception, decreased with the usage of a system [9]. Trust can also have an influence on global teams that engage in virtual collaboration [10].

Finally, the question is how does the acceptance of collaborative technology change across time and region? Using the US and Australia as examples, it is shown that even though technology access varies across these geographies, the perceived impact is more affected by the length of use rather than by the end-user's regional origin [11].

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9. Market Mechanisms and Their Users

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1 Overview

Online marketplaces represent ideal playing fields for market engineers and researchers in decision-making on mechanisms and aspects of information presentation. Rules and mechanisms for markets vary widely and continue to evolve, especially with the increasing amount of computer power which permits developing and implementing complex, memory-intensive mechanisms like combinatorial auctions. The other major factor in exchange transactions are the market participants and their interaction with such systems and the mechanisms. How humans react to specific set of market rules and principles determines the success or failure of this market. This introduces behavioral aspects to market design considerations.

Explaining and predicting user reactions to market design as well as designing new and more efficient forms of market mechanisms are therefore two of the most urgent tasks for researchers from many fields – including information systems, operations research, economics, and social and political sciences. Phenomena like auction fever, overbidding, information overload, social competition, and other forms of social preferences and behavioral biases illustrate this notion. The papers included in this section as well as the papers included in the Springer LNBIP 218 volume [1] address such aspects and they can be divided into the following three groups:

1.   negotiations and auctions;
2.   peer-to-peer markets; and
3.   emotions in markets.

2 Negotiations and Auctions

Complex market mechanisms, especially in business-to-business auctions, have attracted a good deal of attention in research and practice in the last decades. Auctions and formal negotiation structures represent a possible means of reaching agreements between the involved parties, where usually auctions follow well defined rules and negotiations often do not. In this volume, a series of suggestions are made for applying or combining negotiations and auctions to relevant problems.

A multi-attribute view on the auction market place eBay is considered in [2]. The authors use multiple (parallel) auctions on the same product type with different feature properties, taking advantage of large auction numbers, the price variation therein, and different feature characteristics that fit the bidders' specific preferences.

Another type of auctions is the first-price sealed-bid auction. A special case, in which the responsibility for bid and payment is split is discussed in [3]. Such a division of responsibility may be due to the principal-agent relationship that arises between the bidder and the payer. In two-unit two-bidder scenarios, the effect of overall allowances for one and two units on bidding equilibria are compared. Overall allowances for two units result in an equilibrium with no single-unit bids; only if single-unit allowances exceed two-unit allowances do the agents place single-unit bids.

Two contributions consider supply chain environments. A two-stage multi-echelon supply chain model is introduced in [4]. A numerical example is used to compare the different order and production lot determination approaches that involves central planning (optimization) as well as decentralized negotiations.

Inefficiencies in reverse procurement auctions in just-in-time production environments due to non-linear contract curves with interrelated product or service attributes are discussed in [5]. In order to improve auction efficiency, in terms of outcomes for both sides, post-auction multi-bilateral negotiations are suggested.

3 Peer-to-Peer Markets

Another evolving form of online markets are peer-to-peer platforms. Today's e-commerce landscape experiences the development of a broad variety of such markets. Whereas the last decade was mainly characterized by B2C e-commerce, we now see an increasing number of C2C platforms: private persons share goods and services in large scale peer-to-peer networks. Ebay, for instance, may be regarded as one of the early pioneers in provisioning and managing such a C2C market platform. The spectrum of sharing activities nowadays shifts from mere resale of spare goods to other forms (e.g., co-usage and renting. The proponents of these markets often claim that they offer a more social and sustainable alternative to traditional forms of consumption.

Knowledge of the factors that are used to determine pricing help us to better understand its functioning. The factors that determine prices on the apartment sharing platform Airbnb can be determined with the standard regression analysis [6]. The prices are set by the individual providers, usually private persons, and thus reflect a wide range of influences. The model explains app. 35% of the listing prices' variation, which includes size and location of the place as well as city-specific aspects like population and the general rent price level. The approach allows to obtain such insights into city structures as listing density and spatial price variations.

Another key issue in sharing economy is trust. Using the case of Airbnb the formation of trust is discussed in [7]. The authors propose a model that captures trust-relevant factors such as the hosts' ratings, activity, and trustworthiness as conveyed by their profile pictures and links those factors to booking intention, i.e., the economic manifestation of trust.

4 Emotions in Markets

It is common consensus by now that emotions play a large part in decision-making. Determining the exact circumstances under which certain emotions arise and how they shape the behavior of market participants, however, is still a relatively novel research field today. Inexpensive and small sensors, which are now commonly available, can be used to help consumers improve their decision making, e.g. in a purchase situation. In turn, market providers may use this information to improve their mechanisms, e.g., to choose less (or more) stress- or excitement-inducing auction formats.

In the context of C2C market platforms, a research model of the relationships between cues to trust, trust, emotions and purchase intention in order to increase understanding of C2C market stability is proposed [8]. Cues to trust are further differentiated as heuristic cues – e.g. interest similarity between consumers – or independent cues which have no connection to the consumer's actual decision or purchase situation (e.g. shared birthdays). One major part in the proposed research is better understanding the role of emotions in cue processing and trust formation.

Further developments in this area include adaptive systems with biofeedback applications which adapt to individual and situational consumer needs [8]. Such systems pose new challenges for businesses in terms of data analysis and market engineering: Structuring, processing and interpreting consumers' behavioral data enhanced with biodata is a complex task. Designing stable markets and systems based on such data requires highly skilled analysts and (adaptive) analytics systems.

A framework for integrating NeuroIS methods into business analytics to improve corporate processing and analyze large volumes of consumer and market data is proposed in [9]. The authors suggest adaptive analytics systems, e.g., systems based on biofeedback, to help business analysts improve their decision-making skills.

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Table of Contents

2. NEGOTIATION AND GROUP PROCESSES SUPPORT

3. PREFERENCE ANALYSIS AND DECISION SUPPORT

4. FORMAL MODELS

5. VOTING AND COLLECTIVE DECISION-MAKING

6. CONFLICT RESOLUTION IN ENERGY AND ENVIRONMENTAL MANAGEMENT

7. NEGOTIATION SUPPORT SYSTEMS AND STUDIES

8. ONLINE COLLABORATION AND COMPETITION

9. MARKET MECHANISMS AND THEIR USERS

10. DOCTORIAL CONSORTIUM

1
Group Problem Structuring
and Negotiation

Collaboration through Negotiation: Experiences from the field

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Abstract. In today's world, private and public organizations find themselves needing to work with those that they would traditionally see as competitors. This might be because without working together their future is vulnerable, or that by working together further rent be able to be achieved. However, managing these collaborative ventures is not without its difficulties. This paper looks at how Group Support Systems can assist particularly when used in conjunction with effective stakeholder management, alignment of objectives and ensure early wins.

Keywords: collaboration, negotiation, group support systems.

1 Introduction

Providing group support to organizational decision makers has been of interest and importance to researchers and practitioners for decades [1, 2, 3] particularly when navigating complex messy problem areas, as the challenges of these situations are extensive [4]. Moreover, these challenges escalate when working across organizations rather than within a single organization. For example, collaboration, a particular form of multi-organizational working, has been noted as being fraught with difficulty with failures common [5]. Collaborations can be seen as "the linking or sharing of information, resources, and capabilities by organizations in two or more sectors to achieve jointly an outcome that could not be achieved by organizations in one sector only" [6]. Furthermore, as there are a range of different stimuli for developing collaborations, for example collaborations instigated as a result of government mandate, or formed to achieve a perceived common aim or resolve shared threats then there are also likely to be different implications and considerations. More work in this area is clearly required.

2   Research Method

Based on a number of action research interventions [7] based in mental health, fisheries, and energy this paper explores some of the challenges decision making groups seeking to collaborate have to manage and how using a modelling technique – causal mapping [8] combined with a Group Support System – Group Explorer – can assist in gaining collaboration through negotiation [9]. The use of a GSS – Group Explorer – helps manage politics through: a) an ability to provide anonymity and thus encourage participants to view contributions based on their content rather than their proponent, b) including a chauffeur module allowing visibility of contributions and thus an assessment of where potential coalitions exist and c) examining a data log providing the opportunity for analysis post intervention. The challenges noted in this paper include a) effectively attending to managing context particularly the stakeholder landscape, b) identifying and agreeing objectives and/or issues, and c) providing added value early in the intervention so as to gain buy in and continued support etc.

3   Preliminary Discussion

As noted by [10] and [11] stakeholders proliferate particularly if you are working in public sector arenas where many collaborations are based. One of the first activities therefore is to understand *who* the stakeholders are, *what bases of power and interest each holds* and where the *formal and informal relationships* are. This analysis can provide important insights into navigating what are often quite turbulent waters due to overlapping remits, different demands and requirements etc. In addition to understanding the dynamics of the stakeholder landscape, avoiding getting too closely associated with one party can help ensure credibility and thus assist with managing the politics. However, this raises difficulties in determining whose objective(s) is being targeted [12]. Identifying or being identified by someone who is seen as a trusted party can provide entry and legitimacy for the process. Building relationships with a number of the key stakeholders provides a good base.

Secondly, assuming a single common objective is in place can be deceptively dangerous. This is because different parties may well see the declared objective in a different light from one another but also may well have more than one objective in mind (where some of the objectives will be transparent and open to scrutiny but others are less public). In addition each party may have very different ideas regarding these goals' achievement. Through providing a facilitated structured conversation using the GSS Group Explorer, it is possible to *surface and explore the different objectives, interpretations and means* and thus gain agreement as to the common set of objectives whilst being cognisant of any individual party objectives and interrelationships [13]. An alternative to surfacing and agreeing objectives is to review the issues and their ramifications which the different organizations face. This provides the opportunity to allow all parties to reveal concerns without penalty (including concerns about their own weaknesses and limitations) and through not only surfacing the issues but also some of the causes and consequences helps provide a shared understanding about why

some issues are particularly salient to specific organizations/parties. Thus it provides a good starting point upon which to agree priorities and focus energy.

However it is worth noting that in many cases participants can be wary of each other; the process potentially alters their preferred interaction styles and is a new way of doing something – taking the meeting outside of comfort zones. In addition, understanding the motivation for the nascent tentative collaboration can provide valuable insights into how to manage the process of the intervention. As noted earlier, collaborations might be triggered by financial demands – for example each party on their own is insufficiently large enough to play on a global scale – and so co-opetition becomes important [14] or there is an overwhelming and yet fragile sense that there is a need to work together in order to provide a better service. Where parties have to come together regularly whether it is for regulation purposes or national competitiveness this too much colours the collaboration.

Thirdly ensuring that the meetings are explicitly providing value is critical. Unless the participants see the interventions helping them then they are likely to vote with their feet and not attend. Getting the right people to meetings is always challenging and thus when successful, it is critical to ensure they see the event as worthwhile. Building engagement and trust (through achievement of quick wins) allows for further effective collaborative working. For example, through spending time eliciting and assessing competences across an organization which dealt with four quite different populations (youth, adult, older adult and forensic) it was possible to determine distinctive competences [15, 16]. Some of these competences were specifically associated with the particular cohort; some of them were organizational wide. As a result it was possible to see a) where the organization could focus its activities, b) where effort needed to be maintained to ensure continuity of service and c) where alliances should be built to allow for a more seamless service. Within a very short space those attending could quickly identify the benefits and engaged with the process. This can then be expanded to exploring competences at a service or national level – albeit recognising the importance of expanding trust and ensuring commonality (at least to some extent) of objectives.

As intimated above, the three objectives are not mutually exclusive. Understanding who the stakeholders are and particularly who to work with and why gives insight into different objectives. Illustrating value ensures that the right stakeholders attend and value can be quickly gained through ascertaining objectives. Attending to all three thus provides a powerful integrative way forward for collaborative negotiation.

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Towards a Universal Theory of the Human Group: Sociological Systems Framework Applied to the Comparative Analysis of Groups and Organizations

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Abstract. Drawing on a sociological multi-level, dynamic systems approach – actor--system-dynamics (ASD) – which has been developed and applied in institutional, organizational, and societal analyses we formulate a general model for the comparative analysis of social groups and organizations. Among the key features of the paper: (1) it gives special attention to tension, conflict, and conflict resolution in groups; (2) it also stresses requisites for group sustainability and group production functions; (3) there is a section on group formation with illustrations; (4) the paper conceptualizes and analyzes group rule configurations which differentiate groups from one another analytically but also enable systematic comparisons; (5) it considers the dynamics of group change and transformation.

1 Introduction

Drawing on a sociological multi-level, dynamic systems approach – actor--system-dynamics (ASD) – which has been developed and applied in institutional, organizational, and societal analyses, we formulate a general model for the comparative analysis of social groups and organizations. This social systems approach has not been previously applied in the group area. We claim that the approach can be systematically and fruitfully applied to small as well as large groups and organizations as a methodology to understand and analyze their structure, functioning and dynamics.

2 Model Presentation and Discussion

In this paper a group is considered as system with three universal subsystems on which any human social organization, including small groups, depends and which motivate, shape and regulate group activities and productions. The subsystems are bases or group requisites – necessary for group "functioning" and performance in more or less orderly or coherent ways; on this basis a group may be able to realize its purposes or goals (as well as possibly some members' personal goals) and maintain and reproduce the group. The subsystems are bases or group requisites – necessary for group "functioning" and performance in more or less orderly or coherent ways; on this basis a group may be able to realize its purposes or goals(as well as possibly some members' personal goals) and maintain and reproduce the group.

   The group bases consist of: first, **a rule regime** (collective culture) defining group identity and purpose, shaping and regulating roles and role relationships, normative patterns and behavioral outputs; second, **an agential base of group members** who are socialized or partially socialized carriers of and adherents to the group's identity and rule regime; of relevance here are involvement/participation factors motivating member to adhere to, accept, and implement key components of the rule regime; third, **there is a resource base**, technologies and materials, self-produced and/or obtained from the environment, which are essential to group functioning and key group performances.

   Section I briefly presents the framework and outlines the group systems model, characterized by its three universal bases or subsystems and its finite universal production functions and their outputs as well as the particular context(s) in which groups function. For illustrative purposes, the section identifies three major ideal-type modalities of group formation: informal self-organization by agents, group construction by external agents, and group formation through more or less formal multi-agent negotiation.

   The general systems model presented in Section II characterizes a social group not only by its three universal bases but by its finite universal production functions (elaborated in Section IV) and its outputs as well as by its shared places (situations for interaction) and times for gathering and interacting. Group productions impact on the group itself (reflexivity) and on its environment. These outputs, among other things, maintain/adapt/develop the group bases (or possibly unintentionally undermine/destroy them) Thus, groups can be understood as action and interaction systems producing goods, services, incidents and events, experiences, developments etc. for themselves and possibly for the larger environment on which they depend for resources, recruits, goods and services, and legitimation. The model provides a single perspective for the systematic description and comparative analysis of a wide diversity of groups (Sections III and IV).

   A major distinctive feature in our systems approach is the conceptualization of rules and rule regimes (Sections II, III, IV, and V). Finite universal rule categories (ten distinct categories) are specified; they characterize every functioning social group or organization. A rule regime, while an abstraction is carried, applied, adapted, and transformed by concrete human agents, who interact, exchange, exercise power, and struggle within the group, in large part based on the rule regime that they maintain and adapt as well as transform.

   The paper emphasizes not only the systemic character of all functioning groups – universally their three bases and their output functions together with feedback dynamics – but

also the differentiating character of any given group's distinct rule configuration (Section IV). For illustrative purposes Section IV presents a selection of rule configurations characterizing several ideal types of groups, a military unit, a terrorist group, a recreational or social group, a research group, a corporate entity.

Section V considers the dynamics of groups in terms of modification and transformation of group bases and their production functions. The group system model enables us to systematically identify and explicate the internal and external factors that drive group change and transformation, exposing the complex interdependencies and dynamic potentialities of group systems. Section VI sums up the work and points out its scope and limitations.

3 Conclusion

The group systems model offers a number of promising contributions: (1) a universal systems model identifies the key subsystems and their interrelationships as well as their role in group production functions/outputs and performances; (2) the work conceptualizes and applies rules and rule complexes and their derivatives in roles, role relationships, norms, group procedures and production functions; (3) it identifies the universal categories of rules making up a rule regime, a major subsystem for any functioning group; (4) the model conceptualizes particular "group rule configurations" – rule regimes with specified rules in the universal rule categories – for any given group; groups are identifiable and differentiable by their rule configurations (as well as by their resource and agency bases); (5) it conceptualizes the notion of the degree of coherence (alternatively, degree of incoherence) of rule configurations characteristic of any given group and offers an explanation of why group attention is focused on the coherence of rules in certain group areas; (6) the systems model suggests an interpretation of Erving Goffman's "frontstage backstage" distinction in terms of alternative, differentiated rule regimes which are to a greater or lesser extent incoherent with respect to one another; moreover, the participants who are privy to the differentiation navigate using a shared rule complex to translate coherently and consistently from one regime to the other, using appropriate discourses; (7) incoherence, contradiction, conflict and struggle relating to rule regimes are considered part and parcel of group functioning and development; (8) group stability and change are explicated in terms of internal mechanisms (e.g., governance, innovation, and conflict) as well as external mechanisms (resource availability, legal and other institutional developments, population conditions), pointing up the complex systemic interdependencies and dynamic potentialities of group systems; (9) given the multi-level dynamic systems framework (i.e., ASD) that has been applied in a range of special areas (economic, political, technological, environmental, bio-medical, among others) its application in the field of groups is a promising step toward achieving greater synthesis in sociology and social science.

Managing the relationship between Clients and Consultants

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Abstract. Communication between client and consultant is always a critical factor when using Problem Structuring Methods and facilitated modelling. Both the client and the consultant undergo a process of transformation in their respective understandings. Drawing upon 'Productive Dialogue' we analyse the interactions from a real intervention and provide insights.

Keywords: Problem structuring, facilitated modelling, productive dialogue, clients, consultants.

Extended abstract

Communication between clients and consultants is a critical factor in any project, especially when a project requires the use of problem structuring methods (PSMs) [1], [2] and Facilitated Modelling (FM) [3, 4]. PSMs, FM and interventions are used to support individuals or groups that face complex problems. The extant literature has reported applications of FM approaches [5, 6]. Scholars [7] discuss particular dynamics and process elements that enable intervention practice to take place either through looking at modelling scripts [7, 8, 9] and facilitation practices [10, 11]. Much of the literature on FM and PSMs looks into the role of facilitator [3, 7, 12, 13] in influencing the process of facilitated modelling workshops. Scholars discuss the role of facilitator in terms of 'the management of the social process of group interaction and debate' (P), 'the management of the complexity of the content of the problem' (C) [13], including 'the contribution of substantive expertise, knowledge or opinion' (S) [12]. Yet, there are studies to be conducted that explore how interactions between consultants and clients occur to understand dynamics taking place within interventions. We draw on 'Productive Dialogue' [15, 16]: dialogue interaction where two parties can work collectively towards a general aim, in a turn-taking sequence of verbal exchanges.

We analyse data from an intervention over three workshops in Birmingham & Solihull Urgent Care Joint Clinical Commissioning Group (Birmingham & Solihull UCJCCG). The aim was to: (i) provide an increased and shared understanding of the strategic issues that the Birmingham & Solihull UCJCCG (and its key stakeholders) needs to address over the next 5 years; (ii) identify potential strategic priority areas for action that will best address the above issues, with these areas being understood in the wider context of the stakeholder perceptions of the issues; and (iii) start a process that will enable Birmingham & Solihull UCJCCG to develop a detailed set of coordinated work stream activities that takes account of the priority areas identified. Our focus was on a single review meeting held between workshops two and three, and involved two consultants, two internal analysts, two managers, as well as two facilitators. The meeting took place in a room equipped with a projector linked to Decision Explorer. The focus on a single workshop is appropriate as our interest is to closely examine group interactions in depth (cf. [15, 17]). The interactions between the consultants, analysts, and managers were structured by the facilitators using the causal mapping technique [17]. Permission to audio-record the meeting was granted by Birmingham & Solihull UCJCCG. The meeting was fully transcribed. We followed an iterative-inductive approach to theory--building [18]. We classified the transcript into themes depending on whether the main topic was on project process, content, or roles, and the role of the speaker (external consultant, internal analyst, manager). Then, we coded the transcript following based on the communicative practices [12, 16]. Our results suggested that expertise as used by the external consultants seems to be deployed in cases where it is not 'content' being discussed; rather it is 'process'. In this case expertise is used to structure the discussion and focus on the 'problematic' situation at hand. Furthermore, sequences of codes throughout the transcript revealed that there are particular points in time where consultants deploy and inject expertise (manifested in critical points through 'deploying expertise') to postpone the resolution of Client concerns with regards to the process. Finally, particular sequences of codes and more specifically the exchange between consultants and managers reveal that combining the expertise deployed and injected by the facilitators with the direct experience of the client (manager) of the process (manifested as 'deploying authority' or 'holding others into account') bring the discussion back to 'productive dialogue'. We add to literature on the role of the facilitator and the consultant-client relationships. Our findings complement previous studies that focus on underlining the role of the facilitator [12, 14] in that we further illustrate (i) the facilitators' use and change between (P), (C), and (S) and their display of particular behavioural patterns when topic is changing from project process to content or roles; and (ii) the display of these patterns to shift the trajectory of the workshop towards achieving particular outcomes. The results reinforce the belief about the importance of the facilitator within FM [13] but also further develop this argument, in that we extrapolate through workshop data that both facilitators and clients can utilise their expertise in order to shift the workshop towards particular trajectories and outcomes.

Our study offers insights into how the interactions between consultants and clients emerge, and how they influence the trajectory and outcome of meetings. Our study provides useful lessons to be learnt by external consultants and clients as to how productive dialogue can be achieved, and to how expertise can be drawn upon by external consultants to influence workshop trajectories and achieve particular outcomes. Our results concern the application

of particular methods to a particular problem and therefore their generalizability lies in informing theory on FM. We feel that more research needs to be done in other FM methods, and believe that this study provides food for thought in order to unravel the 'black box' of FM interactions.

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Understanding the links between the Determinants of Procedural Justice and Causal Mapping: Outcomes of Focus Group Workshops using Facilitated Group Decision Software

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Abstract. This paper examines the way in which causal mapping aided by group decision software adheres to the tenets of procedural justice. The workshops utilise a dual facilitation process that allows a more authentic participant voice to be heard. We seek to explain why this process of investigation surfaces more authentic qualitative data by aligning the process of investigation with the principles of procedural justice as found in organizational justice literature.

Keywords: mapping, procedural justice, focus groups.

1 Introduction

In this paper we examine a particular approach to focus group workshops and the manner by which it utilizes certain processes and procedures embodying the dimensions of Procedural Justice which in turn are thought to produce deeper or more meaningful levels of engagement with participants. This cross disciplinary study investigates the use of a soft operations research technique, Causal Mapping [1, 2, 3] where the objective of the workshop is to elicit meaningful information related to decision making. This is studied in the context of both a private sector organization and the student body of a UK university.

The focus group workshops (FGW) make use of a dual (software and human) facilitation process. It enables facilitators to surface the underlying issues that groups feel are key to that particular workshop discussion. Causal Mapping allows participants to raise the key issues of concern by inviting them for their thoughts on a key prompt question which is used to start the focus group session. This prompt question is pre-determined to reflect an important decision making area for that group. In doing this we witnessed a significant amount of "open, honest" and "insightful" information emerging during the facilitated focus group process. The paper seeks to explain why this process of investigation surfaces more authentic qualitative data by aligning the process of investigation with the principles of procedural justice as found in organizational justice literature.

2   Causal Mapping in Focus Group Workshops

Causal Mapping has its roots in the Personal Construct Theory of Kelly [4] and has been developed most notably by Eden [1] amongst others. Causal Mapping was chosen for facilitating the workshops as it enables the synchronous collection and analysis of qualitative data during the workshop live with the participants and provides a coherent picture of a situation. Causal mapping, which allows a "systematic understanding of the issue at hand" [5] as it can deal with the complexity of issues that are interrelated [6]. This approach, integrated with a software aided process, improves efficacy as the intervention tool serves as a means of recording the data generated.

The workshops were run using a mobile laboratory of networked laptops, using Group Explorer® software combined with the Decision Explorer® tool. The process allows the gathering, structuring and analysis of qualitative information that develops in the workshops. It allows the user to work with a model of interlinked ideas using maps created from the participants own understanding of the main prompt question.

3   Framework of Analysis and Method

A working model of the focus group sessions has been developed and can be represented by figure 1 below. The arrows in the looped feedback process represent the dual facilitation process in action. The right hand side of the diagram emphasizes how the dual facilitation process encourages the display of desired extra role behaviors [7] in the FGW's. The benefit of developing these behaviors for the quality of outcomes from the FGWs is discussed below. Box A captures the dual facilitation aspect of the process adopted. It emphasizes the advantages that adopting this approach to gathering information provides. The software enables both facilitators to become more effective. The group facilitator directly managing the group discussion can use recourse to the maps developed to help develop and move the conversation forward. The software facilitator managing the software is able to observe the manner in which the individual participants are contributing to the development of the material. They can ensure that each participant will be given the opportunity by the group facilitator to have

their voice heard. The software facilitator has the time to actively reflect on what is happening during the workshop and make/suitable adjustments. Thus the dual facilitation process is multidimensional. Each facilitator interacts with the software in different ways and thus therefore with the participants and with each other.

Figure 1: The Dual Facilitation Process and the link with Procedural Justice
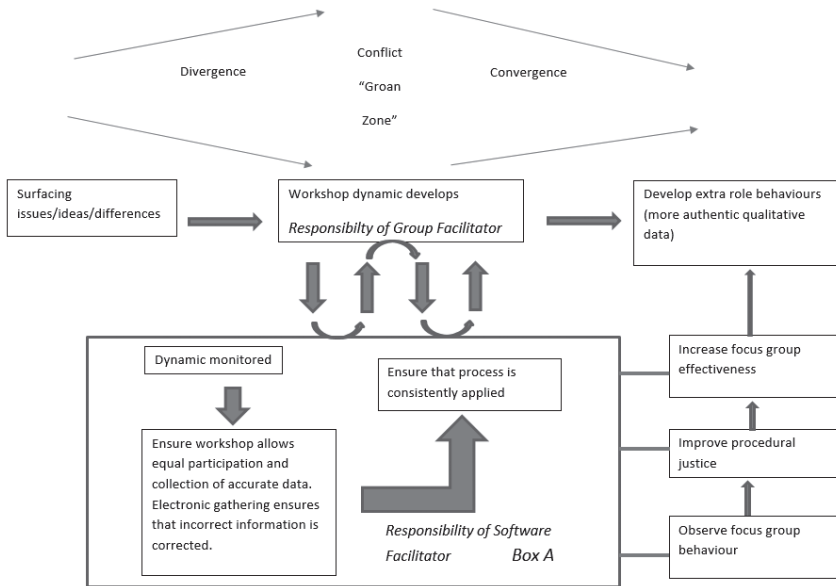
Figure 1 at the top provides the conventional notion of focus group activity passing through the three stages of group thinking, starting with divergence, followed by the "Groan Zone" [8, 9] before the group moves into convergence of thinking. The modeling underneath developed by the authors represents the dual facilitation process as employed in the workshops. The initial surfacing of different ideas occurs in the gathering stage of the focus group process. As the workshop dynamic develops the dual facilitation process allows a looped feedback process to operate whilst the workshop is operating live. Through the use of Group Explorer software, the software facilitator monitors the individuals' contribution to ensure an equal input of ideas from all of the participants. The dual facilitation process aids the enhancement of focus group outcomes as the workshop progresses, by encouraging the display of productive extra role behaviors, namely honesty and openness in divulging sensitive information.

The workshops aimed to foster the right environment to allow the participants to freely discuss in a safe/unthreatening environment, factors relating to the key prompt question. The security of "non-recourse" to any participants comments made, was aided by the fact that the software allows for the individual anonymous inputting of ideas (known as "concepts" in causal mapping) so that there is less of a need to self censor their ideas because of any fears of individual participant being identified.

4   Aligning the Dual Facilitation Process with Procedural Justice Dimensions

In organizational justice research concerns about fairness are based on the inter-related aspects of organizations, such as how resources are distributed-*distributive justice*; the fairness of decision making processes-*procedural justice*; the nature of interpersonal treatment received from others-*interactional justice* and collectively these justice dimensions are known as *organizational justice* [10]. Of these justice dimensions the one which was the main aim of examination for the focus group work undertaken was *procedural justice*, since fairness of process is expected to enhance the focus group outcomes, in terms of levels of firstly; meaningful engagement with the process and secondly; the richness and authenticity of the qualitative data generated.

The work on Justice Literature has developed in waves with each dimension receiving prominence in certain decades; distributive (1950–1970), procedural (mid 1970s to mid 1990s), integrative (mid 1980s to present). Increasingly when examining the area of organizational justice, there has been a movement away from "distributive justice" to "procedural justice" (PJ) concerns.

The aspect of Justice in organizational literature is a subjective notion of justice that states that certain process and procedure types can enhance fairness judgments [11]. "Procedures can refer to official rules of how things are done, how decisions are made etc. This represents the traditional view which in this study we refer to as Procedural Justice Narrow (PJN). Which here directly relates to the activity of running the workshop. An alternative, and possibly more inclusive understanding of procedures can comprise all processes and interactions that occur in the context of organizational life" [12], which we refer to as Procedural Justice Wide (PJW). Having a process to elicit opinions and ideas that is congruent with Procedural Justice Narrow is, it is hoped, more likely to ensure that Procedural Justice wide is achieved.

In the area of PJ the work of Thibaut and Walker [13] paid particular attention to the "level of control" the participants believed they had in a process and the subsequent decisions arrived at through that process. They noted that participants reported higher levels of satisfaction when the process was seen as fair and as such even *second best final decisions* could be accepted by the participants so long as they had experienced control and fair participation in the earlier, process stage. [14] "...disputants viewed the procedure as fair if they perceived that they had process control (that is, control over the presentation and sufficient time to present their case). This process control effect is often referred to as the "fair process effect "or "voice" effect [11, 15]. In this context fair decision making would allow participants control over the procedures that determine the outcome, as opposed to the outcomes themselves.

Linking this to the workshops studied in this paper, in an organizational context with a hierarchical structure such as a university or private sector organization, direct decision making tends to reside at the top, and given that participants recognize this as the correct legal structure, they are prepared to accept "indirect opportunities" to impact on decision making as acceptable. This indirect aspect is termed "process control" by Thibaut and Walker [13], or the opportunity to express "voice". The dual facilitation process used in the focus group

workshops allowed all participants to directly input their concepts (thoughts) into the Group Explorer system, without any censoring of views; hence we propose that the power to express "voice" for the participants is greatly enhanced by this process.

Colquitt, J.A et al. [14] notes that Leventhal broadened the determinants of procedural justice to points beyond process control [16]. This requires six criteria to be met if procedure is to be perceived as fair [14]. These 6 determinants are drawn out to compare to the characteristics of the dual facilitation process used in the study in table 1 below.

Table 1. (Colquitt, J. A et al 2001, p. 426).

Determinant	Workshop Process; Dual facilitation
a) Procedures should be applied consistently across people and across time	We conduct the workshops using laptop laboratory setting, ensures uniformity over time, with a key prompt question derived for each group and general steps followed.
b) Procedures should be free from bias (ie. ensuring that a third part has no vested interest in a particular settlement)	As facilitators we are independent of the university senior executive/organization, and cannot impact on policy formulation at senior level.
c) Procedures should ensure that accurate information is collected and used in making decisions	Electronic gather of statements/concepts directly from the students, ensures accurate collection of qualitative/experiential data with a clear audit trail through cluster building.
d) Procedures should have a mechanism to correct flawed or incorrect decisions	The process can be used iteratively to ensure accuracy of information gathered. Concepts entered can be corrected electronically if incorrect.
e)Procedures should conform to prevailing standards of ethics or morality	Trained independent facilitators ensure process is ethically used with a correct employment of group norms in the focus sessions.
f) Procedures should ensure opinions of various groups affected by the decision have been taken into account	Ethnic minority background students are often not directly consulted in policy formulation, yet this process affords them a clear and transparent voice.

When processes of investigation embody PJ determinants, the participants show commitment to the decisions made and will exhibit extra-role behaviors [7]. PJ also enhances the levels of voluntary contribution by "invoking the side of human behavior that goes beyond the out-come driven self interest" in exhibiting the extra-role behaviors [7]. All participants in our study were either volunteers or had been invited to take part by the lead member of the focus group (for the private organizations). Hence participants looked to experience a "fair" process of focus group investigation so as to engage meaningfully. In this study, the extra--role behavior would be to divulge information that participants are not normally obliged to divulge and in doing so show "honesty" of opinion in a transparent manner. This would enable them to volunteer sensitive individual information (given the initial anonymity of the facilitated software driven process) relating to; how they felt they had been treated, how they had interacted with university tutors or to what extent as junior managers they could impact on decision making. As the inputting is anonymous electronic inputting to individual PCs, participants are less likely to self sensor and will be more likely to engage in exhibiting extra-role behaviors and allow to surface sensitive individual opinions, which otherwise they would

not feel safe to express. This can be illustrated by some concepts drawn from the student maps (which are not presented here for brevity) containing statements such as 64," individual favoritism" which leads to statement 63 "certain groups get favored by tutors", or statement 92; "students should be judged on ability rather than perception of ability". Similarly in the private organization focus groups maps (maps also not presented for brevity) we had statements such as 29 "better dialogue between sales, warehouse and administration to achieve consensus agreement", clearly indicating communication issues that needed resolving.

The construction of the maps enables the facilitators to understand the conversation so that they may help surface more meaningful qualitative data. The understanding of qualitative research employed in this study is derived from Eisenhardt and Graebner [17] who stipulate that "qualitative research is highly descriptive, emphasizing the social construction of reality, and focuses on revealing how extant theory operates in particular examples" [17].

Some statistical testing employing a questionnaire approach has been undertaken to examine if the 6 determinants of PJ are being experienced by the participants in the workshop process, using the dual facilitation process. Questionnaires were designed to check if the dual facilitation process was procedurally fair. Preliminary findings show a good degree of resonance between the dual facilitation process and the determinants, as noted above.

5   Summary and Conclusion

In the area of Organizational Justice research there are very few practitioner orientated reviews and there is a lack of practice based theory development [18]. The examination here is firmly "practice based" in terms of context, as the study is drawn from focus group research on students and organizations.

The electronic gather of qualitative statements (known as concepts) on the prompt question allows the participants a clear "voice". It has been noted that "voice" has value beyond is ability to shape decision making processes and outcomes [19]. In the field of organizational research, justice is considered to be socially constructed. In the focus group space we propose that, this subjective aspect of a socially constructed reality, can be "managed" and "controlled" via human facilitation and use of group decision negotiation software, such that the overall *structured process* used in these focus group studies becomes fairer, in the vein of procedural justice. Although it is based upon a small sample and more comparative studies are needed, the statistical analysis appears to confirm the alignment between the dual facilitation process and the determinants of procedural justice.

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Negotiating meaning through artefacts:
a micro-level analysis of strategy discourse

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Abstract. This research contributes to the domain of strategy making, specifically to unpacking the complexity of sociomateriality in strategy discourse. Scholars have emphasized the potential of artefacts to enhance sensemaking during strategizing. However there is a lack of insight into how artefacts and conversational aspects are linked at the micro-level of discourse, also how artefacts and sensemaking shape one another. This research addresses this gap by empirically analyzing strategy discourse within a facilitated modelling workshop. Considering strategizing as a socially constructed activity, the author analyzes a workshop transcript to assess the extent to which stakeholders' appropriation of artefacts supports them in engaging in negotiation of meaning with action implications. Moreover, *how* artefacts and negotiation of meaning shape one another is identified. The data suggest that appropriating artefacts helps stakeholders negotiate meaning effectively, but appropriation occurs at varying intensities depending on the issue of concern, the artefact used and who appropriates it.

Keywords: Strategy making, facilitated modelling, sensemaking, artefacts, management teams.

Besides words, stakeholders may also use sociomaterial elements such as locations, spatial arrangements and artefacts to engage in strategy discourse. These elements shape interactions between stakeholders, thus creating a joint effort to strategizing [1]. Strategic discourse often takes place within workshops, during which stakeholders sit around tables, in a U-shaped format and/or use artefacts such as flip-charts, post-it notes, and PowerPoint. The focus of this research is on artefacts used during Facilitated Modelling (FM) workshops [2]. Artefacts support stakeholders in adopting particular discursive behaviors and engaging in strategic interactions. At the same time, discursive behaviors shape the content and structure of the artefacts, thus influencing how they are used to enhance strategic interactions [3].

Artefacts are also deemed to foster stakeholders' sensemaking during strategic discourse [3, 4, 1] by helping them make sense of and ascribing new meanings to changing organizational situations [5, 6]. From a discourse perspective sensemaking has been related to negotiation of meaning [7], which results from linguistic interactions amongst stakeholders [8]. Tsoukas [9] emphasizes the generative effect of linguistic interactions as they may contribute to the emergence of productive dialogue. Interactions that occur during productive dialogue are more likely to enhance negotiation of meaning that has action implications. During productive dialogue stakeholders, namely, take distance from their customary ways of acting, thus gaining critical insight into organizational practices and routines. Taking distance supports stakeholders in generating new meanings concerning the issue of concern. According to Tsoukas [9] dialogue is productive when stakeholders are *relationally engaged* in interactions. Relational engagement occurs when stakeholders openly comment on each other's contributions and acknowledge their willingness to collaboratively resolve issues and maintain their social relationships. Stakeholders express relational engagement through particular communicative practices, such as inviting others to engage in the negotiation of meaning, agreeing with alternative meanings, and clarifying and building on others' contributions [7]. Conversely, when *calculated engagement* occurs, stakeholders adopt limited collaborative behaviors and are not open to mutual influence, thus dialogue is unproductive [9]. Calculated engagement is expressed by, for instance, stakeholders ignoring alternative meanings, deploying authority to eliminate meanings, and undermining others' contributions [7].

Despite notable contributions to identifying the links between artefacts and sensemaking [e.g. 3, 4] scholars "do not typically bracket sensemaking and sociomaterial aspects of strategy work together with strategy discourses" [1, p. 193]. There is a need for further empirical analysis of how sensemaking results from the interaction between artefacts and conversational aspects, and how artefacts and sensemaking shape one another [1]. Importantly, the micro-processes that link artefacts and conversational aspects during sensemaking tend to remain in the background of analysis [10]. To address this gap the author presents a qualitative, micro-level analysis of strategy discourse during a one-day FM workshop [2]. The workshop was carried out within a member-driven, food cooperative in Denmark and the artefacts used were the Viable System Model (VSM) [11], and scripts [12] and a power--point presentation (showing e.g. the mission statement of the cooperative and explanations of the VSM) that helped the facilitator manage the workshop.

The author draws on Adaptive Structuration Theory to operationalise the process of strategic discourse supported by artefacts. Structuration implies the production and reproduction of a social system – a social entity engaged in practices, which trigger observable patterns of relations – through stakeholders' appropriation of generative structures. Appropriation occurs by stakeholders adopting particular structuring moves, for example, referring to structures, substituting a structure with another one, combining or contrasting, as well as rejecting structures. Structures are appropriated to produce and reproduce social systems and act within them. At the same time, structures are produced and reproduced through action. Stakeholders appropriate structures and adapt them to their own purposes, thus imposing conditions for structuration that enable and/or constrain group action [13, 14].

The author analyzes the extent to which stakeholders' appropriation of artefacts supports them in adopting communicative practices that foster relational engagement, thus engaging in negotiation of meaning with action implications. Moreover, *how* artefacts and negotiation of meaning shape one another is identified.

The analysis shows that appropriation of artefacts helps stakeholders relationally engage and negotiate meaning that has action implications. Negotiation of meaning contributes to the achievement of workshop outcomes [2] that are, a reformulation of the mission statement, a VSM of the cooperative on a flipchart, and an action plan with first deadlines and priorities for action. The analysis also identifies that appropriation of artefacts occurs at varying intensities depending on (i) the characteristics of the issue addressed by the stakeholders; (ii) the artefact(s) used; and (iii) who (participants or facilitator) uses the artefacts.

By showing how appropriation of artefacts helps stakeholders negotiate meaning with action implications via relational engagement, and that appropriation intensity varies within the same discourse, this research contributes to the domain of strategy making. In particular, it provides theoretical insight into how the use of artefacts and conversational aspects are intertwined at the micro-level of discourse.

This research also contributes to unpacking the complexity and dynamics of FM [15], and indicates suggestions for facilitators of how artefacts can be appropriated for different purposes (e.g. in terms of managing the workshop) and to achieve specific workshop outcomes.

The generalizability of this research is limited as it draws on a single case. Further research involving different cases and different artefacts would enrich the importance of the results for scientific discourse.

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Unpacking the complexity of group problem structuring

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Abstract. In this paper we examine the potential usefulness of adopting ethnomethodology and conversation analytic perspectives to gain a nuanced understanding of the complex micro-practices associated with the practice of problem structuring processes. We illustrate the application of this methodological lens to the case of a facilitated group problem structuring workshop undertaken with a top management team.

Keywords: Problem structuring methods, group process, practice, ethnomethodology, conversation analysis.

There is an increasing academic interest in unpacking the complexity associated with the practice of problem structuring methods (PSMs) [1, 2], and some progress is clearly evident in the extant PSM literature. For example, empirical accounts of the content PSM practice are certainly accessible in the literature. These include works that show how PSMs are used to model particular problem domains [e.g. 3, 4–7], or how PSMs can be mixed with other modelling methods [e.g. 8, 9, 10]. Similarly, accounts of the actual process of PSM practice can be easily found in the literature, particularly in the form of 'deep' reflections, informed by theory, experience, or both [11–13].

In this paper we focus on the process of PSM practice, and argue that in order to better understand its complexity we need to move beyond reflection to examine actual PSM practice *in situ*. This requires producing empirically-grounded insights derived from studying PSM processes in themselves. This important because in order to inform and improve PSM practice we first need to engage with what PSM practitioners actually do when carrying out their work [14]. Indeed, the examination of PSM practice *in situ* have remained relatively unexplored in the literature, despite recent advances [e.g. 15, 16–18].

To this end, we draw on ethnomethodological and conversation analytic perspectives [19, 20] as potentially useful lenses to produce a more nuanced understanding of the complexity of the PSM process within its context of use. We use these lenses to illustrate the extent

to which this approach can contribute to improve our understanding of PSM practice within the content of a group causal mapping workshop. Our focus will be threefold: first, we will concentrate on unpacking the complex intertwining of the technical (group causal mapping) and the social (the participants and PSM facilitator) dimensions within this workshop; second, we will look closely at how the group causal mapping contributes to the problem structuring process by highlighting specific strategies used by the participants and the PSM facilitator to do their work; and, third, we will show how the acknowledgement of the group causal mapping's contribution (i.e. its 'agency') by the participants enables or constrain them to make progress in the workshop.

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Social Housing Allocation:
A Problem Structuring approach

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The demand for social housing (SH) has emerged all over Europe and it is exponentially increasing particularly since the 2008 global economic crisis. This growing temporary housing demand comes from a sector of the population living in the so-called "grey zone", also known as the 'in-work poverty' population. The "grey zone" is composed of individuals in a situation of housing vulnerability [39]: people whose housing needs cannot be met by the market and at the same time who are not eligible to access public housing programs, such as the homeless, internal migrants, city users, single-earner families, the elderly, people subject to eviction, single parents.

Typically, the process underpinning the selection of SH projects has focused on reducing the SH shortage by providing enough supply. Nowadays, the process of selection of SH projects is no longer simply related to the lack of housing stock but also to the social, economic and cultural changes that currently affect a wide segment of the European population [7, 9, 19]. In this new scenario, the focus of SH policies is shifting from the building understood as a product to the people who live in the building. In fact where the human factor is fundamental to target the recipients, in order to pursue the integration of different social groups and the improvement the living conditions in the buildings. As the attention now being given to the topic in the international arena testifies, the scientific community and the market are looking to SH as a key area in which to test new approaches to sustainable design and implementation, taking into account not only the three "consolidated" pillars of sustainability (i. e. environment, society and economy), but also relevant additional dimensions, such as ethics, culture and technology [5].

In this scenario, SH represents a challenge that requires to be made with limited investments and at the same time designed to ensure the reduction of housing cost for users, promoters and managers in the use phase, as well as the achievement of the highest quality

standards. The housing cost, including both the rental costs and those of utilities should not exceed 40% of the users income [33].

It is a given fact that sustainable design has, above all, the environmental performance in terms of building envelope as its object and purpose. Usually, alongside this, the use of renewable energy, eco-friendly materials and technological solutions for the quality of life indoors and the optimal management of water and waste are recognized as integrated quality of the intervention. An aspect that nowadays is considered increasingly important is the ability of real estate transactions to generate and preserve value. Moreover, a key objective of SH is the creation of an "active community" where people can easily integrate into the urban context. Therefore, it is essential to pay particular attention to the location of the project, its accessibility and proximity to services, to all the forms of participation and co-planning that the project can stimulate, to the mix of facilities to be offered (in the individual building and in the neighbourhood), promoting reduced economic and social inequalities and avoiding the creation of social segregation [3]. In this sense, along with the architectural design it is therefore essential to simultaneously undertake the "project of social management" of the intervention, which means predicting the set of actors and actions in the use phase that can ensure their sustainability in terms of the community. In the planning phase it a reference profile of the future community that will ensure a balanced social mix should already be established. However, in the light of recent international environmental protocols for assessing sustainability in construction, such as LEED, SB 100, BREEAM communities, CasaClima Habitat, protocol ITHACA, Lidera, AUDIS [3, 24, 25] it is clear that, if these types of assessments are applied to SH operations, the environmental dimension takes precedence, mostly linked to energy efficiency and the attention to building materials, rather than to the social and economic aspects. Little attention is given to interpersonal sphere of living, or the aptitude of the building for the implementation of specific activities of social inclusion, or to the expected interventions and targeted aid to contrast the difficulties of the future users of social housing. These "non-traditional" aspects for a conventional residence become paramount in an SH intervention.

In order to tackle this social challenge, meet the user needs and foster effective means of public/private investment, this research intends to propose a new more tailored and effective approach for the decision making process related to the allocation of public (and private) resources for SH projects. Our research is articulated through an overview of the literature of the field and the analysis of the process of evaluation and selection of the SH interventions actually adopted by a banking foundation, in order to develop specific considerations and contributions on the topic.

A large and consolidated amount of recent literature concerning SH problems exists in different fields. Mention can be made of the studies conducted in the spheres of the link between energy and technical aspects [16, 18, 19, 20] the relation between technical aspects and construction costs [8, 10, 11, 13, 28, 37, 40], the evaluation methods of the social retrofitting intervention [31, 2, 4, 17, 26, 32, 35, 36], the quality of life and the reduction of social exclusion [12, 14, 21, 23, 29, 30]. The above mentioned extensive literature highlights the need to understand and decide which SH projects are worth funding, based on technical and social considerations, in order to provide access to housing and related social support for

those who need it [26, 38]. Therefore, a consolidated and structured evaluation method able to simultaneously consider all the aforementioned aspects in SH field is still needed. The research presented in this paper begins with the experience of an Italian bank foundation that has been involved in SH projects since 2007. This foundation developed its own assessment methodology to screen large funding requests from social agencies (cooperatives, religious bodies, public administration) wishing to implement SH projects. The methodology consists of three decision-making process stages:

1. A technical evaluation of the buildings in which the SH projects will be hosted is performed. A team according to four main criteria: (i) overall architectural consistency of the building; (ii) economic correctness of the adjustment work planned; (iii) accessibility of the spaces for people with disabilities; and, (iv) flexibility/modularity of the building. These criteria are in turn divided into thirteen sub-criteria;

2. A social evaluation of how the projects intend to provide social support destined for the future beneficiaries (mainly the inhabitants but also the neighbourhood communities) of the SH units is undertaken. A team comprising psychologists, community psychologists and psychotherapists assess all the SH projects according to three main criteria: (i) overall quality of the social support project; (ii) fairness of the financial plan of the social project; and, (iii) possibility to create synergies with cooperatives and social agencies in order to perform social activities. These criteria are subsequently divided into eleven sub-criteria;

3. Criteria weights are assigned and aggregated during the technical and social assessments by a multidisciplinary group of experts in order to obtain a ranking of the projects.

This study conceives the above assessment methodology as a Problem Structuring Method (PSM) [1, 15, 22, 27, 34], since it is configured as a flexible and real mechanism for addressing complex problems by representing the situation in a structured manner, as it exhibits many similarities with consolidated and recognised PSMs [27]. Moreover, the aforementioned methodology has the potential to be significantly improved in order to address complex issues characterized by the presence of multiple actors often with different perspectives or objectives and conflicting interests supporting participants' learning about their own and others' perspectives, as well as the problematic situation of concern [34, 6].

From this perspective, the research intends to experiment a possible improvement to the Bank foundation's assessment methodology, exploiting a participative method, based on the use of emerging technologies. ICT could provide spontaneous and voluntary data to be incorporated into a structured method, not only to support the Decision Maker (DM) in the *ex-ante* phase (with portfolio problems or constructing a tender; with the definition of the architectural, technical and social characteristics of the intervention), but also *in itinere* and in the *ex-post* phases, when it will be possible to monitor if the final outcomes meet the initial objectives.

The decision-making process related to the SH projects will be structured as follows:

– The first level of the decision-making process will directly involve the citizens and the stakeholders with the aim of clarifying the real needs of the beneficiaries of the SH units. In this phase the data will be collected in two ways: "spontaneous data", via the analysis of social networks data, such as tweets and Flickr data; "voluntary data", through partially structured and partially open surveys, analysed with specific semantic theories and tools;

– The second level of the decision-making process will involve the DM, experts, specific stakeholders operating directly in the SH sector (i.e. the managers of the SH buildings) and the citizens, in order to structure the decision-making model through a series of workshops. In this phase the use of PSM and ICT will be strongly supported by visual representation (3D models).

After a pilot test in Italy, the research will continue by performing test planning activities of the decision-making process in other European Countries.

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Two-party conflict resolution in 55 minutes!

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Abstract. In two significant multi-organizational conflict situations a GSS has enabled the resolution of the conflict in under one-hour. In both cases the parties had previously been involved in several off-site workshops designed to resolve the conflict and had failed. This research uses a timed log of the GSS use to explore what happened in the use of the GSS that could not have happened without the use of the GSS, and the exploration suggests important aspects of GSS use that have implication for the resolution of this type of conflict.

Keywords: Group Support Systems (GSS), multi-organizational conflict, anonymity, scripts and stories, causal mapping.

1 Introduction

On three separate occasions, and with different groups of people, we have been involved in conflict resolution between the senior managers of two organizations necessarily required to work together. In each case the conflict has been regarded as highly significant and dysfunctional to both organizations. In addition the conflict situations had been a long-running (6–8 months) prior to our involvement. In each case the two parties had met together on at least three occasions, and on neutral territory, in an attempt to resolve the conflict. The management teams on either side of the conflict were senior enough, and had a high enough degree of autonomy, to reach agreements that could be acted upon without recourse to more senior managers.

Following the attempt to resolve the conflict on their own they requested our involvement on the basis that the use of a Group Support System might produce a breakthrough. In each case a breakthrough occurred within 55 minutes from the start of a planned one-day workshop. The measure of these breakthroughs was taken to be that the senior manager/leader of each group determined that, as far as they were concerned, the conflict had been fundamentally resolved after this time period. In each case the clients were of the view that they could leave the workshop at that time with a satisfactory conclusion. However, because the workshops had been planned in neutral territory and at a location equidistant from each of the party's headquarters, they agreed that they might use the opportunity by taking the rest of the day to establish agreements about ways of avoiding such future conflicts.

2 Research Question

Thus the research question for us was to try and establish how the Group Support System, or other factors, had led to conflict resolution within such a short time relative to the time the groups had already spent trying to resolve the conflict. In each case the senior managers were of the view that it would not have been possible to reach such a resolution in such a short time without the use of the Group Support System.

3 The Group Support System (GSS)

The Group Support System used was *Group Explorer*: a support system built around the traditional use of a networked set of consoles (one for each participant) that are allowed participants to communicate directly with the public display. However, the particular characteristic of *Group Explorer* is that it uses causal mapping as the basis for structuring complex problems such as the conflict situations addressed here.

4 Research Method and Limitations

The system keeps a time based record/log of every interaction occurring. This provided ourselves, as researchers, with a rich set of data amenable to analysis. Because of the sensitivity of the workshops it was not possible to have other highly desirable records analysis – such as video tapes, or observer notes. Thus the research reported here suffers from two significant weaknesses: a dependency on rich but singular data is recorded by the log of the group support system, and a dependency upon the data from only two cases (in one of the three cases the log failed).

Nevertheless the research question posed is an important one given the success of the three workshops and a tentative analysis of the research data might at least suggest some preliminary hypotheses. It is important to note, of course, that the opportunity for an involvement in such serious conflict situations does not arise on a regular basis, and so the opportunity to gather data from a larger number of instances is highly problematic.

5 Preliminary Discussion

This paper reports on the analysis of the data provided from the two workshops, explores emergent properties of this data through a variety of different analyses that begin to focus on:
i)   different episodes [1], in the group session:
   a)   the first stage – the first episode – involves each participant doing a fairly rapid dump of their own views. The dump lasts about 10 minutes and involves each participant concentrating on typing in their own statements. During this time they make little reference to the public screen and so little listening is undertaken.

    b) after this episode, when input begins to slow and the emotional impact is one of catharsis – a sense of relief as been given opportunity to express your own views without interruption. During this stage there appears to be some awareness of anonymity, but still a sense of the possible need for face-saving.

    c) because there is no requirement, or expectation, the third episode allows for development of both more accusatory statements and more conciliatory statements.

    d) the final, and fourth, episode involves the building of mutual understanding about the misunderstanding.

ii) the significance of the participants building a causal map that links contributions from both parties.

iii) the role of higher level aspects of a GSS in conflict situations, for example:

    a) elaboration of: the role of anonymity in a GSS [2],

    b) claims for being treated as equal partners where, in negotiations, "low-power parties fight for equal treatment and resist the lower status imposed on them by the high power party" [3],

    c) the significance of facilitating a move away from organisational 'scripts', or 'dominant stories' [4],

    d) Zartman's [5] argument that formula/details approach is a good approach for studying complex negotiation situations as it shifts the focus on the goals and options that help both parties in reaching an agreement from which they both can benefit, and

    e) the role of the BATNA of both parties in constraining the bargaining zone (ZOPA) – the zone where it is sensible for both parties to reach an agreement [6] and other principles promoted in 'getting to yes' [7].

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Group Support for Healthcare Data Utilization

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Abstract. The global crisis in healthcare brought about by an aging population necessitates new thinking. Interesting, available (or easily obtainable) data is currently being under-utilized partly as a result of lack of engagement and consensus formation with the multitude of relevant stakeholders. Research in progress is using Group Support Systems (GSS) to help identify relevant data to be collected and used in a systematic approach.

Keywords: Healthcare, Group Support, GSS, Data Utilization.

1 Introduction

Healthcare as we know it is at a time of crisis. No country in the world can deal with the onslaught of chronic diseases brought on by an aging population when the first line of detection (and subsequent treatment) is a personal visit to a doctor [1]. By that point in time, most chronic diseases (e.g., diabetes) are beyond the point of being simply treated (e.g., through diet and exercise) and often require extensive (and expensive) procedures and medicines. Interestingly, many patients potentially susceptible to chronic diseases could be identified were only their existing health data to be systematically collected, integrated and analyzed [2, 3]. Unfortunately, that data is currently being underutilized. Historically, doctors have made decisions largely on the basis of education and experience in the absence of any systematically acquired data outside the scope of specific measures (e.g., from blood tests) related to a specific patient at the time of encounter.

Increasingly, though, there is a plethora of data available to assist in chronic disease prevention and early detection as well as home-based monitoring to maximize treatment effectiveness and minimize ongoing hospital visits [4]. These data are currently being (or could easily be) generated but, for a variety of reasons, is not being utilized. A particularly salient reason is lack of knowledge (and agreement) on what data to collect (and discard) to be made available to whom (and in what form) under varied circumstances. Effective treatment of chronic diseases requires input from a variety of stakeholders, each of whom has their own perspective and reasoning. Continuous monitoring of treatments is also important to

judge effectiveness and fine-tune prescriptions which can include diet and exercise as well as medicines, both traditional and non-conventional. Patients need to also be well informed and integrated into the process to assure compliance and assist in decision-making.

2   Group Support Systems

Group Support Systems (GSS) provide a convenient and efficient mechanism to engage multiple stakeholders to seek solutions to data collection and management issues as well as subsequent buy-in and use. The use of GSS in complicated settings has been well demonstrated going back over twenty-five years in overcoming the process losses and amplifying process gains associated with achieving meaningful consensus, e.g., [5, 6, 7]. Opportunities for systematic application in healthcare are many and warrant serious attention for both localized and distributed use. Technology is up to the task and increasingly portable and cost-effective.

Patients, family members, doctors and administrators at various levels (including local, regional, national and even international) all have a stake and opinions to be considered that can be captured (using a GSS). Failure to comprehensively do so can easily render programs of treatment ineffective. Manual efforts, in the absence of GSS, have not proven sustainable and have generally been found lacking by one or more of the relevant stakeholders [8, 3]. Given the set of circumstances and pressing global need, systematic utilization of GSS can be an important success factor.

3   Research Approach

Research in progress at the Harbin eHealth Research Institute is seeking to address this situation in a series of studies using an action design research approach [9]. This approach has been especially encouraged to be applied in healthcare contexts [10]. Using this research approach, key stakeholders are being identified and engaged to participate in a series of GSS sessions from which key data elements are being identified for a population of interest. Vendors have indicated willingness to provide technology to assist in gathering relevant sensor-based data to be transmitted via mobile devices in cooperation with a major service provider. Relevant medical records and patient history data is also being provided courtesy of local hospital interest and commitment. The ongoing nature of the effectiveness of data analysis and subsequent use by medical community professionals is being evaluated.

Little exists at this point in terms of concrete results extending beyond stakeholder enthusiasm based on focus groups and interaction with medical professionals and administrators. Simply put, the research is in its infancy and has not had time to accumulate conclusive evidence and demonstrate effectiveness. However, we expect over the course of the next four months to have something concrete to offer. Government officials have expressed interested in evidence that supports policy making. Towards that end, we look forward to being able to present preliminary results by mid 2015.

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Negotiation and Group Processes Support

Abstract of Keynote Speech
The Hidden Persuader:
The Role of the Advisor in Negotiations –
Perspectives from the European Union

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Theoretical models of the processes of negotiation and group decision-making often overlook or at least do not fully account for the important role played by persons who advise negotiators and participants in group decision making. Advisors are often overlooked because they are not formally part of the negotiation process. Indeed, they may not even be present at the place where the negotiation is taking place. Yet through their advice, advisors can profoundly influence the negotiation and decision-making processes and ultimately their results. Sight unseen and voice unheard by other parties in a negotiation, advisors are often "hidden persuaders," important but unrecognized sources of influence on the negotiation dynamic.[1] Advice, no matter how earnestly or casually given, can have significant consequences, consequences that neither advisors nor recipients of advice may foresee at the time it is given. It therefore behooves scholars of negotiation and group decision making to understand the role and methods of advisors involved in these processes. This key note talk explores those roles and methods.

Drawing on his prior work, as well as survey research conducted in 2013 among approximately seventy advisors to the European Union Council of Ministers, a forum for continuing and intense negotiations among the representatives of the twenty-eight EU member states, Salacuse explores the nature of advice and the range of relationships that may exist between advisors and their "clients," the negotiators who actually conduct negotiations. He argues that advising is much more than the mere communication of information from advisor to negotiator and that to be effective a relationship must exist between the two parties. Experienced advisors understand this phenomenon and therefore expend considerable effort in building a productive relationship with the negotiators they advise.

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[1] The term "hidden persuader" was of course made famous by Vance Packard's well-known book *The Hidden Persuaders*, first published in 1957, which explores the use of motivational research by the advertising industry to manipulate the expectations of consumers.

Salacuse identifies three models of the advisor-negotiator relationship. Model I is *the advisor as director*, wherein the advisor tends to take control of the negotiating process, directing the negotiator in actions that the negotiator should take to achieve success at the negotiation. Model II is *the advisor as servant* in which the advisor merely responds to the demands of the client for help and guidance in the negotiation. Model III is *the advisor as partner*, wherein advisor and negotiator jointly manage the advising process and together take co-ownership of the problem to be solved. Drawing on historical examples as well as survey data from the EU Council of Ministers, Salacuse explores the factors that lead advisors and negotiators to adopt each of these three models and the differing effects on the negotiation process that each of the three may have. He then considers how an understanding of the advising process may help negotiators on both sides of the table to arrive and more effective agreements and concludes by offering a framework of seven principles to enable advisors to carry out their task more productively.

What is Really Behind All This?
The Relationship between Negotiation Styles and Negotiation Tactics

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Abstract. In increasingly competitive markets it is crucial for industrial marketers to understand buyers' negotiation behavior in order to adapt their selling strategies. Consequently, negotiation styles – characterized as observable patterns of behavior – have captured the attention of many scholars. So far, however, the manifested tactical behavior accompanying a specific negotiation style has not been the focus of empirical analysis. Hence, the main purpose of the present paper is to examine the relationship between purchasing managers' negotiation style and their tactical behavior. Our results reveal that certain negotiation tactics accompany specific styles, but these tactics were not throughout obvious at first glance, especially with regard to the collaborating and compromising style. We also analyze whether the crucial long-term business orientation in the purchasing context influences tactical behavior irrespective of the applied style. Our findings show that the long-term orientation of purchasing negotiators had an impact on their applied negotiation tactics.

Keywords: Negotiation Styles, Negotiation Tactics, Buyers' Negotiation Behavior, Long-Term Orientation.

1 Introduction

Negotiations – defined as interpersonal decision-making processes [1] – occur in various situations in private and professional contexts [e.g. 2]. In the latter, negotiations are especially prevalent in buyer-seller relationships [3], where both parties have to come to a joint decision on several issues, such as price, quantity, and delivery conditions [e.g. 4]. In today's competitive markets it becomes increasingly difficult for sellers to reach favorable outcomes. Thus, sellers are strongly concerned with having a better understanding of buyers' negotiation behavior in order to adapt their selling strategies [5]. Following this line of thinking, it seems useful to examine which negotiation styles – defined as observable patterns of negotiation

behavior [6] – purchasing managers apply, and especially what tactical behavior goes along with the specific negotiation style. Only by having these insights into a buyer's negotiation behavior, can sellers optimally prepare for upcoming negotiations and thus improve their negotiation performance.

Although several studies have examined different aspects of purchasers' negotiation behaviors, such as the different determinants (e.g., organizational or individual influences) of negotiation behavior [7], the influence of a superior's monitoring on buyers' behavior [5], or the impact of buyers' personal characteristics on negotiation performance [3], there has been very little analysis of purchasing managers' negotiation styles [e.g. 8]. To the best of our knowledge only a few studies have examined negotiation styles in the purchasing context [e.g. 9]. For instance, Perdue, Day and Michaels [10] focus on revealing the relevance of the different negotiation styles in the purchasing context, and a follow-up study showed the preferred negotiation styles according to the type of the negotiation counterpart [11]. Moreover, Ganesan [12] has found that different negotiation styles of buyers accompany a certain concession-making behavior on both important and unimportant negotiation issues.

Although these studies provide valuable insights, they have not been satisfactory enough for sellers. A major reason for this is that there is no study that empirically analyzes the relationship between purchasing managers' negotiation styles and their manifested tactical behavior.

Against this background, the main objective of the present paper is to examine purchasers' applied negotiation styles comprehensively by also investigating the manifested tactics that go along with them. In order to gain profound insights, we distinguish between a buyer's long-term and short-term business orientation. Based on these insights, we want to derive valuable implications for the selling practice.

We now present existing literature on negotiation styles and negotiation tactics, on the basis of which we elaborate our hypotheses and report on a large sample of purchasing managers. A description of our methodology and results follows, before we derive implications for both research and practice.

2   Theoretical Background

Negotiation styles are learned patterns of behaviors that are characterized by individual preferences of negotiating [e.g. 6]. Most scholars identify five different negotiation styles by drawing from Blake and Mouton's [13] Managerial Grid [e.g. 14, 15], which was the first framework that classified different styles of handling managerial conflict according to two dimensions. Accordingly, Thomas [14] elaborated on two dimensions – cooperativeness and assertiveness – and arrayed the following styles along these two axes: A competing style stands for an uncooperative and assertive behavior, which is expressed in defending its own position, if necessary at the expenses of the other party; an assertive and cooperative negotiator, who tries to fulfill the interest of both parties, is considered to be collaborating. The compromising style is set in the middle of both dimensions and characterizes a negotiator who is seeking a middle-ground position and looks to split the win-set. Unassertive and

uncooperative negotiators attempt not to address the conflict and are thus named as negotiators applying the avoiding style. The opposite of the competing negotiator is the accommodating one, who is described as a person neglecting his own concerns to satisfy the needs of the other negotiation party. Despite the conceptual background of these negotiation styles, scholars have exposed, by means of a survey among buyers, that the two latter ones – the avoiding and accommodating styles – seem not to be crucial to depicting the negotiation behavior of purchasing managers [10]. A possible explanation might be that industrial buyers are instructed to reach the most favorable outcomes for their companies during a negotiation encounter with representatives of their supplier [10]. This goal can be difficult to achieve by avoiding negotiators that try to keep out of the negotiation or negotiators who apply the accommodating style that neglects their own needs.

These negotiation styles are reflected in specific behaviors in negotiations [6]. One specific behavior that has often been the subject of analysis is negotiation tactics. For instance, the focus has been on whether certain negotiation tactics can be judged as ethically acceptable [16], what impact negotiation tactics have on the negotiation outcome [17], and the use of negotiation tactics that depend on negotiators' characteristics, such as gender or nationality [16]. Considering the tactical behavior of purchasers, the existing studies become more limited. Alexander, Schul and Babakus [18] detected that buyers initiate and respond more often with aggressive negotiation tactics than sellers do. Similarly, Perdue [19] examined 10 aggressive bargaining tactics that are applied by industrial buyers, and she revealed that buyers favor influencing the seller's perception about the level of competition. Against this background, the following figure gives an overview of relevant negotiation tactics in the purchasing context, and their degree of competitiveness or cooperativeness (assigned independently by two persons experienced in negotiation research):

Table 1. Conceptual Framework.

Type of Negotiation Tactic	Description of the Negotiation Tactic	Author	Cooperative vs. Competitive Orientation
Good Guy-Bad Guy	Two negotiators try to assign different roles during the negotiation: the role of the bad guy, who makes unreasonable demands and behaves inappropriately, and the role of the good guy, who represents the buyer's reasonable and real position.	Perdue [19]	Competitive
Excessive Demands	By making excessive demands, the own bargaining zone is enlarged, and the buyer might get more insights into the seller's position.	Perdue [19]	Competitive
Limited Authority	Negotiators try to create the impression that they have limited authorization regarding, for instance, the budget or rescheduling the negotiation. Thus, sellers can only move the negotiation up to the next authority or accept the buyer's conditions.	Perdue [19]	Competitive
Putting Down	The buyer tries to put down the performance of the seller, which in return might leave the seller in a more defensive position or even concerned about losing the business.	Perdue [19]	Competitive

Type of Negotiation Tactic	Description of the Negotiation Tactic	Author	Cooperative vs. Competitive Orientation
Punishment	Negotiators threaten their counterpart with moving the negotiations up to the level of the seller's boss, which would result in a loss of face for the seller.	Perdue [19]	Competitive
Threatening	Buyers using this tactic threaten the seller with closing the contract with a competitor if the buyer's demands are not met.	Perdue [19]	Competitive
Employing a Shill	The buyer gives the seller the impression that there is a competitor (real or imagined) who offers a better deal.	Perdue [19]	Competitive
Aggressive Competition	The impression is given by the buyer that there are other competitors who are intensively fighting to get the agreement.	Perdue [19]	Competitive
Time Pressure	Buyers applying this tactic try to impose time pressure on their negotiation counterpart in order to force them to make quicker decisions.	Perdue [19]	Competitive
Lack of Flexibility	Buyers claim the lack of flexibility to make any significant concessions to their opening demands.	Perdue [19]	Competitive
Gentleness	Buyers who apply this tactic do not push their negotiation counterpart to come to an agreement but rather give them enough time to think properly about the proposed negotiation conditions.	Karrass [20]	Cooperative
First Offer	Buyers who express the first offer during the negotiation try to set a cognitive anchor, which influences the counterpart's offer positively regarding their own negotiation outcome.	Lewicki [21] Galinsky & Mussweiler [22]	Competitive/ Cooperative
Acknow--ledgement	Negotiators who apply this tactic express their acknowledgement to their counterpart, confirm its competence and might even praise their performance.	Karrass [20]	Cooperative
Tit for Tat	Negotiators who use this tactic foster a reciprocal accommodating behavior with their counterpart. If they give in, they expect the other party to accommodate them.	Karrass [20]	Cooperative

Furthermore, negotiation research in general has revealed some evidence that for instance a competing negotiator would rather apply more competitive negotiation tactics. Thus, Lewicki and Robinson [16] have found that negotiators rating themselves as more aggressive/ competitive more often use tactics that others rate as "unethical" negotiation tactics. By contrast, Pullins et al. [23] state that negotiation parties deploy cooperative negotiation tactics in order to reach win-win outcomes, which indicates a collaborating negotiation style. As the compromising style lies between the collaborating and dominating negotiation style [e.g. 14], it seems evident that compromising negotiators tend to apply equally cooperative and competitive negotiation tactics. As these insights are not empirically examined in the context of purchasing managers' negotiation styles, we derive the subsequent hypotheses:

H1a: *Competing purchasing negotiators apply more competitive negotiation tactics.*

H1b: *Collaborating purchasing negotiators apply more cooperative negotiation tactics.*

H1c: *Compromising purchasing negotiators apply equally cooperative and competitive negotiation tactics.*

In the context of buyer-seller negotiations, it further seems to be necessary to distinguish between short- and long-term relationships. Existing research has shown that especially close buyer-seller relationships can help buyers to establish a substantial competitive advantage, as more information is received, or better prices are allowed [e.g. 7, 12, 24].

Moreover, Ganesan [12] has found that a long-term oriented retailer, characterized as the perception that outcomes are interdependent, is more likely to apply a problem-solving (equivalent to Thomas' [14] collaborating negotiation style) or a compromising negotiation style. However, up to now research has not yet examined whether negotiators change their tactical behavior when they plan a long-term business relationship versus a short-term encounter with their negotiation partner irrespective of their applied negotiation style. Thus, it is conceivable that even negotiators, who generally apply a competing negotiation style, rather tend to execute more cooperative negotiation tactics when negotiating with a long-term business partner. Against this background, we derive the following hypothesis:

H2: *Purchasing managers, who are in a long-term business relationship with their negotiation partner, apply more cooperative negotiation tactics irrespective of their negotiation style.*

3   Empirical Study

3.1   Methodology

In order to test our hypotheses, a large online survey was conducted among purchasing managers, whom we asked to recall their past negotiation with sales representatives. The questionnaire consisted of two parts: The first part covered questions considering the managers' negotiations with suppliers, the second one asked for personal and organizational information. In total, 3,000 buyers were contacted via e-mail and diverse purchasing forums and platforms. The return rate was 12%, and 269 questionnaires were answered completely.

To detect which negotiation style was applied by the subjects, we used a reduced version of Thomas and Kilmann's [25] conflict mode instrument that consists of 20 items. This scale was slightly adapted to the buyer-seller context and tested in a pre-study for its reliability and validity. Subsequently, the subjects had to rank the items on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree) and thus indicate how they behaved in their last negotiation. The competitive negotiation tactics were based on Perdue's [19] scale for aggressive negotiation tactics. The remaining four tactics (*Gentleness*, *First Offer*, *Acknowledgement*, *Tit for Tat*) were derived from a literature analysis and interviews with purchasing managers. As above subjects had to rank whether they applied the respective negotiation tactics during their last negotiation on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree).

In order to capture the long-term orientation of the subjects, we relied on a seven-point Likert scale of Ganesan [12] (1 = strongly disagree; 7 = strongly agree).

3.2 Results

Our results reveal that the most applied negotiation styles in our buyer's sample are the collaborating negotiation style with a mean value of 5.79, followed by the competing (mean value = 5.32) and the compromising negotiation styles (mean value = 4.14). Purchasing managers barely used the accommodating (mean value = 3.79) and avoiding styles (mean value = 3.22), which confirms previous results [9, 10]. According to their highest score on the specific negotiation style items, we classified 145 purchasing managers as collaborative negotiators, 62 as competitive, and 16 showed a compromising negotiation style.

Table 2. Correlations between Negotiation Styles and Negotiation Tactics.

Negotiation Tactics	N	Mean	SD	Collaborating	Competing	Compromising
Good Guy-Bad Guy	268	2.99	2.04	.01	**.236**	.071
Excessive Demands	267	3.32	2.04	−.094	**.126***	−.006
Limited Authority	268	3.36	2.08	−.072	**.134***	**.227**
Putting Down	268	2.47	1.78	0	**.167**	.031
Punishment	269	2.39	1.95	.021	**.154***	.043
Threatening	268	4.74	1.86	−.038	**.292**	−.002
Employing a Shill	268	4.09	2.24	.001	**.138***	.047
Aggressive Competition	268	5.06	2.03	.065	**.266**	.005
Time Pressure	268	2.83	1.89	.016	**.248**	.08
Lack of Flexibility	269	4.08	1.96	−.06	**.245**	.11
First Offer	264	3.11	2.14	−.035	.073	−.039
Gentleness	268	4.28	1.38	**.216**	.115	**.272**
Tit for Tat	267	3.13	1.40	.107	.059	**.312**
Acknowledgement	269	5.02	1.28	**.272**	.03	**.205**

* $p < .05$ ** $p < .01$

In order to answer our hypotheses $H1_a$, $H1_b$ and $H1_c$, we conducted a Pearson correlation analysis. The results show that the aggressive tactics detected by Perdue [19] indeed positively correlate with the competing negotiation style on a significant level. Thus, our Hypothesis $H1_a$ is confirmed. A collaborating negotiation style is significantly correlated to the *Gentleness* and *Acknowledgement* tactics but not to the *Tit for Tat* tactic. Therefore, our Hypothesis $H1_b$ can only be confirmed in part. The *Gentleness*, *Tit for Tat* and *Acknowledgement* tactic go along with a compromising style, as a significant positive correlation was found. Moreover, the negotiation tactic *Limited Authority* is also positively related to a compromising negotiation style. This finding does not support our Hypothesis $H1_c$ that a compromising negotiator tends to apply equally cooperative and competitive tactics, as more cooperative negotiation

tactics are deployed. It also detected that negotiation tactics are not exclusive to one negotiation style. Moreover, the only negotiation tactic that seems not related to a specific style is the *First Offer* tactic.

Table 3. Correlations between Negotiation Styles and Negotiation Tactics in the Context of Long-Term Orientation.

Negotiation Tactics	Collaborating Style			Competing Style			Compromising Style		
	Mean	SD	Long--Term	Mean	SD	Long--Term	Mean	SD	Long--Term
Good Guy-Bad Guy	2.86	1.97	.057	3.35	2.18	**−.327****	2.19	1.97	.248
Excessive Demands	3.07	2.00	.011	3.72	2.10	−.105	3.88	2.34	−.411
Limited Authority	3.10	1.97	.076	3.61	2.17	−.117	3.50	2.25	−.344
Putting Down	2.46	1.70	−.033	2.68	2.08	−.071	1.94	1.53	−.085
Punishment	2.26	1.82	−.01	2.34	1.99	−.214	2.75	2.35	.239
Threatening	4.58	1.80	−.044	5.16	1.81	−.021	3.81	2.23	.37
Employing a Shill	4.06	2.19	**.185***	4.18	2.21	−.055	4.56	2.39	.141
Aggressive Competition	4.96	2.08	.115	5.25	1.83	−.24	4.50	2.42	.148
Time Pressure	2.60	1.73	−.046	3.21	2.24	**−.296***	2.47	1.64	−.269
Lack of Flexibility	3.77	1.84	.037	4.63	1.92	−.018	4.31	2.24	−.23
First Offer	2.98	2.07	.041	3.10	2.28	−.148	3.19	2.32	.169
Gentleness	4.39	1.39	**.190***	3.95	1.44	−.077	4.34	1.35	.123
Tit for Tat	3.19	1.39	.01	2.76	1.40	**−.267***	3.50	1.65	.081
Acknowledgement	5.13	1.23	**.211***	4.63	1.35	−.02	5.16	1.06	−.125

* p < .05 ** p < .01

In a second step, we examined the impact of long-term oriented purchasing managers and its impact on their tactical behavior, irrespective of the applied negotiation style. As Table 2 shows, there is a significant positive correlation between the tactics *Employing a Shill*, *Gentleness* and *Acknowledgement* and a long-term orientation regarding negotiators who could be ranked as collaborative negotiators. Within the competing negotiators, only a negative significant relation between the *Good Guy-Bad Guy*, *Time Pressure* and *Tit for Tat* tactics was revealed. This shows that the competing negotiator applies less competitive tactics in long-term business relationships, whereas the collaborating negotiator now uses a competitive tactic in this context. No significant correlation is shown between negotiation tactics and a long-term orientation concerning the compromising negotiator. Thus, H2 can only be confirmed in part.

4 Discussion

The main objective of our paper was to analyze the tactical negotiation behavior that goes along with the specific negotiation styles of purchasing managers. A secondary objective was

to analyze whether a long-term business orientation of purchasing managers influences the tactical behavior irrespective of the applied negotiation style.

Our study revealed that competing purchasing negotiators only apply competitive tactics and that the compromising negotiator tends to apply cooperative tactics rather than competitive ones, but not exclusively. Moreover, the collaborative negotiator does not apply the *Tit for Tat* tactic, originally classified above as cooperative in nature. The *Limited Authority* tactic is not exclusively attributed to one negotiation style, and the *First Offer* tactic could not even be assigned to any of the negotiation styles. Our findings underline that most of the negotiation tactics seem to characterize a specific negotiation style. Thus, sellers who are acquainted with the negotiation style of their negotiation counterpart can optimize their negotiation preparation and develop adequate selling strategies [e.g. 5]. In so doing, sellers obtain a valuable instrument to improve their negotiation performance. Considering the tactical behavior in the setting of a long-term oriented purchasing manager, the competing negotiator may choose no longer to apply any of the competitive negotiation tactics. It is notable that the collaborating negotiator deploys the *Employing a Shill* competitive tactic, which gives the impression that other competitors are offering a better deal. An explanation for this approach may lie in collaborating purchasing managers in a long-term relationship wanting to ensure that their counterpart does not feel too secure and that the deal is already closed.

Although our study contributes to a more profound insight into negotiation styles and tactics, it also has some shortcomings. Further studies should imply more negotiation tactics and classify them into more detailed categories. Thus, it is conceivable that the differentiation between cooperative and competitive tactics falls short and single categories are needed for each negotiation style, as the *Tit for Tat* tactic might indicate. Moreover, we applied a self--assessment instrument to capture the different negotiation styles of the purchasing managers. However, literature provides some evidence that the self-assessed negotiation style after the negotiation process might differ from the actual behavior shown during the negotiation process [e.g. 26]. Finally, we limited our study to one influencing factor of the relationship between negotiation styles and their tactical behavior. It is likely that more factors have an impact on tactical behavior, such as the level of conflict or a variable bonus for purchasing managers, both of which might increase the pressure on their negotiation behavior.

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Process Framing in Negotiation

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Abstract. The aim of our study is the assessment of framing effects in negotiation. We conduct an experiment in which we frame the negotiation process as integrative or distributive while holding the offers and payoffs constant. Our results show that integrative framing leads to more favorable perceptions of a variety of negotiation outcome measures.

Keywords: Negotiation, Framing.

1 Introduction

Over the past two decades framing effects have gained the attention of researchers in a broad range of disciplines including sociology [1], communication [2], psychology [3], and management [4–6]. Scholars in the fields of conflict, negotiation and bargaining also have embraced framing as an important concept [7–9].

Previous studies in negotiation literature manipulate frames that are brought to the bargaining table, e.g., by assessing pre-existing frames of negotiators or presenting pre-negotiation information in different ways [8, 10]. We conduct a negotiation experiment in which we frame the negotiation process as integrative vs distributive while keeping the economic aspect of the negotiation constant. Our results show that process framing affects a variety of economic and non-economic outcome variables.

2 Framing

Framing refers to the notion that an observation or idea can be viewed from a variety of perspectives and be construed as having implications for multiple values or considerations [11]. Thus, the way an issue is formulated and presented has considerable influence on choice and decision making [12].

Framing is an important topic in the study of negotiation [9]. Framing has relevance for concepts such as cooperative-competitive orientations, expectations for a settlement, choice of dispute resolution methods and approaches to third-party intervention [see 9, and literature therein]. Additionally, framing also influences the type and quality of negotiated agreements [13–15] as well as the perpetuation or resolution of conflicts [6, 16, 17]. Mediators also use framing as a technique for finding common ground among negotiators by altering the way messages are conveyed and social accounts of the conflict are constructed [18, 19].

Most framing studies in the field of negotiation focus on gain-loss framing. A negotiator holds a gain frame if what has been offered to her is a gain with respect to a reference point; conversely, she holds a loss frame if that what has been offered to her is a loss with respect to the reference point [7]. Neale and Bazerman [20] show that individuals who view an outcome as potential gain make concessions and consider the negotiation outcome as more fair than negotiators who hold a loss-frame or see their trade-offs as losses. Moreover, negotiators with gain-frames complete more transactions and achieve higher overall payoffs than do negotiators with loss-frames [21, 22]. On the other hand, loss-frames in negotiation are linked to escalation of conflict [23], potential impasse [24, 25] and third-party intervention [26]. De Dreu, Emans and Van De Vliert [27] find that the counterpart's wording in a negotiation influences the negotiator's subsequent behavior; when the counterpart sends messages that convey a loss or a gain frame, negotiators tend to reciprocate. In a further study, De Dreu, Carnevale, Emans and van de Vliert [28] find that other's communicated gain frame leads to lower demands and larger concessions than other's communicated loss frame, especially when negotiators hold a gain – rather than a loss-frame themselves. Other framing manipulations that have been investigated in the domain of negotiation include framing situations as opportunities to negotiate vs. opportunities to ask [29] or framing opportunities in negotiation as dangerous vs. neutral [30].

3   Integrative and Distributive Process Framing

Integrative strategies in negotiation stress maximizing the amount of available resources (e.g., through information exchange and formulating mutually beneficial tradeoffs), whereas distributive strategies focus on dividing resources among counterparts (e.g., through value claiming and persuasion) [31].

In most real-life situations, a negotiator has incomplete information about the counterparts' attitudes, preferences, priorities and judgments [32]. Thus, for the negotiator it is difficult to know whether there is integrative potential in a conflict situation [33]. However, negotiators do have assumptions and make inferences about the counterparts' priorities and preferences [34]. These inferences, i.e. the perspective a negotiator adopts in a given situation, is influenced by cues in and surrounding the negotiation. These cues may refer to characteristics of the counterpart, agenda and content of the negotiation, negotiation process, and communication between the negotiators [35].

Our experimental design keeps the economic aspects of the negotiation constant, while integrative and distributive messages are used to frame the negotiation as integrative or

distributive. We use a visa technique in which students think that they negotiate in a seller-
-buyer business negotiation, while, in fact, students are sent pre-defined messages and no
real negotiation takes place. An instant messaging software is used for communication.
In addition, several mediator variables are assessed in a pre-questionnaire to control for the
participants' individual differences. The results show that process framing induces the focal
negotiator to evaluate various outcome measures more positively.

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First Come, First Served? – The Impact of the First Concession on Negotiation Outcome

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Abstract. Negotiation processes are often inefficient and lengthy since negotiation parties hesitate to make the first offer, as well as concessions, to their opponents. This happens because they fear it would be harmful if they gave away too much at an early stage of the negotiation process. In this context, research has already shown that making the first offer has a positive impact on a party's individual negotiation outcome. However, no study has analyzed the strategic importance of the first concession. This is especially interesting since according to the anchor theory it can be assumed that a party's first concession influences the opponent's concessions, which further influences the negotiation party's individual outcome. Hence, we conducted two large-scale negotiation experiments and found that parties that submitted the first concession achieved a better individual outcome than those that did not. Furthermore, we found the first concession influences the opponent's concession behavior in terms of the reward theory.

Keywords: first concession, concession behavior, anchoring, negotiation outcome.

1 Introduction

Negotiation processes represent an important form of social interaction in today's organizations [1]. They occur whenever there are at least two parties with partly diverging preferences that try to accommodate each other by offers and counteroffers in order to come to an agreement [2]. Thereby, the parties typically try to assert their own interests and to maximize their own negotiation performance [e.g. 1]. In this context, studies from negotiation research, among others, have shown that a systematic concession behavior has a positive impact on a party's negotiation outcome [e.g. 3]. Moreover, researchers have found that reciprocating concessions represents an effective strategy to induce further concessions from the opponent [e.g. 4]. Others have concluded that small own concessions lead to larger opponent concessions

[e.g. 5]. Overall, these findings reveal that offers and counteroffers are of strategic importance in negotiations. However, negotiation parties often hesitate to make the first offer or concessions in a negotiation because they fear unnecessarily giving away too much of their potential individual outcome. The problem is that this approach results in long and inefficient negotiation processes, as well as late agreements.

This is all the more surprising, since numerous studies from negotiation research show that making the first offer in a negotiation represents a distributive advantage and positively impacts a party's negotiation outcome [e.g. 6, 7, 8]. The anchor theory can explain this effect: Researchers found that the first offer serves as a cognitive anchor for the opponent's counteroffer [e.g. 9, 10]. This means that when a negotiation party makes a high first offer that is unfavorable for the opponent, the opponent responds with a less favorable counteroffer for itself and finally receives a less favorable negotiation outcome [11]. Given the vast amount of studies that confirm this anchor effect, in negotiation research it is now widely accepted that making the first offer in a negotiation represents a beneficial negotiation strategy.

However, while there are several studies that analyze the anchor effect with regard to the first offer in a negotiation, we know little about the first concession and its consequences in negotiations. However, since there is always one party in a negotiation who concedes first, the question arises if making the first concession in a negotiation matters? We believe that this question has not yet been answered by existing research. However, we think that this point is especially interesting since – according to the anchor theory – it can be assumed that a negotiation party's first concession influences the opponent's concession behavior and therefore the extent to which the opponent is willing to concede during the negotiation. Thus, by making the first concession in a negotiation, negotiation parties function as pacemakers and control the concession-making process in their own favor. This means that they provoke opponents' concessions in order to achieve favorable negotiation outcomes.

In order to gain insight into the effects of a negotiation party's first concession, our study has three purposes. We aim to examine: (1) the impact of a negotiation party's first concession on its negotiation outcome, (2) the interplay between the first concession and the first offer, and (3) to what extent a negotiation party's first concession influences the opponent's concession behavior. For the last purpose we draw on the three theories of contingent concession-making that are discussed in negotiation literature: the reward (reinforcement) theory, the reciprocity theory, and the aspiration level theory.

In the following, we first present the relevant literature on the anchor effect and concession behavior in order to derive our hypotheses. Then, we report on two negotiation experiments and describe our results. Finally, we discuss the findings of our study.

2 Conceptual Framework and Hypotheses

The anchor effect can be traced back to the prospect theory that was developed in the 1970s when Tversky and Kahneman [12] conducted an experiment in which the subjects had to estimate various quantities. They concluded that subjects rely on simple heuristics when estimating quantities. More concretely, they found that if the experimenter suggests different

starting points for the estimation task, these starting points serve as cognitive anchor points that influence the subjects' final estimation. However, negotiation research has dealt with the role of the first offer as anchor point in negotiations since the 1960s. For instance, Chertkoff and Conley [13], as well as Liebert et al. [11], were among the first negotiation researchers who showed that the first offer in a negotiation serves as a predictor for the final negotiation outcome. Over the years, this result has been replicated by many other researchers [e.g. 6, 10, 14, 15]. Furthermore, Benton, Kelley, and Liebling [16], Liebert et al. [11], as well as Kristensen and Gärling [7], found that the first offer influences not only the final negotiation outcome but also the opponent's counteroffer. They call this the anchoring-and-adjustment process between a negotiation party's first offer and the opponent's counteroffer, since they found that the opponent adjusts its counteroffer according to the negotiation party's first offer. They further found that the advantageousness of the opponent's counteroffer increases with a negotiation party's first offer. Thus, since the counteroffer-adjustment process occurs in the negotiation party's favor, it is not surprising that researchers found the negotiation party to submit the first offer achieves a better individual negotiation outcome than its opponent [e.g. 8].

Even though there are several studies that analyze the anchor effect of the first offer in negotiations, there is no study that investigates this effect with regard to the first concession. However, since existing negotiation literature on concessions has shown that the negotiation parties' concession behavior is contingent on each other [e.g. 4, 17], it can be assumed that the anchoring-and-adjustment process also takes place when a negotiation party submits its first concession. This means that if a negotiation party makes the first concession, this first concession may serve as an anchor for the opponent's subsequent concession. For instance, it is conceivable that when a negotiation party makes a large first concession, the opponent responds with a large concession, although the opponent generally planned to concede less [e.g. 18]. Hence, negotiation parties that submit the first concession can influence the concession-making process in their favor and thus achieve better individual negotiation outcomes than their opponents. Therefore, we state the following hypothesis:

H1a: *Negotiation parties that submit the first concession in a negotiation achieve better individual negotiation outcomes than their opponents.*

In order to have a sufficient range for own concessions, negotiation parties should enter the negotiation with sufficiently high demands [e.g. 17]. The higher the demands at the beginning, the larger the ranges that negotiation parties have for making concessions during the negotiations. Thus, negotiation parties should also make the first offer in a negotiation since it is conceivable that by making the first offer and the first concession, the negotiation parties benefit twice: Whereas the anchor effect of the first offer positively influences the individual negotiation outcome due to the opponent's more favorable counteroffer, the individual outcome becomes even more favorable due to the first concession's influence on the opponent's concession behavior. Thus, it can be assumed that the first concession partly supports the first offer's positive impact on the individual negotiation outcome. Therefore, we add the following hypothesis:

H1b: *Negotiation parties that submit the first offer and the first concession in a negotiation achieve better individual negotiation outcomes than negotiation parties that only submit the first offer.*

Assuming that a negotiation party's first concession serves as a concession anchor that influences the opponent's concession behavior to the negotiation party's favor, the question arises to what extent a negotiation party's first concession influences the opponent concession behavior. In this context, different theories from concession research in negotiation literature provide possible explanatory approaches: When analyzing contingent concession strategies, researchers distinguish between the reward theory [17], the reciprocity theory [e.g. 19, 20], and the aspiration level theory [5].

The reward theory (also: reinforcement theory) goes back to Wall [17] and proposes that negotiation parties reward their opponents' concessions with own concessions in order to reinforce further opponent concessions. Thus, the negotiation parties' own concessions should be noticeably larger than the opponents' concessions so that the opponent perceives them as rewarding. However, in order to make large concessions Wall [17] proposes that negotiation parties start the negotiation with favorable offers for themselves that give sufficient range for concessions. Since we aim to determine whether or not the reward theory is appropriate to describe the effect induced by a negotiation party's first concession, we investigate the following hypothesis:

H2: *The total concession magnitude is larger for negotiation parties that submit the first offer and the first concession than for parties that only submit the first offer.*

Contrary to the reward theory, the aspiration level theory implies that the opponent's concessions are larger when a negotiation party only makes small concessions [e.g. 21]. This effect becomes even more accurate when negotiation parties combine small concessions with aggressive first offers [e.g. 22]. Owing to the negotiation party's aggressive first offer and small concessions, the opponent decreases its aspiration level and adapts a soft bargaining stance by making large concessions, whereas the negotiation party only makes small concessions, if any [e.g. 5, 23]. In order to test whether the negotiation party's first concession influences the opponent's concession behavior in terms of the aspiration level theory, we add the following hypothesis:

H3: *The total concession magnitude is smaller for negotiation parties that submit the first offer and the first concession than for parties that only submit the first offer.*

According to the reciprocity theory, opponent concessions reciprocate a negotiation party's concessions [e.g. 18, 20]. This means that the opponent uses the negotiation party's concession magnitude as a basis for its own concession magnitude. Hence, it can be assumed that by making the first concession in a negotiation, negotiation parties function as pacemakers by inducing reciprocated opponent concessions. It is conceivable that when a negotiation party makes a large first concession, the opponent responds with a large concession, although the

opponent planned to concede less [e.g. 24]. In order to test this theory with regard to a negotiation party's first concession, we propose the following hypothesis:

H4: *The concession-making process is more reciprocal when negotiation parties submit the first offer and the first concession than when they only submit the first offer.*

3 Empirical Study

3.1 Methodology

To test our hypotheses, we analyzed two large-scale negotiation experiments. Experiment 1 was a student experiment that we conducted in 2008 at two German public universities. In total, 338 German student teams consisting of two members each negotiated a business-to-business negotiation case. They had to reach agreement on four distributive and two integrative negotiation issues [see 25]. Experiment 2 took place in 2013. Altogether, 134 German student teams from two public universities negotiated a case in the tourism service sector. Team size ranged from two to three persons, and the students were not obligated to reach agreement on the six negotiation issues, of which four had an integrative character. For both experiments the teams were either assigned the role of either buyer or seller. One week before the negotiation all participants obtained extensive role descriptions and background information. The 90-minute negotiations took place in an online chat room where the members of each team negotiated together in front of one computer. In Experiment 1, we had 222 teams (111 dyads) that came to an agreement, and in Experiment 2 there were 98 teams (49 dyads) that ended up closing a contract.

To get insight into the negotiation parties' offers and counteroffers, we analyzed the chat transcripts by means of an offer-by-offer approach. Since a party's offer could cover multiple negotiation issues, we had to calculate total package offers. Then we determined a party's concessions. We called an offer a concession when a negotiation party made a total (package offer) that was more favorable to its opponent than its previous (total package) offer had been. After having calculating the negotiation parties' offers and concessions, we noted which negotiation party made the first offer and the first concession in a negotiation. Furthermore, we determined the negotiation parties' total concession magnitude and checked our protocol for reciprocal concessions between the negotiation parties. Then, we calculated the parties' individual outcomes on the basis of their profit function. We used a Z transformation to make the buyers' and sellers' individual outcomes comparable. We then performed a Shapiro-Wilk test to assess the parties' individual outcomes for normal distribution. Finally, we checked our data set for differences between buyers and sellers. However, we could not find any significant differences with regard to the buyers' and sellers' first offers, first concessions, and individual negotiation outcomes.

Since our data is gathered from negotiation dyads, we had to consider the dependence between the buyers and sellers in one dyad. Thus, to test our hypotheses we used paired

t-tests when analyzing whole dyads and t-tests for independent samples when focusing on only one party (e.g. the one that made the first offer). Since existing research has shown that it is difficult to obtain statistical significant (p-value) by comparing small groups, we interpreted the Cohen's d as significance criteria that combine p-value with population size [see 26]. Cohen [27] proposes a small effect if the Cohen's d value shows a value >0.2 and a medium-sized effect>0.5. Hypotheses 3a, b, c, and 4 were descriptively analyzed by means of relative frequencies.

3.2   Results

The results, presented in Table 1, indicate that negotiation parties that made the first concession obtained better individual outcomes than negotiation parties that did not. The Cohen's d values indicate small effects. Thus, we can confirm Hypothesis 1a.

Table 1. Paired T-Tests for Anchor Effect.

		Experiment 1		Experiment 2	
		IO Mean (S.D.)	Sig. (Cohen's d)	IO Mean (S.D.)	Sig. (Cohen's d)
First Concession	1 (yes)	0.02127 (0.11600)	0.027 (0.358)	0.03945 (0.22827)	0.235 (0.347)
	0 (no)	−0.01982 (0.11374)		−0.03849 (0.22638)	

With regard to Hypothesis 1b we found that negotiation parties that submitted the first offer and the first concession achieved better individual negotiation outcomes than negotiation parties that only submitted the first offer (see Table 2). Since the Cohen's d values indicate small effects, we can also confirm H1b.

Table 2. T-Tests for Relationship between First Offer and First Concession.

			Experiment 1			Experiment 2		
			First Concession			First Concession		
			1 (yes)	0 (no)	Sig. (Cohen's d)	1 (yes)	0 (no)	Sig. (Cohen's d)
			IO Mean (S.D.)	IO Mean (S.D.)		IO Mean (S.D.)	IO Mean (S.D.)	
First Offer	1	IO Mean (S.D.)	n=89 0.02572 (0.12370)	n=22 −0.00045 (0.09293)	0.177 (0.243)	n=34 0.04416 (0.21598)	n=15 −0.02705 (0.26172)	0.162 (0.309)
	0	IO Mean (S.D.)	n=22 0.00326 (0.07709)	n=89 −0.02461 (0.11829)	0.148 (0.250)	n=15 0.02876 (0.26176)	n=34 −0.04354 (0.21306)	0.156 (0.316)
	Sig. (Cohen's d)		0.209 (0.193)	0.1875 (0.301)		0.415 (0.067)	0.408 (0.072)	

Furthermore, we found that the total concession magnitude was larger for negotiation parties that submitted the first offer and the first concession than for parties that only submitted the first offer. Given the significant results and the Cohen's d values that indicate a medium--sized effect (see Table 3), we confirm Hypothesis 2 but have to reject Hypothesis 3.

Table 3. T-Tests Reward and Aspiration Level Theory.

			Experiment 1			Experiment 2		
			First Concession			First Concession		
			1 (yes)	0 (no)		1 (yes)	0 (no)	
			Means of Total Concession Magnitude (S.D.)		Sig. (Cohen's d)	Means of Total Concession Magnitude (S.D.)		Sig. (Cohen's d)
First Offer	1	Means of Total Concession Magnitude (S.D.)	0.02807 (0.07373)	−0.11897 (0.09342)	0.016 (0.513)	0.04941 (0.14765)	−0.02580 (0.14773)	0.053 (0.509)
	0		0.00407 (0.09376)	−0.02614 (0.10761)	0.114 (0.288)	−0.01989 (0.13420)	−0.04109 (0.13333)	0.445 (0.158)
	Sig. (Cohen's d)		0.095 (0.308)	0.285 (0.136)		0.023 (0.482)	0.408 (0.111)	

The results presented in Table 4 do not show that the concession-making process is more reciprocal when negotiation parties submit the first offer and the first concession than when they only submit the first offer. Owing to the non-significant results and the small Cramer-V values we reject Hypothesis 4.

Table 4. Chi-Quadrat Tests Reciprocity Theory.

	Experiment 1		Experiment 2	
	Reciprocal Concession-Making Process		Reciprocal Concession-Making Process	
	Yes	No	Yes	No
First Offer & First Concession	32	57	6	27
First Offer Only	7	15	3	12
Sig. (Cramer-V)	0,461 (0,035)		0,585 (0,022)	

4 Discussion

The purpose of this study was to examine the strategic importance of the first concession in negotiations. In this context, we draw on the anchor effect from the prospect theory and analyzed two large-scale negotiation experiments. Our results show that negotiation parties

that made the first concession achieved better individual negotiation outcomes than parties that did not. We further arrived at the result that negotiation parties obtained even better individual negotiation outcomes when they submitted the first offer and the first concession instead of only making the first offer. In this context, we also detected that – accordingly to the reward theory [e.g. 17] and thus in contrast to the aspiration level theory [e.g. 21] – the total concession magnitude was larger for the negotiation parties that submitted the first offer and the first concession than for those that only made the first offer. However, we did not find that the concession-making process is more reciprocal (see reciprocity theory) when negotiation parties submit the first offer and the first concession than when they only submit the first offer.

These results have important implications for the negotiation practice. First, practitioners should notice that submitting the first concession represents an adequate strategy to influence the negotiation outcome in their favor. Furthermore, practitioners should know that when first setting an anchor by making the first offer and then submitting the first concession, they can even improve their individual negotiation outcomes. According to the reward theory, by submitting the first offer they can create a sufficient range for large own concessions, which they will subsequently need to provoke opponent concessions.

Even though our study provides important implications, it also has some shortcomings. Owing to our multi-issue negotiation experiments, we calculated and analyzed total package offers and did not consider the negotiation issues individually. Although we found several negotiation parties that submitted package offers, there were also some parties that discussed the issues sequentially. In this regard, it could be interesting to analyze how a repeated application of the first concession strategy – in other words, concerning different negotiation issues – influences the parties' negotiation outcomes. Furthermore, future research could analyze in what way influencing factors, such as the parties' power distribution, have an impact on the first concession strategy's effectiveness. For example, it is likely that a negotiation party's power even enhances the effect that results from the party's first concession since the opponent makes more and larger concessions.

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Back to the Future: An Examination of the Factors Affecting Desire to Negotiate Again

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Abstract. One hundred fifteen dyadic negotiations were examined to determine factors affecting likelihood of negotiating again with the same counterpart. Results suggest that reaching an agreement is an important factor, along with perceptions of individual outcome and the other party's honesty. The implications of these findings for practitioners and future research are discussed.

Keywords: Negotiation, Tactics, Process, Outcomes.

1   Introduction

Negotiation is an interpersonal decision-making process that an individual undertakes when his/her objectives cannot be achieved single-handedly [1]. It is an essential skill for all social encounters and economic exchanges, including those occurring in organizational contexts – strategic planning, purchasing, hirings/firings/promotions, sales, budgeting, customer relations, reorganizations, mergers/acquisitions etc.

The issue of what constitutes a good negotiation, to our knowledge, has never been definitively answered. Many would argue that achieving one's objectives, the primary motivation for undertaking a negotiation in the first place, would be a necessary condition. Indeed, instrumental outcomes have been a common measure in negotiation studies [2]. Yet objectives that are achieved at the expense of the other party(ies) can create reputational issues that will forestall future negotiations with this or other essential partners. For this reason, some have argued that it is important that a counterpart feels good enough about the process and outcome that he/she would choose to negotiate again [3].

Indeed, many if not most negotiations are with individuals with whom we have long-term relationships (spouse, children, other relatives, neighbors, coworkers, distributors), and even in those cases where a negotiation is thought to be one-off, it is surprising how frequently the

parties will be reunited through some act of chance [4]. Nonetheless, this contextual feature of negotiations is often lost in laboratory simulations involving only a single encounter/negotiation. Given the probability of subsequent negotiations, the complexities of the negotiation process (venue, length, approach/tactics), and the variety of outcome metrics to be considered (self, other, joint; actual and perceived), the following question warrants consideration: What factors best predict the desire of a counterpart to negotiate again?

2 Theoretical Background

This paper identifies five hypotheses related to predicting a negotiator's desire to negotiate again with the same counterpart, using expectancy theory as a primary theoretical model [5]. Expectancy theory contends that individuals are motivated to act when they believe an effort will lead to a desired performance (expectancy), and this performance in turn will result in an outcome (instrumentality) that is valued (valence). As suggested by this description, expectancy theory can be used to understand an individual's motivation to initiate a negotiation. For example, if an individual believes that engaging a prospective counterpart in a negotiation is likely to lead to achieving one's desired objectives (valued outcomes), then he/she will be more inclined to take action in engaging that individual. The basis for these assessments can be past experiences with this particular counterpart (personal or vicarious) or relatable experiences with other parties.

3 Methods and Results

One hundred fifteen dyadic email-based negotiations were analyzed using hierarchical regression analysis to test the five hypotheses, which yielded both expected and unexpected findings. As expected, reaching an agreement was a significant positive predictor of desire to negotiate again. Achievement of one's objectives is a primary reason for initiating a negotiation, and there may be more than a few occasions where an individual would choose a suboptimally negotiated outcome over no agreement at all. To further understand this result, the factors associated with reaching an agreement were investigated. Two factors were found to play significant roles: the more messages exchanged, the greater the likelihood of reaching an agreement, and the fewer the number of competitive tactics employed per message by an individual, the greater the likelihood of reaching an agreement.

In those cases where an agreement was reached, a negotiator's perceived individual outcome and the negotiator's perceived honesty of the other party were positively associated with desire to negotiate again. Perceived self honesty was negatively associated with desire to negotiate again. In those cases where an agreement was not reached, only perceived honesty of the other party was positively associated with desire to negotiate again. Overall, these results suggest that perceptions rather than actual behaviors or outcomes are most significant in predicting desire to negotiate again.

4 Discussion and Conclusions

The findings of this study have several potential practical implications. First, if you want a counterpart to desire to negotiate with you again, it is important to keep communications alive. The more messages communicated, the greater the likelihood of an agreement, and the greater the likelihood of an agreement, the greater the desire to negotiate again. While competitive tactics can lead to reciprocation and a reduced likelihood of an agreement, it is conceivable that maintaining communications will eventually cause the parties to move away from competitive tactics in favor of more constructive behaviors. Second, once an agreement is reached, consider reinforcing a counterpart's positive perceptions of his or her individual outcome (perhaps through favorable comparisons with other sales, purchases, practices etc.) as well as one's own honesty during the negotiation, as these perceptions can increase the counterpart's desire to negotiate again. Third, where no agreement is reached, cite examples of one's own honesty and fair play during the negotiation, which can increase the counterpart's desire to negotiate again.

As with all negotiation studies, the findings related to this simulation come with some caveats which can serve as the basis for future research. These include the use of email as a communication medium in these negotiations (which can uniquely affect relational development, ethical behavior etc.), the limitation of the analysis of competitive behaviors to six tactics that could feasibly be executed and identified in email-based negotiations, and the choice of participants from a single country culture and single organization.

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Personal Traits that Hinder Cooperative Negotiations and Information Technology Usage in Familial Disputes

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Abstract. This article identifies the main personal traits that hinder the facilitation of cooperative negotiations in familial disputes. The analysis is conducted in the context of parental divorce proceedings, concerning in particular so-called 'parenting plans' and using the author's own negotiation support system, known as the *Parenting Plan Support System*. Studies to optimize system efficiency disclosed the personal traits that hinder paths to parental agreement. A few working hypotheses concerning the possible influence of those traits on the use of PPSS are listed, along with possible solutions to the identified problems.

Keywords: family disputes, parenting plan, negotiation, traits, information technologies.

1 Introduction

The main goal of this article is to identify relevant personal traits that hinder the facilitation of effective cooperative negotiations in family disputes [1, 2]. The analysis focuses on parental divorce negotiations, concerning the specifics of the method of enacting parental powers and contact with the child. The established catalogues of personal traits were generated specifically in relation to studies for efficiency optimization of the author's negotiation support system. Known as the *Parenting Plan Support System* (hereinafter referred to as 'PPSS'), this is a dedicated tool to help parents to overcome discord in negotiating a parental plan [3, 4], broadly founded on the use of informatics tools in negotiation.

The paper is a preliminary study, delimiting the scope of proposed future investigations. Section 2 introduces the topic of the deliberation process and catalogues the personal traits that hinder effective cooperative negotiation during family disputes, including provisions for making a parental plan. In section 3, a number of hypotheses are formulated relating to the influence of those personal traits on the possibility and effectiveness of informatics support systems for negotiation, with specific reference to the aforementioned PPSS. Section 4 draws concluding findings and highlights certain properties of the program that can limit the influence of parental personal traits that might otherwise hinder agreement of a parent plan.

2   Personal Traits that Hinder Cooperative Negotiation

The main goal of parent plan negotiations is to reach an understanding that will cover all necessary elements within its legitimate scope, with particular regard to realizing the general provision 'for the good of the child.' The personal traits that may substantially limit or prohibit effective negotiation between parents in conflict are varied, just as divorce itself is multifaceted, representing as it does a divorce between parents, a divorce of emotions and a legal, economic, social and psychological divorce [5].

A crisis that threatens the endurance of a family touches the fundamental values and beliefs of a married couple. A divorcing couple can find themselves at divergent stages of the decision to divorce – one partner may want change while the other wants things to stay as they are – or of the so-called 'psychological' phases of divorce (denial, grief, anger, reconstruction) that cause fundamental differences in perceptions of the reality of the relationship [6]. It is necessary to underline that as a result of both partners' transition through the psychological phases of divorce, it may be difficult for them to determine a reliably stable hierarchy of their own needs, as they are simultaneously subject to changes related to the stage of the divorce, the stage of escalation of the dispute and the accompanying intricately connected emotions. For each partner, this demands reflection (perhaps repeatedly) on the redefinition of self, their value system and their social role.

Relevant essential personal traits in this context include each party's attitude to the communicational dimension of negotiating and their respective methods of decision-making and conflict resolution. These traits often establish patterns of negative interaction that inform the marital crisis, complicating that crisis still further. With help from systems like PPSS, it should be possible to limit or overcome the impact of these patterns. In undertaking negotiations from a personal perspective and with a cooperative attitude that concentrates primarily on 'the good of the child', substantial roadblocks are commonly encountered, arising from the traits outlined below.

2.1   Traits Regarding a Style of Decision-Making

Among the barriers on the road to effective negotiation and agreement are differences in the decision-making styles of the two parties, as described for example in the Feeling versus Thinking Model of Decision-Making [7, 8].

The 'feeling' style of decision-making characterizes a person who believes it necessary to take account of their own values and beliefs in making any sort of decision, assigning particular significance to feelings, emotions and real communication between the parties in conflict. This decision-making type prefers to find solutions that are viable for both parties (win-win), and people of the 'feeling' style are therefore characterized by a high level of sensitivity and a concern about the effects of their decision-making on others. Beyond acting to achieve a satisfying outcome, they consider it no less important to improve and maintain positive relations between the parties in conflict, as well as personal, interpersonal and societal harmony.

The 'thinking' style of decision-maker is logic- and reason-oriented above all else. They favour a rational attitude that controls and resists emotions, taking a cost-benefit analysis approach to diagnosing situations. The justice/fairness paradigm is universally applied and is not reliant on the specific details of the situation. Based on these assumptions, a decision need not arrive at a final postulate in full compliance with the values of both parties.

It is important to note that neither of these styles of decision-making can be unambiguously prejudged as more consistently useful for effective cooperative negotiations whose goal is to reach an understanding in a specific conflict [9]. Out of consideration for parents in conflict, it is more important determine potential difficulties in conducting negotiations where the parties have differing decision-making styles.

2.2 Traits Related to the Causes of Conflict and Preferred Conflict-Resolution Method

Among the personal traits analyzed here, it is imperative to consider the hard-to-negotiate causes of the conflict (for example, so-called 'conflict of values' or relational conflict), as well as the destructive character of the parties' approach to the conflict [10, 11]. The chances of a successful cooperative negotiation are significantly decreased where either party favours a 'win-lose' or, still worse, a 'lose-lose' paradigm of conflict resolution [12]. A further important barrier to cooperative negotiation and agreement is strong dissimilarity between the parties in their respective internalized hierarchies of the desired substantial outcomes and of the mutual relationships [11]. In cases where negotiations between parents concerning the content of a parent plan are driven by each parent's valued and valid ideal result, especially when narrowly understood as personal interest, this may conflict with the chief decision--making factor common to all parties: the good of the child.

2.3 Traits Related to Psychological Conditions

Among the psychological traits that hinder cooperative negotiation, it is also necessary to note the potential for discord where parties are in divergent psychological phases of the divorce, especially in relation to the constructive phase [5]. There is often a significant dilemma concerning the parties' honesty and trust in the negotiations in light of their previous negative experiences during cohabitation. Differing preferences for justifications for decisions taken in making concessions and reaching agreement are of particular significance. These are

personal traits that, when not in tune, can form a barrier to effective negotiation and agreement, especially when they miss or marginalize the good of the child [13].

For both parties, negative mental (emotional) states, emotional injuries and lived traumas can be unusually destructive to the negotiation process, especially in the context of abandoning or breaking up with the other, or being abandoned or broken up with. Both parties are likely to harbour feelings and needs [14], and inadequate mastery by either party of negative mental (emotional) states may undermine good faith in the negotiation, manifesting itself in ill mannered behaviour. Excessive ambition can also present as a destructive trait, especially in the need to take everything and at any cost. This problem often arises from a conflict between personalities that are predisposed to react differently (often grossly so) to the conflict situation [15]. Beyond that, participants in such bargaining often run into insuperable difficulties if one of the parties suffers from a psychological disease or a serious personality disorder of a psychopathic character (e.g. antisocial personality disorder) [16]. Any change in behaviour of the impaired party is only possible if undertaken in the self-interest of the impaired party. This essentially excludes any approach that relies on making concessions and an amicable settlement that takes account of the good of the child, the interests of both sides or even the social surroundings. Another important trait that affects the behaviour and decisions of both parties is their negotiating position. Differences in negotiating resources, especially where one side is dependent on the other, creates a risk that one side may exert undue pressure, extending even to threats or blackmail. These definitions may also differ depending on each party's existing BATNA (best alternative to a negotiated agreement).

2.4 Traits Based on Perceptual-Cognitive Determinants

One fundamental perceptual-cognitive determinant of cooperative negotiation is the lack of common framing, of specific individual problems as well as the whole conflict situation. Most importantly, this may include overlooking or marginalizing the frame of the good of the child. As a method of perceiving and reflecting, framing a conflict has an inevitably abstract character, referring to how people define a situation and organize and order information, as well as how they ultimately determine what is most important for them and what is irrelevant. Because the negotiating parties each use their own methods to frame the issue, methods that need to be uncovered, understood and harmonized as mismatched frames can cause further conflict while acting as barriers to any arbitration-based solution [11].

A further negative trait that hinders effective conclusion of negotiations relates to differing narratives regarding the facts – for example, what the child likes, their abilities and their relationships with specific people. A dysfunctional interpretation of reality may follow from misinformation or lack of information, as well as from stereotyping, wishful thinking and erroneous reasoning heuristics nourished by such misinformation.

2.5 Traits Related to Quality of Communication

Among communication-related personal traits that hinder cooperative negotiation, particular emphasis must be placed on any toxic language used by either party, often infringing on the

principle of mutual respect and escalating the conflict. This includes the tendency of parents in conflict to use manipulative techniques and eristic tricks that may involve the children [17]. Misunderstandings, entailing a lack of understanding of messages broadcast by the other party, also create a strong risk of failure to reach agreement.

In composing their statements, parties to the negotiation often use substantive or meta--substantive arguments, at the same time relying on the so-called *tria officia dicendi*: the logical sphere, the emotional sphere and the sphere of will. Nonverbal communication plays a considerable (and, in the opinion of some, integral) role in communication. Even so, as nonverbal communication has both a conscious and subconscious character, it is often the cause of heightened antagonism between the negotiating parties. In many cases, this justifies the use of so-called 'indirect' communication, which may include informatics tools without visuals [18]. Finally, a substantial barrier to concluding an agreement may occur when a party to the conflict reveals a lack of coherent verbal and nonverbal messages to their interlocutor, especially when this leads to being caught in a lie [19].

3   Hypotheses Concerning the Relation of Personal Traits and Use of Information Technologies in Family Dispute Resolution

This section presents is some working hypotheses concerning the influence of the personal factors outlined above on the potential use of AI-enhanced expert systems in negotiations, with particular reference to family disputes). Our specific concern is to deploy these hypotheses in relation to possible enhancement of the PPSS. As the system has been thoroughly discussed in [3 and 4], a very brief description will suffice here.

PPSS is a hybrid [20] system that combines elements of rule-based and case-based knowledge representation. The trend towards incorporation of case-based reasoning structures into negotiation support systems and online dispute resolution (ODR) has been the subject of recent debate [21, 22]. One objective of PPSS project is to contribute to this line of development by assisting spouses in developing a so-called 'parenting plan', which is an agreement concerning relations between parents and children after a divorce is granted. The system asks the parents questions to help them choose among options for the preferred provisions of the agreement. Importantly, the system assesses the chosen options with respect to the criterion of the children's well-being, which is a necessary condition for acceptance of the plan by the court in divorce proceedings. The system also enables parents to compare their choices, to deliberate on them and to make tradeoffs. in this respect, PPSS echoes the third part of the architecture described in [23].

How, then, do the personal factors described above (cf. [24], p. 234) affect the viability and efficiency of systems such as PPSS? This question is an empirical one and can only be answered on the basis of experimental data. Within the scope of this short paper, it is possible only to formulate certain working hypotheses regarding the possible influence of those factors.

1. As regards preferred style of decision-making, PPSS would probably yield results favouring persons characterized by the 'thinking' style of decision-making. This is because the program involves making choices between options assessed by the system for their conformity with Polish law (supported by relevant psychological and pedagogical knowledge).

2. While factors underlying the sources of conflict will determine the very decision to use the program or not, it is hoped that the 'objective' stance exhibited by the program can help to establish possible common ground between spouses – including, for instance, those conflicted in their preferred values. In aiming to formulate an agreement acceptable under Polish law, users would be motivated to internalize or at least conform to the values fostered by the judiciary.

3. Psychological factors represent potentially the greatest confounding influence in the efficient use of PPSS. Given that the system necessarily offers a finite set of options, a distressed person may feel frustrated that their preferences cannot be fulfilled by use of the system. One solution proposed by the authors to mitigate this problem is the introduction of an educational module into the system to instruct spouses about the purposes and limitations of the system.

4. In the hope that PPSS can ameliorate problems arising from differences of perception and cognition, the extensive and exhaustive set of questions and options, together with assessments based on the decisions of the Polish courts, provides a unified frame for perceiving the dispute. The dispute itself is then transformed into a different task: to develop an agreement that will be favourably assessed by the program.

In overview, the problems related to personal traits of spouses using PPSS in the course of their dispute suggest a number of directions for empirical research, encompassed in particular by the hypotheses listed above.

4 Conclusions

In summary, it is important to emphasize that the multifaceted and divergent traits informing each individual party's response in the concrete situation of parental conflict and determining each party's capacity for cooperative negotiation result inter alia from the personality of each party, their earlier life experiences, the quality of their intra-familial relationships, the subject of the conflict and its weight for each party and the party's psychological (emotional) state and communicative competencies, in addition to all the facts of the case [13].

In highlighting the value of using an expert system such as PPSS in the process of negotiation between parents in conflict, it behoves us to emphasize that the system would first educate the parties in terms of their legal circumstances and the priority of the good of the child, as well as the preferred cooperative negotiation strategy of good faith, before moving to the decision-making phase and any final version of the plan. Although the program itself is not intended to reduce all the possible negative influence of personal traits of the negotiating parties, its use may be beneficial in certain contexts. The characteristics of the program may indeed limit the influence of many negative personal traits, in particular due to the fact that the system a) as a rule proposes indirect communication based on messages generated

from the program's database (reducing the risk of conflict escalation in verbal and nonverbal communication during face-to-face time between the parties); b) proposes an agenda for the negotiation focused on prospective aspects of the child's functioning, so minimizing the element of negative relations between the parents; c) offers varied solutions for all important issues in agreeing the parent plan (which is particularly helpful for parents without adequate knowledge resources and experience or who have not yet reached the constructive psychological phase); d) declares the areas of presence/absence of agreement; e) objectively evaluates chosen options, relying on a comprehensive database (legal, psychological, pedagogical) and focusing on the good of the child; f) examines the coherence and completeness of the plan; g) generates and enables exchange of relevant information tied directly to the subject of the negotiation; h) only allows the option of automated negotiation when it is difficult for the negotiating spouses to reach agreement; and i) controls the quality of the parent plan, founded on a cooperative approach to negotiation and the good of the child, as well as compliance with the law. Hypotheses concerning the positive influence of the program should be tested empirically in future research.

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Dynamical Negotiation Networks: the impact of need for cognitive closure and emotions on the negotiation outcome in dyadic face-to-face negotiation

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Abstract. Existing theories of negotiations tend to focus on static elements of the negotiation situation that affect outcomes. However, negotiations are a form of communication, and so their outcomes will depend not only on static factors, but also on the negotiation process. We conducted 3 dyadic negotiation studies (N1 = 80, N2 = 90, N3 = 160) in which participants engaged in a role-playing negotiation game about creating a business partnership with their neighbor. We will present the Dynamical Negotiation Networks model and show how the outcome of negotiations is influenced by emotions, creativity, and need for closure of negotiators.

Keywords: Dynamical Negotiation Networks, Negotiation, Emotions, Creativeness, Need for Cognitive Closure.

1 Introduction

Negotiations are a crucial element of human social functioning. They are relevant to all realms of life, from a discussion of which radio station to listen to in the car, through union talks, to international relations. They allow us to resolve conflicts of interest, but they also allow us to achieve goals that are impossible to achieve as individuals [1]. If negotiations are not successful, either due to lack of final agreement, or an inefficient (non-Pareto-optimal) solution – one that does not maximize both parties' profits – the costs can be very high [2, 3].

Existing theories of negotiations tend to focus on static elements of the negotiation situation that affect outcomes. These include power structure [4], available strategies [5], shared history [6], socio-economic conditions [7], and negotiators' personalities [8–10]. Some of these factors have an unquestionable influence on the outcomes of negotiations; others' influence

is debatable (e.g., the negotiator's personality structure will have a weaker effect when his/her economic possibilities are severely limited).

However, negotiations are a form of communication, and so their outcomes will depend not only on static factors, but also on the negotiation process. Attempts to assess how behaviors, strategies, and the progression of behaviors affect negotiations have been made by content analysis researchers (e.g.,[11, 12]). These methods can help us analyze the dynamics of negotiations but they do not allow us to link that process with the negotiation outcome.

Even factors that might not affect outcomes directly might have a clear impact on the process that takes place. Two completely different processes might lead to the same negotiation outcome, while having significant fallout in terms of the negotiators' long-term relationship. In this presentation, we discuss individual difference variables that shape the negotiation process, which, in turn, leads to different negotiation outcomes. We will present the Dynamical Negotiation Networks model and show how the outcome of negotiations is influenced by emotions, creativity, and need for closure of negotiators.

One element that directly influences this process is the need for cognitive closure [13], a construct explaining differences in how individuals acquire knowledge in order to avoid a sense of uncertainty. Individuals with a high need for closure tend to focus on and process more deeply information that is encountered early than do those with a low need for closure. This is because they prefer situations that are unambiguous and clear. A high need for closure can increase the probability of ending talks before an optimal solution is found, whereas a low need can lead to impasse, where no solution is found at all. Individuals with a low need for closure are oriented at processing more information [14]. Their knowledge system is more susceptible to change, and, therefore, is more likely to adapt effectively to changing circumstances. Thus, individuals with a low need for closure are more likely to be persuaded by their negotiation partner [13].

Another potentially relevant individual factor is creativity [15]. High creativity can lead to more exhaustive search for optimal solutions, and so to better overall solutions; while low creativity can lead negotiation partners to settle quickly on satisfying solutions. This relationship is not yet clearly understood, but it is plausible that greater creativity could lead to a richer representation of the negotiation, which in turn could lead to more, better outcomes, particularly when integrative solutions are not readily apparent, and other solutions are impossible. Then, negotiators' propensity to think creatively could influence how much they search for mutually beneficial outcomes.

Additionally, in the past few years researchers have begun to focus on emotions as they affect the negotiation process and outcome (cf. [16]). For example, Tiedens and Linton [17] have shown that negotiators view emotions related to certainty (e.g. happiness or anger) differently than they perceive emotions related to uncertainty (e.g. surprise or fear). An angry negotiator is likely to expect hostile and competitive talks, which, through a self-fulfilling prophecy, could increase the probability of an impasse [8, 18–20]. Positive emotions also affect how the structure and outcome of negotiations are perceived [21].

2 Our research

We conducted 3 dyadic negotiation studies (N1 = 80, N2 = 90, N3 = 160) in which participants engaged in a role-playing negotiation game about creating a business partnership with their neighbour. This partnership required establishing the terms of cooperation on 4 dimensions: how much land, money, and work each partner would put in, and what crop to plant. Each negotiator was assigned different numbers of points to gains or losses on particular dimensions. The games were constructed such that simple 50–50 splits were plausible, but an integrative solution was possible, because the parties had different priorities in the negotiated dimensions. This way, the 50–50 split was a result that was possible, but inefficient – with proper motivation and communication parties could log-roll between these dimensions and achieve higher both joint and individual scores.

In the first study, we studied differences in the negotiation depending on the partners' need for cognitive closure (NCC). In the second study, we compared more vs. less creative individuals to see how this trait affected the enlargement of the negotiation pie, depending on the degree of conflict in the interests of the negotiators. In the third study, we employed actors to manipulate the process of the negotiation, evoking specific emotional reactions in their partner. In all three studies, we measured dynamic changes in how negotiators were responding during the talks with the "mouse paradigm" [22]. We measured moment-to-moment changes in either emotions or NCC.

In the first study, we pre-selected participants based on their scores on NCC [13, 23]. We matched high-scorers (top 25%) with high-scorers and low-scores (bottom 25%) with low-scorers, so that the participants in each pair had similar NCC scores. Individuals with intermediate (middle 50%) scores on NCC were not selected for the study. We did not find differences in the mean outcomes of these negotiations; that is, NCC did not appear to affect the objective final result of the negotiation on average. However, we did find that the discrepancy between individual outcomes were greater among those who had a high NCC. That is, it appears that individuals who are less motivated to come to a conclusion fast are more likely to explore solutions that were equitable. This is corroborated by the finding that high vs. low NCC participants perceived the negotiation process differently: those with a low NCC declared that both they and their partners presented more possible solutions to the negotiated issues. This judgement in turn affected whether they perceived the negotiation process to be fair. Additionally, we have analyzed the networks that high NCC and low NCC negotiators constructed during their interaction using the Dynamical Negotiation Networks method [25]. In this method, negotiations are transcribed and translated into a dynamically constructed semantic network. In such a network, the issues are represented as nodes, and the relationships between them are represented as connections between nodes. According to the assumptions of this method, the process of communication can be represented as a process of building a common network in which elements are successively added and their relationships to other issues are elaborated. The outcome of negotiations is the result of how this network is constructed and how issues are encoded in it. In this way, the relationship between the process of communication and its outcome can be formally analyzed. In this study, we found that, contrary to our expectations, high NCC led to more complex networks than low NCC. In the second study, we again

pre-selected participant, this time based on their responses to a creativity scale [24]. This scales diagnose for the following dimensions: 1) Internal Locus of Control, 2) Cognitive Flexibility, 3) Self-Actualization, and 4) Strong Ego. For our study we took into consideration the Cognitive Flexibility sub-scale only. We found no direct effect of creativity on the negotiation outcome. However, when there was a larger discrepancy of interests, pairs with higher creativity attained better common outcomes, as well as better individual outcomes. This effect was stronger when contentious issues were important vs. not important. Thus, it appears that in especially difficult negotiation conditions, when disagreement is great and the issues at stake are weighty, negotiators' creativity can be significant in reaching more optimal solutions.

Finally, in the third study, actors manipulated the negotiation process so as to evoke either anger or contentment from participants. They did this through offers that were vastly unfair, or very cooperative. We did not observe differences in objective outcomes based on our manipulation. We did, however, observe differences on a number of subjective variables, wherein positive emotions were linked to greater: perceptions of fairness of the outcome and the process; seeking of win-win solutions; satisfaction in the outcome; interest in negotiating with the partner again.

2.1 Further analyses

At this stage, for Studies 2 and 3, we have analyzed only how static variables affect some perceptions of the negotiation process. We are currently preparing dynamic data for analysis, which will allow us to assess how perceptions of the negotiation change as events unfold.

Moreover, for all studies, we will pair this network construction with dynamic data from the "mouse paradigm" will give us a rich representation of how individuals respond to specific issues that come up during the negotiation. These results will be applicable to many instances of negotiation and conflict resolution, where parties will be better able to predict and influence the process of talks, considering factors heretofore understudied.

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Do It by Surveying – Rethinking Methods in Negotiation Research

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Abstract. Since negotiations are generally highly confidential in the business context, data gathering in negotiation research often raises problems, particularly in the B2B area due to highly complex interaction processes. Therefore, negotiation researchers rather draw on negotiation experiments than on surveys with practitioners, as they might be more valid and at the same time less time-consuming, thus more efficient. However, the validity of the data collection by means of surveys highly depends on the question whether negotiators are capable to remember the important components of their preceding negotiation. As it is still rather unknown how well negotiators remember their negotiation, we compare transcribed video recordings of negotiations with the negotiators' statements included in post-surveys in order to determine the negotiators' recall performances.

Keywords: methods in negotiation research, recall performance, cognitive processes, buyer-seller negotiations.

1 Introduction

Negotiations are one of the most important managerial instruments to coordinate decision-making processes within and especially between companies [1]. Buyers and sellers alike have longtime noticed that an effective and efficient management – which means the planning and controlling – of negotiations has a significant impact on their companies' profitability [e.g., 2, 3].

This practical relevance requires a broad scientific research in the field of business negotiations [e.g., 4]. However, since buyer-seller negotiations are complex decision making processes which are generally highly confidential, negotiation researchers complain about problems with negotiation data gathering [e.g., 5]. Companies often do not allow negotiation researchers to participate – even as neutral observers – to get insights into their negotiation processes and procedures [e.g., 6, 7]. This is especially due to two reasons: First, buyer-seller

negotiations generally contain sensitive data which companies do not want to share with third parties. Second, the existence of neutral observers might influence the negotiators' behavior [e.g., 8]. For example, it can be assumed that observed negotiators will use ethically questionable methods such as lying to a lesser extent [e.g., 9, 10, 11] that subsequently may reduce negotiation performance.

Given these problems of data gathering in buyer-seller negotiations, researchers mainly focus on negotiation experiments with students [e.g., 12]. However, such experiments are costly and time-consuming [e.g., 13], and their laboratory character leads to a rather low external validity [e.g., 14, 15]. This is due to the fact that experiments are only to a certain extent capable to experimentally reconstruct complex buyer-seller negotiations that take place in reality. Against this background, researchers aim to apply further data gathering methods such as surveys. These are indicated as more cost- and time-efficient than experiments. Furthermore, they allow researchers to analyze negotiation situations more in-depth by asking real negotiators about real negotiations. However, this requires that the negotiators are able to remember the interaction and the final agreement subsequent to the negotiation process. More concretely, whether and in which cases surveys are a more valid and thus a more efficient data collection method than experiments depends on the negotiators' recall performances [4, 16]. Surprisingly, to date, no study has analyzed negotiators' recall performances within the context of post-enquiries following negotiations. Thus, it is largely unknown which parts of a preceding negotiation the negotiators really keep in mind.

Against this background, our study's main objective is to analyze which negotiation aspects can be validly remembered by negotiators subsequent to the negotiation process and which aspects cannot be assessed by the negotiators' memories. By doing so, we aim to provide first important insights with regard to the question which research interests should be analyzed by means of practitioner surveys or experiments.

In the following, we first create a conceptual framework based on the autobiographical memory idea by Reimer [17]. Then, we empirically analyze the negotiators' recall performances by collecting surveys subsequent to negotiation experiments. Finally, we conclude our paper with recommendations for negotiation research in the future.

2   Conceptual Framework and Hypotheses

With regard to subjects' recall performance, the autobiographical recall of individuals plays a significant attention. This term comprises memories for events and issues related to both the individual himself/herself and his/her context [17]. In accordance with Sudman, Bradburn, and Schwarz [18], we define "recall" as the reconstruction of contents from the past, which leads to a sequence of processing of information and is influenced by non-cognitive processes, such as social and emotional capacities [e.g., 19, 20]. Thus, the recall performance consists of selecting the reminded entities out of the multitude of information and perception flows, and of preserving them over time [17]. Moreover, Reimer [17] distinguishes three basic requirements for the recall process: the memory of facts or incidents has to take place in the life of an individual ("remember, that"), the perfect recall of details has to be in the context

of an incident or issue ("remember, why/where/how"), and the memory has to comprise the right sequence of incidents ("remember, when").

Principally, surveys can assess a variety of different components of buyer-seller negotiations (e.g., negotiated issues, procedural aspects such as fair and trustful behavior, concession strategies). In order to get first insights into the question which components negotiators are able to recall, we analyze the negotiators' recall performances regarding their first and last offers in a threefold manner: First, we analyze whether the negotiators' recall performances are different with regard to their own first and last offers. Second, we examine whether there are differences in their recall performances regarding their own and their counterparts' first and last offers. Third, we investigate the impact of a time lag of the survey following a negotiation with regard to the recall performances of the negotiators' own as well as of their counterparts' first and last offers.

Concerning our first interest of investigation, van der Vaart [21] stated that the retrieval of memories by means of reference periods, or "bounded recalls," prevents erroneous dating. A consideration of the primacy and recency effect in surveys might use information received first and last as such reference periods [22, 23, 24]. The primacy effect [24, 25] is a term that describes individual's tendency to remember information at the beginning of a series of information over time; by contrast, the recency effect [22, 24] refers to a situation in which an individual better remembers information that occurs at the end of a series. Following the studies by Atkinson & Shiffrin [22] and Surprenant [24], the impact of the recency effect outweighs the impact of the primacy effect, which results from short-term memory, as recently received information can be more easily accessed [e.g., 26, 27, 28].

We base our first hypothesis on the above-mentioned effects. Thus, we make use of the both negotiating parties' first and last offers and formulate:

H1: *When conducting a post-enquiry following a negotiation, the negotiators are better able to remember offers at the end of the concerned negotiation than those at the beginning.*

Moreover, there is reason to suppose that an individual remembers concise information that concerns him/her with more precision than information regarding others [29]. With regard to negotiations, the negotiators attach more attention to information that relates to them – coupled with an increased motivation – and are therefore subject to direct involvement. Consequently, they deal more intensively with information that relates to them than with information that does not concern them directly [30]. However, Braun, Ellis and Loftus [31] demonstrated by means of autobiographical advertising (i.e. which concerns the persons themselves by using personal emotions) that respondents remember incidents that have never taken place in the reported manner. This effect of missing self-related memory becomes stronger the farther in the past an incident lies. The reason for this is the "reconstructive nature" of our memory, which permanently adapts the recall of past incidents to an individual's current knowledge and social context [31, 32]. Accordingly, we are not able to predict whether and how information received first and last dominate with regard to both self-perception and that of others. We thus formulate two hypotheses:

H2.1: *When conducting a post-survey following a negotiation, negotiators remember their first offers better than the negotiating counterpart's first offer.*

H2.2: *When conducting a post-survey following a negotiation, negotiators remember their last offers better than the negotiating counterpart's last offer.*

Owing to their complexity, B2B negotiations usually occur in several rounds. Thus, there will only be final agreement through negotiation with the same counterpart beyond certain rounds. As regards negotiation research, there is reason to suppose that the negotiators will either not or only partially remember the contents of previous negotiation rounds if queried after the entire negotiation. Taking into account a certain time lag after to the negotiation round ("delayed free recall"), we propose the following hypotheses:

H3.1: *When conducting a post-survey regarding the first negotiation round at the end of the entire negotiation, negotiators remember their first offers better than the negotiating counterpart's first offer.*

H3.2: *When conducting a post-survey regarding the first negotiation round at the end of the entire negotiation, negotiators remember their last offers better than the negotiating counterpart's last offer.*

Fig. 1 points out that the post-surveys of the hypotheses H2.1 and H2.2 refer to the negotiation round 4 and were conducted immediately after this round. Whereas the post-surveys of the hypotheses H3.1 and H3.2 relate to negotiation round 1, but were also conducted subsequent to all four negotiation rounds.
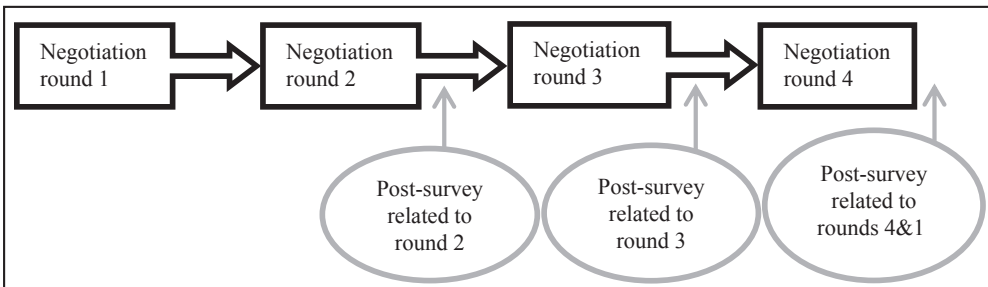
Fig. 1. Conceptual framework of the negotiation experiment.

3 Empirical Study

3.1 Methodology

In order to investigate the subject's recall performance, it is important to establish a basis of comparison, so that we can assess a subject's performance. More specifically, we need to be aware of the happenings during a negotiation in order to verify after the fact whether the subjects remember correctly. Against this background, we applied a multi-method approach by conducting a negotiation experiment and then questioning the negotiators in paper-based post-surveys. In this context, we proceeded to compare the transcribed conversation recordings of the negotiation experiment with the subjects' statements in the post-surveys.

To test our hypotheses, we created a long-term business-relation case consisting of four negotiation rounds, each lasting 10 minutes. The subjects were 20 students enrolled in a negotiation class. However, in order to depict the long-term business relation as accurately as possible, the subjects were not aware of the total number of negotiation rounds. The realistically designed negotiation case was about office supplies that had to be negotiated between a buyer, a university chair, and a seller of office products. The subjects took on the roles of buyer or seller as assigned to them and had to engage in face-to-face negotiations. Before each of the four negotiation rounds, the subjects received role-specific information concerning the negotiation case and had 20 minutes to prepare the following negotiation round. In total, 40 negotiation rounds were recorded on video.

Regarding the post-enquiries, the subjects had to complete a questionnaire immediately after each negotiation round, whereas the questioning concerning the first round took place at the end of the entire negotiation experiment. The partially standardized questionnaire comprised questions relating to first and last offers as well as to their own and their counterpart's offers in the negotiation. For each question, the subjects also had the option to say, "I am not able to remember."

In order to measure the subjects' individual recall performance, we compared the information that each subject reported in the post-surveys to the corresponding indications in the transcribed negotiation protocols. Based on the subjects' price indications, we first calculated the deviation per negotiation issue and per participant i as follows:

$$deviation = \frac{post\text{-}survey's\ statement_i}{real\ statement_i} - 1 \tag{1}$$

Obviously, a subject is able to remember when his/her statement in the post-survey corresponds to the statement made during the negotiation, and thus the deviation amounts to 0. Whereas we state an overestimation if the deviation is higher than 0, negative deviation values represent an underestimation of the price expressed during the negotiation. Depending on the hypothesis to be investigated, the resulting individual deviations, for example,

were aggregated over all negotiation issues or all first offers in a negotiation round, so that an average value is used for further examinations.

Given that a deviation of 0 represents a recall performance of 100%, we used the absolute values of the average deviations and calculated the individual recall performances as follows:

$$recall\ preformance_i = 1 - |deviation_i|. \tag{2}$$

As regards the hypothesis under examination, we aggregated the individual recall performances in order to calculate the total mean over all subjects per negotiation round. We defined a requirement of at least a 5 percent difference between the total recall performances of two objects of investigation to confirm an assumption.

3.2 Results

The resulting recall performances are summarized in Table 1 below. In order to investigate H1, we focused on negotiation rounds 2, 3 and 4 and determined the average recall performances for both the first and last offers for each negotiation round, based on all subjects. In all three rounds, the subjects showed a higher recall performance for information received last, so that the summarized average for remembered contents at the end of the negotiations (90.16%) exceeds the summarized average recall performances relating to first offers (81.31%). Referring to Bjork and Whitten [27] and Kum, Lee and Yeung [28], the results of our study demonstrate the dominance of the recency effect. When examining H2.1, we found that the subjects had not shown a higher recall performance of their own first offers than of the negotiation counterpart's first offer (88.35% vs. 92.34%). However, regarding H2.2, the subjects remembered their own last offers better than those of the negotiation counterparts (97.00% vs. 91.71%). With regard to H3.1, the subjects did not show a higher recall performance of their own first offers than of the negotiation counterpart's first offer (65.65% vs. 65.78%), even though the difference between the recall performances is minimal. Our results confirm that, during the post-survey at the end of the entire experiment, the study's subjects remembered their own last offers significantly better than those of the negotiation counterparts (H3.2: 58.29% vs. 35.73%). To sum up, we state that the subjects' recall performances relating to own and to the counterpart's first and last offers decline as the time period between the negotiation and the post-survey extends (H2.1 & H2.2 vs. H3.1 & H3.2).

Table 1. Average recall performances.
Source: Negotiation experiment, Department of Marketing II, Potsdam University, 2014.

			Recall performances				
Hypotheses	Negotiation round	Number of negotiation issues	Remembered contents	Not remembered contents	Remembered contents	Not remembered contents	Mann--Whitney U Test**
			First offers		Last offers		
H1	2 / 3 / 4*	3 / 1 / 2	0.8131	0.1869	0.9016	0.0984	p = 0.510
			Own first offers		Counterpart's first offers		
H2.1	4	2	0.8835	0.1165	0.9234	0.0766	p = 0.989
			Own last offers		Counterpart's last offers		
H2.2	4	2	0.970	0.030	0.9171	0.0829	p = 0.698
			Own first offers		Counterpart's first offers		
H3.1	1	2	0.6565	0.3435	0.6578	0.3422	p = 0.904
			Own last offers		Counterpart's last offers		
H3.2	1	2	0.5829	0.4171	0.3573	0.6427	p = 0.038

* The results of the negotiation rounds 2, 3 and 4 were aggregated.
** Given the non-normal distribution of the data, the Mann-Whitney U test at a significance level of .05 was conducted for each hypothesis; where $p < 0.1$: marginal significant; $p < 0.05$: significant; $p < 0.01$: highly significant.

4 Discussion

The aim of this study was to provide first important insights into the validity and the suitability of surveys in negotiation research by analyzing the negotiators' recall performance. In this context, we highlighted the relevance of cognitive processes for a persons' recall performance and focused on a comparison of video-recorded negotiations with the subjects' statements included in post-surveys.

Finally, we found that the subjects had demonstrated a particularly high recall performance with regard to information that was provided by them at the end of a negotiation round. In accordance with the studies of Atkinson & Shiffrin [22] and Surprenant [24], our study demonstrated the dominance of the recency effect. The results also show that surveys constitute a suitable data gathering method to depict contents that occur rather at the end of a negotiation, especially when we aim to retrieve information provided by the respondent himself/herself.

Conducting the post-survey with a certain time lag after the negotiation round illustrated that surveys are potentially useful when they are conducted immediately after the negotiation concerned. We therefore conclude, under certain circumstances, that questioning negotiators

after real-life negotiations might be an adequate data gathering method in negotiation research. This facilitates data collection for negotiation researchers, as they are as valid as experiments, but more cost- and time-efficient. As a consequence, the present relevance of experiments might decline.

However, while our study yields valuable implications, future research is needed to address the limitations of our study. Since this was a first study that investigated the importance of the recall performance for surveys in negotiation research, it is recommended to replicate or contradict our study's findings using a B2B practitioner's sample. This is especially true taking into account the small sample size of the study and the fact that only one statistically significant result was obtained (H3.2). Future studies should also include other components by means of which the individuals' recall performances can be assessed. This is especially interesting when looking for suitable research methods that investigate not only result factors such as first respectively last offers, but also procedural aspects, for example, concession patterns [e.g., 33, 34] or particular incidents during a negotiation.

Moreover, time limits for each negotiation round and for answering the post-surveys could have brought arbitrary statements by the subjects that might be counteracted by enhancing the timeframes. The post-survey relating to the negotiation rounds 1 and 4 took place simultaneously in the conducted study, so that cognitive biases [e.g., 35, 36, 37], such as a selective perception, were likely to impact the participants' recall performances in a negative way.

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Negotiating Peace, Conflict and Justice – An Analytical Framework

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Abstract. Despite growing interest in the so-called "peace versus justice" debate, the effects of interventions by the International Criminal Court (ICC) on negotiated peace processes remain unclear. Drawing on insights from the fields of conflict resolution, conflict and peace studies, and negotiation theory, this paper proposes a novel analytical framework to identify and assess the effects of the ICC on conflict and peace processes.

Keywords: international law; International Criminal Court; peace negotiations; peace process; conflict resolution.

1 Introduction

In recent years, a raft of sophisticated arguments regarding the potential positive and negative impacts of the International Criminal Court (ICC) on the conflicts in which it intervenes, have been preferred by scholars and observers. Proponents of the ICC, on the one hand, suggest that the Court can end impunity, deter violence and mass atrocities, and marginalize perpetrators. Critics, on the other hand, insist that the ICC removes the incentives of its targets to enter a peace process, instigates continued and even increased violence, and that judicial sanction is a veneer for more concerted conflict resolution. Still, the peace-justice debate has proven insufficient in elucidating a clear and rigorous framework for how to study the Court's effects on negotiated peace processes.

There is no doubt that interventions by the ICC complicate conflict resolution. But the arguments within the "peace versus justice" debate, as currently constructed, have not provided a sufficient means to identify and analyze how conflicts are shaped by interventions by the Court and what impact this has on potential peace, justice and conflict processes. As a result, despite a desire to move beyond the rigid and dichotomous nature of the debate, a way to do so remains elusive.

Given the amount of time and energy spent on the 'peace versus justice' de-bate, why has a more rigorous research agenda on the effects of international criminal justice on peace processes not emerged? Part of the reason is that the key issues, phases and dynamics that affect and constitute a potential peace process have been neglected. This paper seeks to fill this lacuna by offering an analytical framework with which to assess and analyze the effects of ICC interventions on ongoing and active conflicts.

The paper first examines the treatment of "peace" within the context of the "peace versus justice debate". It is argued that, in studies of the ICC's effects on peace and peace negotiations, neither the negative conception of peace (the cessation of hostilities) nor the positive conception (the achievement of social justice) is sufficiently useful [1].

Both approaches neglect the reality that peace is often a product of a *peace process* – "a political process in which conflicts are resolved by peaceful means" and founded upon a "mixture of politics, diplomacy, changing relationships, negotiation, mediation, and dialogue in both official and unofficial arenas." [2, 3]. Still, despite "limited attention, among conflict researchers, directed toward how states attempt to deal with their past history of violence and how this can eventually affect the prospects for long-term peace and stability" [4], there is a slow but welcome acknowledgement that international criminal justice should be studied through the lens of peacebuilding [5. 6]. This paper seeks to add to this growing body of research by proposing a novel framework for studying the effects of international criminal justice on conflict resolution and peace processes. This is achieved by bringing key elements pertaining to peace processes into the peace-justice debate.

2 Framework

The first task is to identify how an ICC intervention may impact the understanding or narra-tive of a conflict as well as the incentives and attitudes of the parties towards the prospect of entering negotiations. The paper posits that the conflict narrative – the overarching framing or understanding of a conflict's causes and dynamics – along with the attitudes and incentives of the warring parties towards entering a potential peace process will affect all other issues, phases and dynamics of any potential peace process. How the ICC shapes these two issue areas will ultimately determine whether and how a given peace process moves forward.

The second task is to identify the dynamics and phases that are required to move parties towards a peaceful settlement and how the ICC may affect them. There is a general recognition within conflict and peace studies that a peace process consists of three key stages: pre-nego-tiation, negotiation and post-negotiation [7, 8]. Others, e.g., Guelke [9] and Kriegsberg [10], consider additional phases, but the inclusion of these three phases is uncontroversial. Moreover, each phase in a peace process is itself made up of different issues and dynamics. How the ICC affects these dynamics will affect the potential for a peace process to move towards the ultimate aim of conflict resolution. Taking the above, a framework to study and analyze the effects of the ICC on conflict and peace processes begins to take shape (see Fig. 1).
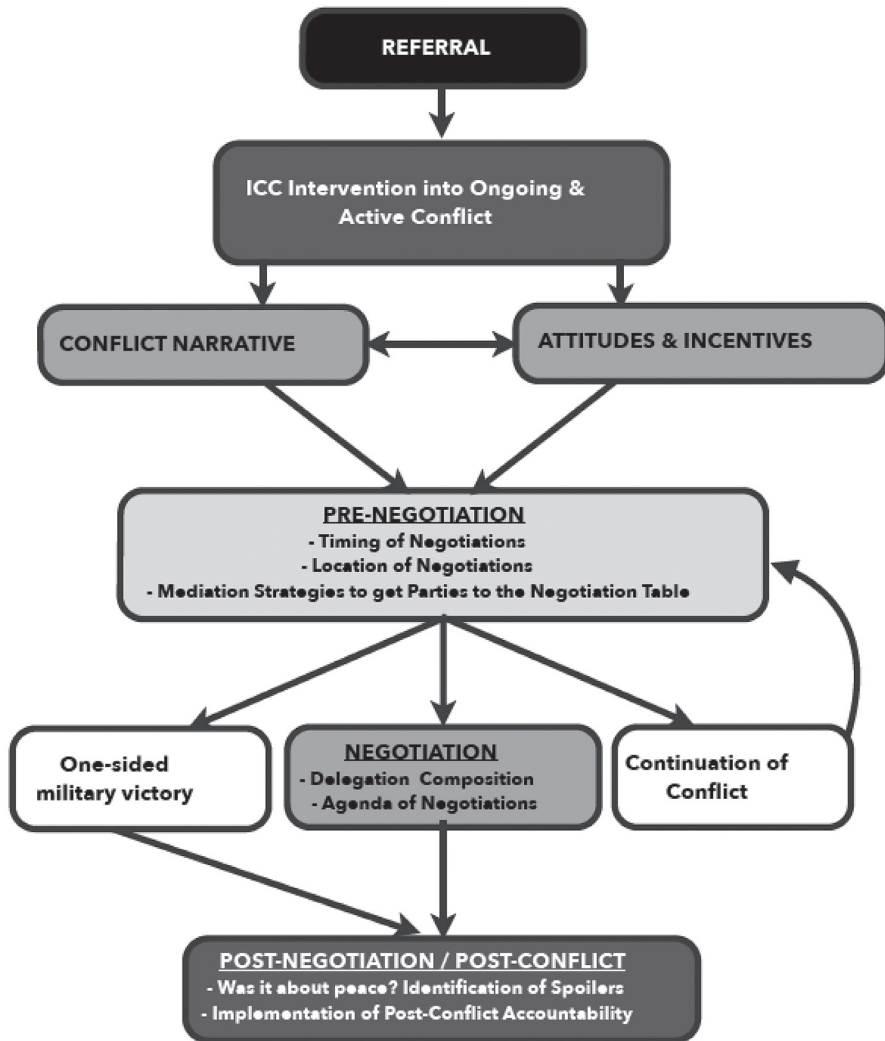
Fig. 1. The effects of ICC intervention on peace processes.

The paper describes each of the phases shown in Fig. 1 and the dynamics of a peace process. It addresses how an ICC intervention could affect each phase. As suggested above, it is argued that the primary effect of ICC interventions on ongoing conflicts is on the conflict narrative – the dominant understanding and discourse of the causes and dynamics of the war, and on the attitudes and incentives of warring parties towards committing to a peace process.

The effect of the ICC on these two issues subsequently affects the three distinct stages of a peace process: the pre-negotiation, negotiation and post-negotiation phases. Key constitutive elements of these phases of a peace process are delineated and the possible effects of the ICC on each are discussed. In the pre-negotiation phase, these are: the timing of negotiations;

the location of peace negotiations; and the mediation strategies employed to get the parties to the negotiation table.

In the peace negotiation phase, the potential effects of the ICC on the composition of delegations at peace talks and the agenda of the negotiations are outlined. In the post-negotiation phase, the framework questions whether a given peace process was actually about peace or was susceptible to spoilers, as well as the potential effects of the Court on the creation and implementation of post-conflict justice and accountability mechanisms. It is hoped that this framework be operationalized as a roadmap and be employed to assess the empirical cases of ICC interventions in ongoing and active conflicts. Indeed, the framework was developed and used as a means to conduct fieldwork research on the impact of the Court on peace processes in Libya and northern Uganda by the author for his PhD dissertation. Findings from this research will be put forward during the presentation of the paper.

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Goal oriented balancing – a general model of negotiation processes

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Abstract. This article presents the first grounded theory on negotiation processes and suggests that it is necessary to simultaneously apply strategies that are focusing on building trust based relationships and those that are more rational when negotiating. The process by which these two dimensions are deployed is dubbed "Goal oriented balancing" and describes how the negotiator is continuously balancing these opposing, and seemingly contrasting, strategies in a situation specific and dynamic manner in order to reach the goal.

Keywords: Negotiation processes, theory, grounded theory, business negotiation.

1 Introduction

Many studies on negotiation and negotiation processes are focusing on some specific dimension or aspect of the negotiation process. However, both managers and researchers have requested studies that show how different aspects of the negotiation process are interrelated [1].

The aim of this study is to produce a general theory on negotiation that shows how the different dimensions of a negotiation process are interrelated. The grounded theory methodology was deployed based on its merits to produce a "broader view" on complex social phenomenon [2, 3, 4, 5, 6]. More over, this particular methodology is also recognized to produce theory that is relevant to the involved actors and thus contributing to managerial relevance [7, 8].

1.1 Extant literature

Studies on negotiations are often focusing on one particular aspect or dimension, for example, the negotiation *parties*, the *context*, the *process* or the *outcomes* [1].

When it comes to negotiation parties, the research focus on individual participants as well as entire organizations. Few studies focus on solely organizational variables [9] and there are some emphasizing both organizational and individual variables [10].

Concerning the negotiation context some researcher has focused on the medium for negotiation and negotiation support systems [11, 12] the negotiation setting [13] the time factor [14] and the negotiation issue [16].

Regarding the negotiation process, there are few studies within the marketing field that describe the actual process as a whole [1]. Rather, they are focusing on certain steps in the negotiation process, [17, 18, 19].

When it comes to negotiation outcomes, two main streams of research can be distinguished, those that view the process from a game-theoretical perspective and given certain possible negotiation alternatives predict possible negotiation outcomes [20, 21, 22] or those that view the process from a behavioral-scientific background and analyze the negotiation parties satisfaction regardless of the factual outcome [23, 24, 25].

Despite these many different accounts on the different aspect of the negation process there are few studies that focus on the negotiation process as a whole [1], this is of major concern since the negotiation process dimension can be considered the core of negotiations [26]. To produce such "broader view" of negotiation processes is the contribution of the present study.

2 Methodology

The present study adopts so-called "grounded theory" methodology (Glaser and Strauss, 1967; Glaser, 1978, 1998, 2001, 2006). This methodology is especially suitable for the present study because (1) grounded theory is based on empirically derived concepts and categories; (2) it produces concepts that reflect the experiences and interpretations of the involved actors; and (3) the methodology places isolated empirical data in a broader context, thus facilitating the conceptualization of multi-dimensional phenomena (such as negotiation processes).

2.1 Data collection

Data were collected from 35 interviews and 27 interactive lectures in total. The data collection was undertaken in two phases. In Phase 1, the first 25 interviews were performed with business negotiators from three companies.

The interviews were audio-recoded and subsequently transcribed, resulting in 1012 pages of transcribed data. Complementary data were also collected as feedback from the 25 interactive lectures, which involved the present author presenting the proposed model to a participatory audience consisting of managers from a variety of companies (the original three companies, plus others). Data from the participants were utilized to confirm and/or modify the early versions of the model in several iterations. These initial interviews were instrumental in forming the main categories in the suggested theory.

In phase two, a more selective sampling was made with negotiators in a broader negotiation context (in accordance to Glaser and Strauss, 1967; Glaser, 2001, 2006, 1998) 10 additional interviews were undertaken (these were not transcribed but notes were taken) with purchasing officers, conflict and crisis negotiators from the Swedish Swat team, leading negotiators from

FBI and diplomatic, union and labor negotiators in order to produce a more formal and general theory on negotiation. Two additional interactive lectures with the Swedish Swat Team and with FBI were undertaken in which the final version of the model was presented.

3   The results – Goal oriented balancing

The model suggested in this study can be summarized as follows:
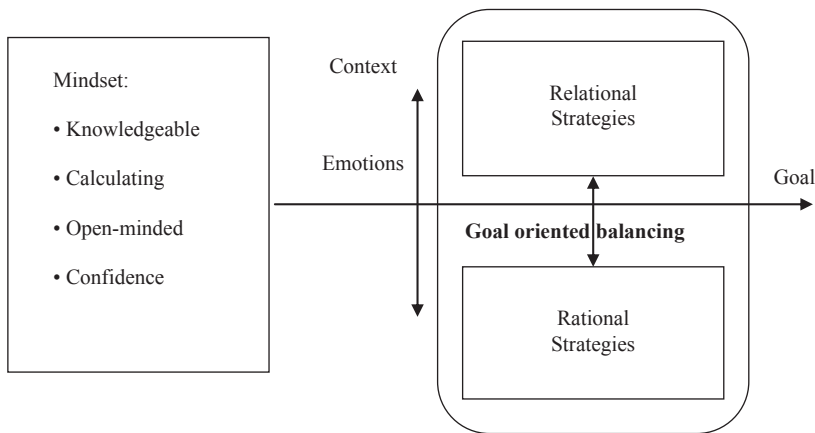
Fig. 1. A suggested model of negotiation processes.

3.1   The mindset

As seen in the figure above, the first dimension in the model is dubbed "mindset" and describes the mindset of the negotiator prior to the negotiation process and it emphasizes the importance that the negotiator is: "knowledgeable", "calculating", "open minded", and having "confidence".

The first element in a negotiator mindset is to be knowledgeable regarding the underlying facts related to the negotiation. Those facts can be about the counterpart's goals, driving forces and motives as well as about other circumstances, internal issues and mandates.

Regarding the subcategory of calculating, this implies that the negotiator has to calculate beforehand in order to secure the self-interest of the negotiator. Those calculations can be about the process, that is, different arguments and strategies possible to deploy in order to reach an agreement. But it can also be about the context and circumstances surrounding the negotiation process and how these contextual factors can be used strategically or the way they have to be tackled in order to reach the goal.

The time factor (the arrow in the figure) is also something that the negotiator has to consider since it is always present and, in most cases, affects the negotiation process. In a crisis

negotiation, the time factor is almost always on the side of the negotiator and, similarly, in a business setting it is common that a solution that is presented later in a negotiation process receive a more positive response compared to if it is presented earlier in the process.

The subcategory of open mindedness describes the importance of the negotiator having an open mind towards the counterpart regarding the counterpart's motives, goals and driving forces, despite the obtained knowledge and the calculations conducted beforehand. By being open minded, the negotiator can often obtain new and important information about the counterpart's agenda that will come to use when deploying and adapting the strategies in the actual negotiation process.

Concerning confidence, this study suggests that it is important that the negotiator has confidence with regards to the possibilities to reach a negotiated solution. Sometimes it is this confidence that makes the negotiator believe in the possibility to reach an agreement and, at other times, this confidence makes the negotiator ask for something that others might regard as difficult or impossible to get.

3.2 The core process

The theory proposed in this study describes that the main concern of the involved actors in a negotiation process is to reach a goal and the social process by which this main concern is continuously resolved is dubbed "goal oriented balancing". This core category describes the way that the negotiator balances two seemingly opposing categories in a dynamic fashion, bit-by-bit, a little different each time. These two aspects that are being balanced are the two categories dubbed "relational" and "rational" strategies.

More specifically, the category of relational strategies is describing different strategies and tactics that establish a trust based relationship with the counterpart. Those strategies can be the use of "open-ended questions", to "listen actively", "being transparent", and to "go first" (to give something to the counterpart). Thus, all these strategies are aiming at building a trust based relationship.

The rational strategies are about tactics and strategies regarding elements of the negotiation process that are not emotional and are not concerning the relationship between the counterparts. In other words, those rational strategies are about the use of "factual arguments", "power", and "contextual factors" such as the time factor or physical circumstances surrounding the negotiation process in order to reach the goal.

The core category of "goal oriented balancing" describes how these two seemingly contrasting tendencies (the relational and rational strategies) are balanced bit-by-bit, a little different each time. In order to balance these dimensions in a situation specific manner, the negotiator has to be conscious and present in this process.

When such delicate balance is present, the negotiator is successful in both building trust based relationships and, at the same time, managing to deploy rational strategies and tactics in order to reach the goal. Importantly, these two processes are supportive of each other. This study suggests that this delicate balancing process is what a negotiator is doing regardless of whether it is a business, hostage, diplomatic or political negotiation.

The arrow describing the emotional factor in the figure is illustrating that the more emotional loaded the situation is the more the negotiator has to rely on relational strategies (for example, in a hostage situation, the more rational tactics and arguments aiming at changing the behavior comes in later in the process when a relationship with the counterpart has been established). On the other end of this emotional spectrum is, for example, a public procurement situation in which the process is designed with the aim to diminish the importance of relationships. In such setting, the negotiator is relying more on rational strategies (even if there always are some relational strategies present) in order to reach the goal. Many private business negotiations are positioned in the middle of these two extremes. In other words, in a business situation, both relational and rational negotiation strategies have to be deployed.

3.3 The context

As seen in the figure, the process by which the two main categories are being balanced against each other is surrounded by the context. In this study, this context is defined as the environment and the circumstances surrounding the negotiation process. Consequently, the negotiator has to take this context into consideration since it can affect the process or can be used tactically by the negotiator (as described above).

4 Conclusions

This study shows that contemporary negotiation processes are complex and dynamic endeavours in which contrasting strategies are deployed in a situation specific manner best described as 'goal oriented balancing'. The holistic and integrative model proposed here describes the management process in two categories: relational and rational strategies. The core process of 'goal oriented balancing' describes the way these two complementary strategies are deployed in real situations.

In terms of theoretical contributions, this study achieves its primary purpose of developing a conceptual framework to provide a better theoretical understanding of negotiation processes. Moreover, through the broader view of this conceptual and integrated model, different dimensions present in negotiation research are effectively integrated.

In terms of practical contributions, practitioners can use the empirically derived model proposed in this study in order to analyse negotiation processes. This practical utility can range from issues of major import (such as strategic decision-making) to issues of internal management education and training (such as initiating a more reflective learning process).

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Does Anger Pay?

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Abstract. Negotiation research with programmed displays of emotion suggests that anger can elicit concessions from counterparts. Three studies of interacting negotiators with financial incentives found no evidence that anger facilitates value claiming. In a laboratory experiment, anger display impaired trust and yielded few concessions. Many subjects refused to display anger despite the costs. A conjoint analysis revealed that subjects were willing to pay a large sum in experimental points to avoid receiving angry messages from other subjects and a still much larger sum to avoid expressing angry messages. Across studies, we observed consistent relationships between individual differences and emotion with neuroticism positively correlated to anger experience and expression. Implications for research and practice are considered.

Keywords: Negotiation, anger, trust, outcomes, personality.

1 Extended Abstract

Some practitioners [1] believe that negotiation advantage can be gained through *emotional misrepresentations*, the deliberate expression of an emotion that is other than one genuinely felt by the negotiator. That type of deceit can take various forms. Someone feeling anxious might attempt to convey outward signals associated with happiness. Someone genuinely happy might attempt to suppress any outward signal of emotion, conveying to observers a sense of neutral affect instead. Or someone actually experiencing no strong emotions at all could attempt to express verbal and/or paralinguistic cues associated with anger. A stream of recent experiments has established that computer expressed anger generates predictable response patterns from negotiating counterparts including in certain circumstances increased concession making [2, 3, 4]. In these studies, subjects were paired with a programmed counterpart that conveyed unfelt anger during the negotiation. Subjects receiving these messages inferred their 'counterpart' was tougher and had a higher limit for settling the negotiation than others. They generated a steeper concession curve.

That pattern suggests that false expressions of anger may prove tactically advantageous for purposes of claiming value. But all those studies lack both the reciprocal interdependence and

the counterparty risk endemic to complex negotiations ranging from employment contracting to nuclear disarmament treaties. In this paper we report three studies that investigated the use and efficacy of expressing unfelt anger using very different research methods. In a laboratory experiment we financially incentivized one member of an interacting dyad with genuine reciprocal interdependence to convey angry messages throughout a negotiation over terms of a service contract. Utilizing dyads enabled us to assess the impact of expressing anger on the expresser as well as the recipient of this anger. The reciprocation of angry messages by the recipient now becomes a strong direct stimulus to the original expresser. This emotional blowback is likely to trigger the genuine experience of an emotion originally feigned for tactical reasons. The ensuing negative affect cycling should result in trust deterioration heightening counterparty risk during the implementation of any deal. Workplace observations and recalled experiences of being a target of anger indicate that being the target of expression of anger results in negative evaluations of the expresser along with attempts to reciprocate the emotional harm caused by an outburst [5, 6]. In eBay disputes, expressing angry words reduced rate of resolution by almost 50% [7]. We hypothesize that misrepresenting anger will yield few benefits for the expresser. A further question is who will actually engage in this practice as anger is difficult to express for most people [5]. Some of the big five constructs have been identified as potential antecedents of anger expression, with interviewer ratings of agreeableness, emotional stability (i.e., reverse-keyed neuroticism), and conscientiousness correlating with negatively with judgments of conflict within married couples [8].

156 participants (78 female, age M=25.90, SD=10.34) participated in return for a five dollar show-up fee plus the possibility of earning more money from negotiating. Participants were told that they would be engaged in a two stage negotiation. All completed questionnaire measures of neuroticism, conscientiousness, and agreeableness [9]. The first negotiation concerned a software development contract between buyer and a seller with 5 issues, 4 of which were integrative. Participants could make offers as well as communicate via in instant messaging over a computer terminal. Participants earned pay from the experiment from the points they accrued, at an exchange rate of 1000 points per \$1. After the first negotiation, participants completed measures of felt emotion and counterparty perceptions and trust. Those who reached an agreement were briefed on the second negotiation modeled on the contracting game of Miller and Whitford [10]. The buyer requires a seller to exert costly effort completing a project. Project worth depends on effort expended by the seller, with greater cost linked to greater probability of project success. The buyer and seller must negotiate fixed pay to the seller independent of the project success, and bonus pay to be paid only if the project succeeds. After agreement the seller made a private decision on costly effort. Following that choice, success or failure of the project and points earned from the negotiation were communicated to both parties.

Those in the buyer role were asked to express either anger or a neutral tone with sample messages adapted from Van Kleef, De Dreu, and Manstead [2]. Those in the buyer role were told that successful emotional messaging would earn extra payment up to \$2.50. Those in the seller role were exposed to video clips validated to induce either neutral or anxious emotions. Those in the neutral emotion induction condition watched the abstract shapes video [11]. Those in the anxious emotion induction condition watched the anxiety inducing video and

audio clips as used by Brooks and Schweitzer [12]. Thus, the study consisted of a 2 (Strategic emotion: Anger vs. Neutral) X 2 (Seller emotion: Anxious vs. Neutral) design.

Despite incentives many neglected to express anger; 41% of angry condition buyers were rated by the seller as expressing a level of anger 3 or less on a 9 point scale. Those expressing anger scored higher on both trait anxiety and trait anger than those who did. Logistic regression with rated anger revealed a significant effect of trait anxiety with each point increase in trait anxiety associated with a 20% increase in the likelihood of strategic anger expression. Yet expressed anger led to no benefits for the expresser nor disadvantages for the recipient. Regression estimates indicated that perception of anger resulted in no more negotiated points for buyers, no less points for sellers, nor more favorable contract terms in the second stage negotiation (i.e., lower payment).

But expressed anger led to lower perceived integrity and benevolence, both aspects of trust. Seller's perceived benevolence fully mediated the relationship between seller's perception of anger and seller's costly effort [13]. Expressing feigned anger was ineffective at inducing concessions. But by impairing trust it increased counterparty risk resulting in strategic disadvantage.

The choice by so many subjects to forego the financial inducements for anger display led us to undertake a conjoint analysis to determine the actual marginal utility of experiment points as compared to the marginal utility associated with anger expression and anger receipt. 130 undergraduates participated for course credit in a laboratory setting. Participants first completed a battery of personality measures including need for achievement, Machiavellianism, facet-level measures of neuroticism (anxiety, anger, self-consciousness, impulsiveness, and vulnerability), extraversion (warmth, assertiveness, and positive emotions) agreeableness (trust, altruism, compliance, and tender-mindedness), and conscientiousness (dutifulness and self-discipline) [14]. Participants were briefed on a potential mobile phone contract negotiation then completed a discrete choice estimation task.

We presented a series of choices between two profiles that varied in terms of the phone warranty issue, emotional tones expressed, emotional tones received, and context. Attribute levels can be thought of as a condition that affects choice. We created a full factorial design consisting of 24 choice tasks to allow testing for interactions – 2 (warranty: 9 months vs. 1 month), x 2 (emotional tone expressed to counterpart: positive vs. negative), x 2 (emotional tone received from counterpart: positive vs. negative), x 3 (context: in-class, research credits, and pay for performance). Every participant completed the 24 choice tasks, in a within-subject design. Responses from 5 participants were excluded because of invariant responses on the task, indicating that they did not follow instructions.

The negotiating issue was extracted from Van Kleef, De Dreu, & Manstead [2]. Participants were informed they would play the role of a seller in a negotiation over mobile phones. To isolate tradeoffs we focused comparisons on a single issue (i.e., warranty) with two levels (1 month warranty worth 15000 points or 9 months warranty worth 1000 points). Participants were informed that they had a choice of expressing either positive, friendly, and pleasant messages or angry messages. Participants were presented with three contexts in which the negotiation could take place. In the in-class exercise context, the negotiations will not affect their grades, the counterpart will be one of their classmates, and after the simulation,

they will interact with the counterpart in future classes. In the research credit context, extra credit would be issued for participation, the amount of points negotiated did not affect the amount of credit earned, and that their interaction with the counterpart will be anonymous. In the pay for performance context, the negotiation was part of a research study for cash compensation, that the points from the negotiation will be reflected in the amount of cash they receive at the end of the study, and that their interaction with the counterpart will be anonymous. Estimation of a conditional logit model revealed that issues linked to economic outcomes were less important for people who are participating in a research credit context compared to when negotiating with classmates and when points directly translate to cash compensation. We took the ratio of the points (i.e., warranty) issue to the non-points issues. People were willing to forego 26,839 points to avoid expressing anger, and 11,472 points to avoid being the target of anger. These represent extremely large marginal disutility of anger considering the highest points represented by issue is only 15,000. We found no consistent differences in willingness to express anger across the various negotiation contexts. Finally, we tested for individual differences in anger expression and anger expression preferences. Facets of neuroticism were associated with a greater likelihood of choosing anger expression: trait anxiety, anger, self-consciousness, impulsivity, and vulnerability were all associated with a higher likelihood of expressing anger. In contrast, facets of agreeableness and conscientiousness were associated with a lower probability of choosing anger expression: positive emotions, trust, compliance, dutifulness, and straightforwardness were all associated with a lower likelihood of expressing anger. Conceptually, we replicate the positive association between neuroticism and expressing anger.

Finally, we conducted an online survey ascertain when negotiators outside the laboratory falsely display anger. We used a recall method to elicit past instances of negotiations with parties more or less likely to induce misrepresentation of anger: friends, family, acquaintances, and enemies. 120 participants from Amazon's Mturk service were recruited for the study (Age M = 38.26, SD = 12.45, 50% female). Participants were offered $1.75 pay in return for participation. 10 participants provided seriously incomplete answers that were dropped from analysis. Participants completed self-report questionnaires including Machiavellianism, emotional intelligence, and facets of neuroticism (anxiety and anger), and agreeableness (trust and morality) [9]. They were randomly assigned to describe a negotiation in which the counterpart was a friend, family, enemy, or acquaintance, resulting in a four cell one way design. Following recall, they evaluated success of the negotiation on a ten point scale. They also reported levels of positive or negative emotions, including anger, experienced and strategically expressed during the negotiation [15]. Personality variables were unrelated to anger expression though reported anger was negatively associated with trait trust ($\beta = -.36$, $p = .03$), but positively associated with trait anxiety ($\beta = .33$, $p = .05$). Those who trust others experience less anger. Those who are anxious experience more anger in bargaining contexts. False anger was more common with enemies, than with friends, family, or acquaintances. An ANOVA revealed a main effect of condition on experienced anger. Contrasts revealed that people felt more anger negotiating with enemies, than with friends or family. Additional analyses revealed that people tended to fake anger more when they actually felt angry. The most common emotional misrepresentation is heightened or dramatized expression of a felt

emotion. Feigned anger was not associated with self-appraised outcome. When emotions were simultaneously entered in a regression equation, none were associated with self-rated negotiation success. Experienced anger was negatively related to negotiation success. Misrepresenting anger is a negotiating tactic that is difficult to deploy, rarely used, and appears unrelated to success. Trait anxiety is associated with anger expression as are other facets of neuroticism. These results are distinct from a published stream of studies in which anger elicited concessions. When the expresser and target are people bargaining with monetary consequences anger has few positive but some distinct negative implications. Through impaired trust, anger diminishes subsequent efforts to implement the deal. Although individual differences have been underexplored in negotiation research [16], our results show that neuroticism is linked to the expression of anger and the willingness to misrepresent it. Implications for theory and practice are considered.

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3
Preference Analysis and Decision Support

Group Preference Management: Elicitation and Aggregation in Social Choice and in Recommender Systems

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Abstract. Preference management is essential in group recommender systems and in social choice. We introduce a comprehensive framework that defines and classifies preference management systems. We classify preference management according to four main parameters: the available input, preference elicitation, preference aggregation and the outcome.

Keywords: Preference management, group recommender systems, group decisions.

1 Extended Abstract

Group recommender systems assist a user or a group of users to find specific items or services that fit their needs and thus make better decisions. Since the decision is based on some aggregation of the individual user preferences, the management of these user preferences is essential [2]. In computational social choice, methods for the aggregation of user preferences are studied, thus striving to assist users to reach joint decisions [1]. Although both fields share the same goal of joint decision making, we discuss their differences in two perspectives of preference management: preference elicitation and preference aggregation.

Preference elicitation: In both domains, when the users' preferences are incomplete, the missing preferences must be either elicited or estimated. Computational social choice does not accommodate uncertainty in preferences. It is usually implicitly assumed that all of the individual voter preferences are available or can be elicited and the main focus is on the voting rule used for combining the preferences in order to reach a winner candidate. When not enough information is available in order to reach a verdict, some preference elicitation method is employed. On the contrary, in recommender systems it is assumed that the preferences might not be available, so the focus is on predicting a winner candidate using the available

preferences and the preferences that it is possible to elicit. Preference elicitation is viewed as a measure for improving the prediction accuracy.

Preference aggregation: After the preferences are elicited or estimated, some combination scheme must be activated. Here again the different concepts emerge. Recommender systems employ aggregation strategies, while social choice relies on voting rules. As we will show, these are two different concepts.

Our contribution in this paper is two-fold. First, we present a comparative study of preference management in two fields related to decision support. Secondly, we present a preference management framework, which is inspired from both fields. The framework is intended for use when designing a decision support system and holds two independent components: a preference elicitation component and a preference combination component. We also analyze the different input and outcome possibilities.

The framework operates under 3 assumptions. First, we assume that when the users' preferences are unknown in advance they can be acquired during the process (i.e., a user who is asked about her preference on an item, responds to the request). Note that the user is not required to decide on all of her preferences beforehand. Secondly, we assume that a user submits her true preferences. Therefore, in this research we do not consider manipulation. Lastly, for simplicity, we assume that the cost of asking a user for her preferences is equal for all users and for all items. When the cost is unequal, the model can easily be extended to a weighted model.

We classify preference management according to four main parameters: the available input, preference elicitation, preference aggregation and the outcome. The systems' input consists of candidates and users (or voters). We define candidates as the items that are available for selection. We define the users as the group that will select from these items. Apart from the candidates and users, sometimes the system also holds historical information such as other items and other users. The system may also hold information about the item attributes or data about the users such as demographic data. We define 3 main interaction styles for preference elicitation: Unambiguous interaction, critique based interaction, and interaction based on linguistic expressions.

The two fields study and treat Preference aggregation in a different manner. The systems' outcome is also treated differently. In recommender systems, the outcome is a single recommendation or a ranked list of recommended items. However, social in social choice, the outcome is deterministic; the outcome is an item or items that necessarily fit the users' requirements.

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Do the negotiators' profiles influence an accuracy in defining the negotiation offer scoring systems?

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Abstract. In this paper we explore the problem of building the negotiation offers scoring systems, that are the analytical frameworks for decision support in negotiation. Based on the electronic negotiation experiment, we analyze the ability of the negotiators to accurate representation of the preferences, imposed on them by the case description, in a form of the SAW-based additive scoring system. We try to find what is the scale of discrepancy between the negotiators own scoring systems and the ideal reference ones derived from the case description, depending on some negotiators characteristics that constitute their negotiation profiles. The profiles we use for our analyses are derived from the Thomas-Kilmann conflict mode instrument.

Keywords: preference elicitation, negotiation offer scoring systems, negotiation profiles, TKI.

1 Introduction

The negotiation offer scoring system is a crucial element of decision support in negotiation [10]. It allows to compare the negotiation offers submitted by the parties, measure the scale of concessions made by them, visualize the negotiation progress and conduct a symmetric analysis that aims at determining the efficient solutions and recommending fair contracts for both parties. Therefore, building such a system is recommended to be a part of the prenegotiation preparation, and is conducted according to thorough step-by-step protocol that implements selected multiple criteria decision making (MCDM) methods. The fundamental purpose of

such an approach is to affect the negotiator to define the negotiation problem adequately and correctly and think of it in an analytical way with some mental and cognitive effort, which could allow to avoid misjudgments and simplifications that result from fast thinking that employs mainly heuristics and intuition [4, 13]. However, the most popular tool recommended by the negotiation analysis to design and evaluate such scoring systems derives from the simple additive weighting (SAW) approach [5] and amounts to assigning the scoring points to all the elements of the negotiation template, i.e. the negotiation issues and their resolution levels (options). Despite its technical simplicity, SAW is being criticized for enforcing the decision makers to operate directly with cardinal rates, which appears not to be intuitive and results in many mistakes and misinterpretations [1, 3, 15]. There are also some experimental studies that elaborate on the problem of using SAW in the context of the negotiation support [7, 12, 14], as well as the authors own initial research [11] that confirmed the negotiators' problems with an adequate definition of preferences in a form of formal SAW-based scoring system. These results may indicate the necessity of developing some alternative negotiation support tools and techniques on one hand, but on the other they form the grounds for undertaking further SAW-oriented research that could identify the key factors that determine the problems with using SAW and reasons of the mistakes made during the prenegotiation analysis and the process of building the negotiation offers scoring systems.

In this paper we present the results of ongoing research on problems and mistakes in building the negotiation offers scoring system, when a software support for negotiation is provided. Based on the Inspire [8] electronic negotiation system's database we analyze, whether the negotiators' mistakes and inaccuracy in analytical process of building such a scoring system are influenced by their personal characteristics describing their negotiation profile. While building the negotiators profiles we use a well-known profiling mechanism based on the Thomas-Killman Conflict Mode Instrument [9]. This paper consists of two more sections. In section 2 we describe the negotiation electronic experiment and our approach in measuring inaccuracy in scoring the negotiation template, then in section 3 we discuss the results both with respect to the individual characteristics of the negotiators' profiles and taking into account a clusters of negotiators of similar profiles. We conclude on future work that could enrich the analysis we presented of other determinants, characteristics and negotiators skills that potentially may influence the negotiators' inability in reliable scoring the negotiation template.

2 Experimental Setup

2.1 Negotiation case and preferential information

In our research we analyze the results of the electronic negotiation experiment conducted in Inspire electronic negotiation system. In this experiment 378 students from Poland, Austria, China, Taiwan, Great Britain, Ukraine and Canada negotiated a bilateral problem of sign-

ing a contract between an entertaining company (Mosico party) and a singer (Fado), which involved four negotiation issues with predefined salient options, as shown in Table 1.

Table 1. Mosico-Fado negotiation template.

Issues to negotiate	Issue options
Number of new songs (introduced and performed each year)	11; 12; 13; 14 or 15 songs
Royalties for CDs (in percent)	1.5; 2; 2.5 or 3%
Contract signing bonus (in dollars)	$125,000; $150,000; $200,000
Number of promotional concerts (per year)	5; 6; 7 or 8 concerts

The preferences of the parties were described in the case verbally and visualized by means of circles, the sizes of which represented the strength of preferences among issues and their options (Fig. 1). The negotiators were ordered to follow this preferential information while building the negotiation offers scoring systems.
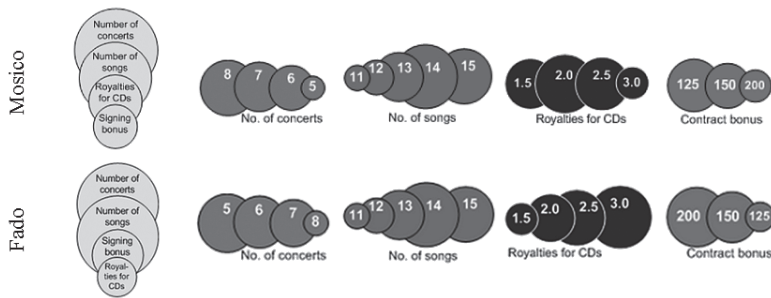
Fig. 1. Visual representation of parties' preferences in the Inspire experiment.

2.2 Measuring accuracy of the negotiation scoring system

The accuracy of the scoring values that the negotiators assign to the issues and options compared to reference values may be measured in two ways. One way is to use an ordinal measure which describes solely the correctness of the order of preferences.

The measure of the correctness of the ranking order (ordinal accuracy index OAI) is the ratio of the two numbers of rankings given by: (1) the number of correct rankings by ith negotiators (n_i^{cor}), i.e. subjective rankings that are in concordance with rankings in the reference order, for both options and issues; and the total number of all rankings (in our case there is five different rankings to be built – see Fig. 1):

$$OAI_i = \frac{n_i^{cor}}{5}.$$

(1)

The ordinal ranking index measures the accuracy of the issues and option rating order but not their values. The differences between the reference values and the values assigned by the negotiators are measured with the cardinal ranking index. It determines a net difference between the rates assigned to issues and options, but avoids double counting of differences in the rates of issue and this very issue best option (see [11]). Thus, the total cardinal inaccuracy index is represented by the following formula:

$$CII = \sum_j \left| u_j^{\text{ref}} - u_j^i \right| + \sum_j \sum_{k=1,\dots,N_j} u_j^{\text{ref}} \cdot \left| \bar{u}_{jk}^{\text{ref}} - \bar{u}_{jk}^i \right|, \tag{2}$$

where:

u_j^{ref} – is a reference rating of jth issue;

u_j^i – is a subjective rating of jth issue defined by ith negotiator;

$\bar{u}_{jk}^{\text{ref}}$ – is a normalized reference rating of kth option of jth issue;

$\bar{u}_{jk}^i$ – is a normalized subjective rating of kth option of jth issue defined by ith negotiator.

N_j – is a number of options of jth issue.

Note, that in the case of the cardinal inaccuracy measurement, the reference rating may be obtained in two different ways: (1) the values derived from the circles' sizes (areas); and (2) the values derived from the circles' radiuses. We will determine the cardinal inaccuracy using both areas and radiuses[1].

2.3 TKI-based negotiators profiles

The Thomas-Killman Conflict Mode Instrument [9] is a questionnaire-based psychometric test that consists of 30 questions regarding the surveyed person's attitude toward conflict and conflict solving. Deriving from the answers the profile of the negotiator is determined that allows to identify the intensity of her/his behavior along two basic dimensions: assertiveness and cooperativeness. These two dimensions are used to define five methods of dealing with conflict: competing, collaborating, compromising, avoiding, and accommodating. The competing mode represents a high concern for self, low concern for others; collaborating – high concern for self and others, *compromising*-moderate concern for self and for others; *accommodating*-low concern for self and high concern for others, and *avoiding*-low concern for self and low concern for others.

Technically, each of these modes is evaluated on 0–12 scale. The score determined for each of the modes reflects the intensity of using this particular mode in the process of conflict solving. In our experiment we used this numerical description of the modes to find, whether there are any links between the negotiators' profiles and the accuracy in defining the scoring systems by them.

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[1] Note, that the ranking correctness may also be measured by means of a correlation coefficients. However, here we use a simpler approach that is based on the notion of distance measuring.

3   Results

We started our analysis with verifying the dependence between the intensities of individual modes of the TKI profiles and the accuracy of the scoring system built by the negotiators. We determined Pearson correlation coefficients (PCC) between the rate of each of the five modes and the ordinal accuracy index (OAI) and two cardinal accuracy indexes: one for circles' areas as reference (CIIA) and second – for circles' radiuses (CIIR); dividing our negotiators into two groups reflecting the parties they were assigned to represent. In Table 2 the PCC's values are presented showing no direct relations between compared variables (the strongest correlations for each index is shaded).

Being unable to find any relationship between the profiles components and the accuracy of the scoring system we decided to cluster the negotiators into the categories of similar TKI profiles. Since the optimal number of clusters could not be objectively established a priori, we applied the hierarchical clustering approach with Ward's minimum variance as a linkage criterion. The clustering procedure was stopped at a break-even step where the within-cluster variance began to grow and the between-cluster variance to decline rapidly (see [2]). The procedure recommended 6 clusters for Mosico and 7 for Fado party. The area charts representing the intensities of the subsequent modes in TKI profiles for the negotiators within each cluster are represented in Fig. 2.

Table 2. Pearson correlation coefficients for TKI modes and accuracy indexes.

TKI mode	Mosico			Fado		
	CIIR	CIIA	OAI	CIIR	CIIA	OAI
Competing	0.014	−0.009	−0.006	0.123	0.121	−0.007
Collaborating	0.023	0.018	−0.070	−0.085	−0.081	0.045
Compromising	−0.209	−0.193	0.135	−0.105	−0.127	−0.039
Avoiding	0.038	0.044	0.031	−0.094	−0.093	0.078
Accommodating	0,099	0,114	−0,077	0.078	0.094	−0.058

■Competing ■Collaborating □Compromising ■Avoiding □Accomodating
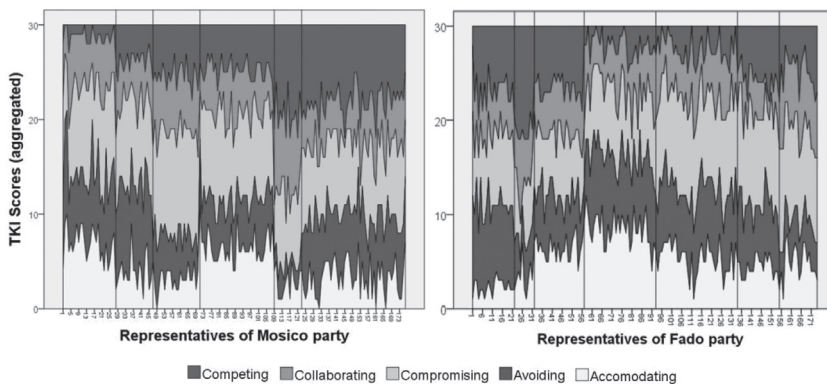
Fig. 2. Mosico-Fado TKI Scores with respect to Clusters.

The clusters were number (according to order of appearance in a graph from left to right) and the average TKI profiles were determined for each cluster. Then the ordinal accuracy index (OAI) and two cardinal accuracy indexes CIIA and CRRR were determined to find the clusters' characteristics of accuracy. The results for Mosico and Fado party are presented in Table 3 and 4 respectively.

Within all Mosico clusters there is cluster 3, for which the cardinal inaccuracy indexes where the lowest and the ordinal OAI – the highest. It means the negotiators assigned to this cluster were the most accurate in defining their scoring systems. While those form cluster 5 – most inaccurate, taking into account CIIR and OAI indexes. CIIA indicates cluster 4 to be most inaccurate. However, there is also cluster 2 of particularly high CIIA and CIIR. The t-tests confirmed the statistical significance ($p < 0.05$) for:

Table 3. Clusters of profiles and their accuracy characteristics for Mosico party.

Cluster	TKI average profile					CIIR	CIIA	OAI
	Competing	Collabor.	Comprom.	Avoiding	Accomod.			
1 (N=27)	1.19	5.33	9.26	7.30	6.93	93.97	85.68	0.66
2 (N=19)	3.74	4.47	8.84	9.05	3.89	100.74	88. 90	0.65
3 (N=24)	5.33	6.08	10.96	4.50	3.13	72.94	64.60	0.79
4 (N=38)	4.71	4.55	9.03	5.16	6.55	97.36	92.50	0.67
5 (N=14)	9.50	8.29	7.43	2.07	2.71	101.74	88.53	0.57
6 (N=54)	8.13	4.50	7.56	6.48	3.33	91.30	79.96	0.71

CIIR, between clusters: 2 and 3 ($p = 0.019$), 3 and 4 ($p = 0.03$), 3 and 5 ($p = 0.037$);
CIIA, between clusters: 2 and 3 ($p = 0.033$), 3 and 4 ($p = 0.015$);
OAI, between clusters 3 and 5 ($p = 0.042$).

When we look at the average characteristic of cluster 3 we find that it is represented by the negotiators that were the most compromising and second high in collaborating. Mapping these results into TKI two-dimension scale we may advance a thesis, that people that are particularly high (but not extreme) assertive and collaborative are also very focused on the accuracy of the prenegotiation preparation in building the scoring system since, perhaps, they are more aware of the possibilities of finding the fair and mutually satisfying agreement that are given by the well-defined scoring systems of both the parties.

Table 4. Clusters of profiles and their accuracy characteristics for Fado party.

Cluster	TKI average profile					CIIR	CIIA	OAI
	Competing	Collabor.	Comprom.	Avoiding	Accomod.			
1 (N=21)	6.62	4.81	7.52	8.76	2.29	56.05	68.48	0.70
2 (N=10)	11.20	5.50	5.70	4.30	3.30	76.86	83.46	0.58
3 (N=25)	6.60	4.92	6.60	5.52	6.36	72.51	82.98	0.66
4 (N=36)	2.06	4.81	7.06	7.58	8.50	63.28	74.20	0.64
5 (N=41)	2.44	5.22	9.80	7.15	5.39	63.37	71.18	0.61
6 (N=21)	5.57	3.38	10.05	6.48	4.52	73.18	82.97	0.58
7 (N=20)	4.80	6.55	9.80	4.00	4.85	53.56	64.19	0.68

Unfortunately, for Fado party the results obtained are more inconclusive. We obtained two clusters: 1 which is most accurate for OAI, and 7 – most accurate for CIIR and CIIA. All remaining clusters are worse from them for CIIA and CIIR. Yet, the differences in average values of all the accuracy indexes we used are not statistically significant for $p < 0.05$.

Knowing the recommended number of clusters we clustered the negotiators once again using the alternative k-means clustering procedure. Needless to say, the clusters obtained were different with respect to the average profiles. Similarly to the results obtained for hierarchical clustering, the differences between average accuracy indexes appeared not to be statistically significant.

Finally, we changed the viewpoint of the analysis and clustered the negotiators into the classes of similarity with respect to the level of accuracy in defining the negotiation offers scoring systems. For instance, for CIIR we identify five following classes of accuracy (form very high to very low): $CIIR \leq 50$; $50 < CIIR \leq 100$; $100 < CIIR \leq 150$; $150 < CIIR$. For clusters defined this way we analyzed whether the average TKI profiles differ significantly among themselves. Unfortunately, no single statistically significant difference was identified.

4   Conclusions and future work

TKI is quite often used for the research and analysis in a field of negotiation to find the relations and dependencies between the negotiators personal and demographical characteristics and the results they obtain in negotiation or the behavior and strategies they choose during the negotiation process [6, 16]. However, in case of analyzing the differences in accuracy and diligence in defining the negotiation offers scoring system it appeared to be inconclusive. Some observations of significant importance made for Mosico negotiators could not be confirmed for Fado party or when the research setup was changed. We are not able to

confirm that either the individual modes nor the whole TKI profile influence the prenegotiation accuracy in preference defining and building the negotiation offers scoring system by the users of Inspire system.

Our future work will focus on more comprehensive and detailed analysis of the phenomenon of inaccuracy in analytical tasks of the negotiators. We will try to use other sets of personal characteristics describing the negotiators analytical profile, such as the education background, fields of study, cognitive capabilities etc. We will also verify, whether and how the way of describing and visualizing the preferences influence the accuracy in mapping them into quantitative scoring system and such inaccurate scoring system may affect results and the process of the negotiation between parties. It could be also interesting to implement a preference accuracy checkup tool in the Inspire system, that would indicate the potential problems with correctness of the negotiators' scoring systems and observe if and to which extent they are willing to correct them according to the formal requirements of the case description.

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Holistic evaluation of the negotiation template – comparing MARS and GRIP approaches

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Abstract. In this paper we discuss two approaches, MARS and GRIP, that can be used for holistic evaluation of the negotiation template, and are based on the notion of indirect definition of the preferences over the set of reference alternatives that described the feasible negotiation offers. We discuss the similarities and differences of both approaches and consider their advantages and disadvantages if applied to the process of determining the negotiation offer scoring system that reflecting the negotiator's individual preferences over the negotiation issues and options. We also consider the potential changes that may be implemented in MARS and GRIP procedures that make them fit better to the negotiation support context.

Keywords: Negotiation template, negotiation offer scoring system, preference analysis, MARS, GRIP, ordinal regression.

1 Introduction

Despite the decision theory offers a huge diversity of methods and techniques for supporting multi-criteria and multi-party decisions only few of them are applied to asymmetric negotiation support, in particular to evaluate the negotiation template and build the negotiation offer scoring system, which may be perceived as a specific class of the classic multiple criteria decision making (MCDM) problem (see [15, 16]). Usually, a simple additive weighting method [9] is recommended as a straightforward approach that allows to elicit the negotiator's preferences quickly in the prenegotiation phase deriving from their subjective judgments (expressed by means of cardinal scores) on the utility/desirability of the atomic elements of the negotiation template, i.e. the issues and options separately. SAW is used, for instance, in such negotiation

support systems as Inspire [11] or Negoisst [17]. Despite SAW seems to be technically and computationally simple, there are some theoretical and experimental research that address problems in assigning and interpreting the abstract scores by the decision makers (DM), which undermines the usefulness of SAW in building reliable scoring systems that adequately reflect DM's intrinsic preferences [2, 20]. Therefore other approaches are proposed that try to reduce the cognitive demand by changing the evaluation perspective and introducing the notions of verbal evaluation. AHP was applied in Web-HIPRE system [14], in which both asymmetric and symmetric negotiation analysis may be conducted [10]; and thus the nine-point verbal scale and pair-wise comparisons of the elements of the negotiation template can be used by the negotiators. In another approach based on TOPSIS [16] the subjective negotiation option rates are replaced with the notion of distances measured to the reference aspiration and reservation packages defined individually by the negotiators, which reduces significantly the negotiator's workload during the process of negotiation template evaluation. However, they are still the methods of the direct preference elicitation that requires of DM/negotiator a clear and precise definition of all the parameters of the preference model (e.g. issue weights, option rates, aspiration and reservation values etc.).

Yet, there is another decision making approach that allows defining preferences in the indirect way, by means of some holistic judgments regarding the selected examples of the potential solutions, based on which the parameters of the preference model are induced and all the remaining alternatives considered within the decision making problem may be evaluated and rank. This approach is based on the disaggregation (regression) paradigm [7] and may be implemented for the set of MCDM methods based on both the multiple attribute utility/ value theory and the outranking relations. Depending on a particular MCDM method used the holistic judgments may provide a preferential information on assigning some examples of alternatives to verbally predefined categories [13] or defining the preference relation on selected pairs of reference alternatives [4, 18]. Such definition of preferences reduces significantly the cognitive effort of DM. From the viewpoint of the negotiation support the indirect disaggregation preference elicitation approach may be of particular interest, since it allows negotiators to express their general opinion on some alternative negotiation offers represented in a form of complete packages. This is a typical situation that negotiators face during the win-win negotiation process. They need to compare and evaluate the subsequent offers describing the terms of two alternative contracts and consider, which of them is better, and if they exceed their BATNAs and meet their aspirations both defined by means of some reference alternatives [5, 19]. Thus, it could be interesting to find, if some of the disaggregation methods may be applied in the prenegotiation support for holistic evaluation of the negotiation template, allowing to build the complete negotiation offer scoring system.

MARS [6], a method for multi-issue negotiation support, was designed previously by the authors of this paper as a hybrid of ZAPROS [12] and MACBETH [1]. It introduces the notions of holistic verbal judgments and allows to build the negotiation offer scoring system deriving from the pair-wise comparisons of some predefined set of reference alternatives. However, it is not free from some drawbacks and limitations. Therefore, in this paper we focus on a theoretical discussion on the applicability of other MCDM methods that apply the notion of indirect preference definition and disaggregation of holistically defined preferences.

Our goal is to compare MARS with the ordinal regression based approach called GRIP [4] and discuss, whether some elements of both those approaches may be improved to make them more efficient and easier to use negotiation support tools. We organize the paper as follows. In section 2 we define the negotiation decision problem as a problem of indirect scoring the negotiation template. In section 3 we provide a reminder of the methods under consideration, than in section 4 we discuss their similarities and differences and conclude what are the potential changes and improvements that could be introduced into their algorithms. We conclude with the future works that deal with the potential limitations in technical implementations of these methods in a form of the negotiation support systems.

2   A negotiation template and its indirect evaluation

To provide a reliable decision support in negotiation the negotiation analysis recommends a checklist of the prenegotiation tasks that allow negotiators to identify and structure the negotiation problem, design and evaluate a negotiation template and build the negotiation offer scoring system [15]. The negotiation template is a simplified definition of the negotiation space and specifies the set of negotiation issues $F = (f_1, f_2, ..., f_n)$, and the sets of feasible resolution levels (options) $X_i = \{x_i^j\}_{j=1, ..., |x_i|}$ for each issue f_i. This way it defines the negotiation problem as a discrete decision making problem. If some negotiation issues are of continuous character (like the price or time of delivery), the feasible ranges may be represented by means of finite sets of salient options. Thus the set of all feasible negotiation offers (packages) may be defined as $X = \prod_{i=1}^{n} X_i$. Each alternative $x \in X$ may be described then as a vector of options $x = (x_1, x_2, ..., x_n)$. Evaluation of the template requires building the negotiation offer scoring systems, which is a set of non-decreasing marginal value functions $u_i : X_i \rightarrow R$, for $i = 1, ..., n$, that allow to assign scores $u_i(x_i^j)$ to each option defined in the negotiation template and evaluate each negotiation offer $x \in X$ by means of additive value function[1]

$$U(x) = \sum_{i=1}^{n} u_i(x_i). \qquad (1)$$

Acknowledging the cognitive problems with direct definition of the scoring systems by the DMs/negotiators (see [2, 20]), the holistic indirect evaluation of the template should allow for:
1.   Building the scoring system based on the preferential information defined for a predefined set of reference packages $P \subseteq X$.
2.   Extending the scoring system for all feasible offers from X.
3.   Taking into account either complete or incomplete preferential information defined for P.

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[1] We assume here, that according to the general assumptions of additive preference aggregation the DM's preferences over the resolution levels are mutually preference independent.

4. Defining the preferences and strength of preferences for elements or pairs from P verbally using more intuitive linguistic terms.
5. Defining aspiration and reservation levels as the additional preferential information.
6. Eliminating the necessity of explicit definition of the issue weights.

3 Formal methods for indirect evaluation of negotiation template

3.1 MARS

The MARS (*Measuring Attractiveness near Reference Solution*) procedure of indirect eliciting preferences and building the negotiation offer scoring systems consists of 5 steps (for details see [6]):

Step 1. Determining the evaluation scale (resolution levels) for each negotiation issue.

Step 2. Defining the reference set $P = Y_{nIRS}$, where Y_{nIRS} consists of Ideal Reference Solution (IRS) with the best options for all the criteria and the packages with the best evaluation for all the criteria but one (set of packages being near to IRS).

Step 3. Pairwise comparison of packages from P, using the ordinal or verbal scale, or MACBETH-like semantic categories.

Step 4. Solving the linear program corresponding to the comparisons performed (using the MACBETH approach) to obtain the packages' scores on the 0–100 scale.

Step 5. Ordering all alternatives from X with respect to the IRS. The scores of options that form IRS are equal to 100 each, while each non-ideal option receives the score equal to score of this near-to-IRS alternative, which it comprises. To obtain the global scores of packages on the 0–100 scale the scoring formula (1) needs to be adopted to MARS specificity and takes the following form

$$U(x) = \frac{\sum_{i=1}^{n} u_i(x_i) - \min_x\{U(x)\}}{100n - \min_x\{U(x)\}} . \tag{2}$$

It should be noted that the reference set Y_{nIRS} is built based on the recommendations of ZAPROS procedure, and consists of packages that are easy to compare, since they differ in two issues only and require of negotiator to think in terms of the concessions she/he is more likely to make. The comparison of concessions is done verbally, according to classic MACBETH scheme of pairwise evaluation (Fig. 1). E.g. for (70, 7, VG) being IRS, comparing (70, 14, VG) with (50, 7, VG) requires answering a question: "do I prefer to concede of 20 for f_1 or 7 for f_2, and of how much?".

Seller 1

	70, 7, VG	70, 14, VG	70, 21, VG	70, 7, AV	60, 7, VG	50, 7, VG	40, 7, VG	70, 7, VP	30, 7, VG	Current scale
70, 7, VG	no	weak	weak	moderate	moderate	moderate	strong	strong	v. strong	100.00
70, 14, VG		no	weak	weak-mod	weak	moderate	strong	strong	v. strong	92.59
70, 21, VG			no	weak	weak	moderate	moderate	moderate	v. strong	85.19
70, 7, AV				no	very weak	moderate	moderate	moderate	v. strong	77.78
60, 7, VG					no	moderate	mod-strg	moderate	v. strong	74.07
50, 7, VG						no	weak-mod	vweak-weak	strong	51.85
40, 7, VG							no	very weak	moderate	40.74
70, 7, VP								no	moderate	37.04
30, 7, VG									no	0.00

extreme / v. strong / strong / moderate / weak / very weak / no

Consistent judgements

Fig. 1. MACBETH-like comparisons of ZAPROS-like packages in MARS approach.

The advantages of MARS are: (1) a simple procedure that requires comparison of single concessions made on two issues at a time; (2) operating with intuitive verbal scale; (3) lack of issue weights. On the other hand, there are some drawbacks of this approach: (1) precisely defined reference set, the size of which depends on number of salient options $|P| = 1 + \sum_{i=1}^{n} (|X_i| - 1)$ that even for small negotiation problems may generate huge number of required comparisons equal to $\frac{|P|(|P|-1)}{2}$; (2) limited number of verbal categories in the scale used for pairwise comparisons; (3) alternative solutions of linear program solved in step 4 that results in ambiguity in selecting the final system of scores.

3.2 Building the ranking of alternatives with GRIP

GRIP (*Generalized Regression with Intensities of Preference*) derives from the notion of ordinal regression and UTA [4; 18]. In general, GRIP builds a set of additive value functions representing a reference preorder and intensities of preference. Its procedure of analyzing a MCDM problem consists of the following steps:

Step 1. Determining the evaluation scale for each decision criterion.

Step 2. Defining the set of the reference alternatives $P \subset X$, that may consists of those alternatives for which DM's judgment is certain and preference information is easy to obtain.

Step 3. Providing the preference information that describes:

- a preference relation on a set of reference alternatives from P, e.g. "alternative a is at least as good as b",
- or/and intensities of preference for pairs of alternatives from the set $P \times P$ with respect to all criteria or selected criterion respectively, e.g. "a is preferred to b at least as much as c is preferred to d".

Step 4. Checking for existence of at least one value function compatible with the preference information provided by the DM and next building a set of compatible additive value functions (a linear program is built and solved).

Step 5. Receiving recommendation in terms of necessary and possible conclusions for pairs of alternatives of intensities of preferences:

- In a necessary ranking (partial preorder) a (or pair of alternatives) is ranked at least as good as b (or other pair) if and only if $U(a) \geq U(b)$ for all the value functions compatible with the preference information.

- In a possible ranking a (or pair of alternatives) is ranked at least as good as b (or other pair) if and only if $U(a) \geq U(b)$ for at least one value function compatible with the preference information.

Step 6. Ranking alternativies from the set X using the "most representative" value function. An original suggestion of such a function was formulated by Figueira et al. [3], some other may be found in [8].

Please note, that from the viewpoint of the DM/negotiator the preferential information provided in step 3 does not require any particular cognitive effort, but at least being able to define a partial order on the alternatives from P. If we consider the same P as in Fig. 1, the preferential information provided by negotiator in GRIP may be the ordinal ranking only, from which the cardinal scores are inferred (Fig. 2).

Offer	Ranks provided by the negotiator	Cardinal rates
(70, 7, VG)	1	1.000
(70, 14, VG)	2	0.918
(70, 21, VG)	3	0.836
(70, 7, AV)	4	0.816
(60, 7, VG)	5	0.796
(50, 7, VG)	6	0.715
(40, 7, VG)	7	0.633
(70, 7, VP)	8	0.613
(30, 7, VG)	9	0.551
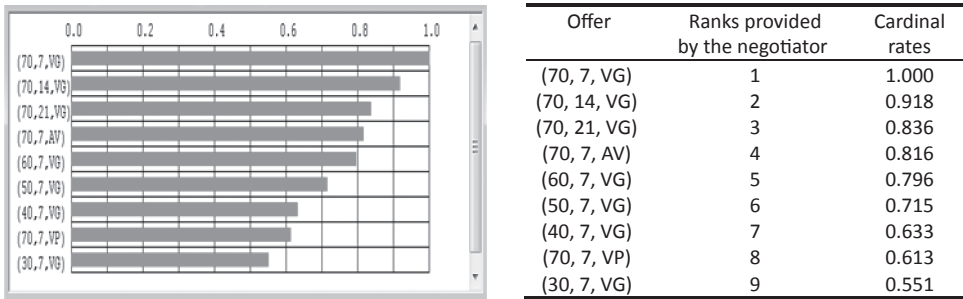
Fig. 2. Preferential information and ratings for offers from P in GRIP.

4 Comparison of MARS and GRIP used for negotiation support

Analyzing the MARS and GRIP procedures presented in section 3 some similarities can be found. Both the approaches elicit preferences from the reference set P, so they meet the postulate 1 of indirect evaluation of the negotiation template. The scoring system obtained this way is defined by means of sets of additive scoring functions and both methods offer the additional procedures to identify within these sets a single and "best fitting" one. MARS and GRIP-based scoring systems may be extended to all salient options (postulate 2), and more – if the issue is quantitative – to other feasible options by implementing the notion of linear interpolation between the neighboring salient ones. Both of the methods we discussed allow negotiators defining the complete or partial orders (postulate 3), however, it is only MARS, which allows to use 6-point verbal scale to address the strength of preferences between offers (postulate 4). GRIP allows to grasp some kind of additional preference relations (called intensity), however it is done by means of preferential relation between differences in evaluated elements only. Both in MARS and GRIP it is possible to take into account

the aspiration and reservation levels, however they must be defined in a form of reference packages and included in P (postulate 5). Both the methods do not require defining the issue weights (postulate 6).

There are, however, some nuances that differ these two approaches from the technical and pragmatic point of view and may influence the final decision on choosing one of them for final template evaluation. Both methods differ in defining the set P. For MARS it is absolutely necessary to use Y_{nIRS}, otherwise not each salient option could be precisely scored. For GRIP there is no such a recommendation. It may be assumed, that in GRIP the same Y_{nIRS} may be used, but the negotiator may add it some other packages that she/he claims they may be easily compared to the others from Y_{nIRS}. Most evident may be the difference in preferential information required by MARS and GRIP that influence in a total workload required of the negotiators while evaluating the template. As mentioned, MARS requires a pairwise comparisons of all packages within P, while it is enough to rank them for GRIP (compare Fig. 1 and Table 1). Cognitive effort seems far less in GRIP then. However, in MARS the negotiator may also define precisely the preferences for the pairs of packages above the diagonal only, and for all remaining pairs declare, that the preference relation exists but of unknown strength. In this case a MACBETH-specific approach will add to the linear program the constraints describing the possibility of occurrence of each possible preference relations defined by means of 6-point verbal scale. Cognitive effort of the negotiator is significantly reduced then (and comparable to GRIP's one), however, at the cost of precision of the scoring system obtained. It also should be noted, that the preferential information in MARS, despite being more cognitively demanding, is richer than in GRIP. In other words, we are able to build a scoring system in GRIP using preferential data from MARS, but a converse situation is not possible. Finally, GRIP provides the negotiator with much richer output, allowing to consider various sets of necessary and possible rankings and even aggregating alternative solutions into a single "average" one (see UTA approach [18]), while MARS offers only a single "best fitting" scoring system with a potential sensitivity analysis.

5 Conclusions

The comparison we presented in this paper is a part of ongoing research that aims at building an alternative to SAW approach for prenegotiation preparation, in particular, for building the negotiation offer scoring system. The method we analyzed would allow to change the overall approach in prenegotiation preparation, not forcing the negotiators to operate with abstract and interpretatively unclear scores and assign them directly to the elements of the negotiation template. Both approaches derive from linear programming models, however it is MARS that requires more detailed information and seems to be a bit more demanding from the user. Thus the question arises, whether MARS may lead to the more accurate scoring system than GRIP? Or maybe a fusion of these methods will appear to be better solution? One of the possibilities, for instance, is to use Y_{nIRS} (or the subset of Y_{nIRS}) as a reference set in GRIP, which will allow to take advantage of both GRIP's low cognitive demand, and MARS-specific intuitive packages that are easy to compare.

Our future work will focus on verifying use and usefulness of both approaches. In the empirical research we will organize a series of experiments within which the negotiators would use both the methods and provide us with a feedback of the ease of use of MARS and GRIP. We will also verify the accuracy of the scoring systems built by means of them in simulation tests for randomly defined scoring systems describing the intrinsic preference structures of the supported negotiators.

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Inferring pseudo criteria parameters in a procedure for group decision-making

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Abstract. This is a disaggregation approach for group decision making with ELECTRE III method. The procedure uses an inferring tool in which the group is supported for parameters modification of outranking methods in an iterative and interactive process. The inferring parameters tool concerns individual preference and group preference to support members in getting an agreed collective solution. This procedure shows how the inferring parameters tool may be used to help the group to iteratively reach an agreement on how to rank alternatives at a time, reflecting the preferences at the individual level and at the collective level.

Keywords: Group decision-making/GDSS, preference disaggregation analysis, outranking method, genetic algorithm.

1 Introduction

Reaching an agreement in a group decision-making process is a difficult task. When members of the group use multicriteria decision aids methods to model their individual preferences, they should change repeatedly their individual parameters until an agreement on the collective solution is reached. This work deals with the stages of modifying individual preferences (inter-criteria parameters) in a group decision process for outranking methods where the decision makers (DMs) must define individual parameters to generate individual rankings.

The DMs in this group decision procedure define their individual parameters for an outranking method (e.g. ELECTRE or PROMETHEE) and generate individual ranking. Subsequently, a group based outranking method is used to obtain a collective ranking. The problem we are dealing with is in the parameters modification stage, where the DMs modifying their individual parameters repeatedly to obtain different individual solution and different collective

solution before an agreement is reached. This is a procedure that can be used as a previous stage of multilateral negotiation or when the last one cannot be performed.

It is known defining outranking's parameters could be a complex task, particularly in-difference, preference and veto thresholds. When DMs are agree to change their individual parameters with values easy to accept because a possible ill definition, this procedure can be used. It helps to get a collective ranking that every DM can support.

For this problem we work with a model [1] based on outranking method for inferring inter-criteria parameters. In the stage of definition of parameters, the procedure supports DMs in a group decision-making. The model includes DM's marginal information to propose parameters for the outranking method, which generate individual solutions closer to the collective solution. The inferring model is exploited with a genetic algorithm, which takes as input DM's original parameters and shared preference between individual and collective solution. The output of the genetic algorithms is the set of parameters weights, indifference thresholds, preference thresholds and veto thresholds (w, q, p, v, respectively), which can generate a ranking (individual solution) more similar to the group ranking (collective solution). In this procedure, the DMs use of an appropriate Multicriteria Decision Aids method (ELECTRE III, a ranking method proposed by Roy [2]), and the SADGAGE software [3], which support a multicriteria group decision making to generate individual solutions and the collective solution.

2 Group decision-making procedure

The group decision-making is performed in the context described as follow. The Fig. 1 illus-trates the schema of a group decision-making procedure where the DMs work in an individual manner. In each iteration, the DMs construct their individual preferential models and individual ranking. In outranking methods, the DMs express their preference in pseudo-criteria form (w, q, p, v). With a group preferential aggregation method, which is based on individual's results, a temporal collective ranking is generated. Two methods have been recognized in the scientific literature [4] and [5].

The procedure shown in the Fig. 1 is conducted iteratively by the group to reach an agree-ment. The agreement is regarded with the proximity of every individual result with group solution. It can be measured as a function of similarity between the ranking of the i-th DM (R_i) and group ranking (R_G).

$$Proximity\,(R_i, R_G) \tag{1}$$

Jabeur and Martel [6] and Leyva and Alvarez [7] present two particular indexes to measure proximity between rankings. The agreement level (C_A) can be calculated with the information obtained by the approximation of the individuals' results (see Eq. 2).

$$C_A = \sum_{i=1}^{ND} \frac{proximity(R_i, R_G)}{ND}, \tag{2}$$

where ND is the number of DMs belonging to the group (participants).

Every DM can modify his/her individual preference, however we can identify with Eq. 1 those DMs presenting more disagreement with the collective solution (D set), thus they are priority to modifying their preference.

In this type of procedure, the group's members have agreed to modify their individual preferences to obtain a preference closer to group preference. In this sense, when the agreement is not reached ($C_A < \alpha$) the new D set of DMs can modify their preference. As it is a difficult task for the DM, an inferring parameter tool supports the DM in this modification stage. It uses preference information between DM and group (A^{Ri}), individual ranking (R_i) and group ranking (R_G).
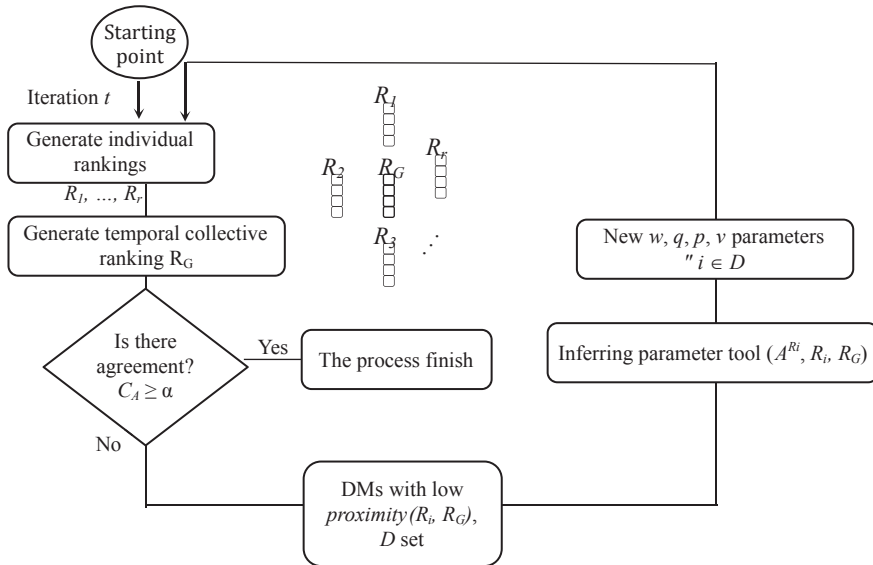
Fig. 1. Group decision-making procedure with individual rankings to reach agreed collective solution.

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A Multicriteria Group Decision Model for Supporting Operations in Intelligent Electrical Power Grids

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Abstract. This study presents a two-phase multicriteria decision model to support group in sorting decision problems with a lack of information. The first phase involves the assessment of individual set of decision rules using the dominance-based rough set approach (DRSA). The second phase introduces an aggregation procedure to generate a collective set of decision rules. To illustrate the applicability of the model a numerical application is used in a context of Energy Utility that needs to establish a set of decision rules to coordinate a distributed real-time operation in Intelligent Electrical Power Grids, so called smart grids.

Keywords: group decision-making, rough sets, sorting problems, Energy Utility.

1 Introduction

In group decision-making approaches, individuals often make judgments on the same decision problem in an isolated and independent way. Due to the different points of view amongst decision makers (DM), there may be disagreements, conflicts and regrets on the same decision problem. Moreover, DMs can make several mistakes during the decision making process, for instance: mistakes caused due to time constraints, mistakes caused due to lack of information, mistakes caused due to an individual who may be likely to be cardinally inconsistent, mistakes caused due to the fact that all participants in the group decision making may not have equal expertise about the decision area etc. [1].

In the literature, we can find analytical group multicriteria decision making (MCDM) methods developed to support different problematics (e.g, ranking, choice, sorting) aggregation of DMs' preferences [2, 3, 4, 5], but an analyst may have difficulty in handling errors or inconsistencies caused by DMs using such methods. Moreover, it is possible find decision problems in which converging toward agreements by a procedure for minimizing dissimilarities

(or maximizing similarities) between DMs may not be suitable [6]. For these reasons, this study seeks for group decision models based on rough set approaches to sort potential actions into several ordered categories [7]. A dominance-based rough set approach (DRSA) seems useful since it can deal with a lack of information, does not require any preference parameter such as criteria weights and is able to detect inconsistency in the input data [1].

2   A brief description of the model

The model was developed for a collaborative process and supposes that DMs are willing to give up their most preferred decision rules in order to construct aggregative decision rules in a less conflicting way. Group meetings may not be necessary or could be held back until the last step of the model. The model extends the study by Chakhar and Saad [8] by modifying the second step of that model. For this new model we consider the existence of different weights for DMs and we are studying how different operation rules can be adopted to reduce the assignment intervals in case of existence of potential actions which can be assigned to more than one class.

   The steps of the model are: *First step:* Generate individual decision rules by applying the DRSA [9] for ordinal classification; *Second step:* Identify similarities and differences among DMs in order to aggregate these individual rules by reducing assignment intervals and establishing a collective decision table. Thereafter, DRSA may be applied so as to generate collective decision rules.

3   Numerical application

An intelligent electricity grid (IEG), a so called Smart Grid, is an electrical grid that combines information and communication technologies with power (generation/ transmission/ distribution) systems in order to improve efficiency, reliability and sustainability in the production and distribution of electricity [10, 11, 12]. In discussions on smart grids, a major issue is the transition from operating a centralized (and unidirectional) electricity grid towards operating a decentralized and multidirectional electricity grid in which end-users will shift from a passive role as consumers to an active role as co-provider [13]. This new operational paradigm implies the need to consider different individual interests, such as Energy Utility, Consumers, Government, Manufactures etc. Based on that, the necessity to combine those interests and establish a set of operational decision rules to support real time operations is not an easy task.

   The model proposed was applied in such a context, considering four decision makers (DM): an Energy Utility representative, a Telecom/IT representative, a Government representative and a Regulatory Agency representative and a set of six criteria (Industrial impact, Residential impact, Commercial impact, Environmental impact, Tourism vulnerability, Security vulnerability) was considered. The collective decision rules are supposed to sort fault occurrences and support system operators by providing a suitable course of actions. All DMs have stated

their own individual preferences and for each of them different weights (which reflect their knowledge about the electricity system) were assessed.

4 Summary and conclusions

The main goal of this study is how to make it possible to reach a set of decision rules in a less conflicting way by proposing a model that allows DMs involved in a multicriteria sorting problem to assess collective decision rules that are in accordance with their preferences (or areas of expertise).

At this stage of the development of the model, some limitations and drawbacks have been noted. The need to eliminate inconsistency problems may be hard work for the analyst, even we had considering a method that gives support for that. The model is not immune to misrepresentations and DMs may modify their preferences in order to promote their own decision rules. Another fact is that by now the findings were based only in one type of aggregation rule and additional tests should be conducted in order to evaluate the behavior of the model by using other aggregation rules. An ongoing research study is developing a rule--based decision support system which will allow the collective decision rules to be exploited in order to classify other decision potential actions.

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Stakeholders' Engagement in Sustainability Reporting

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Abstract. Sustainability reporting is a key activity for organizations to inform stakeholders on their sustainable strategy and attendant efforts to put it into practice. Despite the existing guidelines for sustainability reporting, and specifically those by the Global Reporting Initiative, stress the importance of stakeholder engagement in identifying the relevant sustainability topics (which are called material aspects), to our knowledge the literature does not provide a structured procedure to combine the different stakeholders' assessments, so as to identify material aspects. In this paper we propose an approach to deal with such a group decision making problem, based on the additive weighted aggregation of the stakeholders' verbal assessments.

Keywords: sustainability reporting, Global Reporting Initiative, stakeholder engagement, material aspects, group decision making.

1 Sustainable Development and Sustainable Companies

In the last decades awareness has grown about problems such as poverty, global warming, water scarcity and the resulting need for a development that has to be socially and environmentally sustainable. Sustainable development was defined by Brundtland [1] as *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. Such a definition asks for seeing the world as a connected system along both the space dimension (needs of the present, in particular across countries and societies) and the time dimension (needs across present and future generations and, hence, the focus on environment).

Due to their impact on environment and society, companies are key players for sustainable development. Elkington [2] coined the phrase "the triple bottom line" (TBL) to identify the implications sustainable development has for companies. They should address three different bottom lines: (i) the traditional bottom line of the *profit* and loss account; (ii) the bottom line of a company's *people* account; (iii) the bottom line of the company's *planet* account. The TBL

concept is then based on three Ps (profit, people and planet) and implies that only a company that addresses a TBL is taking account of the full cost involved in doing business.

The above issues have been addressed by the literature on Corporate Social Responsibility (CSR) at least since the mid of last century. The term CSR was indeed introduced by Bowen in 1953 [3]. A slight different perspective was adopted by Freeman [4], who proposed the stakeholder theory, which is peculiar in that it emphasizes the need for (i) looking at a company as a network of stakeholders and (ii) integrating social responsibility within the firm's business strategy.

Lately, CSR has become matter of interest to European Union, which in 2011, updated the previous definition of CSR, formulated in 2001. Initially, EU defined CSR as *a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis* [5]. Later on CSR is defined as *the responsibility of enterprises for their impacts on society* [6]. In the newer definition, EU turns *concern* into *responsibility* and recognizes a comprehensive *impact on society* that includes both social and environmental dimensions.

2   Sustainability Reporting: Materiality and Stakeholder Engagement

In the previous Section we argued about the need for companies for embracing sustainable strategies. However, it is not always obvious that a higher sustainability of a company ensures higher performance along the economic dimension. In some cases the linkage is quite direct: for example, using less material or energy inputs increases environmental sustainability and at the same time reduces production costs. In other cases, the impact is less tangible: for example, a company's free nursery for the employees' children enhances the well-being of employees, but it is unclear how and to which extent this impacts on the company's performance. With this respect, we argue that communication is key [7–8]. In particular, sustainability reporting represents a useful tool to inform all stakeholders and make them able to recognize the value of a company's sustainable practices, even in terms of a higher market share or price [9]. A company's sustainability report is a document that describes how the company deals with its economic, environmental, and social impacts. Developing the report is a strategic process, which implies dealing with sustainability before reporting on it. As such, sustainability reporting supports CSR strategy and implementation.

Sustainability reporting is not mandatory, even though, for example, Singapore stock market is about to require it for listed companies [10], nor a common format exists to which reports should adhere. However, in the last decades guidelines have been developed, which help develop a sustainability report. The Global Reporting Initiative (GRI) guidelines [11] are among the most authoritative, even though they let a certain discretion in particular with respect to the so called materiality analysis, which has to be carried out through a process of stakeholder engagement [12].

Stakeholder engagement not only requires informing them on a company's decisions, but also to have them contributing to the decision process, often involving negotiation to trade-off conflicting objectives. In this paper we are specifically interested in the stakeholder engagement during the sustainability reporting process. According to the last released GRI guidelines (GRI-G4, May 2013 [13]), materiality analysis is the key step in this process and its output is the so called materiality matrix. To determine its materiality matrix a company must identify and prioritize its own material aspects, namely the sustainability topics (selected from a predefined list given by GRI) that are the most critical aspects for the company's business processes. As mentioned above, the GRI-G4 guidelines require stakeholder engagement for the materiality analysis. Yet, the guidelines do not give any specific indications nor tools to get stakeholder actually engaged. We have developed a structured approach that can be used for that purpose. The approach is specifically tailored for the requirements of materiality analysis as described by GRI-G4 and summarized in the following Section.

3   The Materiality Matrix: Capturing the Stakeholders' View

Identifying and prioritizing a company's material aspects leads to the determination of the materiality matrix, which is a key step along the process of sustainability reporting and in turn a milestone along the sustainability journey. As defined by GRI-G4, such a matrix depicts the critical topics concerning sustainability for a given company (Figure 1).
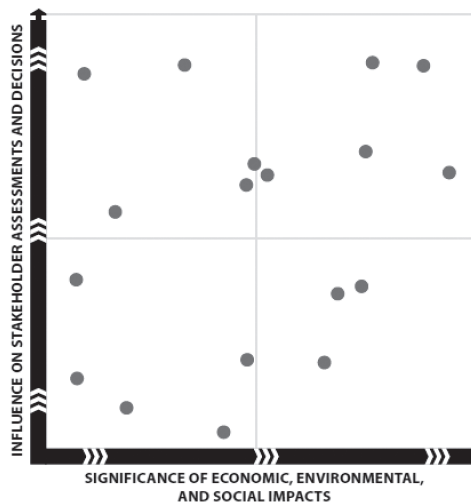
Fig. 1. The materiality matrix (source GRI-G4).

The matrix depicts every sustainability aspect as a dot properly positioned within it. Any aspect has to be characterized in terms of "significance of economic, environmental, and social impacts" (*x*-axis) and "influence on stakeholder assessments and decisions" (*y*-axis) [13]. The

former dimension requires an evaluation by the entrepreneur/s or top manager/s and is relatively easy to be determined (at the worst, by asking a subjective evaluation expressed along an adequate Likert scale). On the contrary, the latter dimension is more complex (not only due to the fact that – in our opinion – the guidelines do not give much help). The main criticalities are: identifying which stakeholders (and how they) should express the evaluation; getting evaluations by different stakeholders that are comparable among each other; defining a way to synthesize several evaluations into a single one, which has to be used to position the dot associated with the aspect along the y-axis.

The above process is quite complex as well as critical in that it heavily impacts on the sustainability report: indeed the report will have to analytically address exactly those sustainability aspects identified as material. Next Section describes the structured approach we developed to supports a company's materiality analysis as described by GRI-G4, so attempting to enhance the reliability of the sustainability report.

4 An Approach to Capture the Stakeholders' Evaluation

This Section presents an approach to support the materiality analysis of an organization involved in the sustainability reporting process. It is composed by the following six steps.

1. Identify sustainability aspects. At first, the organization should identify all the aspects and any other relevant topic which could potentially be included in the sustainability report. In accordance to the precautionary principle, all the sustainability aspects that may (i) reflect the organization's relevant economic, environmental or social impact, or (ii) affect the assessments and decisions of stakeholders should be listed. GRI Sustainability reporting guidelines provide a broad list of prospective aspects [13]. Once such a list has been obtained, each mentioned aspect should be classified as belonging to the economic, environmental or social category, the latter being possibly partitioned in sub-categories (human rights, labor practices, product responsibility, and society).

2. Identify stakeholders and prioritize them. The organization should identify its stakeholders, so as to engage them in assessing to which extent every sustainability aspect affects their assessments and decisions.

Nonetheless, not all the stakeholders are equally relevant. Thus their prioritization is crucial. A possible classification of stakeholders distinguishes between primary and secondary stakeholders, the latter being essential for the organization's survival [14]. Stakeholders have also been classified based on their importance, or salience, which, in turn, may depend on three drivers, i.e. urgency, power, and legitimacy [15]. We claim that a stakeholder may have higher or lower salience with reference to each sustainability aspect. For example, should corruption be used as a way to win a competitive tender, shareholder salience could be reduced by increasing the salience of other stakeholders. For the sake of simplicity, we suggest to discriminate the stakeholders' salience with regard to the category to which the sustainability aspects belong, i.e. economic, social and environmental.

To assess such a salience, the organization has to compare stakeholders pairwise as for their importance within each category of sustainability aspects. The pairwise comparison

procedure, indeed, combines a rigorous mathematical approach with observations based on psychology, and has been extensively adopted to solve different types of weighing problems, even in the field of sustainability [16]. The comparison should be expressed in terms of dominance index, according to the Saaty's fundamental scale of judgments [17]. The weight of the k-th stakeholder with reference to the c-th category of aspect, denoted as u_{kc}, can be easily derived by the logarithmic least squares method [18]:

$$u_{kc} = \frac{\sqrt[n]{\Pi_{j=1}^{n} a_{kjc}}}{\sum_{t=1}^{n} \left(\sqrt[n]{\Pi_{j=1}^{n} a_{tjc}} \right)}, \tag{1}$$

where a_{kjc} denotes the dominance index of the k-th stakeholder compared to the j-th one as for the c-th category of sustainability aspect. Based on the characteristics of the organization, e.g. its dimension, the above comparison is directly in the hands of the entrepreneur/s or the top manager/s or rather delegated to someone having a comprehensive viewpoint of the organization.

To check the consistency of pairwise comparisons, it is suggested to use the geometric consistency index, as proposed by [19]. Possible inconsistencies can be amended by the procedure presented in [20].

3. Adopt and calibrate a set of verbal labels. This set should include all the adjectives, or adverbs, that will be potentially used to assess sustainability aspects by a company representative and every stakeholder. It has been suggested [21] to adopt a set whose granularity, i.e. the number of labels included in it, is moderate, so as to give users all the labels they need to give reliable assessments, as well as to make easy for them to discriminate among labels. For instance five-label scales could be {extremely, much, neither much nor little, little, very little}, {excellent, very good, good, fair, poor} or {crucial, substantial, valuable, marginal, negligible}.

It should be observed, however, that stakeholders might differ in terms of cultural background and even spoken language. Thus, meanings attributed to a same word may vary: in general, the way to rank labels in a set could be disputed and, once the order is defined, the difference of meaning between two consecutive labels could be different from the one between another couple of consecutive elements.

To mitigate this problem, a preliminary procedure to calibrate the set of verbal labels is needed: we propose to adopt a pairwise comparison procedure. In return for the additional effort that it requires to each decision maker, this calibration enhances the evaluation reliability for all the aspects he/she will have to consider. Specifically, each decision maker asked to evaluate the sustainability aspects should assess the relative importance of every i-th label compared with the j-th one. Such a relative importance, denoted as a_{ijk} (k referring to the decision maker) is expressed in terms of dominance index derived by the so-called Saaty's fundamental scale of judgment. Once all the pairwise comparisons have been carried out, the weight of the i-th label according to the k-th decision maker can be calculated by the logarithmic least squares method:

$$w_{ik} = \frac{\sqrt[n]{\Pi_{j=1}^{n} a_{ijk}}}{\sum_{t=1}^{n} \left(\sqrt[n]{\Pi_{j=1}^{n} a_{tjk}} \right)}, \tag{2}$$

where n is the granularity of the set (typically, $n = 5$ or 7). Consistency of pairwise comparisons made by a given decision maker can be assessed and possibly amended.

4. Assess sustainability aspects. Both the organization and each stakeholder should assess every sustainability aspects by assigning it a verbal label included in the set. Specifically, in accordance to the GRI-G4 guidelines, the organization should assess sustainability aspects with regard to the significance of their economic, environmental and social impacts, whereas stakeholders should do it as for the influence those aspects have on their assessments and decisions.

All these verbal assessments should be then converted into quantitative assessments. To this aim, the weights that are associated to the attendant labels of the set for each decision maker are adopted. The assessment of the organization as for the i-th sustainability aspect is denoted as x_i, whereas the evaluation of the k-th stakeholder for the i-th aspect is denoted as y_{ik}.

5. Combine the stakeholders' assessments. A multi-attribute group decision making methodology is proposed hereafter to aggregate the possibly diverse opinions of the several stakeholders. This is a typical problem wherein the focus is the aggregation of individual priorities [22]: stakeholders' opinions, indeed, are related to their thoughts about the influence that an aspect has on their own assessments and decisions. To aggregate such opinions, i.e. the weights of the attendant labels, both geometric and arithmetic means are allowed [22], as neither method violates the unanimity rule, which says that if individuals unanimously prefer an alternative A to another alternative B, then also the group as a whole must prefer A to B.

We adopted the arithmetic weighted mean. Therefore, the aggregate assessment of the i-th sustainability aspect, belonging to the c-th category, is given by the additive weighted aggregation operator [23]:

$$y_i = \Sigma_k y_{ik} u_{kc}. \tag{3}$$

6. Determine the material aspects. Once determined x_i and y_i, their values can be used as coordinates to represent the associated aspects as points in the materiality matrix. Determining which aspects are material requires the definition of appropriate thresholds θ_x and θ_y along both axes: aspects above both thresholds are certainly material. Furthermore, the GRI-G4 guidelines [13] stress that *significance within one viewpoint is more important than convergence between the different viewpoints*. With this regard, we suggest to use a rule of thumb, based on the Euclidean norm: any aspect i such that:

$$E_i = \sqrt{x_i^2 + y_i^2} \geq \varepsilon, \tag{4}$$

where $\varepsilon > \sqrt{\theta_x^2 + \theta_y^2}$, should be considered material as well.

5 Conclusions

The paper addressed the multi-stakeholder decision-making problem encountered by companies in the process of materiality analysis, which is part of the wider sustainability reporting process. The problem involves gathering the views of company's stakeholders on the sustainability topics that are crucial to the company's business processes. We proposed a model that allows such views to be captured as well as translated into a single evaluation, according to what requested by the last released Global Reporting Initiative guidelines. Although it is based on existing techniques, our model is new with respect to its tailored application to the sustainability domain.

Our contribution is expected to enhance the quality of sustainability reporting as it codifies one of its (maybe "the") key steps – materiality analysis – so ensuring higher reliability and comparability of sustainability reports. A further practical implication concerns the stakeholder engagement: as stakeholders' opinions are more reliably described and taken into account, stakeholders are likely to develop a higher trust towards the company, so improving their engagement.

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Group Approach to Support Decision Making in Watershed Committees

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Abstract. A group decision making process is often complex due to the number of actors involved. The complexity increases when many alternatives and criteria are included when modeling the problem, a situation often faced by watershed committees in Brazil that make water management decisions on the basins they represent. We propose a group decision-making approach based on the ELECTRE II method and a weighted-voting quartile method to assist committees to find an appropriate alternative that is the best compromise among all decision makers involved. The applicability of the method is illustrated by giving an example of an application.

Keywords: group decision making; water resources; aggregation of individual preferences.

1   Introduction

Usually, water resource management decision problems require the involvement of many decision-makers (DMs), each of whom has his/her own value system and different interests. When decisions are taken by a group of individuals, the focus of the decision process is on the group, rather than on a single DM. This raises the question of how to better aggregate the DMs' preference structures.

In Brazil, watersheds are represented by committees that make decisions regarding the watershed they represent. These committees are formed by representatives from the public sector, private sector and water users and make decisions that usually involve different issues such as economic, social and environmental ones, which makes the decision process more complex [1].

It is hard for a group to consider all the relevant factors that are part of the decision process, as well the value systems of all individuals involved without the help of a well-structured decision support tool. This is one of the reasons that justifies the growing effort of researchers to design new models and information systems to assist group decision-making [2–4].

    This paper proposes a group-decision making approach to help watershed committees find a compromise solution that represents all DMs based on the aggregation of their individual choices.

    First, the ELECTRE II (reported by [5]) method is used to help each DM obtain a ranking of alternatives. This method is used extensively in the literature and of simple application. This last characteristic is particularly important since members of watershed committees have different backgrounds and different levels of education. After individual preferences are elicited, they are aggregated through a weighted voting system based on classification by quartile [6].

    What mostly differs this work from [6] is that a different method for individual ranking is used, also a different problem is explored that has other characteristics such as the number of alternatives that are considerably inferior to those considered in [6], which shows that, although the method might show advantages when dealing with many alternatives, it can also be very useful with less alternatives.

    Voting systems are mostly simple and transparent, both for the voters and those who calculate the winning alternative, and are therefore appropriate tools for this context of group-decision making [7]. For other approaches using voting procedures in water management see [8] and [9].

    The weighted voting quartile method has a phase in which the best alternatives are filtered. In addition, there is the Veto phase that avoids alternatives being chosen that have received very low rankings from some actors while other DMs placed them in high ranking positions. Thus, this procedure enables the group to make a more balanced choice of alternative.

2   The approach and Results

The stages of the proposed approach are summarized in Figure 1. To illustrate its applicability a problem faced by a watershed committee to reduce a sedimentation process in a Brazilian watershed was chosen.

    The example considers four DMs (the chair of the committee, a representative from society, a users' representative and a government representative), six alternatives (dredging, macro drainage, to avoid occupation of the riparian area, to supervise/monitor the basin, to educate the population on environmental issues and re-vegetating the riparian forest). Three criteria were considered: cost of implementing the alternative, environmental benefit from implementing the alternative and waiting time until the benefits are noticed. The ELECTRE II method was used to obtain the final rankings of each DM.

    From the individual rankings, group aggregation through the weighted voting method starts. The first step is to create a list of alternatives that includes the upper and lower quartiles.

    The first filtering phase eliminates the alternatives that are not in the upper quartile. In this case, alternatives A1 and A2 are eliminated.

The second filtering phase eliminates the alternatives that the majority of DMs consider are in the lower quartile. In this example, alternatives A3, A4, A5, A6 go to the next phase which is called the Veto phase.

In the Veto phase, a positional counting of alternatives is performed. And finally, in the choosing phase, the alternative chosen will be the one that displays the largest difference between strength and weakness, which in this case is alternative A6 (revegetating the riparian forest). This alternative is the first in the ranking of DM2 and DM3 and is the second in ranking for DM1. Its worst ranking position is for DM4 who ranks it fourth; however it does not belong to the lower quartile.
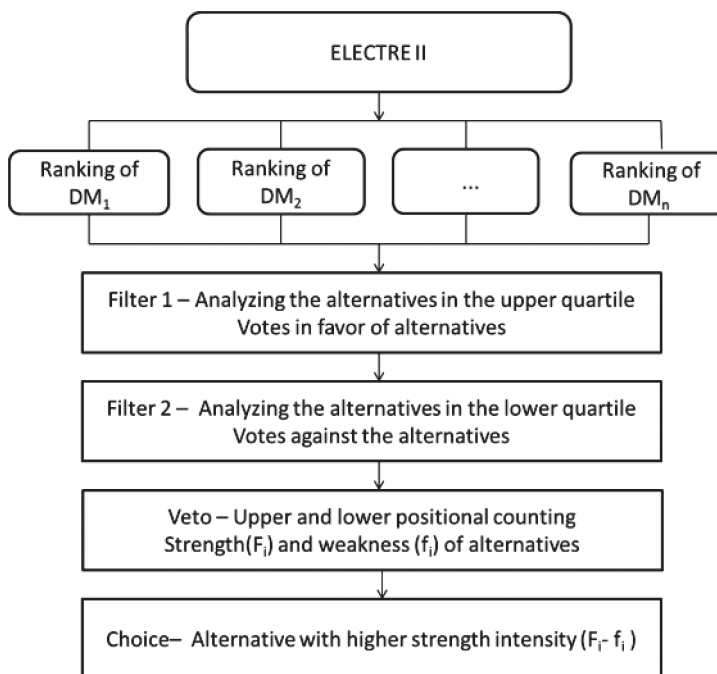

Fig. 1. Proposed approach.

3 Final Remarks

A method for group decision making is proposed which includes an application to illustrate its applicability. To analyze the influence of the criteria, a sensitivity analysis of the weights is recommended. This can give information about, for example, with what modifications to the weights, the final rankings will stay the same.

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Group Decision Model for Subcontractors Selection in Construction Industry

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Abstract. In the literature, several papers evaluating the supply chain dealing with different problems can be found, such as contract conditions, distance between plant and supplier, time and size of stock and maintenance costs, relationship between buyer and supplier, among several other studies. Anyhow is unusual to find papers in which the criteria focus on the relationship during the service execution and their problems. Usually there are a large diversity of issues in the construction industry, being part of the construction culture the use of subcontractors in order to make minor services. In this paper, the proposed group decision model studies the behaviour and best techniques to hire subcontractors, based on an additive multi-criteria method, dealing with important conflicting criteria.

Keywords: Group decision, Voting Procedures, Multi-criteria Decision, Additive Model.

1 Introduction

There are several papers in the literature about supply chain dealing with diverse problems. Models which use qualitative and quantitative variables using linguistic values to assess the ratings and weights for these factors, which were aggregated in a hierarchy multi-criteria model based on TOPSIS concept [1], selection of subcontractors combined with the Minkowski distance function and grey number operations to deal with the problem of uncertain information [2]; modification of other models [3]. The application of TOPSIS method to create new models is due to its flexibility in over-ranking analysis, and many authors uses it to combine with other methods.

Models using Analytic Hierarchy Process (AHP) were also very popular, comparing, or modifying the TOPSIS methods [4], creating analytical model to evaluate various aspects of suppliers [5]; to evaluate bidders before the bid procedure in construction field [6]; combined with linear programming [7]. The third most popular object of study were Intuitionistic

Fuzzy (IF) numbers-based models, to propose new operators [8]; to determine the relative importance of criteria [9]; to extend Linear Programing Technique for Multidimensional Analysis (LINMAP) to MADM [10]. There are also propositions of other models, such as linear programming (LP) [11] and the ones based on the VIKOR method [12].

In the construction industry, is very common to use of subcontractors in order to make minor services. Therefore, this paper proposes a group decision model that studies the behaviour and best techniques to hire subcontractors in which an additive model is applied in order to achieve the best solution and to deal with conflicting criteria.

2   Main problem and context

In Brazil, outsourcing by contractors is part of the construction culture, even though it does not make use of procedures to lead the hiring process or to avoid future problems related to it. Among the hiring possibilities, there are many areas involved due to the diversity found in this industry, like highways, airports, construction of industries, buildings etc. Thus, it is necessary to contract partners to be responsible for projects, consultants, transport and food supply of personnel, and materials.

The hiring process though is very subjective, because the decision makers have many factors to evaluate during this process and it changes depending on the application of the service and of the consequences, the decision-maker will have to deal with. Usually it is a consensual decision, once risks and costs involved are large sums.

Thus, it is important for the contractors to have a methodology to lead them through the hiring process, even if it is a pre-qualification procedure, in order to help them out in deciding which partner would be better suited for the job.

3   Group Decision Model

The Model proposed in this paper applies a procedure to assess criteria of decision-makers and their weights. In this kind of group decision problem, the majority of contractors working in the construction industry, has a director playing the role of a supra decision maker, but consider the managers opinions, once they might deal with the consequences of all decision made during the project development. The stakeholders involved in the hiring process are the contractor's client, the surrounding population, the mayor, the federal government, and so on.

It is important to notice that the hiring process can be divided in two categories: low cost and high cost. The director, head of the project, and his managers that will help him out to make the decisions and deal with the consequences should decide the threshold. The first category usually involves a very simple hiring process, so the ranking order could be made applying a voting procedure. In the second category, once is on high cost contracts, which will involve risks and some costs will not be able to be evaluated, then a more structured model has to be used, in this case we propose the application of an additive model. The aggregation

of the process should be based on the final group decision and these procedures should be studied and applied.

Thus, we propose a new model, presented on figure 1, to select not only suppliers, but also subcontractors, in order to do so, this study compares voting procedures and an additive method for group decisions and analyses their applications.
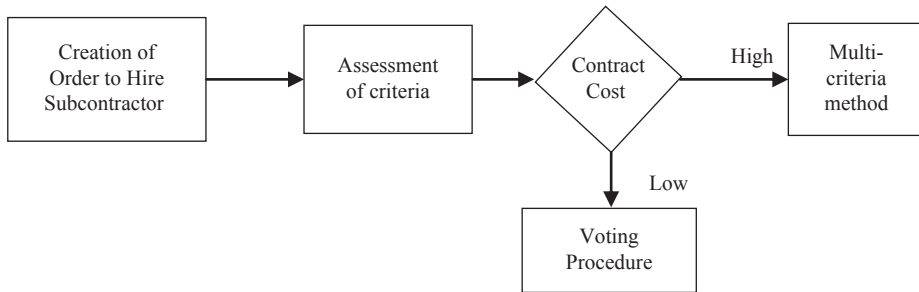
Fig. 1. Hiring process flow applying proposed model.

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4
Formal Models

Abstract of Keynote Speech.
Robust Classification Decisions under Uncertainty and Rule Preference Model of Multiple Decision Makers

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Classification of acts described by outcomes that may be gained with some probabilities is a challenging problem mainly because an aggregation of the outcomes which leads to recommended classifications needs to respect preferences of a single or multiple decision makers (MDs). Moreover, the method used to assist the DMs has to satisfy their expectations concerning the type of recommendations. It should also rely on realistically available preference information, and handle a possible inconsistency of this information. Finally, it should use a preference model that aggregates the outcomes in an intelligible way, without the need of compensation between the different outcomes. To respond satisfactorily to the above requirements, we propose a methodology that relies on preference information in the form of classification examples provided by DMs on a subset of reference acts. As this information may be inconsistent with respect to stochastic dominance relation, it is structured using Dominance-based Rough Set Approach, and the resulting lower approximations of the quality class unions are used as an input for constructing a preference model in terms of "if..., then..." decision rules. Decision rules constitute an intelligible aggregation model that is non-compensatory and able to represent interactions between the outcomes. We induce all minimal-cover sets of rules, each one being compatible with non-ambiguous classification examples and satisfying some additional requirements imposed by the DMs, like assignment--based preference relations, and class cardinalities. Applying such compatible instances of the preference model on a set of all acts, we draw conclusions about the certainty of recommendation assured by different minimal-cover sets of rules. Then, we solve an optimization problem to get a univocal (precise) classification for all acts, taking into account the robustness concern. We also present a set of indicators and outcomes for judging the spaces of consensus and disagreement between the DMs.

Cooperative Group Multi-attribute Analysis of Routing Models for Telecommunication Networks

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Abstract. Flow-oriented, decentralized optimization routing models in telecommunication networks have inherent limitations that imply the necessity of evaluating them through multidimensional, potentially conflicting, often incommensurate points of view, involving imprecise information. In this paper we formulate a decision problem focused on the comparison and selection of flow-oriented routing models evaluated through multiple global network performance measures. We will show the usefulness and potentiality, from a methodological point of view, of using in this context multi-attribute analysis using the VIP software, which may involve cooperative group decision with a facilitator.

Keywords: multi-attribute decision analysis, group decision support; telecommunication networks, routing.

1 Introduction and Motivation

There are potential advantages in formulating routing problems, in modern communication networks, as multi-criteria optimisation problems, as these formulations enable the trade--offs among distinct performance metrics and other network cost function(s), to be pursued in a consistent manner [1]. For these reasons and for scalability considerations, decentralised flow-oriented routing models, including bi-criteria optimisation models have been proposed and tested in different network environments. These routing methods lead to different routing solutions for each node-to-node flow or VC (Virtual Connection) demand. A reference monograph on routing models for telecommunication networks, including key mathematical formulations and algorithms can be seen in [2].

A major contribution of our study is to show the usefulness and potential, from a methodological point of view, of using a multi-attribute analysis model dealing with incomplete information, in the decision process involved in the evaluation and choice of a flow-oriented routing method to be applied in a given telecommunication network. This is founded on the fact that flow oriented routing optimization models [3] are applied in a per demand basis and use, what we may designate as 'surrogate objective functions' in relation with the "real" objective functions, corresponding to global network performance metrics, as analyzed in [3] That is, the flow oriented routing models have to be evaluated through global network performance parameters, corresponding to the attributes of our decision problem, often conflicting and incommensurate.

Hence, in this study, we consider, as alternatives of the formulated decision problem, several variants of a bi-criteria flow-oriented routing model as well the two associated single-criterion routing models. The attributes of the decision problem are various network performance metrics that enable the evaluation of the global effect, at network level, of using the various routing methods, when incremental traffic is offered to a given network.

Moreover, the developed decision multi-attribute model, assuming an additive value function under imprecise information, may involve more than one decision maker, in a specific application context of network routing design. The imprecise information feature of the multi-attribute model stems from the fact that the scaling constants (also designated as importance parameters or weights) associated with the considered attributes are not fixed a priori, although various inequality relations between them can be set a priori as agreed among possible decision makers. Of course, this is more realistic and flexible than requiring an a priori fixation of the scaling constants. Furthermore, although some of those inequality relations are consensual, for technical reasons, different decision agents, in a context of cooperative face-to-face analysis among experts, may assign different relative importance to the scaling constants associated with some attributes, or even consider different inequalities among them. Congruently the considered multi-attribute analysis tool, the *VIP Analysis package*, will enable the achievement of a compatibility of the incomplete information supplied by different DAs, be obtained and, as a final result of the interactive analysis process, to reach some robust conclusions, hence helping the group decision evaluation and choice of a routing method alternative, to be implemented in a particular network environment. A reference monograph on the key concepts concerning multi-attribute models can be seen in [4].

2 Outline of the Decision Problem and of the Multi-attribute Analysis Model

2.1 The Decision Problem

The first six *alternatives* a_i of the proposed *decision problem* are variants of a bi-criteria flow--oriented routing model, in a transport telecommunication network, all using as path metrics, to be optimized, the load cost and the number of arcs (or "hop count") and differing in the

method of automated route choice (among the non-dominated solutions), as described in [5]. The other two alternatives are the single criterion routing models that use, as path metric to be minimized, the load cost or the hop count [5].

In order to briefly review these routing method alternatives, let us consider a directed capacitated network (N, L, C) where N is the node set, L the arc set and C the set of the capacities (total bandwidths) C_k of the arcs l_k ($k=1,.../L/$). Let f_s, r_s denote a node to node traffic flow from node v_i to node v_j (associated with a virtual connection request VC, requiring a certain bandwidth d_s in the used arcs) and a feasible loopless path (or route – i.e. a loopless path from v_i to v_j such that every arc in r_s has, at the moment of the arrival of the VC request, an available bandwidth $b_k \geq d_s$), respectively. The current set of feasible routes for flow f_s is designated as $D(f_s)$. Let m_k^i designate an additive cost (corresponding to the *path metric* $m^i(r_s)$ for route r_s), i ($i=1, 2$), associated with every arc l_k.

Then, the general basic bi-criteria flow oriented routing optimization model is formulated as:

$$\min_{r_s \in D(f_s)} m^i(r_s) = \sum_{l_k \in r_s} m_k^i \quad (i=1, 2). \tag{1}$$

In the considered model, the first path metric is the load cost that is expressed through a piecewise linear function in terms of the relative bandwidth occupation in the arcs, thenceforth depending, for arc l_k, on b_k and C_k (see details in [5]). The second metric is the number of arcs of the path (or hop count), i.e. $m_k^1=1$. A solution r' is said to dominate the solution r iff $m^1(r') \leq m^1(r)$ and $m^2(r') \leq m^2(r)$ and at least one of inequalities is strict. A path r^* is said to be non-dominated iff there is no other feasible path which dominates r^*. The non-dominated paths were obtained by calculating k-shortest paths considering, as objective function, any convex combination of the two path metrics and by using a non-dominance test on the calculated solutions.

The variants of this basic bi-criteria routing model (each of them corresponding to a specific routing method to be applied in the network) are related to different ways of automated selection of a "good" trade-off solution to the bi-criteria routing model (1), in the non-dominated solution set, for each offered flow f_s. Note that, the parameters involved in the selection of a route (among the non-dominated solutions of the problem) depend not only on the current flow being offered to the network but also on the global network states, so they vary dynamically as more flows are offered to the network, in a scenario of stochastic incremental traffic. Further details, on these modeling aspects, can be seen in [5] and in the references therein.

The other two alternatives of the decision problem are, naturally, the single criterion routing optimization methods that use, as path metric to be minimized, either $m^1(r_s)$ or $m^2(r_s)$.

Concerning the *attributes* of the model, these are global network performance metrics involving three fundamental types of metrics: mean total carried bandwidth (TCB), mean total residual bandwidth (TRB) and mean number of accepted node-to-node VCs (TAC). Each of these fundamental metrics is decomposed into three attributes corresponding to the associated performance values obtained while the blocking probability of a connection request remains

in zero (Br1 = 0%) or attains the thresholds of Br2 = 5% or Br2 = 10%. The values for these performance measures in the network case study are estimated through stochastic discrete event simulation, considering incremental traffic and using the method of batch means for sample mean and confidence interval estimation.

2.2 The Multi-attribute Analysis Model

The decision support tool used in our study is the *VIP analysis software* [6] having in mind the adequacy of the features of the associated multi-attribute analysis method to the nature of our decision problem. The model considers an additive value function under imprecise information:

$$V(a_i, k) = \sum_{j=1}^{n} k_j v_j(a_i). \tag{2}$$

where a_i and v_j represent the ith alternative and the jth normalized global network performance measure, of one of the types described above, k_j is the scaling constant of v_j and k represents the vector of scaling constants, $k = (k_1, k_2, ..., k_n)$.

Let us briefly review the most relevant concepts/definitions used in the multi-attribute analysis package (see [6]) for further details).

Let T denote the set of acceptable values of the vector k of scaling constants.

The *regret*(a_i, a_j) associated with alternative a_j, when compared with a_i, and here denoted as reg_{ij} is the maximal difference:

$$reg_{ij} = \max_{k \in T} \left\{ V(a_i, k) - V(a_j, k) \right\}. \tag{3}$$

If reg_{ij} is negative or null then $V(a_j, k) \geq V(a_i, k) \, \forall \, k \in T$ and a_j is said to dominate a_i, (i.e. a_i is *dominated* by a_j). A relaxation to this dominance relation, by a tolerance parameter ε, means that:

$$V(a_j, k) \geq V(a_i, k) - \varepsilon \, \forall \, k \in T. \tag{4}$$

In this case we say that a_j *quasi dominates* a_i with tolerance ε.

For every alternative a_i the maximum regret associated with it, when its is compared with all other alternatives which may have a higher additive value for given T, is:

$$reg_{\max}(a_i) = \max_{j \neq i} \left\{ reg_{ji} \right\} = \max_{k \in T} \left\{ \max_{j \neq i} \left\{ V(a_j, k) \right\} - V(a_i, k) \right\}. \tag{5}$$

If $reg_{max}(a_i)$ is negative or null then a_i is *optimal*; if $reg_{max}(a_i) - \varepsilon$ is negative or null then a_i is *quasi-optimal*. If this is true only for a subset K* of T then we can say that a_i is optimal (or quasi optimal) at K*.

VIP Analysis [6] is an interactive software package dedicated to the choice problematic regarding the evaluation of a discrete set of alternatives according to a multi-attribute additive value function. The principal characteristic of this tool is that no precise values, for the scaling constants/weights, are required. Instead, it can accept imprecise information (i.e. intervals and/or linear constraints) on these values, usually identified by indirect ways, as for example by comparing swings. The major objectives are the discovering of robust conclusions (holding for every feasible combination of the scaling constants), and secondly identifying what is the variability of the results due to the imprecision in the parameter values. Furthermore, this tool is very adequate to support a group of decision makers meeting around a computer, which seems useful in the context of this work. However, it must be emphasized that a proficient use of VIP-Analysis requires a facilitator. In a first phase some tools enable filtering the alternatives. In particular the VIP module calculates the *range of values* of each alternative:

$$\left[\min_{k \in T} \{V(\mathrm{a}_i, k)\}, \max_{k \in T} \{V(\mathrm{a}_i, k)\} \right]. \tag{6}$$

This enables, for example, the elimination of those with a minimum value below a certain threshold, fixed by the decision makers); the maximum regret concerning each alternative (enabling the elimination of those with a max regret beyond a threshold fixed by the decision makers); and the dominated solutions. The alternatives passing the filtering phase are analysed using the matrix of regrets, $[reg_{ij}]$ (i, j=1,...m), defined in (3), designated as *pairwise confrontation table*, together with the relaxation of the concepts of optimality and dominance, exploring the concepts of quasi-optimality and the concept of quasi-dominance, enabling the decision makers to identify robust conclusions in order to help in the search for the best alternative. In those cases where the decision makers are able of fixing some trade-offs between pairs of criteria, it is possible to reduce the number of independent variable scaling constants. When just three independent variables remain, the system provides a graphical representation of the space of the weights, allowing a user-friendly representation of the optimality and quasi-optimality domains.

Concerning a group decision environment we consider that a GDSS based on VIP analysis [7] should neither propose a definite ranking of the alternatives nor, in many situations, determine an aggregated model from the individual ones. The system is designed to reflect to each member the consequences of his/her inputs, confronting them with analogous images of the group member's inputs. Hence, the aggregation procedures will be used only to provide reflection of the group's inputs to each of its members, namely by showing all the results that are compatible with the input provided and the agreed comparison criteria but, in some cases, without necessarily pointing out to a particular result as being the group's choice. Nevertheless, in the addressed network design decision problem, a final alternative must be chosen. So two situations may occur at the end of the analysis process: either one alternative becomes the one accepted by all the DMs – as a result of its inherent merits in a given network environment – or two or more alternatives should finally be considered by the DMs in the group, a case in which the head of the team, the DM responsible for the rout-

ing method implementation, whom we may designate as 'last resort DM', will have to make a ultimate selection among a final short list of alternatives.

3 Outline of the Experimentation

A reference network based on the France telecommunication transport network, described in [5], considering that all links (arcs of the network topology) have 10 Gb/s capacity and three connection service types, was considered.

A first set of experiments was carried out, considering a total of 15 constraints on the scaling constants, which are either inequality relations (corresponding to 13 constraints) or equality relations (2 constraints), as usually assumed by most network designers when evaluating routing methods, namely considering: i) TCB and TAC measures are more relevant than TRB measures for the same level of blocking; ii) for a given type of network metric the measure for Br1 is more important than the measure for Br2 and similarly for measures for Br2 and Br3. The equality relations concern the measures TCB and TAC, for Br1 and Br2. For each experiment in the set various runs of the VIP software were carried out for sensitivity analysis, involving specification of different levels of dominance relation relaxation, i.e. quasi--dominance defined by the relative tolerance ε (different ε values were considered for testing quasi-dominance or "reinforced" dominance – negative ε). A first experiment (E1) enabled to identify one alternative absolutely dominated (a8), i.e. its more favorable value is lower than the worst value of other alternative, and with very poor relative values in almost all attributes and four alternatives which were dominated by a_3 or by a_4. Moreover a_3 was the solution with maximal minimal value and a_4 the solution with minimal maximal regret, with respect to the additive value function.

The consideration of a small relaxation to dominance revealed, by examining the confrontation table, that all alternatives (different from a_3, a_4) were quasi-dominated by a_3 or a_4, for $\varepsilon \geq 0.01$. In a second experiment a8 was eliminated ("filtering" procedure) and the sensitivity analysis of the remaining alternatives enabled the conclusion that for $\varepsilon \geq 0.01$ all alternatives other than a_3 and a_4 were quasi-dominated by one of these two, the third better alternative, in terms of value and maximal regret, being a_1. In order to analyse, in separate, the relative performance of the two most promising alternatives, with respect the remaining ones, two experiments were performed by further elimination of either a_3 or a_4 (together with a_8). This enabled the conclusion that, in isolation, a_3 and a_4 are quasi optimal with respect to a_1, a_2, a_5, a_6 for $\varepsilon > 0.02$ and $\varepsilon > 0.003$, respectively. A separate comparison of the third more promising solution (a1) with a_3 and a_4 alone (by filtering all the other alternatives) showed that a_1 is quasi-dominated by a_4 for $\varepsilon > 0.003$ and also by a_3 for $\varepsilon >= 0.05$.

A second set of experiments, still in progress, refers to *cooperative group decision* and considers two more DMs working face-to-face with the one (denoted as expert 1, or DM_1) involved in the analysis described above. One of the DM (let us say DM_2), instead of four of the inequality relations considered by DM_1, assumes specific proportion relations between the corresponding scaling constants (for example instead of $k_1 > k_2$, he/she considers $k_1 = b_{12}k_2$ with a specific value $b_{12} > 1$ and similarly for three other constraints on (k_7, k_8), (k_5, k_4) and (k_3, k_9).

This leads to only 3 independent scaling constants and enables the calculation of the sets of scaling constants k which lead to possible k-optimality conditions for some alternative(s). The VIP package, in these cases also presents a graphical representation of those sets, in the scaling constants space, through 'indifference regions' (see details in [6]). The third DM, DM_3, is, in a sense, out of the 'main stream', in terms of common preferences, and considers that some of those inequality relations should be reversed, for example considering that TRB (Total Residual Bandwidth) is more important than TCB (Total Carried Bandwidth) for the same level of blocking probability, that is favouring short term minimisation of the usage of networks resources, instead of total mean carried bandwidth. This will naturally favour other types of routing solutions, as compared with the ones favoured by the analysis of the DM_1 and DM_2, in particular it will favour paths with fewer number of hops.

For each DM, the intervals of values for the additive value function and the pairwise confrontation tables among alternatives, will be calculated throughout the joint analysis process, leading to the preferred alternative(s) by each of them, defined by the sets of results R_d ($d = 1, 2, 3$), where R_d is the set of results, function of the set T_d which, each of them, considers as acceptable set of values for the parameters k. Thence, the individual perspectives may be aggregated, at the VIP method's output level, by considering a *α-majority rule*, as proposed in [7]. This aggregation rule means that a result r is considered acceptable if at least αD (D=3 in this case) DMs (α=1/3,2/3,1) include it in their set of results, R_d. Noting that there is a relation between the sets R_d and the sets of conclusions C_d, of the types $V(a_i) \geq y$; $V(a_i) \leq y$, $regret_{max}(a_i) \geq y$; $V(a_i) - V(a_j) \leq y$, the interplay between the tolerance ε, defining a quasi-dominance relation between two solutions and α-majority relations, may be analysed (following the type of procedure shown in [7]).

At the end of the joint analysis process, involving the three DMs, a process that provides reflection of the group's inputs to each of its members, namely by showing all the results and conclusions that are compatible with the input provided and the agreed comparison criteria, a final routing method will have to be selected, to be applied in that particular network. Two situations may occur: either one alternative becomes the one accepted by all the DMs – as a consequence of its inherent merits, taking into account the outcomes of the sensitivity/robustness analysis, provided by the described procedures – or two or more routing alternatives should finally be considered as 'equally' advantageous, by the DMs in the group. In this case the 'head of the team', the DM responsible for the routing method implementation, whom we may designate as 'last resort DM', will have to make a ultimate selection among the final short list of alternatives.

4   Conclusions and Further Work

A major conclusion of our study is to show the usefulness and potential, from a methodological point of view, of using a multi-attribute analysis model, dealing with incomplete information, in a network design decision process that involves the evaluation and choice of a flow-oriented routing method, to be applied in a given telecommunication network. This has to do with the fact that flow oriented routing models have to be evaluated through global

network performance parameters, corresponding to the attributes of our decision problem, often conflicting and incommensurate. A second major conclusion was the adequacy of the use of the VIP multi-attribute analysis package, that assumes an additive value function under imprecise information, to tackle this problem, in a context of cooperative face-to-face analysis among experts.

Concerning the experimental work, an extensive number of experiences has been planed and the experiments concerning the group decision instances are still in progress, seeking to make the most of some particular features of the used extension of the original VIP analysis tool.

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Locality, Robustness and Interactions in Simple Cooperative Dynamic Game

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Abstract. We consider simple stochastic dynamic game in which agents optimize their multivariate objective functions in a reference to local centers (local medians) induced by statistical depth function. We pose a question if it is possible to change characteristics of a global, aggregate choice of agents by means of an intervention in interactions between their preferences.

Keywords: Cooperative Dynamic Game, Depth Function, Locality.

1 Introduction

Dynamic games are mathematical models of the interaction between different agents who are controlling a dynamical system. Such situations occur in many economic and financial contexts like armed conflicts, economic sanctions, economic competition, real estate financing market evolution but also in environmental or regional economics and social networks (i.e., e.g., Fecebook) or public eye monitoring. Cooperative games theory emphasize the structure of the value-creating relationships among players.

In the paper we consider cooperative stochastic dynamic games in which behaviours of agents strongly depend on their closeness to local centres in a certain feature space. Tendencies to cooperate are strongly influenced by positions of local centres. Our finding may help us in understanding of a certain class of market imperfections – situations, where global optimality is not achieved due to existence of certain sort of "secure thinking" within a group of cooperating agents.

2 Robustness, locality and data depth concept

Robust statistics aims at identifying a tendency represented by an influential majority of data and detecting observations departing from that tendency (see [2]). Nonparametric and robust

statistical procedures are especially useful in the Economics where an activity of influential majority of agents determines behavior of a market, closeness to a financial crash etc. From a conceptual point of view, robust statistics is closely tied with well-known ideas like *Pareto's* effectiveness or *Nash* equilibrium (see [1, 7]).

Data depth concept was originally introduced as a way to generalize the concepts of median and quantiles to the multivariate framework. A depth function $D(\cdot, F)$ associates with any $\mathbf{x} \in \mathfrak{R}^d$ a measure $D(\mathbf{x}, F) \in [0, 1]$ of its centrality w.r.t. a probability measure $F \in P$ over $\mathfrak{R}^d$ or w.r.t. an empirical measure $F_n \in P$ calculated from a sample $X^n = \{x_1, ..., x_n\} \subset \mathfrak{R}^d$. The larger the depth of $\mathbf{x}$, the more central $\mathbf{x}$ is w.r.t. to F or F_n. The most celebrated examples of the depth known in the literature are *Tukey* and *Liu* depth. For our purposes, the most interesting depth seems to be the *weighted L^p depth*. The weighted L^p depth $D(x, F)$ of a point $\mathbf{x} \in \mathfrak{R}^d$, $d \geq 1$ being a realization of some d dimensional random vector $\mathbf{X}$ with distribution F, is defined

$$D(x; F) = \frac{1}{1 + \mathbb{E}w(\|x - X\|_p)},$$ (1)

where $\mathbb{E}$ denotes the expectation, w is a suitable weight function on $[0, \infty)$, and $\|\cdot\|_p$ stands for the L^p norm (see [8]).

The set of points having depth at least α is called α-trimmed region. Its border may be treated as *multivariate quantile*. The α-trimmed region w.r.t. distribution F, denoted by $D_\alpha(F)$, is defined as

$$D_\alpha(F) = \{z \in \mathfrak{R}^d : D(z, F) \geq \alpha\}$$ (2)

A point, in which depth function takes a maximum is called a **multivariate median** induced by this depth (see [5] for theoretical details and applications of the concept).

In an opposition to a density function, the depth function has a global nature i.e., e.g., that it expresses a centrality of a point w.r.t. a whole sample. A successful concept of **local depth** was proposed in [6]. Using an idea of symmertrization of a sample w.r.t. a given point, authors define a neighborhood of a point, and then using this neighborhood they define a *local depth* as a global depth conditioned on this neighborhood. The idea leads among other to a notion of *local* (multivariate) *median* and to effective robust classification rule. A degree of locality of depth expresses a parameter $\beta \in (0, 1]$. For $\beta=1$ the local depth reduces to its global counterpart (no localization).
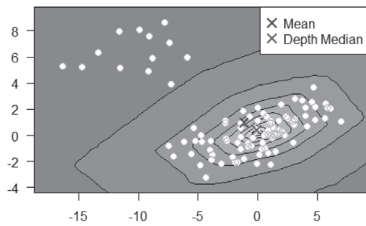
Fig. 1. Local L^2 depth, locality = 100%.   **Fig. 2.** Local L^2 depth, locality = 20%.
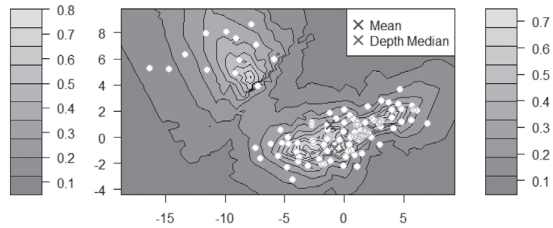
Fig. 1 and 2 present sample contour plots for L^2 depths differing with respect to degree of locality (100% means "no locality – we calculate a global depth") for data generated from a two-dimensional mixture of normal distributions. The global medians as well as mean vectors are indicated by crosses. *Source: DepthProc R package.*

3 The considered game

We consider simple stochastic dynamic game in which agents make their choices as an effect of certain type of local optimization of their multivariate objective functions. Agents make choices basing on similarity of their positions to local centers defined as local medians induced by depth function with certain degree of locality.

We intensively study a behavior of an aggregate choice of the agents and possibilities of changing the aggregate choice trajectory by means of an intervention in interactions between their preferences. Interactions between preferences are modelled using algebra of transition matrices associated with discrete Markov chains. The paper extends ideas considered in [4].

4 Main Findings

Main findings of the paper relate to determining a relation between characteristics of trajectory of the aggregate, group choice and a degree of locality used by agents in a process of making choices. We present circumstances under which it is possible to change the group choice trajectory by modifying interactions between the agents. We discuss several questions concerning possibilities of finding an empirical dimension of the considered games as a result of statistical research conducted using real data.

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The outcomes of buyer-seller negotiations: the contribution of the games theory

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Abstract. On the basis of games theory, our aim is to empirically model behaviors perceived as a matrix from business negotiations repeated within the framework of a complex simulation. The results show that the empirical data significantly leads to an asymmetric structure in the cooperation/competition relationship.

Keywords: Games theory, negotiation, dyads, cooperative/competitive behavior, matrix.

1 Introduction

The decision to adopt a cooperative or competitive stance in negotiation is one of the major challengers for both researchers and practitioners [1]. Nowadays, it is commonly held that both cooperation and competition co-exist in negotiation. However, this also presents a dilemma namely of whether one engages in more cooperative or more competitive behavior in a given situation. The literature has made it possible to identify factors suggesting that one approach may be preferred or not at a given moment [2, 3]. However, there is not always an alignment between the context (distributive, integrative) and the behavior. The parties can act differently according to the context, their interests or their perceptions of the power differential [4].

One of the approaches for studying the cooperation-competition dilemma is the games theory because it makes it possible to model behaviors and outcomes by disregarding many of the eventualities surrounding negotiations, eventualities which make any generalizations difficult. Such an approach has much inspired negotiation research [5].

Many studies seek to identify the inputs of a games theory matrix into the decisions that are made in the course of a negotiation [5]. Games theory research is most often a back and forth between a modeling (e.g., Schelling points) and experimental findings, generally presenting a significant deviation from the forecasts. Applied to a negotiation, certain research aims to ascertain to what extent theory reflects reality or simulations. Some authors [6] have

particularly sought to discover how much Nash equilibrium was attained in business nego-
tiations (the case for 42.2% of the dyads). To our knowledge, any research that has adopted
the opposite approach, i.e., relying on empirical negotiations so as to model its structure in
terms of cooperation and competition.

Our approach is therefore to model behaviors perceived as a matrix, which emerges from
business negotiations repeated within the framework of a complex simulation (see descrip-
tion below).

Our aim is to empirically verify to what extent one can find the structures of games theory
in an open negotiating environment and comprising several points of negotiation.

2 Games theory and business negotiation

2.1 The inputs of games theory into the dilemma of the negotiator

The so-called « Prisoner's Dilemma » configuration [7] is one of most recognized attempts
to model the tenuousness of cooperation. Four situations are identified: pure conflict, pure
cooperation and two intermediary cases. The situation of pure conflict occurs when the gains
of the co-traders are negative and perfectly correlated in negative terms. Symmetrically, the
situation of perfect cooperation arises when the gains of the negotiators and positive and
positively correlated [6]. The cooperatively primed *tit for tat principle* was notably proposed
in repetitive contexts. Devoid of regulation or follow-up, a competitive behavior is often
going to appear preferable (and reciprocally). The context itself may more or less infer the
possibility of cooperation (an integrative context) or restrict interaction to a limited number
of areas with insufficient resources to satisfy all the players in the negotiation (a distributive
context). The individual preferences or profiles [8] must also be considered. What is therefore
being conducted in business negotiation research?

2.2 The dilemma of the negotiator in a business negotiation

Business negotiation research and training come up against a series of obstacles [9] which
makes university research into a kind of « poor relation » despite the concrete challenges
which characterize it. Business negotiation is rarely approached as a whole, i.e., significantly
concrete negotiating processes which form part of a comprehensive business policy. Research
focuses on this comprehensive policy enshrined in marketing. This has consequences on the
educational aspects where one rarely sees the coexistence of a detailed approach to negotiat-
ing processes and those of sales. More commonly, this entails either one or the other being
viewed separately.

To our minds, analyzing cooperation and competition is particularly useful and relevant
to business negotiation. It is relevant because the outcome of the negotiation is much easier to
understand than in other negotiations such as collective bargaining. It is useful because among
purchasing and sales teams, commercial policies waver between cooperative turning points

and more competitive turning points. Likewise, within the framework of commercial negotiations, the dominance of cooperation has been shown to prevail with sustained exchange [10]. All the same, this temporal cooperation can be tainted by more or less underlying forms of cooperation. Thus, some authors [11] demonstrated that as an expected gratification of their loyalty, buyers loyal to a shop will exercise their powers of negotiation to obtain sizeable discounts. It seems that sellers will more willingly grant sizeable discounts so as not to lose their loyal customers. Maintained cooperation therefore partly jeopardizes economic performance. This shows the ambivalence of the cooperative and competitive positions when the utilitarian interests (financial) and symbolic interests (seeking recognition) become entwined. Choosing a cooperative and/or competitive position also depends on the perception of the players and their cognitive differentiation capabilities [12]. The paucity of analyses of these situations of cooperative and/or competitive negotiations in a commercial setting prompts us to propose the following methodological protocol.

3 Methodology and data collection

A research program has been initiated to associate educational methods and research in a realistic market involving business negotiation. The program is built to be as close as possible to the real general setting of a business negotiation. As a result, the negotiation does not solely include price and volumes but equally involves a number of goods for which several negotiating points must be addressed (described below). Data has been gathered with 3859 negotiations to date and resulting in 9221 questionnaires completed by 1303 negotiators over the course of the past decade or so. Firstly, we will introduce the operating principles of the program and this will be followed by a description of the set of tools which gather the data.

3.1 The principles of the emporium: creation of a market

Based on the principle of the emporium, an area reserved for negotiation in the city ports of Ancient Greece, we have chosen the principle of a trading area by bringing together players who must negotiate in compliance with predefined rules. Thus, we have created a life-like negotiating situation with participants.

The meetings take place by dyads. Thus, in a situation where 4 suppliers are selling to 4 retailers, 16 negotiations are taking place in parallel.

Participants perform within a framework that most closely shares the real features of all business negotiations pertaining to current consumer products and on a market where there is no one dominating position. The existence of a simulated end market means looking for a negotiation optimum which is not just the obtainment of the lowest price.

This simulation presents three significant particularities, the first of which is found in most simulations:

- The negotiator is part of a membership group which commissions him.
- The negotiator is positioned within a temporal and spatial framework of social exchange. His behavior is governed by the need to maintain future negotiations.

– The negotiator is also in a situation where information is in short supply because he is unaware of what is being negotiated at the other negotiating tables.

As each negotiating game that is being performed constitutes a market with its particular dynamics.

3.2 The sensors: tools and capture of data

Apart from the data that is spontaneously produced by a business negotiation and a market, we collect profile data upstream of the negotiations and perception data at the end of each negotiation. By doing this, we are following the descriptive model of [13]. Following this model, we have positioned « sensors » (mainly questionnaires and order form) so as to understand: the antecedents, the process and the outcomes. The dyad, a meeting between two individuals, is derived from a particular relationship. In this sense, it is unique and can be considered therefore as an entity. It results from an interaction between two negotiators. To observe it, one is required to understand both the characteristics of the individuals and the interaction which is unfolding.

The interaction of the negotiators is grasped by a dyadic sensor. After each negotiation, each player is required to go on the computer to complete a questionnaire listing thirty or so items which enables him to express how he perceived the negotiation with his interlocutor (Likert 1 to 6). A factor analysis enabled us to build a scale of cooperation comprising 5 items which measure both concessional attitudes and those disposed towards commonly found solutions. Cronbach's alpha measures 08.4 in 2657 observations (a part of the database).

To the behavior scale and assisted by the literature, we have added certain measurements of the different factors influencing or resulting from the interaction of the negotiating behaviors:

– Trust: we have taken the items from a scale of trust [14];
– Exchanging information: [15] study the link between communication (attitude of the negotiator) and trust of the partner. As for [16], they study the link between information sharing and the outcome of the negotiation.
– Satisfaction: we measure satisfaction through 4 items which discern satisfaction: in respect to the objectives set (sat1), to its personal performance (sat2), to the meeting (sat3), as well as the hypothetical satisfaction of the membership group (sat4). These 4 items are closely linked (alpha=0.9039) which, following the analyses, enables us to interpret them as a measurement of overall satisfaction [17].
– Uncertainty: 4 items enable the negotiator to provide indications on his degree of uncertainty regarding his level of information for decision-making (inc1), on the new elements heightening uncertainty (inc2), on the acceptability of the proposals of the interlocutor (inc3) and finally on the need felt to consult colleagues in the firm (inc4). The alpha amounts to 0.67 for the sellers and 0.72 for the buyers

The emporium makes it possible to assign to each dyad the features of the order form which has been signed between the parties (turnover, discount rate, promotion level, logistic costs, and so on). Processing this data highlights indicators which enable the performance of

the negotiator to be approached. Thus we have developed two profitability yardsticks: the net margin obtained by the seller and the outcome obtained by the retailer using the negotiated order form. The latter yardstick makes it possible to keep track of the costs incurred by weak purchasing volumes (stock shortage costs) or excessive purchases (storage costs).

Looking for a common indicator to provide a comparison prompted us to calculate the seller's mark-up rate. Thus, a high mark-up rate expresses a good outcome by the seller and if low, it underlines a good performance by the buyer. This mark-up rate as well the net outcome of the activity will be our main performance barometers.

4   Analysis of data and outcomes

4.1   Ascertaining the emerging structure in business negotiations

Based on the data that we have described, it is possible to dyadically link the (cooperative/ competitive) behaviors with a certain number of outcomes. To qualify a behavior as cooperative or competitive we have chosen to focus on the perception of the opposing party for whom we have a comprehensive analytics tool which is seemingly both closer to real behavior and above all to what has a bearing on the interaction. As this is a variable in the form of a scale, the first thing to do is to organize each individual into 3 groups within his belonging population (seller/buyer) using opposing perception and for each episode of negotiation. The first group corresponds to the most competitive tercile, the second to the mixed tercile and the third to the most cooperative tercile. We can therefore get closer to the means of presentation that is particular to the matrixes that are found tin games theory. It is therefore possible to match up the outcomes by verifying via ANOVA that the variations observed are statistically significant.

4.1.1   The balance of power

A first table makes it possible to appreciate the balance of power created through the mark-up rate which corresponds here to multiplying factor equal to the turnover net of commercial benefits, divided by the purchasing cost of the seller. The merit of this coefficient is that it permits a more reliable comparison than discounts which depend on the commercial policy, even tactically resorting to initial high or low offers. This rate is nevertheless not directly known by the negotiators (particularly by the buyers but also by the sellers who have no reference about the competition's multiplying factor): this is therefore an objective element in a universe in which players only have partial information and are subjected to subjective perceptions. The mean coefficient is 1.522. In Table 1, a higher coefficient expresses an advantage to the seller who thus benefits from better margins. Inversely, if it is lower the balance tips in favor of the buyer. Let us remember that when a coefficient is 1 this would signify a resale of products without margin. The coefficient average is 1.522.

Table 1. Dyadic behaviors and mark up rate of the seller.

		Buyer		
		competitive	mixed	cooperative
Seller	competitive	1.53	1.56	1.55
	mixed	1.52	1.54	1.54
	cooperative	1.49	1.51	1.52

An outcome can be observed which confirms one of the current assumptions in games theory, i.e., that faced with competitive behavior cooperative behavior is disadvantageous. In equal proportions, this also applies to both buyers and sellers. Whenever the perceived behaviors are symmetrical the outcomes are almost identical (1.52 and 1.53). Competitive behavior may therefore seemingly be more rational unless reciprocity is a certainty.

However, several elements require that this statement is qualified (Table 2). The perspective on satisfaction provides a relevant introduction (and that also means a major outcome shared with games theory research). The first thing one notices is that satisfaction is greater when there is reciprocal cooperation than in any other configuration. The second observation is that satisfaction is not greater when one engages in competitive behavior in front of cooperative behavior once cooperation is shared. Despite this, the mark up matrix (above), like that of the prisoner's dilemma, suggests a bonus for competitive behavior in front of cooperative behavior. The third observation is that the theoretically unfavorable cooperative position as opposed to the competitive position generates not less satisfaction once the competitive mode is bilateral. Satisfaction is closely linked to the perceived behavior of the opposing party, independently to the behavior one has engaged in oneself.

Table 2. Dyadic behavior and satisfaction.

B = Buyer / S = Seller		Buyer		
		competitive	mixed	cooperative
Seller	competitive	S: 3,40 B: 3,50	S: 4,35 B: 3,46	S: 4,98 B: 3,50
	mixed	S: 3,50 B: 4,43	S: 4,45 B: 4,36	S: 5,01 B: 4,43
	cooperative	S: 3,46 B: 5,10	S: 4,39 B: 5,05	S: 4,99 B: 5,08

If satisfaction is mostly linked to the perception of the relationship, certain elements of anticipation and calculation can be sought. Although the simulation is designed to be primarily distributive, there exist several negotiating episodes as well as opportunities for cooperation. Several date show that behind the almost identical mark up rate (1.52... 1 .53), both situations with reciprocal behaviors are not similar.

The first difference concerns the turnover (Table 3). It appears that the turnover is lower in competitive situations. Table 3 shows that the cooperative buyer places bigger orders and, to a lesser extent, the cooperative seller obtains a larger order.

Table 3. Dyadic behaviour and turnover.

		Buyer		
		competitive	mixed	cooperative
Seller	competitive	0.85	0.94	1.07
	mixed	0.93	1.02	1.07
	cooperative	0.95	1.11	1.09

The last point can create a particular dilemma for a seller faced with a competitive buyer. By engaging in turn, in competitive behavior he increases the mark–up rate but loses turnover, contrary to the situation in which he engages in cooperative behavior. What will be the dominant effect in terms of gain (net margin – Table 4)? This is the mark-up effect, albeit slight (overall gain of 0.92 VS 0.88), which converges with the also small satisfaction variation (3.46 VS 3.40).

Table 4. Dyadic behavior and participants' gain (net margin).

		Buyer		
		competitive	mixed	cooperative
Seller	competitive	0.95	0.82	0.96
		0.92	0.96	1.07
	mixed	0.87	0.95	0.91
		0.91	1.01	1.07
	cooperative	1.18	1.1	1.09
		0.88	1.04	1.09

Although one can find in Table 4 a symmetric gain structure for behaviors themselves symmetric, the incentive for cooperation or competition can be differently understood among sellers and buyers. On the whole, it appears that the seller has little to gain or lose by his own behavior, except when it can influence that of the buyer (the chameleon effect, for example). It is above all the buyer's behavior which structures the matrix. However, it is particularly evident not all the gains provide the same satisfaction. Thus the competitive buyer expresses only a slightly higher satisfaction (5.10 VS 5.08) faced with a cooperative seller for a very much greater gain (1.18 VS 1.09), which tends to validate the specific impact of cooperation upon satisfaction.

For the buyer, this is the structure of the Prisoner's Dilemma. Mutual cooperation produces a higher overall return expectancy global (+18%) whereas reciprocal intransigence forges

a lose-lose situation. For the seller, one again finds the structure called the Stag Hunt where cooperation is unequivocally preferable for both but where one remains exposed if the opposing party engages in a non cooperative behavior (through risk aversion or desire to harm).

S= Seller / B = Buyer	Competitive	Cooperative
Competitive	S : 1 B : 1	S : 0 B : 1
Cooperative	S : 1 B : 0	S : 4 B : 4

The simulations based on such a matrix lead to approximately 80% of cooperative behaviors, which again boosts the return expectancy via cooperative behavior. However, in our case the game is mixed comprises two structures (the Prisoner's Dilemma for the buyer, the Stag Hunt for the seller). In fact, the proportion of cooperative behavior is the opposite in the Prisoner's dilemma (only 20%). The question is if it is always in the interest of the seller to engage in (or maintain) cooperative behavior. It will be the case if: mean expectancy per cooperation $(0.2 \times 1.09 + 0.8 \times 0.88 = 0.922)$ > mean expectancy per competition $(0.2 \times 1.07 + 0.8 \times 0.92 = 0.95)$. However, this is not the case; one can explain the cooperative behavior via the interaction or the effects of reputation

5   Conclusion

We have demonstrated that within the realistic albeit simulated framework of business negotiation, the empirical data significantly leads to a structure in the cooperation/competition relationship. This in particular gives rise to an asymmetric structure which, on the one hand, assumes the structure of the Prisoner's dilemma and on the other hand assumes that of the Stag Hunt. When the Prisoner's dilemma (or Stag Hunt) is a structured framework which creates a « game », in our case it is derived from interactions. Except for the means of incentive and sales staff pay (described above), the scenario and constraints are as neutral as possible at this level.

The analysis becomes more acute when one considers that individuals are not caught up in the formulation of a game with limited choices and directed incentives, such as the Prisoner's dilemma, but in interaction. Intransigence and cooperation can be analyzed in terms of contagion (a conflictual or spiral escalation in the positive relationship) and reciprocity (in particular for cooperation). Being intransigent and keeping the other party in a position of cooperation (a possible tactic of the buyer) is only possible up to a certain point. If the seller loses faith in the possibility of any profitable relationship, he is likely to veer towards intransigence. In addition, the buyer might drift towards cooperation due to his profile, his preferences, (long term vision) or his reactivity towards the behavior of the opposing party.

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5
Voting and Collective Decision-making

Do Certain Characteristics of Personality. Influence Decision Making in Approval Voting?

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Abstract. Using approval voting voter can choose alternatives they approve of. Connections between some characteristics of personality and number of chosen alternatives are studied. Authoritarianism and anxiety are considered characteristics. Experiment was conducted over a groups of students and gave a negative answer. No general correlations were found, but in some cases an interval analysis leads to certain rules.

Keywords: approval voting, authoritarianism, anxiety.

1 Introduction

The aim of this paper is to present chosen results of the analysis of connections between certain personality traits and decision making when the approval voting method is used. Approval voting is a voting method introduced by Brams and Fisburn in their famous book "Approval voting" [1] and in some earlier papers (eg. Brams and Fisburn [2]) using this method. Voters choose alternatives they approve of. Each voter may choose none, one or more alternatives from the list. The number of voters who have chosen any given alternative is computed, and the alternative with the highest score wins. This method is used by many scientific societies as well as by the Security Council of the United Nations (in 1996, for example, to narrow the list of potential candidates for Secretary General). Voters may vote for more than one candidate, so they may express their opinion better if they find some candidates equally or similarly suitable. Approval voting is a subject of a campaign presenting its advantages over other voting procedures (see the Internet "The Center for Election Science" [3]). The simplicity of the method is especially stressed.

People may choose different number of alternatives in approval voting. For example the results of Laslier and Van der Straeten's experiment [4, 5] conducted in relation to presidential elections in France demonstrated that average number of chosen alternatives is 3.15. Przybyszewski and Sosnowska [6] in their research concerning presidential elections in Poland in

2005 obtained the result 1.78. This discrepancy raises the question of sources of such differences. Przybyszewski and al. [7] present the following experimental results concerning the average number of chosen alternatives obtained in several experiments conducted by them. In the following table NR denotes the number of respondents, NA – the number of alternatives, ANCA – the average number of chosen alternatives.

Table 1. Average number of choices in different approval votings.
Source: [7].

No	Poll	NR	NA	ANCA
1	presidential poll, representative sample, 2005	669	15	1.78
2	presidential poll, students, SGH, 2009	43	20	3.74
3	presidential poll, students, SGGW, 2009	30	20	2.97
4	presidential poll, students, arts, UW, 2009	31	20	3.22
5	parliamentary poll, students, SGH, 2009	43	14	2.23
6	parliamentary poll, students, SGGW, 2009	30	14	2.23
7	parliamentary poll, students, arts, UW, 2009	28	14	2.25
8	properties of excursions, students, Warsaw, 2009	240	6	2.86
9	interesting lectures, students, SGH, 2009	148	12	4.06
10	prestigious professions, students, SGH, 2009	117	20	4.30
11	mobile telephones, students, Warsaw, 2009	164	8	2.71
12	beers, students, ALK, 2006	200	20	6.81

The question considered in this paper concerns connections between some characteristics of personality and number of chosen alternatives when the approval voting method is applied. The hypothesis was that people with certain personalities choose less rather than more alternatives. The following characteristics were analyzed: authoritarianism and anxiety. The hypothesis was that people with higher level of these characteristics would choose less alternatives than people with a lower level. Authoritarian people prefer clarity and explicitness, therefore it is possible that they would choose less alternatives. Analogously, a choice of greater number of alternatives may cause fear, so anxious people may prefer to choose less alternatives as well. The research was conducted over a sample of students of Warsaw School of Economics. Students chose alternatives by approval voting and fulfilled the questionnaire which helped define their level of authoritarianism and anxiety. Then the correlations were analyzed. The results do not demonstrate such correlation but there is a slight ambiguity.

The paper is constructed as follows. In section 2 the experiment is described. Results are presented in Section 3. Conclusions are made in Section 4.

2 Experiment

Experiment was conducted in winter and spring 2013 as a part of lecture on "Social choice and applications" in Warsaw School of Economics by 7 teams of students under the supervision of Honorata Sosnowska. All teams studied differences between the results of choice made by classical majority method (voter can choose at most one alternative) and approval voting

(voter can choose any number of alternatives). Teams differed in subject of choice because voters' choices are dependent on the subject of choice. In the first part of the experiment (winter 2013, versions no. 1–4) the following subjects of choice were studied: web portals (no. 1), candidates in presidential elections in Poland (no. 2), areas of Warsaw which are the best for living (no. 3), domestic animals (no. 4). All these subjects with the exception of domestic animals were studied in the second part of the experiment (spring 2013, versions no. 5 – web portals, no. 6 – candidates for president, no. 7 – areas of Warsaw.). Students teams calculated some statistical data.

Additionally there were questions on some characteristics of personality in the questionnaire. In the first part of the experiment authoritarianism was studied, in the second part anxiety. A special questionnaire was used during the survey.

The concept of authoritarian personality was introduced by Adorno et al. [8] initially as a way of understanding the massive support for European extreme rightist movements in the 30-ties. Its canonic form is composed of a set of psychological and mental traits that make people believe in oversimplified, deterministic, and hierarchical visions of social life. A person of this type is conventional, distrustful, submissive and/or dominant, dislikes subjectivity, is prone to stereotyping, prejudice and superstitions. This set of traits and the subsequent set of beliefs clearly show a very strong subconscious need to cope with uncertainty or existential anxiety, which can be achieved by construal of the simplistic worldview and thus offering a high level of predictability. In our research we decided to use the 9-item scale of authoritarianism by Świątnicki and Przybyszewski [9], which is composed of non-politics-laden items adopted from other authoritarianism scales. Thus the scale is less content-dependent and less politically biased as compared to the original, widely used, F-scale of acceptable reliability ($\alpha = 0,76$). The items pertain to the matters of a) obedience to parents, authorities, and traditions, b) following specialists, authorities and advisors when one does not understand the problem, c) strength and power as important aspects of social life, and d) high need of moral and ideological unity.

Anxiety treated as a trait not as a state is a psychological predisposition to experience different states of anxiety throughout life. To prevent these unpleasant feelings people may adopt various coping strategies based upon simplification and increasing predictability and cognitive control over events. This causes the anxiety prone people to develop a preference towards simple and logical solutions rather than difficult to comprehend matters of politics (one of those may be a set of authoritarian beliefs). One may expect that such people would be supporters of populist movements, punitive legal systems and, presumably, would prefer more simplistic voting systems. In our study we decided to use a short Anxiety Scale by Koralewicz [10], highly reliable ($\alpha = 0,87$) and widely used.

The general hypothesis is based upon the assumption that both authoritarian and anxious people will develop a strong preference towards simple and easy to comprehend models of reality and bipolar models of politics (i.e. they may see that there is just one perfect candidate and a group of unsuitable candidates). In other words, they may not perceive the differences between the candidates they reject. This kind of understanding of political choices would make the approval voting more difficult for them as they are more accustomed choosing one person from the list and rejecting the rest. Thus, the negative correlation between the number of candidates marked (approved) and the level of anxiety and authoritarianism.

3 Results

Results of the experiment are presented in Tables 2 and 3.

In versions no. 1–4 the correlations between a number of chosen alternatives and authoritarianism are studied.

Table 2. Correlations between the number of chosen alternatives and the level of authoritarianism.
Source: Students of Social Choice courses and authors work.

No	Subject of choice	N	correlations
1.	Web portals	115	no
2.	Candidates for president	195	no, ∩ shape
3.	Quarters of Warsaw	137	no
4.	Domestic animals	571	no

In version no. 1 the Pearson coefficient of correlation is equal to 0.07721, p value 0.421. The Spearman coefficient equals 0.06674, p value 0.4785.

In version no. 2 coefficient of correlation is equal to 0.1228. An interval analysis with interval 0.5 and 0.25 was conducted and the ∩ shape (reverse U) was obtained. The mean number of chosen alternatives at first grows in dependence on an interval assessment of authoritarianism, and then decreases. The peak is between 3 and 3.5 on assessment level measured on a scale 1–5.

In version no. 3. the Pearson coefficient is equal to 0.056 with $\alpha=0.05$

In version no. 4 the Pearson coefficient equals 0.17038.

In version no. 5–7 correlations between the number of chosen alternatives and the level of anxiety are studied.

Table 3. Correlations between the number of chosen alternatives and the level of anxiety.
Source: Students of Social Choice courses and authors work.

No	Subject of choice	N	correlations
5.	Web portals	117	no, ∩ shape
6.	Candidates for president	161	no
7.	Quarters of Warsaw	100	no

In version no. 5 the coefficient of correlation is equal to −0.013. The interval analyses based on intervals 0.5 and 0.25 were studied. The mean number of chosen alternatives increases first, and then decreases depending on the level of fearfulness measured on a scale 1–5. The peak is on 1.5–2.0.

In version no. 6 the Pearson correlation coefficient is equal to 0.02782, Chi square 0.7261. Additionally, the correlation between supporting any political party and the number of chosen alternatives was calculated and the positive correlation was obtained. The hypothesis that voters who do not have one preferred candidate choose more alternatives was not confirmed.

In version no. 7 the V Cramer coefficient is equal to 0.19554 and no correlation ist obtained.

4 Conclusions

The presented experiments demonstrate that there are no general connections between number of chosen alternatives during approval voting and level of authoritarianism and anxiety. These results have to be treated as a pilot study and have to be confirmed on a representative sample as students of Warsaw School of Economics are average authoritarian and weakly anxious. Especially ∩ shape obtained in some interval analyses has to be considered in future research.

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Gathering support from rivals: the two rivals case

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Abstract. Two voters must choose between two alternatives. The voting procedure follows a fixed linear order. If there is not unanimity for any alternative, the procedure is repeated. At every stage, each voter would prefer to vote his preferred alternative. However, I consider an impatience degree that represents when it is worth voting for the non-preferred alternative now rather than waiting for the next stage and voting for the preferred alternative. Intuition suggests that the more patient voter will get his preferred alternative. I found, by backward induction, that the first voter gets his preferred alternative at the first stage independently from his impatience rate.

Keywords: sequential voting, subgame perfect equilibrium.

1 Introduction

There is no doubt that voting is a highly important decision-making procedure used every day and almost everywhere. Political decisions are taken through voting. Decisions in a big company are also taken by voting. It is common that voting takes place only in one stage, making easy the process of decision taking. In this case the voters do not have the possibility of changing their vote.

There are some voting procedures where there are several stages until the decision is taken. Jury trials constitute one such example. The voting does not stop until the majority or all the voters in case of unanimity agree on the decision. The election of the Catholic Pope can also provide an example: till the super majority of cardinals agree on a decision the voting must continue. So, the main question is why and when voters agree to change their votes and when the decision is taken. To answer this question a simple model for two voters is proposed.

The model represents the situation in which two individuals must agree on choosing one alternative of the two by voting. The voting procedure is sequential. Voters are arranged in a fixed linear order. At each stage voters cast their votes in that order. If two votes are different, then the procedure is repeated in a new stage.

At every stage, each voter would prefer to vote his preferred alternative. The decrease of the utilities represents the cost of the delay. Each voter has an impatience degree indicating when it is worth voting for the non-preferred alternative now rather than waiting for the next stage and voting for the preferred alternative.

Since each voter know the impatience degree of both voters, intuition suggests that the more patient voter will manage to get his preferred alternative. It is shown that in the unique solution of the sequential voting procedure obtained by backward induction, the first voter gets his preferred alternative at the first stage.

The paper is organized as follows. First Section 2 provides a short review of the related literature, studying similar models or problem of decision-making. Next, Section 3 and Section 4 describes the model and presents the results, respectively. Section 5 concludes the paper with some remarks.

2   Related Literature

The closest model to the one presented here is Kwiek [1]. He considers a decision-making conclave choosing between two alternatives under a super-majority rule (including unanimity). If a decision is not reached in the first round of voting, then the procedure repeats in the next round, and so on, until the required supermajority is reached. The delay in time is increasingly costly to each player. In this context, he asks which rule offers higher utilitarian welfare? He finds that there is a subgame perfect Nash equilibrium that leads to a unique voting outcome in the first round. This outcome coincides with the alternative preferred by the pivotal voter with the greater indifference time (or, in other words, impatience degree).

Compte and Jehiel [2] study collective search processes. They construct a model in which at each stage the committee is proposed to accept or to decline a certain proposal, in case of rejection the procedure passes to the next stage and a new proposal is considered. They study which members have more impact on the decision under different majority rules. One of the interesting results is that under unanimity when proposals vary along a single dimension the extremists determine the final decision. In their framework the extremists are the voters with more intense preferences and therefore with the highest degree of patience. Applying the results of Compte and Jehiel to the model considered in this paper it is expected that the voters with higher degree of patience are those who define the result.

Ponsatí and Sákovics [3] show the uniqueness of equilibrium in a model with many players, two alternatives and delay costs. Baron and Ferejohn [4] study a dynamic model of bargaining in legislatures, when at each round a randomly selected voter makes a proposal to vote by a committee.

The idea of the uniqueness of the subgame perfect equilibrium is similar to the result of Rubinstein [5], where the proposal of the first individual is accepted by the other individual. In addition, in ultimatum game the subgame perfect equilibrium tells that the first proposal is accepted (see Keith [6], Ochs and Roth [7]). Besides, there is a huge literature on voting by conformity. For instance, Bernheim [8] states that the voters are willing to conform because they recognize that even small departures from the social norm will seriously impair their

status. Despite this penalty, agents with sufficiently extreme preferences refuse to conform. Applying this idea to the model considered here suggests that the voters with higher degree of patience (extreme voters) are not likely to confirm with the first voter.

Some researchers suggest that observing the actions of the other agents would induce individuals to believe that these agents are better informed and therefore, these individuals are likely to imitate their behavior (see, for instance, Banerjee [9]). Herrera and Martinelli [10] develop a model based on the idea that voters follow a leader and attract other voters to follow him too. Rodríguez-Álvarez and Rivas [11] also study the effect of the presence of leaders between the voters on the information transmission among themselves. In the model studied here leadership can be presented as taking the initiative and voting first.

3 Model

There are two individuals, named 1 and 2. There are two alternatives, a and b. A moment in time is denoted by t. Time is discrete: $t \in \{1, 2, 3, ...\}$. Each individual $i \in \{1, 2\}$ is endowed with a utility function u_i defined over the set of pairs (c, t), where $c \in \{a, b\}$ and t is a moment in time.

The two individuals are supposed to be engaged in a sequential voting procedure in which each voter votes for one of the two alternatives following a fixed ordering of the two individuals, where 1 designates the first individual in the ordering and 2 designates the second individual. The voting procedure stops when both individuals vote for the same alternative. In this case, the outcome of the voting procedure is represented by a pair (c, t), where $c \in \{a, b\}$ is the alternative for which both voters have voter and t is the moment in time at which the voting took place. If the voting procedure does not end, then the outcome is represented by the symbol Ø. The voting procedure is defined as follows.

Stage 1. Individual 1 votes either a or b. Knowing this choice, individual 2 next votes either a or b. If both individuals vote for the same alternative c, then the procedure ends and, for $i \in \{1, 2\}$, individual i gets utility $u_i(c, 1)$. If the individuals do not vote for the same alternative, then the procedure moves to stage 2.

Stage t. If stage t is reached, then individual 1 votes either a or b. Knowing this choice, individual 2 next votes for a or votes for b. If both individuals vote for the same alternative, then the procedure ends and, for $i \in \{1, 2\}$, individual i gets utility $u_i(c, t)$. If the individuals do not vote for the same alternative, then the procedure moves to stage $t + 1$.

The procedure represents the collective decision mechanism by means of which voters carry on voting until they reach a unanimous decision.

The individuals' utility functions are assumed to satisfy the following four conditions. Let α_i designate the most preferred alternative by individual i and β_i designate the other least preferred alternative for of individual i.

Persistence. For each individual $i \in \{1, 2\}$ and for each t, $u_i(\alpha_i, t) > u_i(\beta_i, t)$.

Persistence says that each individual has an alternative that is always more preferred than the other: the individual either prefers *a* over *b* at each time *t* or prefers *b* over *a* at each time *t*. This assumption is natural: a supporter of a left party today would rather prefer the left party to the right one tomorrow, too.

Impatience. For each individual $i \in \{1, 2\}$, alternative $c \in \{a, b\}$, and times $t > t'$, $u_i(c, t) < u_i(c, t')$.

Impatience asserts that the more the time passes to make a decision, the smaller is the corresponding utility. Any voting in stages induces the time delay of the decision, and time is usually associated with money costs. It is easy to find examples when the faster one decides the smaller are the expenditures: for instance, plane or train tickets become more expensive with time. As another example, consider a board of directors who needs to make a decision, in which company to invest: while no decision is made, the money is in the bank but is affected by inflation.

Reversion. For each individual $i \in \{1, 2\}$, there is the smallest $t_i \geq 2$ (called reversal time) such that $u_i(\beta_i, t_i) > u_i(\alpha_i, t_i + 1)$.

Reversion holds that, for each individual i, there is at least one stage t_i making the individual prefer to obtain the least preferred alternative now rather than to get a moment immediately later the most preferred alternative. Intuitively, t_i represents the moment at which i loses his patience: it no longer pays to wait for the possibility of obtaining in the future the most preferred alternative by disregarding the possibility of obtaining now the least preferred alternative. When there is a cost of the delay, or in other words, the utility is decreasing with each stage, the voters would rather agree to obtain something now than to wait and continue losing.

Termination. For each individual $i \in \{1, 2\}$, alternative $c \in \{a, b\}$, and all t $u_i(c, t) > u_i(\emptyset)$.

The outcome $\emptyset$ corresponds to the situation in which the procedure never stops. *Termination* states that, for each individual i, the utility of outcome $\emptyset$ is smaller than the utility of any other outcome. Any voting procedure induces some costs, so it is clear that the voters would prefer to stop the procedure rather than to experience these costs at every stage.

4   Result

Proposition 1. Assuming *Persistence*, *Impatience*, *Reversion*, and *Termination* the outcome of the only subgame perfect equilibrium of the sequential voting procedure is $(\alpha_1, 1)$.

The proposition states that the only solution of the sequential voting procedure obtained by backward induction determines that the individual voting first obtains his most preferred option immediately, at the first stage of the procedure.

Proof. If both individuals prefer most the same alternative c, then it is easily verified that in the only subgame perfect equilibrium both choose c at stage 1. If $\alpha_1 \neq \alpha_2$, then, without loss of generality, suppose that $\alpha_1 = a$ (so $\alpha_2 = b$). It must be shown that, at stage 1, both individuals vote for a.

By *Reversion*, consider t_2. If, on the one hand, 1 chooses a, then: (i) by choosing a individual 2 stops the procedure and gets $u_2(a, t_2)$; and (ii) by choosing next b, 2 makes the procedure enter stage $t_2 + 1$. By entering stage $t_2 + 1$, three types of outcomes may result.
(i)   First, the outcome Ø corresponding to an unending procedure. By *Termination*, the utility for 2 of this outcome is smaller than $u_2(a, t)$.
(ii) Second, the outcome corresponding to choosing a at stage $t' \geq t_2$. In that case, 2 gets $u_2(a, t')$, which, by *Impatience*, is smaller than $u_2(a, t_2)$.
(iii) And third, the outcome corresponding to choosing b at stage $t' \geq t_2$. In that case, 2 gets $u_2(b, t')$, which, by the definition of t_2, is smaller than $u_2(a, t_2)$.
As a consequence, the best choice for 2 at stage t_2 when 1 has chosen a is to choose a and stop the procedure.

If, on the other hand, 1 chooses b at stage t_2, then: (i) by choosing b next individual 2 stops the procedure and gets $u_2(b, t_2)$; and (ii) by choosing next a, 2 makes the procedure enter stage $t_2 + 1$. By entering stage $t_2 + 1$, three types of outcomes may result.
(i)   First, the outcome Ø corresponding to an unending procedure. By *Termination*, the utility for 2 of this outcome is smaller than $u_2(b, t_2)$.
(ii) Second, the outcome corresponding to choosing b at stage $t' \geq t_2$. In that case, 2 gets $u_2(b, t')$, which, by *Impatience*, is smaller than $u_2(b, t_2)$.
(iii) And third, the outcome corresponding to choosing a at stage $t' \geq t_2$. In that case, 2 gets $u_2(a, t')$. Since $\alpha_2 = b$, by *Persistence* and *Impatience*, $u_2(a, t') < u_2(b, t') < u_2(b, t_2)$.
In sum, the best choice for 2 at stage t_2 when 1 has chosen b is to choose b.

Now consider the decision of individual 1 at stage t_2. If 1 chooses a, then, since 2 will choose also a as show above, 1 gets $u_1(a, t_2)$. If 1 chooses b, then, since, as just shown, 2 will choose b as well, 1 gets $u_1(b, t_2)$. As $\alpha_1 = a$, $u_1(a, t_2) > u_1(b, t_2)$. Consequently, the best choice for 1 at stage t_2 is a.

To recap, it has been shown that, at stage t_2, by backward induction, both individuals vote for a. Taking this result as the base case of an induction argument, choose $t'' < t_2$ and suppose that, for each $t \in \{t'' + 1, t'' + 2, ..., t_2\}$, backward induction leads both individuals to choose a. It has to be proved that, by backward induction, both individuals also pick a at stage t''. This result would conclude the proof.

To this end, choose $t'' < t_2$ and suppose that, for each $t \in \{t'' + 1, t'' + 2, ..., t_2\}$, backward induction leads both individuals to choose a. In particular, this implies that, at stage $t'' + 1$, 1 gets $u_1(a, t'' + 1)$, whereas 2 gets $u_2(a, t'' + 1)$.

If 1 chooses a at stage t'', then: (i) by choosing a, 2 stops the procedure and gets $u_2(a, t'')$; and (ii) by choosing b, 2 forces the procedure to enter stage $t'' + 1$, where, by the induction hypothesis, 2 would get $u_2(a, t'' + 1)$. By *Impatience*, $u_2(a, t'') > u_2(a, t'' + 1)$ and, therefore, 2 would choose a if 1 chose a at stage t''.

If 1 chooses b at stage t'', then: (i) by choosing b next individual 2 stops the procedure and gets $u_1(b, t'')$; and (ii) by choosing next a, 2 makes the procedure enter stage $t'' + 1$ and gets $u_2(a, t'' + 1)$. Since $a_2 = b$, by *Impatience* and *Reversion*, $u_2(b, t'') > u_2(b, t'' + 1) > u_2(a, t'' + 1)$.

To show that 1 will choose a and thereby finish the proof, it remains to be verified that, by choosing instead b, 1 will get less than $u_1(a, t'')$. To see this, suppose 1 chooses b. If, on the one hand, 2 chooses b, the procedure stops and 1 gets $u_1(b, t'')$, which, since $a_1 = a$, by *Persistence* is smaller than $u_1(a, t'')$. If, on the other hand, 2 selects a, then the procedure reaches stage $t'' + 1$, where, by the induction hypothesis, 1 would get $u_1(a, t'' + 1)$. By *Impatience*, $u_1(a, t'' + 1) < u_1(a, t'')$.

5 Concluding remarks

The result in this paper disproves the previous natural intuition that the most patient voter wins the voting procedure. In other words, being more patient does not guarantee the victory of your preferred alternative. In the present framework, what really matters is the order of the voters.

It is easy to provide real-life examples of the fact that the first one who takes the initiative wins. Consider a situation of two players: a firm and a labor union in case of strike. If the strike happens already, it is to tell that the union sets up some claims to the enterprise. Though it seems that the enterprise is more patient, disposing more resources, in case of strike it is likely that the enterprise agrees with the claims of the union. In case when the strike is about to happen, the enterprise has the power of the first move: it can prevent a strike by making an offer to the workers that will not be rejected. This offer is less generous than the offer in case when strike already happened.

Since the result states that the first who proposes wins, the rivals may be more interested in voting first than in being more patient. For example, consider two parties making a coalition, so they have to choose which of their leaders will be the new head. The key is who will propose first his candidature.

If the order of the voters is not exogenous and defined by the voters themselves, then it is likely that the most extreme voter would take the initiative and votes first. Therefore, in this case the result in some degree coincides with [2] and [11].

The model can be extended along at least two directions. One might be to modify existing elements of the model: to have any number of voters, more than two alternatives, to introduce explicitly a final stage etc. For instance, the case when the number of alternatives is equal to the number of voters can be seen as a committee forced to choose one of them as a chairman. The other line might be to modify the procedure: the most natural extension is not to fix the order of the voters and make it random at each stage. The presence of bribing seems to be challenging and promising. The bribing can be presented in different ways: utility transfer

between the voters, direct payments, increasing the probability to vote first etc. The extension to n voters allows to see what happens if coalitions are allowed; or what happen if the unanimity is not required. Maybe in this case the veto power of the individuals is reduced and the impatience degree matters.

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A formal a priori power analysis of the Security Council of the United Nations

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Abstract. Introducing a veto into the process of group decision making (voting, aggregating preferences) drastically changes the position of decision makers and, consequently, it changes their power index. The United Nations Security Council is probably the most prominent real life example of such a decision body. In this paper we analyse the impact of veto and abstention on a priori power of the UN Security Council members measured by different power indices. We also describe how to derive a voting game where players do not have the power of veto which is equivalent, in the sense of cooperative game theory, to a given voting game with vetoes.

1 Introduction

The United Nations Security Council became a subject of power analysis almost at the same moment as when Lloyd Shapley and Martin Shubik introduced their index of power. In their paper [15] they offered a method for the a priori evaluation of the division of power among various bodies and members of a legislature or committee system. This a priori analysis allows us to notice that the mathematical structure of a voting system can easily lead to a bias in power distribution, which is surprising to and unintended by the authors of the system.

The United Nations is under permanent pressure to make the Security Council more representative of its membership and the present analysis adds some arguments to this debate. There is no doubt that veto members have an especially high voting power, whereas states without vetoes hold almost none. However, these measures of power depend on the type of index used. In addition, power in itself is not the goal. If another permanent member is already reliably voting as one wishes, obtaining a veto of one's own is unnecessary and this is probably the main reason for the existence of abstentions. One may observe the introduction of many modifications of the classical Shapley-Shubik power index (see, for example [12, 11 or 8]). In our paper we do not assess which of these modifications are the best. However, some proposals are presented.

From a theoretical point of view, what we may observe is a transformation from simple "yes-no" cooperative games to simple cooperative games where players have more than two actions available to them. Felsenthal and Machover [3] introduced the term "tertiary games", introducing abstentions into a yes-no voting system, which suits the Security Council case well. Hence, they generalised the problem, which has led to various attempts to better evaluate the role and power of the Security Council's members. For example, Tchantchoa et al. [16] analyse satisfaction, Freixas and Zwicker [5] multiple levels of approval and Grabisch and Lange [6] multichoice games; all for yes–no voting with abstention. The results obtained up to now are rather pessimistic: Felsenthal and Machover [8] even call them "the curious case of the absent abstention". Following this stream, we discuss in this paper the relation between the right of veto, weights of the players and quotas. Our results clarify some general properties and enable an a priori analysis to gain a better understanding of the decision making mechanism of the United Nations Security Council.

2 The decision making procedure in the Security Council

The following description of the voting rules of the Security Council is directly taken from its web page [17]:

"Article 27 of the UN Charter states that: Each member of the Security Council shall have one vote.

Decisions of the Security Council on procedural matters shall be made by an affirmative vote of nine members.

Decisions of the Security Council on all other matters shall be made by an affirmative vote of nine members including the concurring votes of the permanent members; provided that, in decisions under Chapter VI, and under paragraph 3 of Article 52, a party to a dispute shall abstain from voting.

The Right to Veto: The creators of the United Nations Charter conceived that five countries – China, France, the Union of Soviet Socialist Republics (USSR) [which was succeeded in 1990 by the Russian Federation], the United Kingdom and the United States – because of their key roles in the establishment of the United Nations, would continue to play important roles in the maintenance of international peace and security. They were granted the special status of Permanent Member States at the Security Council, along with a special voting power known as the "right to veto". It was agreed by the drafters that if any one of the five permanent members cast a no vote in the 15-member Security Council, the resolution or decision would not be approved.

All five permanent members have exercised the right of veto at one time or another. If a permanent member does not fully agree with a proposed resolution, but does not wish to cast a veto, it may choose to abstain, thus allowing the resolution to be adopted if it obtains the required number of nine favourable votes".

Although the voting rules for members of the Security Council allow the use of yes, no or abstain votes, in most cases resolutions are adopted unanimously. For example, in 2014

there were in total 65 votes and among them only 6 votes were not unanimous 8-2-5, 14-0-1, 14-0-1, 13-0-2, 13-2-0, 13-1-1 (yes-no-abstain respectively).

3 Preliminaries

Let N be a finite set of committee members, q be a quota and wj be the voting weight of member j, where j $\in$ N.

In this paper, we consider a special class of cooperative games called weighted majority games. A weighted majority game G is defined by a quota q and a sequence of nonnegative numbers w_i, $i \in$ n, where we may think of w_i as the number of votes, or weight, of player i and q as the threshold, or quota, needed for a coalition to win. We assume that q and w_j are nonnegative integers. A subset of the players is called a coalition.

Therefore, passing a bill, for example, is equivalent to forming a winning coalition consisting of voters. A simple game (N, v) is said to be proper, if and only if the following is satisfied: for all $T \subset N$, if $v(T) = 1$ *then* $v(N \backslash T) = 0$.

We only analyse simple and proper games where players may vote either yes-no or yes-no-abstain, respectively.

If a given committee member can transform any winning coalition into a non-winning one by using a veto, then that veto is said to be of first degree.

If the veto of a given committee member turns some, but not all, winning coalitions not including that member into non-winning coalitions, then that veto is defined to be of second degree [9].

We shall denote a committee (weighted voting body) with set of members N, quota q and weights w_j, j $\in$ N by $(N, q, w) [= (N, q, w_1, w_2, ..., w_n)]$.

A winning coalition is vulnerable if, among its members, there is at least one member in a swing position, i.e. a change in that member's vote to no would cause the coalition to lose. If only one player is critical, then this player is uniquely powerful in the coalition. The inverse of the number of swings is called the fractional swings for the coalition, f(c). For example, if there are only two such players in the coalition c, then f(c)=1/2.

A power index is a mapping $\varphi: SG \rightarrow R^n$. For each $i \in N$ and $v \in SG$, the ith coordinate of $\varphi(v) \in R^n$, $\varphi(v)(i)$, is interpreted as the voting power of player i in the game v. The two most widely used power indices were proposed by Penrose and Banzhaf [13, 1] and Shapley and Shubik [15]. We shall refer to them as the PB-power index and SS-power index.

The PB-power measure is based on the concept of swings. Let S be a winning coalition in a committee (N, q, w) and i $\in$ S. We say that a member i has a swing in coalition S if

$$\sum_{k \in S} w_k \geq q \ \ and \ \sum_{k \in S \backslash \{i\}} w_k < q$$

Let s_i denote the total number of swings of member i in the committee (N, q, w). Then the PB-power index is defined as

$$\pi_i^{PB}(N,q,w) = \frac{s_i}{\sum_{k \in N} s_k}. \tag{1}$$

In the literature this form is usually called the relative PB-index. The original definition of power of member i by Penrose was

$$\pi_i^P(N,q,w) = \frac{s_i}{2^{n-1}}, \tag{2}$$

which (assuming that all coalitions are equally likely) is nothing else but the probability that a given member will be decisive (the probability of having a swing). In the literature this form is usually called the absolute PB-index. The relative PB-index is obtained by normalizing the absolute PB-index so that the indexes sum to one.

The SS-power measure is based on the concept of a pivot. Let us assume that an ordering of the members in a given permutation expresses the intensity of their support (preferences) for a particular issue in the sense that if member i precedes member j in this permutation, then member i's support for the particular proposal is stronger than member j's support. One can assume that the group supporting the proposal will be formed in the order of the positions of members in the given permutation. If so, then there exists a member such that the group composed from preceding members still does not have enough votes to pass the proposal, and the group of members placed behind him does not have enough votes to block the proposal. The group that gains his support will win. The member in such a pivotal situation has the decisive influence on the final outcome. Assuming that many votes occur, all possible preference orderings are equally likely and given full ignorance about other aspects of individual members' preferences, it makes sense to evaluate the a priori voting power of each committee member as the probability of being in a pivotal situation. This probability is measured by the SS-power index:

$$\pi_i^{SS}(N,q,w) = \frac{p_i}{n!}, \tag{3}$$

where pi is the number of pivotal positions of committee member i and n! is the number of permutations of the committee members (number of different orderings).

Let us now introduce one more power index with a similar nature: the Johnston power index (we refer to it as the J-power index). The Johnston power of player i is the sum of the fractional swings over all the vulnerable coalitions in which i is critical, divided by the total number of fractional swings of all players; in other words, i's proportion of fractional swings.

Let VC be the set of all vulnerable coalitions. Formally, for each vulnerable coalition $c \in VC$, we define $f_i(c)$ by

$$f_i(c) = \begin{cases} f(c), & i \text{ is critical in c} \\ 0, & \text{otherwise} \end{cases},$$

and the Johnston power index [8]:

$$\pi_i^J(N, q, w) = \frac{\sum\limits_{c \in VC} f_i(c)}{\sum\limits_{j=1}^{n} \sum\limits_{c \in VC} f_j(c)}. \tag{4}$$

At the end of introducing the power indices we want to use in our analysis of the UN Security Council, we introduce Coleman's group capacity index [3], C(A), defined as follows:

$$C(A) = \frac{w}{2^n}, \tag{5}$$

where w denotes the total number of winning coalitions. This power index is not in fact a power index in the traditional sense. It is similar in form: it measures the power of a decision body as a whole, not a particular player's power. We understand that this index reflects the ability of a given decision body to act (to make a decision). We also understand that it should decrease when power of veto is introduced. It is obvious that $C(A_v) \le C(A)$, where A_v, A describe decision bodies with and without power of veto, respectively. The question arises as to how strongly introducing power of veto decreases the power of a decision body (as a whole) to act.

4 A priori power of the UN Security Council and its members – yes-no voting

Let us recall that the United Nations Security Council has 5 permanent members with power of veto, 10 non-permanent members without power of veto; in total 15 members (N=15). The quota for a decision to be passed is $q = 9$. All members have equal weight (wi=1, for i=1,...,15). However, the yes-no voting system is not exactly the type of voting in use in the UN Security Council. However, we will see in the next chapter that yes-no voting is a good starting point for more general analysis.

First, we calculate the Shapley-Shubik power index directly[2]. The power of a non-veto player is given by $\pi_i^{SS}(15, 9, 1) = 0.001865$, $i > 5$.

Dividing the rest of the power equally among the 5 permanent members, we get a Shapley-Shubik power index for them of $\pi_i^{SS}(15, 9, 1) = 0.196270$, $i \le 5$.

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[2] One may find general formulas for a decision body with N members, q-quota and k members with a veto of the first degree in [11].

We now calculate the Penrose-Banzhaf power index for both types of members of the council (veto and non-veto members). For all veto members, in order for a motion to be passed the following conditions must be satisfied:

a) each of the members with veto rights must vote for the motion.
b) whenever the number of members with veto rights (k) is less than the quota q, at least $q - k$ of the players without a veto must vote for the motion.

From these two conditions for a motion to be passed, the number of winning coalitions is 848.

In each of these coalitions, all the 5 veto players are swing voters. A non-veto player in a winning coalition is a swing voter if and only if there are 4 non-veto players in the coalition. There are $\binom{10}{4}$ such coalitions and 4 such swing votes in each coalition. It follows that the total number of swing votes is 5080.

It follows that the Penrose-Banzhaf index (the relative PB-index) of a veto player i ($i \leq 5$) is given by

$$\pi_i^{PB}(15, 9, 1) = 0.166929$$

As before, the Penrose-Banzhaf indexes (the relative PB-index) of a non-veto player can be calculated using the symmetry of the game. It follows that

$$\pi_i^{PB}(15, 9, 1) = 0.1\,[1 - 5 * 0.166929] = 0.016535, \ \ i > 5.$$

The absolute values of the Penrose-Banzhaf indexes for members of the UN Security Council for veto-members ($i \leq 5$) are given by $\pi_i^{PB}(15, 9, 1) = 0.051758$ and for non-veto members of the Council ($i < 5$) by $\pi_i^{PB}(15, 9, 1) = 0.005127$.

We now calculate the Johnston power index for both types of members of the Council (veto and non-veto members). We obtain the following values for the Johnston power index for a veto member of the UN Security Council ($i \leq 5$): $\pi_i^j(N, q, w) = 0.177987$, and for a non-veto member ($i > 5$) $\pi_i^j(N, q, w) = 0.011006$.

We now calculate Coleman's group capacity index. This power index represents the ability of the Security Council as a whole to make a decision. The total number of winning coalitions under yes-no voting equals 848. Therefore, Coleman's group capacity index equals $C(A) = 0.025879$.

To finish this part of the analysis, it is appropriate to compare the values of a priori indices of veto and non-veto members of the UN Security Council (yes-no version). One may find the results in Table 1.

Table 1. A comparison of power indices for permanent and non-permanent members for the yes-no voting version of the game based on the UN Security Council from the perspective of a priori power indices.
Source: own calculations.

	Relative Penrose--Banzhaf Power Index	Absolute Penrose-Banzhaf Power Index	Shapley-Shubik Power Index	Johnston Power Index
Permanent member (veto member)	0.166929	0.051758	0.196270	0.177987
Non-permanent (non-veto member)	0.016535	0.005127	0.001865	0.011006
Ratio of non-permanent/permanent members	1 : 10.10	1 : 10.10	1 : 105.24	1 : 16.17

As we may see from Table 1, the ratio between the power indexes of non-permanent and permanent members of the UN Security Council varies from 1 to 10.10 for the Penrose-Banzhaf power index to 1 to 105.24 for the Shapley-Shubik power index. Actually, in the literature on power indices the absolute Penrose-Banzhaf power index is most commonly accepted, so we may conclude that a permanent member of the council is approximately 10 times stronger than a non-permanent one if no member uses his or her right to abstain.

5 A priori power of the UN Security Council and its members – yes-no-abstain voting

Let us recall again that the United Nations Security Council has 5 permanent members with power of veto, 10 non-permanent members without power of veto; in total 15 members (N=15). The quota for a decision to be passed is $q = 9$. All members have equal weights ($w_i = 1$, for $i = 1, ..., 15$). Each member may vote yes, no or abstain.

In fact, abstention by a non-veto player is identical to voting against an issue. This is not the case for veto-players. In a priori analysis, on one hand all veto-players must be included in any winning coalition to prevent a veto being used. On the other hand, when a veto player abstains, then a given coalition must be enlarged by another non-veto player to substitute the veto player who abstains. Let k_v denote the number of veto-players choosing to abstain, $k_v = 0, 1, 2, ...4$ (each permanent member of the council may abstain). This means that in a priori analysis the game (N, q, w) should be replaced by the sequence of games $(N, q + k_v, w)$ for $k_v = 0, ..., 4$. It is easy to notice that for $k_v = 0$ this game is in fact the game with yes-no voting only. Note that we may assume that the abstaining permanent members do not take part in the game, thus we do not need to consider the case $k_v = 5$.

First we calculate the Shapley-Shubik power index directly for a given k_v. The exact values for different values of k_v are presented in Table 2.

Table 2. Shapley-Shubik power index for veto and non-veto members of the UN Security Council as a function of the number of abstentions among permanent members. *Source: own calculations.*

Number of veto players abstaining, k_v	Shapley-Shubik power index for non-permanent members	Shapley-Shubik power index for non-abstaining permanent members	Ratio of power between non-permanent and permanent members (in %)
0	0.001864802	0.196270396	0.95
1	0.006993007	0.232517483	3.01
2	0.019580420	0.268065268	7.30
3	0.042424242	0.287878788	14.74
4	0.072727273	0.272727273	26.67

The results shown in Tab. 2 support our intuition connected with the relaxation of the power of veto, i.e. introducing abstentions. The relative power of a non-permanent member of the UN Security Council increases from 0.95% to 26.67% of the power of a non-abstaining permanent member of the council as the number of permanent members of the council abstaining increases. One result which seems initially counter-intuitive is that the power index of a lone non-abstaining veto player is actually lower than the power index of two non-abstaining veto players. This is probably due to the fact that a lone veto player would need all but two of the non-permanent members to pass a motion. Hence, the non-permanent members are becoming close to veto players.

6 Conclusions

First, it is worth formulating the following two general statements:
- the veto attribute is powerful and increases the power of any individual player equipped with it[3],
- when veto is possible in a certain decision body, then this decision body has less ability to make a decision compared to the same decision body without any power of veto.

We have showed this for the Security Council of the United Nations Organization, but we believe this to be true for any decision body in general.

It is also evident that the position of a non-permanent member of the Council is stronger that represented by the Shapley-Shubik power index.

One of the limitations of the analysis presented here is that it is assumed by abstaining, a permanent member essentially a priori resigns from exerting any power in a given vote. In the future, research should consider how a abstainer might switch their vote.

The evaluation of the power of the members of the UN Security Council should also be enriched by a probabilistic analysis, including the distribution of vetoes and abstentions in the decision making process.

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[3] For normalized power indices this also means that non-veto players should be weaker when power of veto is introduced into a decision body.

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Choosing a Voting Procedure for a Leisure Group Activity

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Abstract. A group of decision makers that are required to reach a joint decision typically state their preferences and aggregate them according to some voting procedure. Usually the choice of the voting procedure is treated as a technical detail. However the voting procedure impacts the final outcome. We present a complete model for a multi criteria decision process for leisure activities. The model includes the choice of the voting procedure, the elicitation of the decision makers' preferences and the aggregation to a final outcome. We examine our model on real world scenarios.

Keywords: Choosing voting procedures; voting procedure properties; multi-criteria decisions; preference elicitation; preference analysis.

1 Introduction

Voting procedures have been widely applied in a range of business group decision problems [1] as well as a range of leisure group activity decision problems. These decision problems require the consideration of multiple objectives, so in fact each decision maker faces a multi-criteria decision making (MCDM) process.

In this study, we focus on leisure group activity decision tasks such as: a group of users that wish to find a movie to watch together, a group of friends that wish to find a restaurant for an evening dinner, or even an organizing committee whose members are trying to select the dishes that will be served at a dinner party. The decision makers are queried for their preferences and once the preferences are available, they are aggregated according to the voting procedure and the outcome is presented to the group as their decision. In all of these cases, it is usually assumed that the voters have agreed on some voting procedure.

We argue it is important to devote attention to the selection of the voting procedure since applying different voting procedures to the same set of voting preferences might lead to different results. The decision makers may have diverse objectives so that they might actually

differ in their preference of the voting procedures. Furthermore, the decision makers may differ in the importance that they ascribe to each of the voting procedure criteria. The criteria include characteristics and formal properties of the voting procedures.

Usually, the decision of the voting procedure is treated as a technical issue and is made by an analyst, instead of by the decision makers themselves. Almeida and Nurmi [1] suggested that this decision should be made by the decision makers and supported by analysts with methodological and technical considerations. They propose an MCDM model for aiding the choice of a voting procedure.

Therefore the decision concerning the choice of a voting procedure should be examined.

We follow the model proposed by [1] and implement a model that is specifically designed for choosing a voting procedure for leisure group activities. We examine three research questions:

(1) To what extent do the different voting procedures impact the decision process
(2) To what extent do the different voting procedures impact the final outcome
(3) Which voting procedures should be used for leisure decision making

We explore the decision making process by examining real-world scenarios. We experiment with four real-world datasets: The Netflix prize dataset [2], the Sushi dataset [3], and two user-study datasets taken from the LetsDoIt[4] recommendation system. In all scenarios, a decision process assists the decision makers in choosing the voting procedure. The decision makers are queried for their preferences, and their preferences are aggregated according to the chosen voting procedure.

2 The model

We consider a scenario where we wish to select a leisure activity such as a movie to watch or a location for dining, out of m alternatives, to a group consisting of k users. The users are queried for their preferences and are able to submit a complete order of their preferences. The queries to the users depend on the voting procedure. For example, an ordered query is a request to for the user to submit her preference between two alternatives: $m_i ? m_j$. A scaled query is a request to submit a rating to alternative m_i from a scale of scores. For the Plurality voting procedure, the decision maker is required to state her preferred alternative out of all m available alternatives. We assume a standard environment, in which each group member is assumed to be capable of providing complete and transitive preference relations over the alternatives.

We propose an MCDM model for choosing a voting procedure. We try to characterize some modal categories of choice situations in which certain performance criteria of choices would seem to be a crucial importance at the expense of others. We then list a few social choice rules that would be suitable for those types of circumstances in the sense of satisfying those desiderata that are crucial.

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[4] http://ponya.co/letsdoit

For choosing of such a social choice rule, two situations may be considered, according to Almeida and Nurmi [1]. The first one is related to repeated situations, so the rule is to be applied in every repetition of the decision making situation. The second situation concerns the choice of a rule to be applied in a specific decision problem in the organization. In this kind of situation, each decision problem may lead to a particular suitable rule. The former is the kind of problem analyzed in this paper. In other words, our focus is on the choice of policy to be applied in each decision situation that satisfies certain characteristics.

The criteria for selecting the voting procedure are based on properties of voting procedures and other characteristics, such as paradoxes that may be relevant to be considered in analyzing a voting procedure. A selection of a set of criteria consisting on the most relevant properties for the voting procedures may be considered [4, 5, 6].

Regarding the choice of a MCDM method, an important question to be taken at this point is associated to the kind of rationality (compensatory or non-compensatory) which would be more appropriate for the choice of a voting procedure [1]. This indicates two distinct directions in choosing the mcdm method. It seems to be reasonable to assume that a non-compensatory method would be more appropriate to be applied in a specific decision problem [1]. Therefore, for this particular case, the PROMETHEE II method has been chosen to be applied in this problem.

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6
Conflict Resolution in Energy and Environmental Management

Symmetric Sequential Stability in the Graph Model for Conflict Resolution

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Abstract. In this work a new solution concept, called symmetric sequential stability, in the graph model for conflict resolution (GMCR) is proposed. We present the relationship of this new concept with four existing stability definitions in the GMCR. Finally, symmetric sequential stability is extended for GMCR with uncertain, probabilistic and fuzzy preferences.

Keywords: stability concepts, conflict resolution, preference structures.

1 Introduction

Based on concepts of game theory and on the conflict analysis of Fraser and Hipel [1], the graph model for conflict resolution (GMCR) is a mathematical tool which can be used to describe and analyze conflicts [2]. Such model describes a set of possible states (scenarios) that can arise in a conflict according to actions that can be taken by individuals involved in a conflict, called DMs. DMs may change the conflict's state by changing some of his actions taking into account their preferences over the set of possible states in the conflict and the countermoves of the other DMs.

Since DMs can behave in different ways, there are several stability definitions (solution concepts) which determine whether or not a DM has incentive to move away from a given state. If some state satisfies a particular stability definition for all DMs, then it is called a possible conflict resolution (equilibrium). In the GMCR, the most used stability definitions are Nash stability [3], general metarationality (GMR) [4], symmetric metarationality (SMR) [4], and sequential stability (SEQ) [5].

In this paper, we propose a new solution concept, called symmetric sequential stability, in the GMCR with 2-DM and present relationship of this definition with the four solution

concepts mentioned above. Additionally, we extended this new solution concept for the GMCR with uncertain [6], probabilistic [7] and fuzzy preferences [8].

The paper is organized as follows. In Section 2, the GMCR and corresponding stability definitions are revised. In Section 3, we present the definition of symmetric sequential stability and compare it with four existing concepts. In Section 4, we extend such definition for the models proposed by [6, 7] and [8]. In Section 5, we present an application to illustrate the proposed solution concept. Finally, we finish in Section 6 with main conclusions and directions for future work.

2 GMCR and stability definitions

In this section, we recall the basic idea of the GMCR and four stability definitions, namely: Nash stability, general metarationality, symmetric metarationality, and sequential stability.

2.1 GMCR

The GMCR is composed of a set of DM's, $N = \{1, ..., n\}$, a set of possible states or conflict scenarios, $S = \{1, ..., s\}$, and, for each DM $i \in N$, a preference relation in S and a directed graph $G_i = \{S, A_i\}$, where $A_i \subseteq S \times S$ determines for each state s to what states DM i can lead the conflict, called achievable states from s in one step.

The GMCR, as well as most of the game theoretic models, adopts that the preferences of a DM i can be expressed by a binary relation, denoted by $\succ_i$, where $s \succ_i q$ indicates that the DM i prefers the object s to the object q. Additionally, one can also derive the binary relationship $\succcurlyeq_i$, where $s \succcurlyeq_i q$ means that DM i does not strictly prefer the object q to the object s.

2.2 Solution concepts in the GMCR

In this short paper, we restrict attention to 2-DM conflict models. We now review four stability concepts used in the GMCR that can be found in [9]. Let $R_i(s) = \{q: (s, q) \in A_i\}$ be the set of states that are reachable from s by DM i. Let $R_i^+(s) = \{q : (s, q) \in A_i : q \succ_i s\}$ be set of all unilateral improvements from s by DM i.

Definition 1: A state $s \in S$ is *Nash stable* for DM $i \in N$ iff $R_i^+(s) = \varnothing$.

Definition 2: A state $s \in S$ is general *metarational (GMR) stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j(q)$ and $s \succcurlyeq_i u$.

Definition 3: A state $s \in S$ is *symmetric metarational (SMR) stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j(q)$, $s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$.

Definition 4: A state $s \in S$ is *sequentially (SEQ) stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j^+(q)$ and $s \succcurlyeq_i u$.

3 Symmetric sequential stability and its relations with other solution concepts

3.1 Symmetric sequential stability

In this section we propose a new notion of stability, called symmetric sequential stability. This definition, as the name implies, is a type of sequential stability in which a player, while planning to move, consider not only the reaction of his opponent, but also his own counter--reaction.

Definition 5: A state $s \in S$ is *symmetric sequentially (SSEQ) stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j^+(q)$, $s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$.

3.2 Relationships with other solution concepts

In the GMCR, there are well known relationships between the four standard stability concepts. Next, we establish some relationships of the SSEQ stability with some of the existing solution concepts.

Theorem 1: The following statements are true in the GMCR:

(a) If state s is Nash stable for DM i, then s is SSEQ stable for DM i.
(b) If state s is SSEQ stable for DM i, then s is sequentially stable for DM i.
(c) If state s is SSEQ stable for DM i, then s symmetric metarational stable for DM i

Proof: For (a), if s is Nash stable for DM i, then $R_i^+(s) = \emptyset$ which implies that s is SSEQ stable for DM i.

For (b), suppose that s is SSEQ stable for DM i. Thus, for all $q \in R_i^+(s)$, there exists u such that $u \in R_j^+(q)$, $s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$. Therefore, it is true that for all $q \in R_i^+(s)$, there exists u such that $u \in R_j^+(q)$, and $s \succcurlyeq_i u$, which implies that s is sequentially stable.

For (c), suppose that s is SSEQ stable for DM i. Thus, for all $q \in R_i^+(s)$, there exists u such that $u \in R_j^+(q)$, $s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$. Since $R_j^+(q), \subseteq R_j(q)$, it follows that for all $q \in R_i^+(s)$, there exists u such that $u \in R_j(q)$, $s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$, which implies that s is symmetric metarational stable for DM i.

4   Extension of the SSEQ stability for GMCR with other preference structures

In this section, we extend the SSEQ stability definition for the GMCR with uncertain [6], probabilistic [7], and fuzzy preference [8] structures. Obviously, the SSEQ definition can be extended to several other preference structures used in the GMCR in a similar way. In what follows, we review, briefly, these models and present the corresponding adapted version of SSEQ to each one of these three preference structures.

4.1   The SSEQ stability in the GMCR with uncertain preferences

[6] proposed to use a new preference structure in the GMCR in which DM's preferences are expressed by a triple of relations $\{\succ_i, \sim_i, U_i\}$, were $s \succcurlyeq_i q$ and $s \sim_i q$ are the strict preference and indifference relations, and sU_iq means DM i is uncertain as to whether he prefers state s to state q, prefers q to s, or is indifferent between s and q.

Let $R_i^U(s) = \{q \in S : (s,q) \in A_i \text{ and } qU_is\}$ the DM i's reachable list from state s by a unilateral uncertain move. Let $R_i^{+,U}(s) = R_i^+(s) \cup R_i^U(s) = (q \in S : (s,q) \in A_i \text{ and } q \succ_i s \text{ or } qU_is)$ the DM i's reachable list from state s by a unilateral improvement or unilateral uncertain move. Then, based on this extended preference structure we have the following SSEQ definitions:

If DM i has an incentive to move to states with uncertain preferences relative to the *status quo*, but, when assessing possible sanctions, will not consider states with uncertain preferences, then we have the following definition:

Definition 6: A state $s \in 5$ is *symmetric sequentially stable* for DM $i \in N$ iff for every $q \in R_i^{+,U}(s)$, there exists u such that $u \in R_j^{+,U}(q), s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$.

If DM i would only move from the *status quo* to preferred states and would be sanctioned only by less preferred or equally preferred states relative to the *status quo*, then we have the following definition:

Definition 7: A state $s \in 5$ is *symmetric sequentially stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j^{+,U}(q), s \succcurlyeq_i u$ and $s \succcurlyeq_i v$ for every $v \in R_i(u)$.

If preference uncertainty is allowed when a DM considers both incentives to leave a state and sanctions to deter him or her from doing so, then we have the following definition:

Definition 8: A state $s \in 5$ is *symmetric sequentially stable* for DM $i \in N$ iff for every $q \in R_i^{+,U}(s)$, there exists u such that $u \in R_j^{+,U}(q)$, where $s \succcurlyeq_i u$ or sU_iu and $s \succcurlyeq_i v$ or sU_iv for every $v \in R_i(u)$.

If a DM is not willing to move to a state with uncertain preference relative to the *status quo*, but is deterred by sanctions to states that have uncertain preference relative to the *status quo*. Then, we have the following definition:

Definition 9: A state $s \in 5$ is *symmetric sequentially stable* for DM $i \in N$ iff for every $q \in R_i^+(s)$, there exists u such that $u \in R_j^{+,U}(q)$, where $s \succcurlyeq_i u$ or $sU_i u$ and $s \succcurlyeq_i v$ or $sU_i v$ for every $v \in R_i(u)$.

4.2   The SSEQ stability in the GMCR with probabilistic preferences

In the model of [7], the authors replace the usual preference notion used in GMCR by adopting probabilistic preferences [10]. According to this model, whenever a DM must state preferences between two particular objects, it may do so with a certain probability. Thus, in the GMCR with probabilistic preferences, for any two states s and q, $P_i(s, q)$ expresses the chance with which DM i prefers state s over q. This probability is defined on 5×5 and must satisfy:

$$P_i(s, q) \geq 0, \ \forall s, q \in S; \tag{1}$$

$$P_i(s, q) + P_i(q, s) \leq 1, \ \forall s, q \in S. \tag{2}$$

Consider parameters α, β, γ lying in the interval [0.1]. Let $R_i^{+\gamma}(s)$ be the set of γ-unilateral improvements from state s made by DM i, where a state u is a γ-unilateral improvement from state v if $u \in R_i(v)$ and $P_i(u, v) > \gamma$. Additionally, also consider $\varphi_i^{+\gamma}(s) = \{q : P_i(q, s) > \gamma\}$ as defined in [7]. In this model, we have the following SSEQ definition:

Definition 10: A state $s \in 5$ is $(\alpha, \beta, \gamma) - symmetric \ sequential \ stable$ for DM $i \in N$ iff for every $q \in R_i^{+(1-\alpha)}(s)$, there exists u such that $u \in R_j^{+\gamma}(q) \cap (\varphi_i^{+(1-\beta)}(s))^c$ such that $R_i(u) \cap \varphi_i^{+(1-\beta)}(s) = \varnothing$.

## 4.3   The SSEQ stability in the GMCR with fuzzy preferences

[8] proposed the use of fuzzy preferences in the GMCR to indicate the degree of uncertainty that a DM can have when comparing two states. Fuzzy preference over the set of states, S, is a fuzzy relation in S, represented by the matrix $R = (r_{ij})_{m \times m}$, with membership function $u_R : S \times S \to [0,1]$, where $u_R(s_i, s_j) = r_{ij}$, the degree of preference for s_i over s_j, satisfies $r_{ij} + r_{ji} = 1$, and $r_{ii} = 0.5$, for all $i, j = 1, 2, ..., m$.

The authors define DM k's fuzzy relative certainty of preference for state s_i over s_j as $\alpha^k(s_i, s_j) = r^k(s_i, s_j) - r^k(s_j, s_i)$, where $r^k(s_i, s_j)$ denote the preference degree of state s_i over s_j for DM k. In this model a state $s_i \in R_k(s)$, where $k \in N$, is called a fuzzy unilateral improvement from s by DM k if and only if $\alpha^k(s_j, s) \geq \gamma_k$, where γ_k is the fuzzy satisficing threshold. Let $\widetilde{R}_{k,\gamma_k}^+(s) = \{s_i \in R_k(s) : \alpha^k(s_i, s) \geq \gamma_k\}$. Then, we have the following SSEQ definition:

Definition 11: A state $s \in 5$ is fuzzy *symmetric sequentially stable* for DM $k \in N$ iff for every $u \in \widetilde{R}^+_{k,\gamma_k}(s)$, there exists u such that $u \in \widetilde{R}^+_{l,\gamma_l}(q)$, $\alpha^k(u,s) < \gamma_k$, and $\alpha^k(v,s) < \gamma_k$ for all $v \in R_k(u)$.

5 Application

We present a modified version of a hypothetical conflict proposed by [11] to illustrate an application of the SSEQ stability. In this conflict, there are two DM's: environmentalist (E) and developers (D). Environmentalists may choose to be proactive (P) in promoting environmental responsibility or not, in this case they are called reactive (R). Developers may choose to be sustainable (S) or not, which is represented by (U). The set of possible states of the conflict is: (P, S), (P, U), (R, U) and (R, S). Figure 1 represents the graph model for this strategic conflict.

a) $(P,S) \succ_E (R,S) \succ_E (P,U) \succ_E (R,U)$ b) $(R,U) \succ_D (P,U) \succ_D (R,S) \succ_D (P,S)$
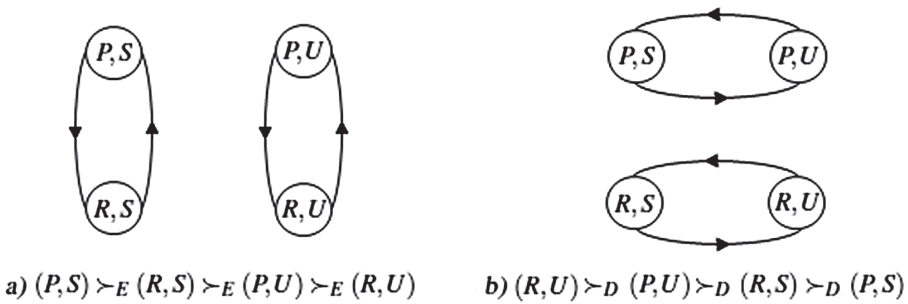
Fig. 1. Conflict in the graph form: (a) player E; (b) player D.

In Table 1, it is represented the stable states, for each DM, according to the most usual definitions of stability and also according SSEQ stability. Each cell in the array specifies for which DMs, if any, the column state column is stable according to the stability definition of the corresponding line.

Table 1. Stable states according to five definitions of stability.

	(P, S)	(R, S)	(P, U)	(R, U)
Nash	E		E, D	D
GMR	E	E	E, D	D
SMR	E	E	E, D	D
SEQ	E	E	E, D	D
SSEQ	E	E	E, D	D

6 Conclusion

This paper presents a new definition of stability, called symmetric sequential stability (SSEQ) in the GMCR. The SSEQ stability is a kind of sequential stability in which the player who moves first considers not only the reaction of his opponents, but also his own counter--reaction. We also present the relationships of SSEQ with four existing solution concepts. Additionally, we extended SSEQ stability for GMCR with uncertain, probabilistic and fuzzy preferences.

In future research, we will investigate the relationship of this new concept with other existing concepts, and we will try to propose a way to obtain stable states, according to this definition, by means of matrix operations.

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Matrix Representation of Solution Concepts in the Graph Model for Conflict Resolution with Probabilistic Preferences

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Abstract. In this paper, matrix methods are developed to determine stable states in the graph model for conflict resolution with probabilistic preferences proposed by [1]. The matrix methods are used to determine more easily the stable states according to four stability definitions proposed for this model, namely: α-Nash stability, (α, β)-metarationality, (α, β)-symmetric metarationality and (α, β, γ)-sequential stability.

Keywords: matrix methods, probabilistic preference, conflict resolution, stability.

1 Introduction

The graph model for conflict resolution (GMCR) is an enhancement of the conflict analysis of Fraser and Hipel [2]. In this model, individuals involved in the conflict, called DM's, may have different preferences over the possible scenarios (states) that may occur during the course of a conflict. The model incorporates several stability definitions (solution concepts) that are procedures to determine whether a particular DM has an incentive to move or not from a given state. A possible conflict resolution (equilibrium) is a state which is stable for all DM's according to a particular stability definition.

In a conflict situation, DMs can normally behave in different ways. To represent the various forms of decision that can arise, a variety of solution concepts have been proposed and used in works based on the GMCR, such as Nash stability [3], general metarationality (GMR) [4], symmetric metarationality (SMR) [4], and sequential stability (SEQ) [5].

DMs' preferences play an essential role in stability analysis. However, preferences may not always be clear or accurate. For example, [6] extends the four solution concepts described

above for uncertain preferences models. [7] presents two models to represent uncertainty in the preference of DMs. In this paper, we are particularly interested in the GMCR with probabilistic preferences proposed by Rêgo and Santos [1]. These GMCR generalizations attempt to capture features that can better represent real-world situations.

In the GMCR with probabilistic preferences, DMs do not simply prefer one state over another one, but they do it with a certain probability. Rêgo and Santos proposed four stability definitions for this model, namely: α-Nash stability, (α, β)-metarationality, (α, β)-symmetric metarationality and (α, β, γ)-sequential stability. In this paper, we propose matrix representations to more easily determine which states are stable according to these four definitions in 2-DM conflict models. Our idea follows the same line of reasoning of that used by [8], where matrix representations were used to facilitate the identification of stable states in the GMCR.

The paper is organized as follows. In Section 2, the GMCR with probabilistic preference and its corresponding stability definitions are revised. In Section 3, we present matrix representations that provide a means to determine stable states in the GMCR with probabilistic preferences. Finally, we finish in Section 4 with main conclusions and directions for future work.

2 GMCR with probabilistic preferences and stability definitions

In this section, we recall the basic idea of the GMCR. We then present the GMCR with probabilistic preferences and its corresponding stability definitions proposed by [1].

2.1 GMCR with probabilistic preferences

The GMCR is composed of a set of DM's, $N = \{1, ..., n\}$, a set of possible states or conflict scenarios, $S = \{1, ..., s\}$, and, for each DM $i \in N$, a preference relation in S and a directed graph $G_i = \{S, A_i\}$, where $A_i \subseteq S \times S$ determines for each state s to what states DM i can lead the conflict, called achievable states from s.

The GMCR, as well as most of the game theoretical models, adopts that the preferences of a DM i can be expressed by a binary relation, denoted by $\succ_i$, in which $x \succ_i y \, x \succ_i y$ indicates that DM i strictly prefers object x to object y.

Recently, [1] replaced the usual preference notion used in GMCR by adopting probabilistic preferences [9]. According to a probabilistic preference model, whenever a DM must state preferences between two particular objects, it may do so with a certain probability. Thus, in the GMCR with probabilistic preferences, for any two states s and q, $P_i(s, q))$ expresses the chance with which DM i prefer state s over q This probability defined on $S \times S$ and must satisfy:

$$P_i(s, q) \geq 0, \forall s, q \in S; \tag{1}$$

$$P_i(s,q) + P_i(q,s) \leq 1, \forall s,q \in S. \tag{2}$$

2.2 Stability definitions in the GMCR with probabilistic preferences

In this short paper, we restrict attention to 2-DM conflict models. Consider parameters α, β, γ lying in the interval [0,1]. Let $R_i(s) = \{q : (s,q) \in A_i\}$ be the set of states that are reachable from s by DM i. Let $R_i^{+\gamma}(s)$ be the set of γ-unilateral improvements from state s made by DM i, where a state u is a γ-unilateral improvement of state v if $u \in R_i(v)$ and $P_i(u,v) > \gamma$. Additionally, also consider $\varphi_i^{+\gamma}(s) = \{q : P_i(q,s) > \gamma\}$, i.e., $\varphi_i^{+\gamma}(s)$ is a list of all the states, not necessarily reachable from s in one step, that DM i would prefer over s with a probability greater than γ. Rêgo and Santos stability definitions are as follows:

Definition 1: A state $s \in S$ is α-*Nash stable* for DM i iff $R_i^{+(1-\alpha)}(s) = \emptyset$.

Definition 2: A state $s \in S$ is (α, β)-*metarational stable* for DM i iff for every $q \in R_i^{+(1-\alpha)}(s)$, there exists u such that $u \in R_j(q) \cap (\varphi_i^{+(1-\beta)}(s))^c$.

Definition 3: A state $s \in S$ is (α, β)-*symmetric metarational stable* for DM i iff for every $q \in R_i^{+(1-\alpha)}(s)$, there exists u satisfying $u \in R_j(q) \cap (\varphi_i^{+(1-\beta)}(s))^c$ such that $R_i(u) \cap \varphi_i^{+(1-\alpha)}(s) = \emptyset$.

Definition 4: A state $s \in S$ is (α, β, γ)-*sequentialy stable* for DM i iff for every $q \in R_i^{+(1-\alpha)}(s)$, there exists u such that $u \in R_j^{+\gamma}(q) \cap (\varphi_i^{+(1-\beta)}(s))^c$.

3 Matrix representations of solution concepts of GMCR with probabilistic preferences

In this section, we propose matrix representations to identify stable states in the GMCR with probabilistic preferences. Consider the $|S| \times |S|$, 0–1 matrices, J_i and $J_i^{+\gamma}$ defined, respectively, by

$$J_i(s,q) = \begin{cases} 1, & if \ q \in R_i(s), \\ 0, & otherwise. \end{cases}$$

And

$$J_i^{+\gamma}(s,q) = \begin{cases} 1, & if \ J_i(s,q) = 1 \ and \ P_i(q,s) > \gamma, \\ 0, & otherwise. \end{cases}$$

The matrix J_i, called DM i accessibility matrix, has element (s, q) equal to 1 iff q is achievable from s by DM i. The element (s, q) of $J_i^{+\gamma}$ receives the value 1 iff q is achievable from s by DM i and DM i prefers q over s with probability greater than γ.

Consider E an $|S| \times |S|$ matrix with all elements equal to 1, and let e_k denote an $|S|$-dimensional column vector with k^{th} element equal to 1 and all other elements equal to 0. For two $|S| \times |S|$ matrices M and N, $W = M \circ N$ is defined as the $|S| \times |S|$ matrix with (s, q) entry $W(s, q) = M(s, q) \cdot N(s, q)$. If M is an $|S| \times |S|$ matrix, then the $|S| \times |S|$ $sign(M)$ matrix has (s, q) entry defined by

$$sign[M(s,q)] = \begin{cases} 1, & M(s,q) > 0 \\ 0, & M(s,q) = 0 \\ -1, & M(s,q) < 0 \end{cases}$$

The probabilistic preferences matrices are given by:

$$Q_i^{+\gamma}(s,q) = \begin{cases} 1, & if \ P_i(q,s) > \gamma, \\ 0, & otherwise. \end{cases}$$

$$Q_i^{-\gamma}(s,q) = \begin{cases} 1, & if \ P_i(q,s) > \gamma, \\ 0, & otherwise. \end{cases}$$

$$Q_i^{=\gamma}(s,q) = \begin{cases} 1, & if \ P_i(q,s) > \gamma, \\ 0, & otherwise. \end{cases}$$

Thus, the no better matrix can be defined by

$$Q_i^{-,=\gamma}(s,q) = 1 - Q_i^{+\gamma}(s,q)$$

Using the above matrices, results analogous to those obtained by [8] remain valid for the GMCR with probabilistic preferences. These results are given by the following four theorems:

Theorem 1: Let $i \in N$. A state s is α-Nash stable for DM i iff $e_s^T \cdot J_i^{+(1-\alpha)} = \vec{0}^T$.

Theorem 2: Let $i \in N$. A state $s \in S$ is (α, β)-metarational stable for DM i iff $M_i^{(\alpha,\beta)-GMR}(s,s) = 0$, where $M_i^{(\alpha,\beta)-GMR} = J_i^{+(1-\alpha)}[E - sign \ (J_j \cdot (Q_i^{-,=(1-\beta)})^T)]$.

Theorem 3: Let $i \in N$. A state $s \in S$ is (α, β)-symmetric metarational stable for DM i iff $M_i^{(\alpha, \beta)-SMR}(s,s) = 0$, where $M_i^{(\alpha, \beta)-SMR} = J_i^{+(1-\alpha)}[E - sign\ (J_j \cdot W)]$ and $W = (Q_i^{-,=(1-\beta)})^T \circ [E - sign\ (J_j \cdot (Q_i^{+(1-\alpha)})^T)]$.

Theorem 4: Let $i \in N$. A state $s \in S$ is (α, β, γ)-sequential stable for DM i iff $M_i^{(\alpha, \beta, \gamma)-SEQ}(s,s) = 0$, where $M_i^{(\alpha, \beta, \gamma)-SEQ}(s,s) = J_i^{+(1-\alpha)}[E - sign\ (J_j^{+\gamma} \cdot (Q_i^{-,=(1-\beta)})^T)$.

The proofs of the above results are analogous to the proofs of the results presented in [8], just replacing the preference matrices appropriately.

4 Conclusion

Following a similar idea as that used by [8], we propose matrix representations to determine stable states in 2-DM GMCR with probabilistic preferences, according to the definitions proposed in [1], namely: α-Nash stability, (α, β)-metarationality, (α, β)-symmetric metarationality and (α, β, γ)-sequential stability.

The methodology presented in this paper can help to find conflict resolutions using GMCR. It combines the advantages of probabilistic preference models, which are more flexible to accommodate preference features of DMs in real conflicts, and of matrix representations of solution concepts in GMCR, which are more effective in determining stabilities and in predicting equilibria, especially in complex conflict models with many feasible states.

Using the approached proposed here, one can more easily determine for which set of parameters' values a given state is stable and, as suggested by [1], such information can be relevant to compare the equilibrium robustness of the states. We are currently investigating an extension of this work to Multi-DM conflicts and to other solution concepts, such as limited-move stability [10], nonmyopic stability [11] and Stackelberg equilibrium [12].

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Option Prioritization Methods in the General Hierarchical Graph Model

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Abstract. Option prioritization methods are designed for obtaining preference relations for decision makers (DMs) within the general hierarchical graph model. Preference structure in this model is constructed by assigning weights to component graph models contained within the overall hierarchical model. The preference relation for each DM in the hierarchical graph model can be determined with the preference statements using the option prioritization method. This new method can simplify the process of obtaining preference relations in the hierarchical graph model by avoiding direct ranking of the numerous states.

Keywords: Option prioritization, hierarchical graph model, preference statement, weighted preference.

1 Introduction

The Graph Model for Conflict Resolution (GMCR) is a formal methodology that can handle strategic conflict and provide meaningful insights.

Research within the paradigm of GMCR includes coalition analysis [8, 7], strength of preference [4], matrix representation of a conflict [12], and preference uncertainties [11, 1, 10]. In particular, the option prioritization method to represent preference relations for DMs has been proposed by Kilgour and Hipel [9], and Fang et al. [2, 3]. The preference relation for a DM can be expressed by a list of statements from the most important at the top of a table and the least important at the bottom. Each preference statement is an expression of option numbers connected by logical symbols. A score is assigned to this state for a given DM to represent its truth value when all the statements are satisfied for a given state. These scores

can be used as an important input to rank states in GMCR II, a decision support system to effectively carry out stability analysis [2, 3].

2 Hierarchical Graph Model for Conflict Resolution

The hierarchical graph model for conflict resolution has been proposed to investigate strategic conflicts that are composed of subconflicts [5]. Some DMs, called common decision makers (CDMs), take part in all subconflicts, while others, referred to as local decision makers (LDMs), only appear in one subconflict.

The stability results in the hierarchical model are calculated using the theorems linking the solution concepts in the hierarchical model with those in the local models [5]. An alternative approach is to represent the hierarchical graph model using matrices [6].

However, this method may be quite complicated when a hierarchical graph model contains a large number of local models. Compared with the aforementioned methodologies, the option prioritization approach can simplify the preference elicitation process in a practical application by representing the preference statements using logical connection involving options. This method avoids the direct ranking of the numerous states.

3 Weighted Preference Structure

In a general hierarchical graph model, each CDM has a different view on the importance of each local conflict. Importance of a local conflict is reflected using a weight for the given DM. The summation of the weights for all local models equals 1.

The score of each state for determining the preference relation for the given DM is the weighted aggregation of the scores for component states.

Lexicographical preference structure is a special case of the weighted structure [5]. In a hierarchical graph model containing two local models, the weight of the more important local model for a given DM approaches to 1. The weight of the less important local model is very close to 0.

4 Option Prioritization Method

In the lexicographical ordering, the preference statements for a CDM in a hierarchical model containing two local models are the collection of all the statements in local models. In this collection, statements in the more important local model are always listed before those in the less important local model. Statements that belong to the same local model are listed following the same order in the corresponding local model.

For the weighted preference structure, each statement for a CDM in the hierarchical model is expressed by the logical connection of statements across local models. The statements for each LDM in the hierarchical model are the same as those in the local model.

5 Conclusions

In this paper, the preference statements in the hierarchical model are constructed using the statements in local models. Because the statements in each local model are easy to acquire, this approach provides an efficient way of determining the preferences in the hierarchical model by avoiding the direct ranking of states.

This method can be applied to real world conflicts that contain numerous subconflicts, such as a supply chain conflict between upstream companies and their suppliers. The option prioritization method can be utilized to effectively provide preference information for GMCR II to carry out stability calculations.

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Generating Hypergame States within the Paradigm of the Graph Model for Conflict Resolution

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Abstract. A comprehensive procedure is designed to model misperception by decision makers (DMs) within the paradigm of the Graph Model for Conflict Resolution (GMCR). To accomplish this, the options or courses of action of each DM in a conflict are categorized according to various types of misperception that are occurring either due to others or the particular DM. Furthermore, the union of all possible kinds of option perception creates the universal set of options for each DM, which in turn can be extended across all DMs in the dispute to generate the universal set of the states. The new design can distinguish between the states that are commonly recognized by DMs and those that are individually misperceived.

Keywords: Universal set of states, Misperception, Graph Model for Conflict Resolution, Universal set of options.

1 Introduction

The Graph Model for Conflict Resolution (GMCR) constitutes a comprehensive approach for studying interactive decision-making situations. It has the capability to model real-life disputes under the assumption of complete information [1, 2, 3]. In other words, all decision makers (DMs) engaged in the dispute are aware of one another's options, strategies, and preferences. That is, they share a mutual understanding of the conflict situation. In real-life, DMs may view the conflict situation differently [4, 5, 6, 7]. The aim of this paper is to introduce a novel approach for modeling DMs' misperceptions using the theory of hypergame [4, 5, 6, 7] within the GMCR framework.

2 Background

Bennett [4, 5] introduced the concept of hypergame theory. A hypergame is a system of individual games in which each game represents a particular DM's viewpoint of the conflict situation. Wang et al. [6] subsequently improved hypergame theory by providing robust mathematical definitions for various hypergame concepts. Classical hypergame theory can only model the opponents' misperceptions about a given DM. However, the proposed approach can also handle a given DM's misperception about itself. In addition, various types of option perception are identified and formally modeled within GMCR. The new approach, which is based on the universal set of states, is different from classical hypergame theory proposed by Wang et al. [6, 7]. In their framework, each game is modeled individually; as a result, one cannot distinguish between the states that are correctly perceived by DMs and the states that are misperceived individually. However, the new procedure successfully achieves this and other benefits.

## 3 Proposed Methodology for State Construction in GMCR

The aim of this research is to model a first-level hypergame within the structure of GMCR. In the first-level hypergame, at least one of the DMs has a misperception about the conflict situation, and no DMs are aware of this misunderstanding. The first-level hypergame in the graph form is a system consisting of individual graphs in which the vertices in each graph represent the states and the arcs show the unilateral moves controlled by the DM among the states. To distinguish between the states that are commonly recognized by each DM in its individual graph and those that are individually misperceived, the concept of the universal set of the states is introduced. The practical objective is to make the states in each individual graph a subset of the universal set of the states. The universal set of states is defined in option form. In fact, the sates in a specific conflict situation are derived from the universal set of options.

In particular, a given DM's universal set of options captures all of the courses of action that are correctly perceived by the DM or misperceived by itself and/or its opponents. Various types of option perception can form a given DM's universal set of options. The first situation is a DM's set of options that are correctly perceived by itself. Another type is the given DM's set of options that are either imagined by itself or by its opponent. These constitute the unreal courses of action that are assumed for the DM as a result of overestimating its capabilities. The final situation is a particular DM's set of options that are either misunderstood in meaning by itself or by its opponents.

In general, it is assumed that a DM can execute any collection of courses of action from its universal set of options, thereby creating a strategy. Moreover, when every DM chooses its strategy the universal set of states is generated as shown in Fig. 1. The universal set of states is a collection of all possible scenarios of DMs' perceptions in a conflict situation.

After defining the universal set of states, one can define the set of states for a particular DM following the steps depicted in Fig. 1. As can be seen, the universal set of states is

partitioned into two groups based on a DM's viewpoint. One of the groups is the hidden states, which represent the scenarios that are unknown to a given DM. In particular, the DM is not aware of its opponents' misperceptions; as a result, the DM cannot envision their actions in its graph. Another group is the recognizable states, which represent the scenarios that are known to the DM. These states constitute the DM's perceived states.
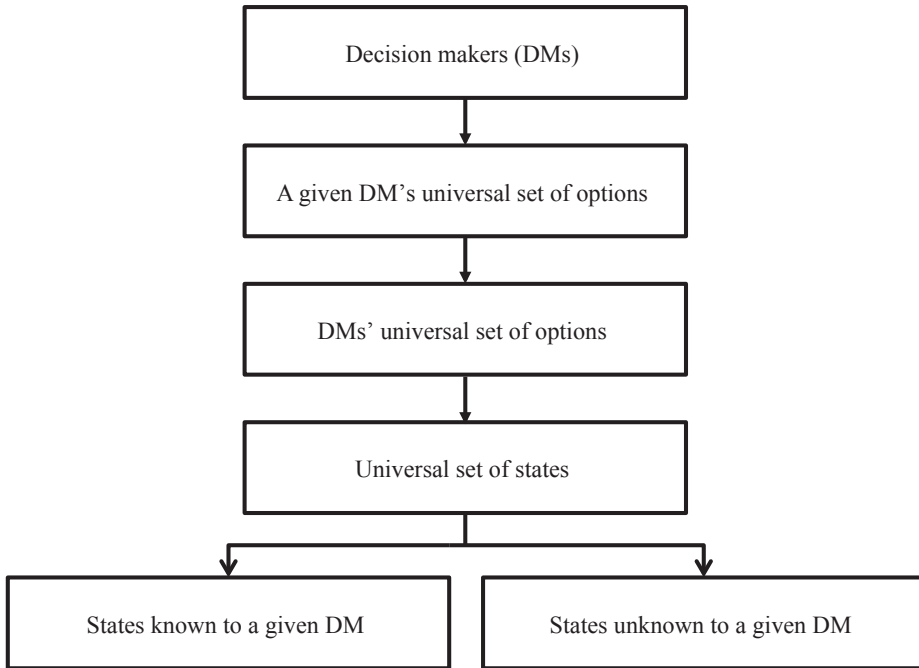
Fig. 1. Modeling procedure of states for a given DM.

4   Conclusions

A new modeling procedure is developed to represent each DM's perception in GMCR. The novelty of this approach is the formulation of the universal set of states to model a first-level hypergame in graph form with the capability to distinguish between the states that are commonly perceived among DMs and the states that are individually perceived by each DM. Future work is required to develop a rigorous approach for carrying out stability analyses of a first-level hypergame.

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Multi-Level Options in the Graph Model for Conflict Resolution

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Abstract. A method to expand the definition of options within the Graph Model for Conflict Resolution is presented. An option is traditionally dimensionless and treated in a binary fashion since it is either selected or not. However, because some options can be chosen according to the level of fulfillment, the concept of a multi--level option is proposed.

Keywords: Conflict resolution, multi-level options, graph model.

1 Introduction

In the Graph Model for Conflict Resolution (GMCR) [1–4], options are defined such that a decision maker (DM) can choose to act or not to act in regard to a particular choice. For example, consider a situation where a DM has the option to sell. Traditionally, the possibilities of an option are represented by {N, Y}, where {N} indicates that the option is not taken, and {Y} means that the option is selected. However, in some real life situations, an option may be realized at several distinct levels. For instance, a DM who has an option to sell, can offer to sell at a high price, a medium price, or a low price. Hence, this type of option requires more than two levels of representation.

2 Background

GMCR [1–4] provides a modeling technique to capture the key characteristics of a particular conflict, predict possible resolutions, and provide strategic insights about the dispute. The main three inputs to a GMCR model are the DMs, options and preferences. Then, states and unilateral moves are presented in a graphical form to show possible transitions from one state to another by DMs. Finally, utilizing stability concepts, such as Nash [5], general metarationality and symmetric metarationality [6], stability calculations are performed to find equilibrium states.

Each option in a standard GMCR doubles the number of strategies. One half is to take action specific to the option; the second is not to take action. As a result, partial options cannot be represented in the present structure. However, options in real life can be carried out at variable levels that could be qualitative or quantitative. An important missing feature of two-level options is that bargaining can be captured only across options, and not within an option.

3 Methodology

Multi-level options are proposed to facilitate the representation of partial achievement of objectives and preference evolution via the introduction of multi-level options. Table 1 shows an example of option form for a conflict having two DMs, A and B. Each DM has a number of options represented by x and y. For a DM (A) considering options x_1, x_2,...; (Yes) means full execution of the option to its highest level, (No) means the option is rejected, and (Partial in x_n) means the option is executed to some level. Partial options can be quantitative or non-quantitative.

One could argue that instead of multi-level options, an option may be quantitatively represented on a continuous base, such as water supply in cubic meter per day. However, rather than expressing a possible water supply option as ranging from 2 to 10 million m^3/day, an analyst may think in terms of levels: low water supply (say 2 to 4 million m^3/day), moderate supply (5 to 7 m^3/day), and high supply (8 to 10 m^3/day).

According to Howard [6, p. 2] "...while twentieth-century social scientists have tried desperately to become more quantitative..., twentieth-century mathematicians have become increasingly nonquantitative". Human thought may be difficult to describe quantitatively [6]. As a result, introducing real values to represent partial options may not necessarily lead to an accurate representation of a DM's choice of action. Therefore, non-quantitative options may represent reality more usefully.

Table 1. Option form for multi-level options.

Decision Maker	Options	Outcomes
A	x_1	(Yes, No, Partial in x_1)
	x_2	(Yes, No, Partial in x_2)
	x_3	(Yes, No, Partial in x_3)
	$\vdots$	$\vdots$
	x_n	(Yes, No, Partial in x_n)
B	y_1	(Yes, No, Partial in y_1)
	y_2	(Yes, No, Partial in y_2)
	y_3	(Yes, No, Partial in y_3)
	$\vdots$	$\vdots$
	y_n	(Yes, No, Partial in y_n)

On the right side of Figure 1, state 1 represents a two-level option that can be reached by a unilateral move from a status quo state. The left side of Figure 1, however, shows an example of a multi-level option x. There is a representation only of a full move from the status quo to state 1. However, option x represents a choice for the DM to make a partial move toward x, which may be possible in some cases. When fully integrated into a model, such a flexible representation can lead to a more comprehensive understanding of a DM's preferences over states. A DM can have different preference priority between two states based on the level of fulfillment of options comprising the states. For example, based on the cost, a DM may have more than one preference structure between two states of renting versus purchasing of an apartment. This type of dependent preference structure can be expressed clearly when multi-level options are used.
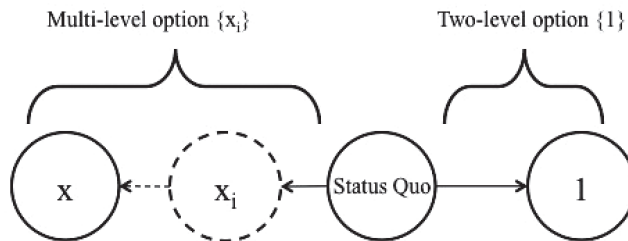
Fig. 1. Multi-level option in the graph model.

4 Conclusions

In multi-level options, options will be partially fulfilled according to the level of realization. For example, if price represents levels of an option, then it could be high, moderate, or low. The benefit of such an approach will lie not only in understanding the evolution of conflicts, but also in observing the drifting of preferences over partial or low achievement of a variable option.

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A Decentralized Optimization Method for Water Resources Allocation

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Abstract. A modified penalty-based decentralized optimization method is designed to determine the benefits that should be awarded to a stakeholder who conserves water, and how much a stakeholder who obtains the extra water should pay. The method is able to achieve optimal economic benefits across all stakeholders in a river basin as well as better stakeholder participation.

Keywords: Decentralized optimization, Penalty-based, Water allocation.

1 Introduction

Water is expected to become a critical constraint for sustainable development as the balance between water demand and water supply becomes a more serious challenge in the near future. Water demand will witness a rapid increase due to population growth, industrialization, and urbanization, while water supply is considered to be constant or even reduced because of water contamination and climate change impacts. Therefore, using available water resources efficiently and productively is an important aspect for sustainable development. This concept should be taken into consideration not only in daily water use, but also in water allocation among competing stakeholders.

One important fact is that almost 70% of the abstracted freshwater is used for irrigation purpose globally [1]. Meanwhile, the water use efficiency of irrigation is generally low. As indicated by Syme et al. [2], "irrigators should only be allocated water if they can show it is being used efficiently on their properties", but they should be encouraged to use water efficiently to conserve water since they have significant potential to conserve water by promoting water use efficiency.

However, it would be difficult for irrigators to conserve water voluntarily, especially in areas where private water licenses are issued. In general, irrigators are willing to reduce water consumption only if they are well compensated. Conversely, those users who attempt to get more water than their water licenses allow have to pay a fair cost to procure extra water. To investigate the amount of the compensation or the cost, a modified penalty-based decentralized optimization method is used in this paper.

2 Methodology

In a decentralized water allocation problem, it is assumed that every stakeholder seeks to maximize its own benefits as much as possible subject to constraints. This study considers an optimization reallocation problem based on the initial water rights allocation that is obtained using the mathematical programming approaches proposed by Wang et al. [3]. A modified penalty-based decentralized method [4, 5] is used to solve the optimization problem. The problem is formulated as follows:

$$\max_{Q_{jt}} \left(\sum_t [NB_{jt} - \beta p_{jt}^*(Q_{jt} - Q_{jt}^*)] : Q_{jt} \in \Omega \right) \tag{1}$$

subject to

$$\begin{cases} h(Q) = 0 \\ g(Q) \ge 0 \\ Q \ge 0 \end{cases} \tag{2}$$

where NB_{jt} represents the net benefits for stakeholder j in time period t which is calculated by its net benefits function. Q_{jt} is the water rights for stakeholder j at time t after reallocation, and Q_{jt}^* is the initial water rights for stakeholder j at time t. p_{jt}^* is the penalty rate for stakeholder j at time t, and is assumed to be equal to the marginal net benefit at Q_{jt}^*. β is the interest factor. $h(Q)=0$ and $g(Q) \ge 0$ represent the equality and non-equality constraints for the problem, respectively. Ω is used to denote the feasible region of the optimization problem.

When $Q_{jt} > Q_{jt}^*$, which means stakeholder j consumes more water than its initial water rights, the term of $-p_{jt}^*(Q_{jt} - Q_{jt}^*)$ is negative. Therefore, the penalty function represents the cost stakeholder j has to pay to acquire more water rights. When $Q_{jt} < Q_{jt}^*$, which indicates stakeholder j consumes less water than its initial water rights, the term of $-p_{jt}^*(Q_{jt} - Q_{jt}^*)$ is positive. Thus, the penalty function represents the compensation stakeholder j can obtain for water conservation. In order to explain the impact of changes of water consumption on net benefits for stakeholders more specifically, Figure 1 is drawn.

As can be seen from Figure 1, if one stakeholder is willing to consume more water by increasing its water rights from Q^* to Q_2, its net benefits increase from the net benefits value at point A (NB^*) to the value at point D (NB_2). Meanwhile, it has to pay a penalty to acquire the

extra water rights ($Q_2 - Q^*$), and the value of penalty is equal to the value at point E minus the value at point A. The penalty is greater than the additional net benefits the stakeholder gains. Therefore, β is needed to scale the penalty to a proper value to encourage the stakeholder to participate in the reallocation, and β should be less than 1.

On the other hand, if one stakeholder is willing to conserving water by decreasing its water rights from Q^* to Q_1, its net benefits drop to the value at point B (NB_1) from the value at point A (NB^*). The stakeholder obtains a compensation for its effort in conserving water, and the value of compensation is equal to the value at point A minus the value at point C. Similarly, the compensation is less than the net benefits the stakeholder losses. Therefore, the objective function for agricultural users is reformulated as follows:

$$\max_{Q_{jt}} \left(\sum_t [NB_{jt} - \frac{1}{b} p_{jt}^* (Q_{jt} - Q_{jt}^*)] : Q_{jt} \in \Omega, \, j \in AGR \right) \tag{3}$$
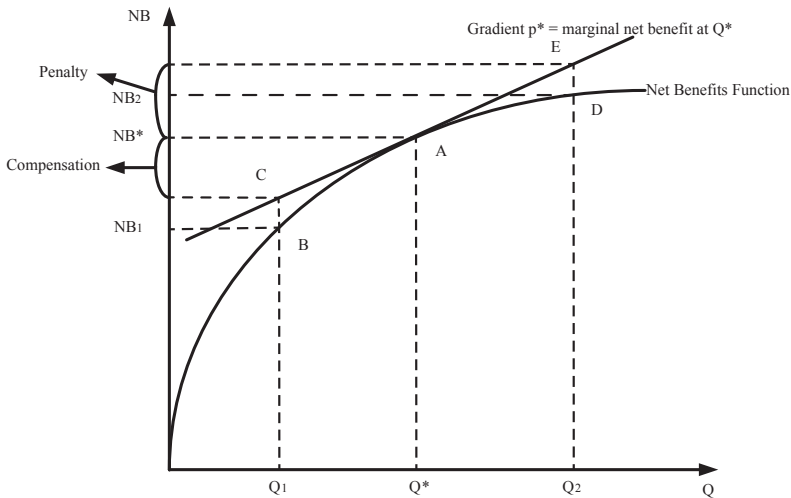
Fig. 1. Influence of penalty function on the net benefits.

3 Insights

The decentralized optimization method can be demonstrated by using an illustrative example. The total net benefits across all stakeholders increase, and can be shared by all stakeholders. The stakeholder with higher value of utilizing water can expect to acquire more additional net benefits. The decentralized optimization method can be applied to investigate real-world water demand management problems, and can also be of great assistance for other scarce resources allocation problems, such as energy allocation.

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7
Negotiation Support Systems and Studies

Ontologies in E-Negotiations

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Abstract. Ontologies have been used in computer science for knowledge representation and reasoning. Since negotiations are complex communication processes, we argue that they will benefit from structured vocabularies. Ontologies can serve as the foundation for electronic negotiation processes and negotiation support systems enabling them.

Keywords: ontology, negotiation support, communication.

1 Introduction

The process of communication is a rather complex one. We refer to objects that exist in the real world or to shared facts. For example, a tree is an object. It is part of the objective reality or of the objective world. To do so, we use our mental representations of concepts that generalise objects. In our example, the concept relating to the object "tree" belongs to the subjective world of each individual. The concept will abstract from the oak tree in the garden or any other specific tree and define its general properties, e.g. it is a plant of wooden material that has roots, a tree trunk, branches and either leaves or needles. To communicate requires giving names or attributing signs to objects to be able to talk about them. For example, the words "tree", "Baum", and "drzewo"are all terms for the same object. A term also denotes the concept as our mental representation of an object. The semiotic triangle depicts the relationships between "object", "concept", and "term" as shown in figure 1.

Communicating only by terms might lead to a variety of misunderstandings [1]. For example, communication partners might use the same term but base it on different underlying concepts. This is an example of ambiguity on the terminological level (such as "tank" representing a military vehicle or a container for fish). Another type of misunderstanding is the usage of different terms for the same concept. For example, "sledge" is used in British English but would be named "sled" in American English. Both terms denote the identical concept.

Although these problems are obvious, structured communication is still based on terms rather than on concepts. Looking at negotiations as complex communication processes, such

misunderstandings and ambiguities can be costly and need to be prevented. One possible means to do so is to use a structured vocabulary based on ontologies. This is what we will discuss in the present paper.
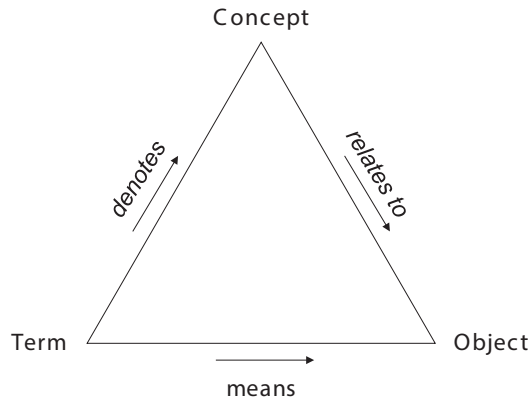
Fig. 1. Semiotic Triangle.

2 Ontologies

Ontologies have been around for centuries and were first discussed in philosophy as the study of existence. At the end of the 20th century, ontology research was adopted as a research area for modern computer science. Here, ontology denotes "a technical term denoting an artifact that is *designed* for a purpose, which is to enable the modeling of knowledge about *some* domain, real or imagined" [2]. In particular, the advent of the Semantic Web was only possible due to underlying ontologies [3].

Nowadays, there is a considerable amount of research on the formal foundations of ontologies (e.g. [4],[5],[6]). In negotiation research, little attention has been paid to the potential of ontologies for negotiations when it comes to human negotiators rather than automated negotiations. One exception is the so-called Montreal Taxonomy which attempts to define negotiation concepts and their relations [7]. However, current work does not seem to continue along those lines.

3 Ontologies in E-Negotiations

Our aim is to assess the potential of ontologies for electronic negotiations.

The negotiation support systems Negoisst is based on an ontology allowing a structured vocabulary to be used in negotiation processes [8]. This enables the negotiators to refer to concepts in their natural language text messages, thereby formally defining parts of the

exchanges. To do so prevents ambiguous interpretations and clarifies meanings in utterances. The possibility of automatic reasoning can be used for an automatic deduction of commitments resulting from the exchanges.

If ontologies change over time [9], the possibility to modify an ontology must be provided. There exist ontology editors but it is doubtful whether negotiators can indeed modify the changes. There might have to be ontology experts (rather than only domain experts) involved.

The overall assessment on the potentials of ontologies for electronic negotiations will be presented at the conference.

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Negotiations and Second Language Acquisition

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Abstract. The number of international and immigrant students at Canadian universities has been increasing over the last two decades. This has created a need to develop the most effective methodology to teach English for Academic Purposes courses to non-native speakers. This paper describes an advanced EAP course that "mimics" regular university courses by focusing on one subject area – decision making and negotiations. It describes the course in terms of the development of language and academic skills gained through texts and assignments typical for university studies. The paper argues that this approach not only helps language acquisition but also helps develop analytical, evaluative and critical thinking necessary for academic success.

Keywords: Negotiations, online negotiations, teaching, experiments, EAP.

1 Introduction

Negotiations are ubiquitous. Individuals, groups and organizations negotiate to resolve a problem or to achieve goals that they cannot achieve on their own. Regardless of their profile and impact, negotiations share some characteristics, e.g. all negotiations involve at least two sides that engage to resolve a conflict or get a better deal. In order to better understand negotiators' behavior and the process including communication dynamics, researchers in the field draw on findings from a variety of disciplines including psychology, communication studies, anthropology, economics and sociology. It is this multidisciplinary aspect of negotiation literature and the importance of communication in the conduct of negotiations that makes them a good choice of topic for teaching language to diverse groups of students.

The paper discusses the value of integrating texts from decision and negotiation literature and the practice of negotiations into English for Academic Purposes courses. Immersion in one theme over the duration of the course creates a content and language rich environment for critical evaluation and meaningful interaction – skills necessary for academic success. This paper highlights the theoretical underpinnings that inform the instructional model and

the pedagogical principles of the course design and delivery, discusses the course components, and shows how engaging students in decision making and negotiation can help achieve the course objectives. Instructor's observations on the efficacy of using negotiation in EAP courses conclude the paper.

2 Language acquisition

Different English language programs use different methodologies to deliver English for Academic Purposes (EAP) courses. The course discussed in the paper used the framework of sustained-content instruction embedded in the theory of second language acquisition [1]. The theory of second language acquisition (SLA) distinguishes between two aspects involved in the development of linguistic competence, i.e. acquisition and learning. Acquisition is a subconscious way of developing language; it is a "natural way" of "picking-up" language, which posits that knowledge of language rules is not necessary for developing fluency. Learning, on the other hand is a conscious effort to attain knowledge of language and language rules. Acquisition plays a central role in developing linguistic competence, while learning plays a supporting role as it helps monitor errors. For acquisition to occur learners need comprehensible input from texts, peers and teachers.

Many EAP programs at Canadian and American universities have adopted one of two instructional models based on SLA theory: content-based instruction [2] and sustained-content instruction [3, 4]. Both focus on the integration of the four language skills and: (1) promote "natural" acquisition of language, (2) emphasize the role of input from "authentic" sources (not simplified for language learners), (3) recognize language's social and communicative functions [5] and (4) put the student in the center of the learning process. The only difference between content-based and sustained-content models is the number of topics used during the course duration; in content-based instruction the teacher will typically use between three and six topics, while in sustained-content courses the focus is on one theme. Sustained-content courses therefore are similar to "regular" university courses in that they use materials on topics in one subject area.

Exploration of one subject area over a longer period of time builds content knowledge and lends itself to the development of critical thinking.

The EAP course described here aimed to create a learning environment where the students acquired academic language by being exposed to rich input from a variety of sources including academic readings, lectures, cases, exercises and teacher's feedback. They learned how to think critically by developing skills such as focused reflection, evaluation, analysis, synthesis and problem solving. Finally, they demonstrated the acquisition of these skills in oral and written assignments; i.e., Power Point presentations, a research essay and a negotiation report.

3 English for Academic Purposes

International and immigrant students who come to study at Carleton University are from different linguistic, cultural and educational backgrounds. They invest in the pursuit of academic degrees at an English speaking university as they recognize the advantage of being fluent in English for their future professional careers. Based on the English test results the students may be placed in one of three levels of English for Academic Purposes courses with the expectation that they meet the English language requirement within one year. The EAP groups are not only linguistically but also academically diversified; the students are enrolled in a variety of programs, including engineering, business, economics, psychology, political science, linguistics etc. Preparing the students for academic success in such a variety of fields creates a challenge and inspires a search for the most suitable course materials and design.

The advanced EAP course discussed in this paper was a full credit course (72 hours of instruction) designed following the methodological framework of sustained-content instruction and focusing on the topic of decision-making and conflict resolution through negotiation. It had three interrelated components: (1) a course pack with readings and language exercises, (2) a research assignment and (3) an on-line negotiation project. The components built on each other helping the learners to move from a lower to a higher level of content knowledge and language proficiency.

3.1 Course-pack

Similar to other university courses, the course-pack included a list of readings as well as class activities and language exercises for second language learners. The first component of the course-pack were guidelines for writing reviews, followed by readings from the literature on decision-making and negotiations which introduced and explained definitions and the main concepts pertaining to the theme of the course. Language activities based on the readings aimed at developing academic vocabulary and complex sentence structures.

In preparation for the on-line negotiations (conducted later in the course), the students practiced face-to-face negotiations, with three students on each side. Having three students representing one party had two benefits: (1) enhanced communication between partners who analyzed the issues and prepared the strategy and tactics and (2) a high level of engagement during negotiations, which could be attributed to the sense of "team" spirit. After the negotiations ended the students evaluated their experience using a questionnaire. The questionnaire guided them through this critical evaluation and also gave them the language to describe the experience.

Most of the class activities focused on pair/group work, collaboration, sharing of ideas and experiences and problem solving. The input from readings and peers created an environment for language acquisition, while language learning activities aimed at vocabulary and grammatical accuracy development (including word games, crossword puzzles, word formation, sentence structures etc.), they played a secondary, albeit also an important role.

3.2   Research assignment

The second component, an independent research assignment, which was introduced in week four of the term, had three objectives: (1) to deepen the students' knowledge of the topic, (2) to foster the development of library research skills and (3) to promote independent learning. Each student had to formulate a research question that related decision-making or negotiations to their field of study. Examples of the topics included the influence of culture on negotiation/ decision-making style, strengths and weaknesses of group decision-making, strengths and weaknesses of decision/negotiation support systems etc. To find answers each student had to locate five sources in the university library (book chapters and/or journal articles) and submit reviews of these sources on a weekly basis. The selection and evaluation of sources is a crucial academic skill necessary for all university courses and an EAP class is an appropriate place to practice these skills. Apart from writing reviews the students also prepared two other assignments based on their research, a PowerPoint Presentation and an essay.

3.3   On-line negotiations

The third component of the course was an on-line negotiation project. To gain a better understanding of the features of online negotiation systems the students compared two NSS sites: Smartsettle [6] and Negoisst [7] and evaluated them from the point of view of clarity and accessibility of information. Comparison/contrast is a prevalent rhetorical mode in research thus an ability to evaluate based on comparison/contrast is crucial for the students' future academic work.

For their own online negotiations the students used Inspire, a Web-based negotiation support system developed to provide training for students and professionals interested in honing their negotiation skills [8]. The case chosen for this course was a contract negotiation between an agent representing a young song writer and singer and a young mid-level manager of a prestigious entertainment agency. The system is based on the phase model of negotiations and integrates computer based technologies with decision and negotiation support tools [9]. Inspire provides a rich negotiation environment with the description of the case, demo, FAQ, decision analytic tools, graphs and the negotiation history. The analytical tools support the participants throughout the process in their decisions, which are aimed at resolving their differences. These features of the system encourage students to evaluate the situation, think how to respond and plan the next move. Furthermore, checking the graphs and history reinforces the understanding of the concepts and language of negotiation analysis. The communication platform allows the counterparts to exchange messages and in the process practice the use of the language of persuasion and argumentation. Formulation of messages helps develop written fluency and, to a certain extent, accuracy as the users have the time to edit their messages. Also, if their counterpart is stronger linguistically, the students tend to "borrow" phrases and expressions in their responses thus expanding their language repertoire.

4   Discussion

The three components of the course were strongly interrelated. They aimed at deepening the students' knowledge of decision making and negotiation as a basis for content, language and critical thinking development. Critical thinking was practiced not only through the selection and evaluation of readings but also through experiential learning involved in role-play simulations.

Negotiation role-plays are a common pedagogical method used in negotiation courses. The method is attributed with promoting greater student engagement in the learning process and thus better learning. Research shows that role-play simulations, if carefully planned, increase motivation and engage students "behaviorally, cognitively and emotionally" in the learning process [10]. In this EAP course the students practiced negotiations both face-to-face and online. They showed involvement in both. Following face-to-face experiments the students evaluated the process and the outcomes using a questionnaire. The same questionnaire was used to evaluate online negotiations. However, while negotiating online, the students were also required to keep a negotiation journal in which they reflected on the process, their counterpart's behavior, as well as their strategies and feelings.

The journals affirm that the majority of the students were engaged both emotionally and cognitively. To illustrate here are a few quotes from the journal entries: *What is he thinking? This is the worst offer I've received so far; "After two days of waiting...I was so worried... It's pretty stressful and I felt anxious waiting for the message*; *I will wait until tomorrow to think this better; It took me about two days to reach a decision regarding the offer that Mr. Mosico sent me.* As well the behavior changed. A few students who were quiet in spontaneous face-to-face exchanges became more articulate online; a student who dominated class discussions exhibiting highly competitive behavior adopted a much more balanced and reasonable attitude in his online messages.

Although the students gave very positive responses to the post-negotiation questionnaire regarding the usefulness of various features of the system and satisfaction with the system's use, the process was not without glitches. 25% of the group had to be reminded to negotiate; 1% had unresponsive counterparts. It would be useful if the system monitored inactive participants and prompted them to respond before receiving any complaints; it took two to three days for the participants to complain and the time frame for the negotiations was one week.

The Inspire negotiation report was the last in-class assignment and the most demanding. It was designed to test the content, academic skills and language learned in the course. In other words, the students had to demonstrate that they understood the main concepts related to decision-making and negotiations, that they can select and synthesize information and that they are able to critically evaluate the negotiation and the system. Finally, they had to show that their language range had increased in terms of vocabulary and sentence structures and that accuracy of language use had improved.

The basis for the report was a questionnaire which asked the students to assess their negotiation experience, their own and the counterpart's behavior and to identify what type of negotiator they and their counterparts were. The report required that the students select and

synthesize information, analyze, evaluate and provide evidence to support statements. To give examples, the students had to describe the main characteristics of negotiations, synthesizing information from the course-pack, refer to the features of web-based NSS systems that they had compared in class and give the characteristics of the Inspire system. They briefly described the case and the process and provided a description of the questionnaire. Specific examples had to be selected from their negotiation to support the evaluation. Discussion of the strengths and weaknesses of the Inspire system concluded the report.

Most of the students did much better on the negotiation report than on previous writing tasks. When asked to what they contributed this improvement one of the reasons they gave was the fact that it was based on real experience, supporting the notion of the value of experiential learning. The other reason was: "the extensive writing in this course".

5 Conclusions

The course discussed in the paper is an example of a sustained-content English for Academic Purposes course which integrates the use of academic texts from decision and negotiation literature and the practice of negotiations. The course gave the students a sense of the challenges they will encounter in their university studies and equipped them with language as well as learning skills and strategies which are transferable to "regular" university courses.

The course delivery was enhanced by the use of the Inspire negotiation system which allowed the students to link the theoretical underpinnings with the unique and new experience of practicing negotiation skills on-line. Joint problem solving required that the students engage in meaningful interactions and "authentic" communication. While negotiating the students were immersed in a rich content and language input which created conditions for natural language acquisition. The asynchronous aspect of the Inspire negotiations gave the learners "extended time and opportunity to react, respond, and interact with the material and each other" [11] and thus created conditions for both language acquisition and language learning.

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Applying the APIM model to concession patterns in electronic negotiations

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The statistical analysis of data from negotiations often poses specific problems. In particular, observations from the parties in a negotiation are not independent from each other [1], requiring the use of specific methods to account for these interdependencies. Negotiations share this property with many other areas of behavioral research studying dyadic interactions between actors. Thus methods developed in other fields of behavioral research can also be applied to negotiations. In the present paper, we focus on one such method, the Actor-Partner Interdependence Model (APIM) [2, 3], and show how this model can be applied to the analysis of negotiation processes.

The focus of this analysis is on the substantive level of negotiations. Negotiation processes take place at many different levels, involving the exchange of substantive offers, but also communication oriented towards relationship building, the development of trust and other aspects which deal not directly with the issues being negotiated [4]. However, substantive communication and offers are a central element of all negotiations [5], therefore we focus on the exchange of offers in this paper.

Offers in multi-issue negotiations specify possible values for each of the issues. By aggregating across issues, offers can be evaluated in terms of the utility which they provide to the parties. However, this creates a major difference between the exchange of offers in negotiations and other forms of dyadic interactions usually analyzed with the APIM model: One offer might be evaluated quite differently by the two parties in a negotiation, and parties typically do not know how the other party evaluates the same offer. In contrast, the standard APIM model is based on the notion of actions from each side, which can objectively be observed by both sides.

We represent each offer in a negotiation by the utility it provides to both sides in the negotiation. From these utilities, we then can calculate the *concession* CO_x^t at time t as the change in utility between offers from the perspective of party x making the offers and the *gain* GA_y^t of the other party y from offers made by party x.

The APIM model explains a dyad member's behavior in time t by the same member's behavior in time $t–1$ (the *actor effect*), and the other member's behavior in time $t–1$ (the *partner effect*). Taking into account that each party can evaluate offers only in terms of its own utility, we have to represent the partner's actions in terms of the gains of a negotiator from the partner's concessions. The model can therefore be written as

$$CO_x^t = \beta_{x0} + \beta_{x1}CO_x^{t-1} + \beta_{x2}GA_x^{t-1} + \varepsilon_x^t$$

(1)

$$CO_y^t = \beta_{y0} + \beta_{y1}CO_y^{t-1} + \beta_{y2}GA_y^{t-1} + \varepsilon_y^t$$

where β_{x1} and β_{y1} represent the two coefficients for the actor effects, β_{x2} and β_{y2} are the two coefficients for partner effects and ε_x^t and ε_y^t are the correlated error terms, respectively. Model (1) assumes that the two dyad members are distinguishable. This assumptions can be statistically tested [3], however, in most negotiations, the roles of the two parties are by definition distinct, so a model of distinguishable dyad members is also more appropriate from a theoretical point of view.

We applied model (1) in a small exemplary study, in which we analyze actor and partner effects in failed and successful negotiations. Reciprocity theory [6] predicts that negotiators respond to their opponent's behavior with similar behavior, thus large concessions from the opponent should be matched with large concessions of the focal negotiator, leading to positive coefficients for the partner effect in model (1). This should hold in particular in successful negotiations, while lack of reciprocity could lead to a failure of negotiations [7].

The actor effect describes how concession patterns change over time. A collaborative negotiation style can be characterized by an initially high level of concessions, which then decreases over time [8]. This would be reflected in model (1) by a significantly negative coefficient of the actor effect. On the other hand, a competitive negotiation style, in which large concessions are made only at late stages of the negotiation, would lead to a positive coefficient of the actor effect. Since a competitive style is more likely to lead to failure of the negotiation [9], we expect the actor coefficient to be smaller (negative with a higher absolute value) in successful negotiations.

Table 1. Estimation results of the APIM model for two data sets.

	Inspire			Bluestar		
	All	Agreement	Failure	All data	Agreement	Failure
Phase 1	*** 0.0520	*** 0.0613	0.0113	***0.0980	***0.1055	***0.0814
Phase 2	*** 0.0579	*** 0.0605	*** 0.0481	***0.1079	***0.1123	***0.0966
Phase 3	*** 0.0272	*** 0.0203	*** 0.0467	***0.0723	***0.0740	***0.0681
Role	** 0.0147	* 0.0138	* 0.0197	*−0.0158	*−0.0185	−0.0100
Actor (1)	*** −0.1369	*** −0.1587	° −0.0975	***−0.1757	**−0.1654	*−0.1949
Actor (2)	° −0.0456	* −0.0681	0.0296	***−0.2913	***−0.2418	***−0.3995
Partner (1)	° −0.0326	* −0.0428	−0.0009	***0.1673	*0.1108	*0.1808
Partner (2)	−0.0230	° −0.0357	0.0390	**0.0915	*0.0892	0.0809
AIC	−3657,77	−2714,69	−906,91	−1490,78	−1035,14	−396,75
L. ratio	*** 88.75	*** 89.90	6.10	*** 205.75	*** 84.06	*** 86.28

***: $p < 0.1\%$; **: $p < 1\%$; *: $p < 5\%$; °: $p < 10\%$

For this exemplary study, we estimated model (1) using the nlme package [10] for two data sets: The Inspire Database [11], which contains over 2000 records of buyer-seller negotiations collected in various negotiation experiments since 1996, and the BlueStar case data [12], which was collected during a negotiation experiment using a joint venture case. We estimated an extended version of model (1), which also takes into account specific differences between roles as well as during different phases of the negotiation. Results of these estimations are shown in table 1.

As hypothesized, we find a significant negative actor effect in most negotiations. In the Inspire dataset, this effect is indeed stronger for successful negotiations, while in the BlueStar data set, failed negotiations unexpectedly show a stronger effect. The partner effect is only significant in the BlueStar data set, however, we find again that the hypothesized effect is stronger in failed than in successful negotiations.

In the present paper, we have shown how Actor-Partner Interdependence Models can be used to analyze offer processes in (electronic) negotiations, and how the parameters of these models are connected to standard concepts from negotiation analysis. Our results from applying this model to two data sets show a considerable variation of estimation results across different problem domains, and also some unexpected differences between successful and failed negotiations.

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The Effect of Buyers' Negotiation Approach on Sellers' Attitude and Behavior

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Abstract. Many commercial negotiation processes involve a single negotiator, who represents one side (e.g., the buyer), and multiple negotiators (e.g., the sellers), who represent the other side. These multi-bilateral negotiations can be conducted online both in a synchronous and asynchronous mode. This study discusses a relationship between the buyer's approach, and the sellers' attitude and behavior. Based on the results of an online experiment, we observe that the sellers match the buyer's competitive approach. When the buyers are cooperative, then the sellers' approach is opportunistic and it does not affect the sellers' satisfaction.

Keywords: e-negotiations, multi-bilateral negotiations, strategy, satisfaction.

1 Introduction

Many negotiations, particularly of the commercial nature, are multi-bilateral; on the one side there is a single party (e.g., a buyer) who has to interact with a number of counterparts (e.g., sellers). This type of negotiation is well-established and often employed in both business and consumer transactions [1–3]. One side, e.g., the buyer initiates the negotiation with several sellers. The buyer makes an initial offer and waits for responses from the sellers following which she engages in a separate bilateral negotiation with each seller. On rare occasions, due to the process complexity and high costs, a single participant (e.g., buyer) invites multiple participants (e.g., sellers) and the negotiations are conducted almost concurrently. Often, there are delays between offers submitted by multiple participants and counteroffers made by the single participant (e.g., the sale of the Universal by Vivendi and Glenmorangie whisky distiller to LVMH [4].

Although multi-bilateral negotiations take place in real-life there are only a few studies which dealt with this type of processes and their focus was on political interactions among state governments and their representatives [1, 5]. An exception are the negotiations under-

taken by software agents [6–8]. The software agents that participate in automated negotiations exchange bids and the exchange process follows an a priori defined protocol.

E-business and e-market systems make the multi-bilateral negotiations practical; the buyer, for example, needs not to travel from one seller to another and engage in a sequential interaction pattern. In a recent study, Guo and Iyer [9] compared sequential and multi-bilateral negotiations in a supply chain context. Their results show that multi-bilateral negotiations are optimal for the single-actor side when the profitability of the side represented by multiple actors is similar. When the profitability dispersion is large, then sequential negotiations may be preferable. The mechanism studied by Guo and Iyer is based on the Nash bargaining model in which the parties can exchange only offers and counteroffers. There is no place for argumentation, explanation and other free-text exchanges that are typical for human negotiations.

2   Data and the hypothesized model

The data used in this study are part of a larger experiment conducted by Kersten, Vahidov and Gimon [10] to study the type of objectives used in negotiations and auctions and their impacts on a variety of factors including the transaction process and the outcomes. The experiment was conducted online and prior to the experiment the participants received training on usage of the system.

In this study, we consider the part of this experiment in which the participants were asked to play the role of sellers or buyers in a multi-bilateral negotiation case. The case involved a producer (buyer) who was seeking a transportation and logistics provider (seller). To grant a contract to a seller, the buyer was considering three attributes: (1) standard rate of transportation; (2) rush rate for unexpected delivery; and (3) penalty for delay in delivery of the requested goods. The ranges for all attributes were clarified for the sellers and the sellers had access to a rating calculator which could assess the expected profit of any alternative for the company that the seller was representing.

The experiments were conducted under two treatments. In one group the buyer had a competitive approach (try to gain maximum profit) and in the other a cooperative approach (try to reach a fair agreement). Buyers were selected from graduate and senior undergraduate students and received detailed instructions regarding their behavior.

In total, 229 complete cases of sellers were collected: 129 cases under cooperative negotiation and the rest under a competitive negotiation environment. Upon completion of negotiation all participants completed a questionnaire which assessed various aspects of the system and their negotiation experience. In this study, we consider only a subset of the questions related to the sellers' behaviour (negotiation strategy) and their satisfaction from the outcomes of the negotiations under the two experimental conditions.

2.1 Measures

Drawing on previous research [10, 11]; we use nine items (O1 – O9) to measure seller behavior (strategy) during the course of negotiation. In addition to using these variables, nine more items which measured the sellers' assessment of the buyers' behavior (strategy) are used (P1 – P9). These two sets of variables were considered as indicators of independent constructs for this study.

For indicators of the dependent construct, a set of five items measuring seller satisfaction (S1 – S5) with the negotiation was used for this study. These items were indicators of the negotiation outcome and process. All measures consisted of 7-point, Likert-style rating scales. Table 1 lists the items used in this study.

Table 1. Measured variables used.

Construct	Variable	Lickert scale anchors
Sellers Strategy	O1 (P1)	Uninformative ~ Informative
	O2 (P2)	Pushover ~ Persuasive
Perceived Partner Strategy (Sellers' assessment of the buyers' strategy)	O3 (P3)	Deceptive ~ Honest
	O4 (P4)	Exploitative ~ Accommodating
	O5 (P5)	Competitive ~ Cooperative
	O6 (P6)	Untrustworthy ~ Trustworthy
	O7 (P7)	Unlikable ~ Likable
	O8 (P8)	Unfair ~ Fair
	O9 (P9)	Rigid ~ Flexible
Satisfaction	S1	I am satisfied with the results that I achieved
	S2	I am satisfied with the results as compared to my expectations
	S3	I find the process was competitive.
	S4	I enjoyed the bidding
	S5	I am satisfied with the bidding process.

2.2 The Model

The model used in this study is shown in Figure 1. In this model the nine items related to the measure of perceived buyer behavior were considered to be indicators of an underlying factor named "perceived partner strategy". Similarly, the nine measures of seller behavior and the five measures of seller satisfaction were considered to be indicators of two underlying factors named "seller strategy" and "satisfaction" respectively.

In the structural part of the above path model, we hypothesize that the sellers' perception of the buyers' behavior, in the sense of acting competitive or cooperatively, (Perceived Partner Strategy) affects the sellers' own behavior or strategy (Seller Strategy). Furthermore, it is hypothesized that seller satisfaction from the outcome of the negotiation, is influenced by both their own strategy and their perception of their partner's (buyer) strategy.

3 Data Analysis and Findings

We used EQS 6.1 [12] to study the structure of the underlying factors and to test the proposed model. Goodness of fit of all models under consideration were assessed by multiple indices suggested by Hu and Bentler [13] including Comparative Fit Index (CFI) [5], Root Mean Square Error of Approximation (RMSEA) and standardized Root Mean-square of Residuals (RMR). The CFI ranges in value from zero to 1.00, with a value of .95 as the cut-off point for good fit [14]. The RMSEA takes into account the error of approximation in the population and is expressed per degree of freedom, thus making it sensitive to model complexity; values less than .05 indicate good fit [15]. The cut off point for standardized RMR similar to RMSEA is also .05.
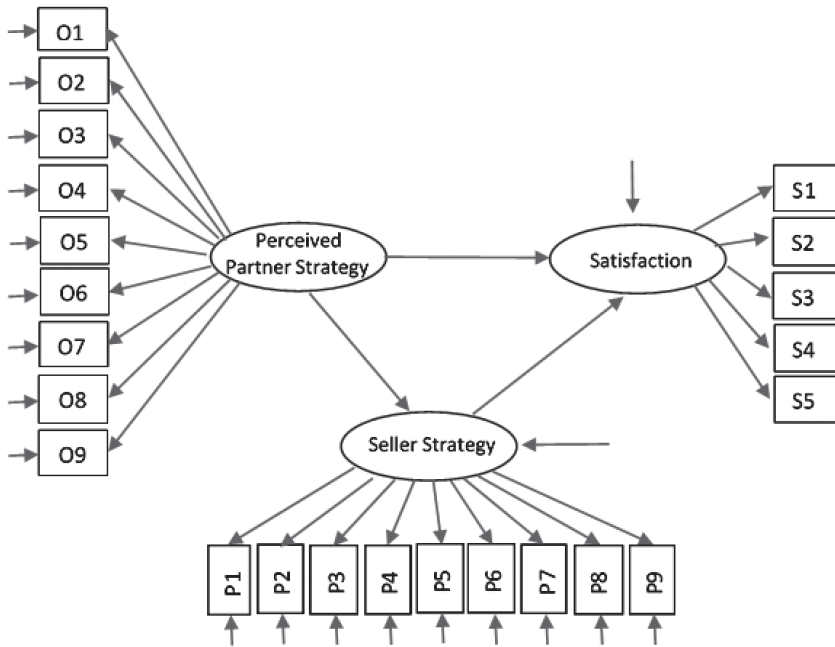
Fig. 1. The path analysis model used to study effect of buyers' behavior on sellers' behavior (strategy) and satisfaction.

3.1 Factor Analysis

To test the proposed factor structure, first a multiple group confirmatory factor analysis was conducted on the 23 items. The grouping of the data, as indicated before, was based on the actual buyer's behavior in negotiating the contract. That is, the sellers' responses to the 23 post experiment questions were divided into two groups based on their participation in a group where the buyer's negotiation behavior was competitive or cooperative. The model

fitted the data reasonably well. The Chi-Square goodness of fit index was significant but other fit indices were within the acceptable ranges.

To assess psychometric property of the three sub-scales we constrained the factor loadings to be equal in the two groups and compared the new value of the chi-square with the one without any constrains. No significant change in the value of chi-square was observed (chi-square difference = 25.29 with 21 d.f.). That is, the fit of the constrained model was similar to that of unconstrained one which indicates invariance of the factor loadings in the two groups. In other words, the psychometric properties of the instrument – in terms of what was measured – is the same in the two groups. The standardized values of the loadings for the combine group along with the coefficient alpha for the three sub-scales are reported in Table 2.

From Table 2 we note that all factor loadings except for a few indicators "O2", "S2" and "O4" are reasonable large which demonstrates construct validity of the instrument. In addition, the coefficient alphas for all three subscales are more than 0.85. Since coefficient alpha is considered as a lower bound estimate of the reliability of an instrument [16], we can conclude that the instrument is also very reliable.

Table 2. Standardized factor loadings and Cronbach's alpha for the sub-scales.

Perceived Partner Strategy	Sellers' Strategy	Satisfaction
P1 = 0.767	O1 = 0.671	S1 = 0.647
P2 = 0.614	O2 = 0.548	S2 = 0.598
P3 = 0.824	O3 = 0.759	S3 = 0.837
P4 = 0.795	O4 = 0.599	S4 = 0.905
P5 = 0.804	O5 = 0.644	S5 = 0.902
P6 = 0.868	O6 = 0.917	
P7 = 0.852	O7 = 0.850	
P8 = 0.895	O8 = 0.852	
P9 = 0.776	O9 = 0.668	
Cronbach's α = .941	Cronbach's α = .912	Cronbach's α = .889

3.2 Analysis of the Structural Relations

The path coefficients joining the three underlying factors (constructs) are considered as structural coefficients which reflect the effect of various factors on one another. The estimated values of these coefficients for both groups are reported in Figure 2. In this figure the estimated parameters for the competitively treated group are given inside the paths, within brackets.
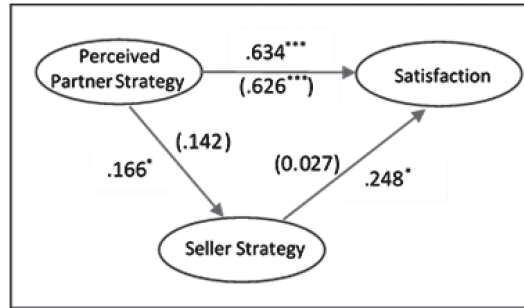
Fig. 2. Estimated path coefficients.

We note from this figure that the magnitude of the paths from perceived partner strategy to seller satisfaction are similar and highly significant in both groups. In addition, the magnitude of the paths from perceived partner strategy to seller strategy (although on the border line for the competitive group) are also very similar in the two groups. However, the path coefficients between seller strategy and seller satisfaction are quite different in the two groups. This path – which reflects the influence of the sellers' strategy on their own satisfaction – is significant ($\alpha < 0.05$) in the cooperative group but non-significant in the group where the buyer followed a competitive negotiation strategy.

This suggests that the seller's strategy in the competitive setting is mainly aimed at counterbalancing the negotiation strategy of the partner (buyer), whereas in the cooperative setting, the seller's strategy has the additional goal of maximizing his/her satisfaction in term of the negotiation outcomes. This is very much in line with previous research on reciprocity where sellers tend to reciprocate a competitive strategy of buyers, but try to exploit a cooperative buyer. See for example [19].

4   Conclusions

Many studies in the literature have compared cooperative negotiations with competitive ones and discussed their advantages/disadvantages in various situations [17–19]. In this study we observed that regardless of the negotiation environment – whether cooperative or competitive – the seller's satisfaction is significantly influenced by their perception of their counterpart's strategy.

In a cooperative negotiation environment, the seller's strategy, in addition to playing a role in counterbalancing the buyer's strategy, also contributes to the maximization of the seller's satisfaction. This is in contrast to competitive negotiation settings in which the seller's strategy is mainly reactive towards the buyer's strategy, and does not directly contribute to the seller's satisfaction. For example, in this study, we notice that in the cooperative experimental setting, the two predictors, perceived partner strategy and seller's strategy, explain about 62% of the variation in seller satisfaction (see Figure 2). In the competitive negotiation environment, due to the seller's strategy and its lack of effect on seller satisfaction, this value is about 52.5%.

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Cross-cultural analysis of time-preference behavior and its impact on E-negotiation

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Abstract. Many studies have considered how cultural factors influence the communication of parties and how people behave during the negotiation process. In this study, we consider how time-preference behavior of people can vary with respect to the culture in which they are located, as well as the impact that this will have in an e-negotiation interaction. Thus, we aim to assess the effects of cultural difference, starting with Brazil and India, on the preferences associated with time.

Keywords: e-negotiation; time-preference; cross-cultural analysis.

1 Introduction

Behavioral aspects are beginning to be considered in electronic negotiations, owing to the importance of considering human elements such as power and learning [1]. One missing behavioral aspect, however, is time preference[5], which reflects the value that a buyer attaches to a good or service whose delivery time is allowed to vary [2, 3]. To illustrate, consider two persons who are offered a movie ticket for $10 on day 1 versus $1 on day 5. If A takes the $10 offer and B takes $1, then A is willing to pay 10 times the amount as B to watch the movie four days early, and to that extent, A can be considered as impatient.

As can be seen here, inter-temporal choice is a decision involving trade-offs between time and cost. There are some applications of the concept of inter-temporal choice in several contexts such as consumer durables, internet services, and online purchase and delivery fees. However, there is no empirical work on time discount behavior linked to the culture of the people.

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[5] We use the terms time-preference and inter-temporal choice interchangeably.

Cultural differences influence decisions and understanding cultural aspects is a key element for successful negotiations. Thus, studies that address how cultural factors influence the people behave during the negotiation process has gained importance [4, 5]. In that perspective, this study aims to analyze the effect of cultural difference on behavioral time-preference, starting with Brazil and India. These two developing countries have many similar aspects and also huge cultural difference. This is significant owing to the globalization of markets, which encourages people from different countries, with different cultural backgrounds, to interact and also to negotiate.

2   Cultural Effects in Negotiation Processes

Cultural aspects are one of the factors that directly influence trading [6]. Cultural factors play a crucial role in various levels of the negotiation process and, for a practitioner, ignoring this reality is to run the risk of making the whole approach to failure. Some concepts may vary from one culture to another, so the same scale can measure something different. The result of a negotiation between cultures depends on the knowledge that each side has about the other's culture, "the way each negotiator perceives the behavior of the other, and the unconscious goals that each culture emphasizes and assigns to its members" [6].

Cultural differences can be felt and can be learned, so as to react positively to prevent failures in negotiating. The cultural factor directly impacts the negotiation and how the actors are manifested at different levels. Faure and Shakun [7] show some levels: The first is the cognitive level, with regard to ways of perceiving the nature of the negotiators in the game they are playing and what's at stake. The second level is that of beliefs. Culture puts forth a set of values that operate as instrumental objectives, thereby guiding the behavior of negotiators. The third level relates to the range of acceptable behavior that allows or culture which emphasizes the most appropriate responses to movements of the partner. Identity is the last level of interaction and respect to the degree of consciousness of an actor developed about yourself and how sensitive it is to be challenged.

Some studies are conducted in order to test hypotheses about the impact of cultural factors on negotiation processes and suggest some measures to improve communication and outcomes of intercultural negotiations [8, 9, 10].

Salacuse [11] examined the effects of cultural differences in international negotiations and suggests ways to overcome the problems encountered in intercultural relations. The author suggests four ways to build a cultural bridge for negotiations: a) Bridge the gap using the other side's culture; b) Bridge the gap using your own culture; c) Bridge with some combination of both cultures; and d) Bridge with the third culture.

Metcalf et al [12] compared cultural tendencies in negotiation from five different countries: Finland, India, Mexico, Turkey and the United States. The study found many interesting results that contradict the common knowledge about the way these countries behave. For example, many works indicate that Mexican and Indian negotiators do not hope for punctuality and usually follow a slower pace, while Turkish negotiators are punctual, but also follow a slower pace. As for the Americans the saying "time is money" represent the way they negotiate.

Nevertheless, a greater percentage of respondents from Finland, India, Mexico and Turkey presented a higher sensitivity towards time than the American respondents.

However it is noticed that there was no work to assess the cultural difference on the preferences associated to time. Therefore this is the focus of this work.

3 Expected Results and Final Remarks

Inter-temporal choice is the decision involving trade-offs between time and cost or benefits. In terms of application of the concept of inter-temporal choice, cost-time trade-offs have been studied in the context of consumer durables, internet services [13], and online purchase and delivery fees [14]. However, there has been no empirical work on time discounting behavior and its relationship to culture.

In order to analyze how time-preference behavior of people can vary with respect to the culture, a web-based tool with mechanisms for performing the elicitation of time-preferences will be built. It is important to emphasize that it will incorporate factors that can characterize cultural differences in the elicitation of preferences process. This web-based tool will be applied in an experiment with students of two universities located in Brazil and India. Then, with the data analysis it would be possible to evaluate how cultural aspects can influence behavioral time-preferences. In turn, its impact on electronic negotiation can be incorporated and assessed.

With this ongoing research, we expect validate the results of the analysis of the effect behavioral time-preference cross-cultural in order to incorporate it into many trading systems via the Internet, increasingly in the world market.

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NegPlace Platform a Web Negotiation Support System that incorporates negotiators' styles and personalities

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Abstract. This paper presents the NegPlace Platform, a web Negotiation Support System which makes the new contribution of allowing information about personality traits and the negotiation style of each negotiator to be captured before starting the negotiation, thereby improving the negotiation process among negotiatorsunknown to one another. The Type Indicators (MBTI) model was used in the NegPlace to capture some personal traits of negotiators and the Thomas-Kilmann Conflict Mode Instrument (TKI) was used to incorporate negotiation styles. So, the initial proposal of the NegPlace system is to make the negotiation experience better for the negotiators since they have prior knowledge of each other's characteristics. It is expected that negotiators will be more satisfied at the end of the negotiation process, since by using the information on the parties involved, they can prepare proposals based on each negotiator's characteristics thus facilitating communication between the parties and shortening the length of the negotiation.

Keywords: Negotiation Support System, Negotiation Style, Web NSS

1 Introduction

This paper presents a new web NSS, NegPlace platform, that incorporates negotiators' personal traits and negotiation styles before the negotiationstarts.

Negotiations using a web environment are the targets for many studies in different research areas [1, 2, 3], which incorporate many of the most encompassing technologies in their functionality or even provide new features. Such environments have been driven by the development of specific tools for this type of negotiation, called Negotiation Support Systems (NSS).

Thus, the basic principle of an NSS is to enable decision support and facilitate the communication process [4]. These types of systems provide a friendly environment in which

negotiators can exchange offers, including counter-offers [5]. So, they are very interactive systems, which need means to ease the communication process, as well as information that enables negotiation strategies to be constructed.

Given the improvement in the communication process, the NSS developed in this research (NegPlace) seeks to incorporate information about the negotiator, in the expectation that negotiators' satisfaction will be increased, the quality of the communication process facilitated and enhanced and preparations for trading strategies and communication enabled.

The Type Indicators (MBTI) model was implanted in the NegPlace to capture some personal traits of negotiators and the Thomas-Kilmann Conflict Mode Instrument (TKI) was implanted to incorporate negotiation styles.

2   Review of the Literature

Negotiation Support Systems (NSS) are computerized systems that use information and communication technology through electronic media [6], thus guiding some or all online activities [7]. In addition, NSSs support the negotiation process between negotiators, thereby facilitating communication, structuring and organizational processes, and providing access to information relating to negotiating [8]. Thus, this type of system is characterized by enabling people from different places and time zones to communicate by using computational resources [9].

There are several approaches. NSSs may use different models and tools that take various perspectives, such as neural networks [10, 11], Fuzzy logic [12, 13], meta-modeling [14], multi-agents [15], and the negotiator's preferences and behavior [16]. These approaches are inserted into the negotiation in order to assist the negotiator in handling relevant information and they provide support for making an offer.

(The) Table 1 presents a short view of these system including NegPlace first version.

Table 1. NSS short view.

NSS	kind of support
WebNS [17]	Supports the structuring of text-based exchanges and automatic process documentation.
Interactive Computer- -Assisted Negotiation Support System [18]	Assists negotiators to achieve agreements among parties having conflicting objectives on water resources.
Inspire [9]	Supports the negotiators to construct a utility function based on conjoint analysis and discrete optimization.
Kasbah [19]	Assists negotiators to get price aspiration and reservation levels, and the strategy represented as a concession function for lowering the price over the course of a negotiation.
Web-HIPRE [20]	Uses multi-attribute value theory based methods and the AHP method to construct a hierarchical model of the attributes of the problem selected and the participants' objectives.
Negoisst [21]	Assists the negotiators to elicit their preferencesandconstruct value functions.
GENIUS [22]	Simulates negotiation issues in a general environment while emulating human behavior.
NegPlace [23] (first version)	Supports negotiators to draft communication and negotiation strategies using personality traits.

In this research study, the system proposed makes use of NSS technologies and basic characteristics in its tools and functionality, thereby providing the negotiator with a propitious negotiation environment. The system also makes use of the Myers-Briggs Type Indicator (MBTI) [24, 25] so as to capture and use personality style in the negotiating process. Therefore, as a result it is expected that satisfaction will be increased, quality of the communication process improved and negotiation time reduced.

This expectation is based on evidence in the literature that argues that mutual knowledge increases the chance of communication being successful [26, 27].

The creation of mutual knowledge with another individual underpins the feeling of being understood, an important indicator of relational satisfaction [28]. Feeling understood as a result of mutual knowledge can be used to solve problems efficiently [29].

Although there are different models that capture personal traits [30, 31, 32], the MBTI model was chosen due to its robustness, reliability and its run-time and recording of results being quick. Thus, the MBTI has been built into the system for which first a 28-question questionnaire was applied and then the responses used to capture the personality style and the main recommendations on this personality style.

In this research study, the system proposed makes use of NSS technologies and basic characteristics in its tools and functionality, thereby providing the negotiator with a propitious negotiation environment.

3   The NegPlace Platform

The NegPlace System is a web-based Negotiation Support System (NSS) developed to guide the negotiation process while using a web environment. By doing so, negotiators find that the system is flexible, portable and always available if they use different devices, be they fixed or mobile, anywhere with an internet connection and a web browser.

To design and build the NegPlace System, free platforms were used, such as: Eclipse, Integrated Development Environment (IDE), developed by IBM, which enables fast and efficient development when the programming language Java is used; Mysql, a Relational Database Management System (RDBMS), originally developed by Sun Microsystems, provides the necessary tools for storing and retrieving data using Structured Query Language (SQL) language; and the Java development language, created and developed by Sun Microsystems, enables applications for different types of platforms to be developed on the Web.

What initially prompted conceiving of the negotiation environment of NegPlace System was Inspire NSS [9], an environment that assists negotiators in bilateral negotiations and uses Web tools. The main features of Inspire were developed and improved when needed, in NegPlace experiments. However, some other features were not developed in the initial release due to there being no need for these tools in this study, but they may be incorporated into future releases.Figure 1 shows the flow of processes of the NegPlace platform.
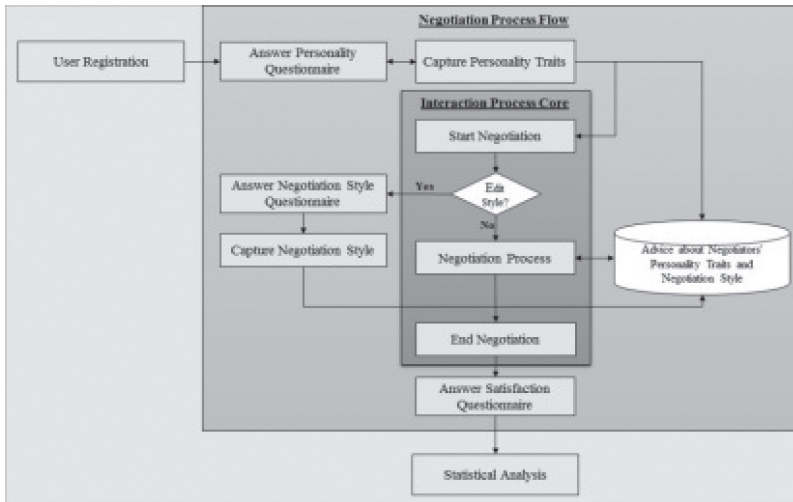
Fig. 1. The flow of processes in NegPlace.

Like the main features of the NegPlace System in the negotiation process, the system has tools that enable and facilitate pre-negotiation, negotiation and post-negotiation, and it incorporates the negotiator's personality type in its phases. Thus, the personality styles of other parties to the negotiation may be accessed and used by negotiators from the moment that the negotiation process starts until the completion of the negotiation, if the parties involved agree to this.

However, information on another negotiator's personality style is restricted to the participants in the negotiation problem, so searching for the personality style of users who are not taking part in the negotiation problem is not possible. This information is informative and is presented via color intensity scales and the general characteristics of certain types of combinations of personality dimensions that draw on the Myers-Briggs Type Indicators (MBTI) model [24, 25] as shown in Figure 2.

The features on negotiators' personality type are intended to provide information about the parties who are involved in negotiations, when there is little or no direct contact between the parties. Nonetheless, information about negotiators can also be used for a strategic purpose, since the personality style of each negotiator can directly impact the development of proposals in the pre-negotiation and negotiation process. Figures 2 and 3 present information provided on the platform about each negotiator. This information can be consulted at any time during the negotiation process.
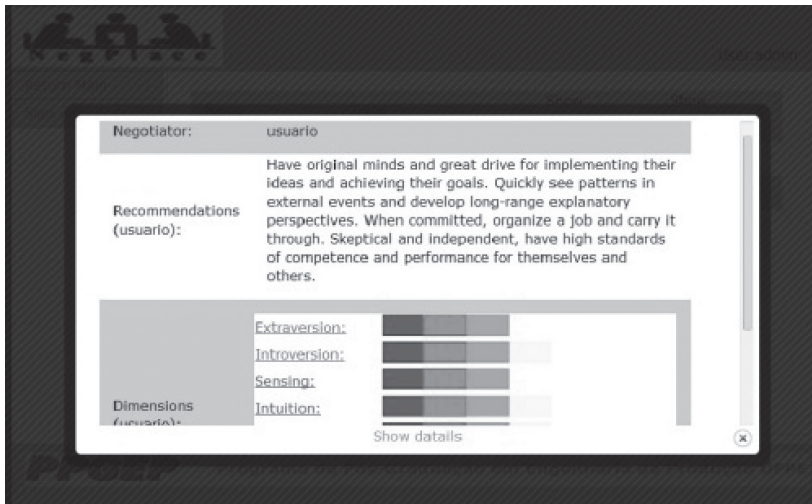
Fig. 2. A negotiator's personality traits.

To recognize the personality style of each negotiator, the MBTI model, proposed byMyers [24] is used together with data supplied by negotiators who have registered on NegPlace by completing a personality questionnaire, which is available on first access to the system. These data are processed and applied to the MBTI model, which provides the personality style after combining bipolar dimensions: Extraversion and Introversion; Sensing and Intuition; Thinking and Feeling; Judging and Perceiving. The information provided by NegPlace is shown in Figure 2.
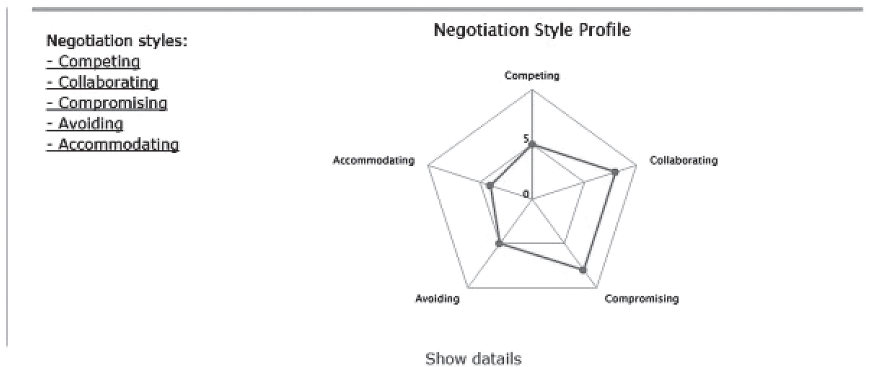
Fig. 3. Negotiation style profile.

One of the models that was considered to support individuals in becoming more aware of their characteristicstyle in managing conflict is the TKI model [33]. The TKI model, based

on the work of Kenneth W. Thomas and Ralph H. Kilmann. [34], definesfive specific styles of dealing with conflicts: (1) The competing style; (2) The accommodating style; (3) The avoiding style: this style is unassertive and uncooperative; (4) The collaborating style; (5) The compromising style. Figure 3 presents the negotiation style profile of a negotiator available in the platform. This information can be accessed in more details by NegPlace.

Information held on the personality of registered negotiators in NegPlace does not violate the privacy of personal information nor does it supply any information on past or current negotiations. This information is of a private character, and is rigorously restricted to the individual profile of each negotiator. Therefore, information about the personality characteristics is in the form of general recommendations which aim at reducing the subjective characteristics between the negotiators and can be used for a strategic purpose.

Therefore, the initial proposal of the NegPlace system is to make the negotiation experience better for the negotiators since they have prior knowledge of the characteristics of each negotiator's personality, with regard to the parties taking part in a negotiation problem. Thus, it is expected that negotiators will be more satisfied at the end of the negotiation process, since by using the information on the parties involved, they can prepare proposals based on each negotiator's personality style, using graphics and multimedia features provided by the system, thereby facilitating communication between the parties and shortening the length of the negotiation.

4 Conclusion

This paper set out to describe the development of a web-based Negotiation Support System (NSS) that facilitates the communication process in a negotiation, as well as the development of communication strategies and negotiation, on using the personality traits and negotiation style of those involved in the negotiating process.

A first version of NegPlace, which incorporates only information of the personality traits of the negotiators, was tested by means of a controlled experiment, confirming the hypothesis of improved satisfaction and communication in the negotiation process [23]. Other experiments are being developed with the new version that incorporates information on negotiator style. Further research will be developed to investigate how the strategic behavior of each individual can affect the potential positive effect of the tool proposed.

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Face-to-Face versus Computer-Mediated Collaborative Decision Making Process in Extreme Events: A Comparative Study

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Abstract. This study examined the methodological availability of scenario-based exercises (SBEs) in crisis management, and considered the role of information communication technology (ICT) in SBEs. Results showed that SBEs are beneficial regardless of the participants' nationality or communication methods, while computer-mediated SBEs tend to be less active. The finding implies that a different approach should be taken between in face-to-face SBEs and in computer-mediated SBEs.

Keywords: Crisis Management, Decision Making, Scenario, Information Communication Technology, Comparative Study.

1 Introduction

Making decisions timely and appropriately at the time of crisis is often a difficult and stressful task due to uncertainties, time constraints and decision overload [1]. Among existing training methods for crisis response, scenario-based exercises (SBEs) through discussions have an advantage in learning a potential crisis and foreseeing its consequences [2, 3]. Although scenarios have been widely used in crisis management, SBEs are not established methodologically because of the insufficient efforts on setting a common ground of training and education in the area of crisis management [4].

In conducting SBEs, it is worth exploring how the differences between face-to-face (FTF) and computer-mediated environments affect the process and outcomes of exercises. A number of existing studies have suggested that there are certain differences between these ways of communication (e.g. [5]). Since information communication technology (ICT) has been an indispensable tool for crisis management [6], examination of the use of ICT in SBEs contribute to advancing the utilization in the field of crisis management.

This study investigated the methodological feasibility of SBEs in the context of crisis management, and explored the role of ICT in SBEs as a mediator of the decision process. Since

prior research on risks (e.g. risk perception, risk-taking) and decision making has discussed the influence of individual differences (e.g. [7], [8]), this research was also concerned with this aspect. Five key variables (Person [i.e. demographics, decision styles, prior knowledge and experience of disasters etc.], Task, Group, Facilitator, Technology [i.e. ICT]) were identified through the examination of the key literature (e.g. [9]).

2   Methodology

This exploratory research took a workshop-style laboratory-based experimental approach based on Papamichail et al. [10]. Workshops took a form of FTF and computer-mediated (i.e. online). UK and Japan were selected as subjects for this study in terms of accessibility and the comparison of cultural differences. Two types of scenarios (earthquake in Japan, flooding in the UK) were devised on the basis of relevant literature and interviews with key stakeholders. The other instruments used in this research were a mental model exercise for the understanding of a scenario [11], a pre-workshop questionnaire related to the Person variable [12, 13], and a post-workshop questionnaire on the evaluation of group process and outcomes [14, 15, 16]. Three British groups with 18 participants and three Japanese groups participated in FTF workshops. Similarly, three British groups with 16 participants and three Japanese groups with 17 participants were involved in online workshops. Participants were mainly students from the University of Manchester. Participants discussed the situation and decision problems given in the scenario, and made decisions as a group.

The results of each workshop were analyzed in terms of the contents and the group process. Thematic analysis [17] was adopted for the analysis of the contents. The Decision Function Coding System (DFCS) developed by Poole and Holmes [18] was employed for the analysis of the group process. The inter-coder reliability in the DFCS analysis was 0.92, which was high enough to rely on the result of coding.

3   Results

Almost all participants in FTF and online workshops admitted that SBEs are a valuable method in order to consider decision problems at the time of crisis, and to help change their mindset. In terms of the contents and the process of the discussion, British and Japanese participants showed noticeable similarities. The major difference between these participants was disaster awareness mainly influenced by the Great East Japan Earthquake in 2011. This result indicates that disaster experience is one of the key factors that contribute to decisions. From the viewpoint of individual differences, work experience and family composition (i.e. participants who have a spouse and child/children) were identified as influential factors in decisions. The most significant finding was the difference of the communication method. Compared to FTF workshops, online workshops were less interactive and argumentative. As several participants mentioned, flexibility in participation in computer-mediated environments seemed to prevent the participants from concentrating on the discussion.

4   Conclusion and Future Work

Overall, this research confirmed that SBEs are profitable methods to enhance the ability of decision making in times of crisis. At the same time, this study suggests the need for further research on SBEs (e.g. other crises, other cultural contexts) and the use of ICT for it (e.g. different types of ICT).

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Requirements Analysis as a Negotiation Process

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Abstract. Requirements engineering is an essential part of software development. Here, the necessary requirements are elicited, clarified, agreed upon, validated, and documented. To do so, the stakeholders engage in complex negotiation processes. The paper discusses the specifics of such requirements negotiations and the potential of negotiation systems to support them.

Keywords: requirements negotiations, requirements analysis, requirements engineering, negotiation support systems.

1 Introduction

In software development, requirements engineering is essential for a project to succeed [1, 2]. In general, requirements engineering consists of requirements analysis and requirements management. Whereas in the former, all requirements necessary for the software to be developed are elicited, clarified, jointly agreed upon, validated, and documented among all relevant stakeholders, the latter phase covers requirements traceability, prioritising requirements, managing requirements changes, and the maintenance of the user requirement specification (cf. [1]). These requirements develop over time. Requirements of low quality or unresolved conflicts such as mutually exclusive requirements often lead to longer duration of the development, higher development costs, wrong functionality, or even project failure.

To prevent such scenarios, all stakeholder involved have to come to an agreement. The pitfalls hereby lie in diverging individual preferences and objectives as well as in diverse stakeholder groups [1, 3]. Such groups involve developers, customers, managers, and users who all have different and often opposite preferences and objectives. Thus, there is a high risk of conflicts, e.g. due to individual concerns of stakeholders such as the fear of losing one's employment or a need to demonstrate one's power. In addition, there is the possibility

of interest conflicts, data conflicts, value conflicts, relationship conflicts, and structural conflicts [4].

Despite individual goals, each stakeholder group has the overall goal of reaching a successful software development project. The groups' interdependent tasks become apparent. Obviously, the customers need developers to code their desired software, and developers need the customers' requirements and knowledge to build adequate software. Requirements engineering is a "(...) cooperative, iterative, and incremental process" [1]. Its main focus is to establish a common terminology of customers and developers in order to enable an effective and efficient communicative exchange.

To summarise, the processes of requirements engineering, especially requirements elicitation and requirements analysis, is a negotiation process [5]. We adapt the definition of Bichler [6] and define requirement negotiation as an iterative process of communication and decision-making between customer and developer and maybe other parties who have the overall goal of agreeing on a software development process and outcome. Neither of the partners can reach this goal unilaterally as their tasks are interwoven in that the requirements are the basis for the development process which will have to be based on realistic target specifications. The negotiations involve multiple attributes and thus facilitate integrative negotiation outcomes (cf. [7]). Consequently, we will use the term requirements negotiation for the above described process.

2   Negotiation in the Requirements Engineering Process

Some authors integrate negotiating requirements in the context of requirements engineering as a separate phase among requirements analysis and requirements management [8, 9]. Other approaches situate requirements negotiation in the elicitation process during requirements analysis [10, 11], which holds similarities to the pre-negotiation phase [5].

More common approaches also integrate requirements negotiation in requirements analysis, but place it during the reconciliation phase. As the main activity of the reconciliation is conflict management, which consists of the tasks of conflict identification, conflict analysis, conflict resolution, and the documentation of the solution (cf. [1]), the underlying aspect of reaching consensus encourages this view point.

Hence, we classify requirements negotiation as a cross-sectional activity. As stated above, requirements negotiation is realised during both requirements elicitation and the succeeding requirements analysis phase [5]. To improve readability, we will use the more generic term requirements analysis for both activities.

2.1   Electronic Requirements Negotiations

Requirements negotiations are about a software that is to be developed. Thus, the specifics of software itself and of the process of designing and developing it have a strong influence on the medium that used in the negotiation process.

Firstly, the stakeholders are often dislocated. Software development is nowadays often carried out in low-wage countries with high programming expertise. Secondly, software development is often done in a dislocated manner, i.e. the development teams are located in various countries and continents. Finally, the software itself is a digital good which makes it desirable to use digital media in the process leading to its specification. Therefore, many if not most processes of requirements analysis for software development are carried out with the help of digital media. We will consequently focus on electronic requirements negotiations in our work which are defined as follows.

Electronic requirements negotiation is performed and supported by means of information and communication technology in terms of communication support, decision support, and/or document management. Such support is only possible through the adoption of information and communication technology which consequently offers additional value.

2.2 Approaches

Among the different approaches of negotiating requirements, investigated research does not always involve or follow a defined process model. It is often assumed that the requirements negotiation processes are obvious and therefore not mentioned [8]. Furthermore, negotiation is done by commenting and voting for requirements [12].

Nevertheless, the majority of the applied process models are developed by researchers in the requirements engineering discipline, which can be grouped by certain aspects. One group addresses the automated support of negotiating requirements. This is achieved by revealing the individuals' preferences. The negotiation software detects conflicts among the requirements, characterises the conflict, and generates resolution alternatives such as one of the conflicting values, a compromise value, or reformulation of the conflicting values [13, 14]. For this purpose, autonomous software agents can be used to resolve conflicts according to the revealed preferences. For the automation of managing requirements changes, more formal approaches formulate a logical representation of the requirement specification and the to-be-specification of the requirements to consolidate them [15]. Therefore, one approach has developed a compromise-based algorithm based on a logical language without human involvement to reach consistent requirements [16]. Furthermore, a broker-based negotiation framework has been discussed which automatically determines the non-functional requirements of a required business service. Active participation of stakeholders is not required. However, they must provide specific input data such as an agreed functional goal model, control flow information, and stakeholder utility functions [17].

Among the other researchers that argue for the human component to be indispensable, there is a large group whose work is based on the so-called Theory W and the related Win-Win negotiation model [18, 19]. Theory W is a software project management theory that is based on the Harvard Principled Negotiation [20], aiming to reach an integrative solution. It supports conflict management by previously defining each stakeholder's win conditions, attempting to fulfil them, and coming to a perceived fair and agreeable resolution for every stakeholder.

The WinWin negotiation model has been combined among others with the SCRUM methodology [21], complementing the WinWin negotiation model by quality assurance and multi-criteria preference techniques [22], or extending the WinWin spiral model by multi criteria preference analysis negotiations and a broker based negotiations framework [23].

Another group of researchers have introduced approaches whose basic concepts involve negotiation theory but are different from the mentioned WinWin approach. For examining the communication medium in distributed settings versus on-site settings, a framework based on social presence, computer-mediated communication theories, media richness theory, common ground theory, media synchronicity, cognitive-based view, time-interaction-performance and task/technology fit is developed, stating that in certain phases of the requirements negotiation process synchronous text-based chat is more effective than face-to-face [9]. Also based on the media richness theory, some research investigates how the medium (face-to-face, distributed three-dimensional virtual environment and text-based structured chat) influences the time to negotiate, the quality of the negotiated software requirements, and the number of problematic and solved issues within the requirements negotiation process [24]. As a result, their study shows that the time needed to negotiate software requirements is influenced by communication media (face-to-face being the quickest), whereas the number of issues was larger using the distributed three-dimensional virtual environment.

Other research investigates distributed asynchronous electronic requirements negotiation in particular [25]. The influence of a given task structure or a given negotiation structure with explicit sequence of certain negotiation phases of the negotiation process model proposed by Gulliver [26] and extended by Kersten [27] on requirements negotiation groups' activeness, satisfaction with their process, and conflict in a distributed environment is discussed. It was shown that groups provided with a task structure are more active than those without, but the latter are more satisfied with their process. The lowest level of conflict was found among the groups that neither used task structure nor negotiation sequence. The study was performed with a web-based collaboration environment.

2.3 Discussion

Since stakeholders hardly know their complete requirements in advance, and therefore requirements must evolve over time, we have to deal with incomplete, changing, and missing information at the beginning of the process. Interaction of all relevant stakeholders in terms of exchanging information, ideas, thoughts, and arguments is necessary during the whole process of requirements negotiations to come to an agreed, specified set of requirements [5].

The process of electronic requirements negotiation as part of requirements analysis is a complex one (cf. sections 1 and 2.1). To assess what is required to support such electronic negotiations, we will first look at automated approaches. They need complete knowledge of individual preferences [17]. This means that the requirements must be completely elicited and their utility known. This is unrealistic and even often infeasible since that input is not available right from the beginning [5]. Requirements are elicited and agreed upon in interactive communication processes between the involved stakeholders. Thus, automated approaches are not sufficient for the complex communicative and social process of negotiation.

The approaches based on the Harvard model are very conceptual. This can be challenging, since conceptual approaches easily get too structured to support such complex real-world processes with diverse influencing factors. The mentioned approaches besides the WinWin-group seem very promising. Unfortunately, most of these approaches are not continued and thus no recent work can be reported.

Often, collaboration environments are used for electronic requirements negotiation [25], which indeed support group processes, but obviously lack adequate negotiation support. Collaboration software focuses on supporting group tasks and is not designed to support a complete negotiation process, including pre-negotiation, negotiation, and settlement. Requirements engineering software is not sufficiently adapted for meeting this task either [2, 7].

In contrast, we have sophisticated negotiation support systems already available, which are designed to ideally handle the complex task of electronic negotiation processes, dealing with incomplete and changing information.

3   Potential of Negotiation Support Systems for Supporting Requirements Negotiation

The process of requirements analysis including steps of clarification and terminology development is most definitely a negotiation process since it fulfils all the criteria of such a process. Although there exist approaches in the research field of requirements engineering, negotiation research has up to now disregarded this application area. Looking at negotiation support systems, the question is whether NSSs can be used for electronic requirements negotiations. We will discuss each support component, i.e. communication support, decision support, and document management w.r.t. the specifics of requirements negotiations.

The negotiation processes are between lay people and experts. In particular, each stakeholder acts both as a lay person and as an expert. The customer is an expert in the application domain but a lay person when it comes to the technical aspects of software development. This, however, is where the developer's expertise lies who is at the same time a lay person in the specific application domain. This requires a dedicated *communication support*, in particular terminological support since the terminologies will differ to the extent that misunderstandings seem inevitable if communication is unsupported. For example, semantic support needs to clarify the meaning of utterances whereas pragmatic support can help to place a statement into context [28].

Since requirements will evolve over time and might very well change during the process, an NSS will have to deal with incomplete and missing information. This will require adequate *decision support* as well as flexible processes that allow negotiation issues to be inserted, modified, or deleted (cf. also [29]).

All interactions need to be document for several reasons. Firstly, the interaction processes involve several stakeholders (as described above) and might require internal coordination which itself must be based on a sound, complete, and consistent process documentation. Secondly, software development processes require a specification agreed upon by the stakeholders as

a document in several versions specific to such development process. Thirdly, documentation that is directly derived from the interactions enables traceability and enhances trust [28, 30, 31].

We argue that negotiation support systems are pre-destined for electronic requirements negotiations. In particular, Negoisst is well-suited with its sophisticated communication support, decision support, and document management [28, 32]. Nevertheless, the above specifics require adapted solutions which is what we are currently working on.

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8
Online Collaboration
and Competition

An Agent-Based Model of Knowledge Transferal

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Abstract. We set out a model of inter-team knowledge evolution through inter-group interaction. We introduce facilitation into the model and show how different models of facilitation create different results in group members' knowledge.

Keywords: agent-based model, knowledge transfer, decision making, social networks.

1   Introduction

Agent-based modelling and complexity science have been cited as possible solutions for investigating team interactions. At its heart lies the interaction between human agents within and comprising a complex system of interactions.

Agent-based models have been thought of as dividing into two camps: as a method for studying the dynamics of social systems (the 'microworld approach'), or as a type of boundary object [1]. The use of agent-based models within operational research has been limited, with debate existing as to the use of agent-based models rather than actually building agent-based models. While the microworld and boundary object perspectives are not necessarily mutually exclusive, this paper takes the former approach: modelling the actors within the social system. We leave for further research the use of agent-based models themselves as boundary objects [2]. In doing so, we start the process of using agent-based models within the operational research community.

2   Motivation

A recent stream of research has studied the interactions between individuals within workshop settings [3], groups [4], and dialogue [5]. We combine this with agent-based approaches of firm interaction [6] and the dissemination of culture [7] to create a model of inter-personal interaction within workshop settings.

We wish to investigate how interactions between participants and facilitator(s) determine the dissemination of knowledge between participants and how this affects the final outcome of a group-level decision (for example voting on an outcome or determining how to proceed from a menu of choices).

We expect that the behaviour of a facilitator will have an effect on these outcomes, and wish to investigate when and how facilitator engagement has a positive or negative effect on outcomes. For example, we may wish to investigate situations where too much facilitation has a negative effect on the group decision making process.

3 Agent-Based Model

We model the interaction between N participants and M $\in$ {0,1} facilitators.

Each participant starts the simulation with a preference or propensity for an idea that varies along a scale. In our example, we can think of this preference for black or white: each participant has a shade of gray (somewhere between black and white on this preference scale). We can think of this as their a priori preference for an outcome, for example their preference for option 'A' or option 'B', coded as black or white in the model. Each individual has a threshold where they change their expressed view. For simplicity's sake, we set this at $\theta = 0.5$ for each participant. While participants have an inherent view that expresses some doubt as to whether black or white is their preference, they express themselves as either black or white.

In the model, interaction between participants updates the preference of the participants within the dialogue. Various rules are considered for these updates including:

- Each participant in a dialogue updates their preference according to the average preference level of the other participants in the dialogue
- A majority rule is enacted where if a participant is in a minority, they update their preference towards the majority

Facilitators (when in the model) can also indirectly influence participants:

- By restricting or encouraging discourse (movement of participants in the model) and thereby restricting individual participants from entering into the dialogue where preferences are updated
- By dividing participants into groups

In our agent-based model, we represent each participant as occupying a position in a space. Participants interact depending on the rules set down by the facilitator.

Other parameters that can be explored are:

- Participants' 'vocalization' where they express their opinion to the group: this is in effect their circle of influence. For some individuals this may be only when neighbors to others; for some participants, they may be able to cast their opinion wider than their direct locale

- Participants' 'persuasiveness' where they are able to change the opinion of others by a larger or smaller amount
- The number of participants
- The multidimensionality of propensities where participants rather than having a unidimensional value (black to white) have multidimensional preferences, either as a scale or as Boolean values

Inherent propensity

Expressed propensity
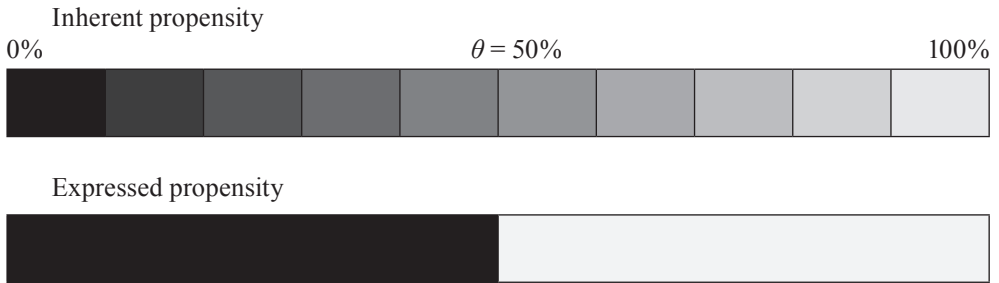
Fig. 1. Expressed and inherent propensities.

The Agent-Based Model shown below represents N participants within the workshop, each with their inherent propensity displayed by means of their colour.
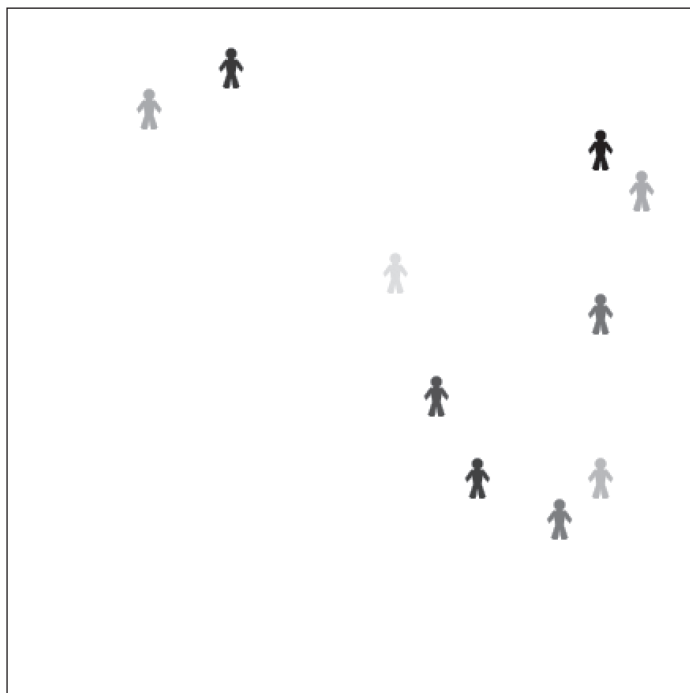
Fig. 2. Running agent-based model showing agents' propensities.

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Shopping for Love: Do men and women do it differently online?

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Abstract. The prevalence of social media is changing the way humans engage in human relationships. This is having a major effect upon relationships counseling organizations, which are finding that their clients are losing certain negotiation skills that are developed in courtships. Online dating is a social media phenomenon, which is altering the way we engage in relationships. We used a detailed online survey to develop useful insights into this problem. While the hypothesis that men use online dating services for temporary physical encounters was only partially supported, results did show that it ranked slightly higher in motivation for men than women. Significantly, what the research did unambiguously show is that men are much more in a hurry than women to find a mate. For both genders looks and temporary physical encounters were not high on the priority list.

Keywords: online dating, human relationships, social media, gender differences.

1 Introduction; Social Media and Human Relationships

Chambers [1] argues that despite widespread social anxieties about the impact of digital technologies on traditional social ties, emerging findings indicate that social network sites and other social media have become important sites for cultivating personal relationships.

Social media use has reached near saturation levels in Australia. The impact of social media on developing and maintaining relationships is of increasing concern to Victoria University researchers and Relationships Australia Victoria (RAV) practitioners. For example, RAV is finding that because of an extensive use of social media for communications, their clients are losing certain negotiation skills that are developed in courtships.

A two-part survey of Relationships Australia practitioners and members of the community conducted in 2011 exploring relationships determined that social media and technology was beginning to play a role in modern Australian human relationships [2].

A total of 120 people took part in the practitioner survey, which focused on whether the use of social media and technology was being raised by clients in counseling sessions. Results showed that 80 per cent of respondents had counseled clients who raised concerns about the impact of Facebook on their relationships, with 72 per cent encountering concerns about email and almost 50 per cent hearing concerns about mobile internet devices, and blogs and forums. Practitioners reported that of those whose relationships were adversely affected by social media, 53 per cent were impacted to a great extent and more than 40 per cent were somewhat impacted.

Common themes, which emerged from community respondents, included:
- The dichotomy between social media generating positive feelings of connection versus accentuating feelings of loneliness and creating illusory, false or shallow connection
- Suspicion over partners online activities and connections, including fears of online cheating

Other findings that arose included:
- Online stalking, checking and monitoring of partners email, mobile and electronic communication and hacking into ex-partners Facebook accounts
- All-consuming use of the internet and technology to the exclusion of one's partner

These findings are consistent with recent research [3, 4, 5, 6]. In addition, social media content is increasingly being used as evidence in divorce proceedings [7]. Various support and counseling programs exist around maintaining healthy relationships in the real world and managing family disputes and separations including RAVs own services. However, few focus on the impact that social media has on intimate human relationships. While the initial surveys conducted by RAV indicated that such issues do exist, they did not explore potential reasons for the phenomenon. Consequently, Victoria University is working with RAV to examine this critical issue, drawing on current research and producing a representative national data set the analysis of which will inform the development of new approaches and protocols for the provision of counseling and other support services.

Currently, with funding from the Centre for Cultural Diversity and Wellbeing at Victoria University and the support of RAV, we are conducting a major research project 'Helpful or harmful? Examining social media and human relationships in the information age'. As a part of this program we have conducted a pilot project on how men and women engage in online dating.

2 Literature review; Online Dating

Compared to previous generations, marriage is being postponed and access to potential partners becomes limited as we progress through life [8]. Not only are people delaying marriages or finding it difficult to meet a long-term partner, but also the development of the Internet has allowed communication and advertising more easily [9].

Online dating services are big business; a Google search on online dating on 28 October 2014, bought up more than 142,000,000 results. There are more than 500 dating and matchmaking sites in Australia [10]. For the past 5 years, RSVP has commissioned research company, AC Nielsen[1] to conduct research on the Australian dating climate. According to the most recent report, 64% of Australians have used or would consider using an online dating service. Since 2008, the online dating industry has experienced a growth rate of 3.5% per year; this amasses to a more than $2 billion dollar industry[2]

There has been much research into whether men and women have different attitudes towards sex [11, 12]. In their research, Rosenthal et al. [12] highlighted that generally women had sex for love, commitment and intimacy, whereas men had sex for physical pleasure and sexual prowess. This research aims to explore whether this phenomenon transfers to the online world.

Most internet research has found that specific motivations drive people to use the internet for romantic relationships. These include the opportunity to open up a wider market of potential mates, loneliness (seeking companionship), and the opportunity to project oneself as the user wishes to be portrayed [9, 13] The Internet provides some individuals the ability to role-play and engage in greater identity and role construction than possible in the real world [14]. Exploration into gender differences when using online dating services is more limited. Gunter [15] discussed an American survey, which found that there were differences between genders in expectations and outcomes. A key difference was that men were more likely than women to state that they were looking for a casual encounter or"no strings attached" fling.

Saad & Eba [16] investigated gender differences when looking for a partner. In doing so, they completed a series of experimental tasks. Some differences they found included that men place more importance on youth and beauty compared to women who look for features related to procurement and sharing of resources. Women were also more coy and choosy sexually, and were more likely than men to be selective in choosing a potential partner.

There are two schools of thought in regards to whether the Internet is aiding in the formation of genuine relationships. The first feels that the Internet can help give people a sense of belonging and genuine relationships can be formed free from restrictions like distance, age and physical appearance [17]. In contrast there are those who argue that online relationships are shallow. In his book *Silicon Snake Oil*, Clifford Stoll [18] expresses his view that that computer networks isolate us.

3 Aim & Approach

The aim of this research is to understand whether there is a difference in motivation between genders when using an online dating service. In particular, we aim to gain insights into how people feel about online dating. It is hypothesized that the primary reason men use an online

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[1] http://www.nielsen.com/content/corporate/au/en.html last accessed 28 September 2014.
[2] See Yoder, S 2014, 'How Online Dating Became a $2 Billion Industry' http://www.thefiscaltimes.com/Authors/Y/Steve-Yoder Last accessed December 10 2014.

dating service is for sex and casual encounters, whereas the primary reason women use an online dating service is to form an ongoing relationship.

The following research questions are asked:

RQ1. What do men and women think about online dating services?

RQ2. Do men and women have different motivations when using an online dating service?

RQ3. What motivates men and women to select other users with whom to communicate?

RQ4. What do men and women think about dating in general?

114 surveys were completed. A 24-question online-administered survey was developed in order to collect data for this research; four questions out of the 24 were aimed at those respondents who had not used an online dating service. The survey consisted of three general information gathering questions including age group, gender and employment status. These attributes were collected to look at whether there was a particular age group or gender that used online dating services and whether employment status had any relationship with online dating services usage.

The remainder of the survey consisted of a series of five point Likert scales aimed at investigating what opinions users of online dating services held of dating in general, online dating in particular and how they select other users to communicate with online. Respondents who have not used an online dating service were asked a series of questions aimed to explore why they have not done so and if they were to reconsider which services they would use. A nonprobability sampling approach was taken on the basis of convenience.

Once the results were returned and collated, they went through a process of data analysis using the Statistical Package for Social Sciences (SPSS).[3] A series of t Tests were administered in the analysis of results; this form of statistical testing was nominated as the sample size was small and the objective was to find differences in motivations between men and women. Of the 106 responses received, there were approximately twice as many female respondents (70) compared to males (36). This research was interested in the motivations and opinions of both males and females. Whilst there were more female respondents; there were still a sufficient proportion of male respondents to make useful conclusions.

4 Findings

All respondents were asked if they had ever used an online dating service, nearly half those surveyed had not used one, totaling 51 respondents. Of these 51, more than half of the respondents do not consider using an online dating service to be a good way to start a relationship. Of the 55 who had used an online dating service, 39 think such services are a good way to start a relationship.

The researchers have received funding to conduct a significantly larger online survey of a representative sample of the general community. As we will interview circa three hundred people who have used online dating services, we expect to obtain more statistically significant results.

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[3] See http://www-01.ibm.com/software/analytics/spss/ last accessed 30 September 2014.

For the current study, of those 70 women who responded, 51% have used an online dating service, while of the 36 men who responded, 52% men have used an online dating service.

In response to RQ1 (What do men and women think about online dating services?), all respondents were asked whether they felt online dating services were a good way to start a romantic relationship. Of the 51 respondents who had not used an online dating service, 49% said yes, whereas of the 55 respondents who had used an online dating service, 71% said yes.

In RQ2 (Do men and women have different motivations when using an online dating service?) we investigated whether there are gender differences in the use of online dating systems. The majority of respondents cited that the reason they used an online dating service was for dating or a long-term relationship. Although there are more men looking for physical encounters, it still ranks as the least important motivation. This does not support the hypothesis that men's motivations are for temporary physical encounters. One female respondent (aged 26–35) commented upon why she used online dating services:

> *"It is easy – it can be done while wearing your PJs with messy hair and no make-up from the safety of the couch. It's a little like window shopping, or browsing eBay and can be addictive. When you are a busy person with a full life, finding time to get into situations where you are likely to meet someone is tricky – you don't (or at least I don't), often just happen across appropriate people."*

Another motivation for men appears to be that online dating services allow them efficient use of their time. As highlighted in Table 1 below, our results show that men find that online dating saves time, whereas women are not as concerned about this issue. The table below demonstrates statistical significance in differences in motivations of use between genders. It would appear that male respondents feel they have less time to put into meeting people or do not wish to spend the time on their search, whereas women are prepared to invest more time making new connections.

Table 1. Respondents views on whether online dating services save time.

Variable	Gender	N	Mean	Sig. (2-tailed)
Online dating saves me time meeting people	Male	18	4.00	0.003
	Female	36	2.86	

As seen in Table 2 below, men think online dating is a numbers game, meaning that the more women they contact the greater the likelihood they will receive a positive response i.e. a woman accepting their offer to communicate. Women who completed the survey appear to be more selective in their choices with whom to communicate – they are less inclined to agree with the statement. This suggests that there is a gender difference in the way in which men and women utilize online dating services to pursue potential partners, men tend to adhere to the theory of quantity. While there is no wrong or right approach, Rudder [19]

tellingly notes that, dating is a game of reciprocity, meaning what one person wants is only half the story.

Table 2. Respondents' motivations for using an online dating service.

Variable	Gender	N	Mean	Sig. (2-tailed)
I am looking for temporary physical encounters	Male	18	2.61	0.047
	Female	36	2.03	
It's a numbers game, the more people I contact, the more opportunity I have to meet new people	Male	18	3.83	0.010
	Female	36	2.86	

The results also showed that there was a significant difference in motivations for using online dating services between genders when it came to seeking out a temporary physical encounter. Men are more likely to answer that they are looking for temporary physical encounters than women; however it was the lowest priority for both genders, as shown in table 3 below.

Table 3. Reasons why men and women use an online dating service.

Variable	Do not agree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Total responses	Mean
I am looking for a long term relationship	4	4	7	11	27	53	4.00
Online dating services give me more choice of people	3	6	2	21	21	53	3.96
It is easier to meet people online	4	7	7	15	20	53	3.75
I am looking for temporary physical encounters	25	7	9	8	4	53	2.23

In addition to examining the reasons why users might be initially interested in utilizing online dating services, we also investigated what motivates participants to communicate with other online dating service users (RQ3 – What motivates men and women to select other users with whom to communicate?)

Table 4 below indicates that for both men and women, looks/appearances are more important than seeking a temporary physical encounter when it comes to selecting which users to communicate with. Again, while this does not rank the highest of motivations for selecting a user, it does suggest that surface features are important when using online dating services.

Table 4. Motivations for selecting a user with whom to communicate.

Variable	Do not agree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Total responses	Mean
Their relationship status says they are single	4	3	5	18	23	53	4.00
Looks/attractiveness	1	1	5	24	22	53	4.23
It's a numbers game, the more people I contact, the more opportunity I have to meet new people	7	12	7	18	9	53	3.19
I am looking for temporary physical encounters	27	9	5	7	5	53	2.13

Our final research question investigated possible gender differences related to wider more general issues about dating, rather than being restricted to online dating (RQ4 – What do men and women think about dating in general?). Table 5 shows that even though both men and women use online dating services, when questioned about their opinions on dating in general most respondents agree that they like getting to know someone face-to-face and see benefits of meeting in person.

However, if men feel online dating saves them time, are they in a hurry to meet potential partners and have they researched whether the person they will meet via online dating is compatible?

Table 5. Respondents' motivations for using an online dating service[4].

Variable	Gender	N	Mean	Sig. (2-tailed)
I enjoy getting to know someone face to face	Male	19	4.37	0.047
	Female	36	4.75	
I feel more comfortable meeting someone online	Male	18	3.50	0.020
	Female	35	2.57	

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[4] It may seem anomalous that in Tables 1 and 2, there are 54 respondents, in Tables 3 and 4, there are 53 respondents, and in Table 5 there are 53 and 55 respondents. However, the survey did not force the respondents to reply to each question. Hence, not all respondents replied to every question.

Further the statement 'I am looking for temporary physical encounters was asked in three different question sets (one that looked at respondents motivations for using Online Dating Systems (RQ2), a second investigating reasons why participants use an Online Dating System and a third questions what motivates participants to speak to another user). Again, this is why there is a difference in results.

5 Conclusion

There are many aspects as to how social media has changed the manner in which we engage in human relationships. One important factor is how we engage in online dating and in particular whether men and women have different approaches to using online dating. We have used a detailed online survey to develop useful insights into this problem.

As stated previously, for the purpose of this research, a non-probability sampling approach was used. This is a limitation of the project. In future research, we will extend our sample beyond universities and also question a representative sample.

While the hypothesis that men use online dating services for temporary physical encounters was only partially supported, results did show that it ranked slightly higher in motivation for men than women. Unsurprisingly, what the research did unambiguously show (at a statistically significant level) is that men are much more in a hurry than women to find a mate. For both genders looks and temporary physical encounters were not high on the priority list.

Our investigation into how the different genders use online dating is only an initial foray into the way social media changes the way in which we engage in human relationships. Even in the domain of online dating we need to further investigate issues of deception, fraud, security and safety. We also should consider how religion, culture, education and socio-economic status influence how we use online dating services.

Finally we would like to thank an anonymous reviewer for some very valuable comments. This has led to a strengthening of the paper and the development of important research questions to be addressed in future projects.

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Exploring Trust Factors in Global Hybrid Virtual Collaboration: A Case Study of a Chinese Multi-national Firm

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Abstract. Hybrid virtual collaboration has been adopted by many multi-national companies. In such global settings, trust is a significant issue. We have conducted a case study in a Chinese multi-national firm that has 40 branches around the world to explore trust factors and their associated sub-factors in their global hybrid virtual teams. We interviewed five managers including the CIO of the company. By analyzing the data, we validated some trust factors and sub-factors of previous research and found a new important factor that is 'job requirement', which could weaken the influence of some factors. Meanwhile, we also developed a cognitive mapping model of the trust factors validated and newly found in our case. Our study reveals trust factors that can influence trust in global hybrid business teams and provide directions for future work.

Keywords: Trust factors, Global virtual team, Case study, Hybrid collaboration.

1 Introduction

Emerging information technologies have been widely applied in the virtual collaboration for many businesses around the world. Virtual teams have been playing an increasingly significant role in organizational collaboration [1, 2]. However, for longitudinal collaboration, pure virtual collaboration without any chances to see the other side collaborators has many limitations in real business environment. Therefore, using face-to-face communication has become a new preference as it is expected to enhance team performance [3]. Hybrid virtual teams can virtually collaborate online but also have opportunities for face-to-face communication [4] to untangle misunderstandings [5] and build consensus [6].

The concept of trust, which a situation when individuals feel comfortable and open in sharing their insights and concerns [7], has attracted many scholars' attention [8, 9, 10].

Furthermore, with the development of world economy, trust issues in global virtual teams have been addressed by many scholars [11, 12, 13, 15]. Team conferences hold frequently in global virtual teams. Trust plays an important role in team decision making and negotiation. For example, Tundjung et.al [14] proposed a reputation based trust model to achieve consensus in group decision making. And trust is a precondition for negotiation, especially in traditional Chinese business environment, there is unlikely to be any trust to start with [18]. Trust also influences the willingness to sustain team negotiation [20].

Some scholars focus on trust factors in group collaboration that decompose trust into several parts [12, 16]. However, many previous studies have used students as experimental subjects, while few are investigating firm contexts to develop models of trust factors. According to Cheng et al. [17], trust factors and their interrelationships could be different in different contexts. Currently, there is a lack of empirical field research focusing on hybrid virtual teams in real business contexts. Specifically, there is a dearth of research focusing on trust issues which may represent a critical requirement for successful and productive hybrid team performance. Therefore, we explore what trust factors are significant in multi-national firms for hybrid global collaboration.

2   Case Study

In order to explore practice-based findings in real global hybrid business collaboration teams, we have pursued an exploratory case study [21] in a large-scale Chinese multi-national enterprise (Company A). The company is a listed company and one of the top 500 companies in China.

As a multi-national enterprise, Company A has a lot of requirements for virtual collaboration between its headquarters and sub-companies around the world. However, sometimes, for a long project, representatives and core members in the sub-companies also need to fly to the headquarters to have face-to-face meetings and collaborate. Additionally, there are also some occurrences that the members in sub-companies located in different countries could fly to each other to have face-to-face meetings besides their virtual collaboration. This kind of global hybrid virtual collaboration makes its Information Technology (IT) department playing an important role in the company.

There are two main kinds of virtual collaboration tools that used by the company: Tencent Real Time Exchange (RTX is for instant messaging and document transfer) and POLYCOM video conference system (for online meeting). In the virtual meeting, there are usually dozens of participants in the virtual video conference with different agendas. However, sometimes they have over 100 participants around the world for large online meetings. Most of the staff from different departments and branches that participate in the conference are Chinese. Some participants are local citizens in their country, but the head office has arranged for real-time translators for them, so there are no language barriers to communication. The online meeting session normally lasts for several hours, but some sessions may last a whole day. The Chief Information Officer (CIO) is in charge of all the information technologies and communication sessions.

3 Data Collection

For our data collection, we have visited the head office several times to conduct interviews. We identified and successfully interviewed 5 managers who are involved in many global virtual collaboration sessions. See table1 below.

Table 1. Interviewee list and job role.

| Interviewee	I1	I2	I3	I4	I5
Position	Chief Information Officer (CIO)	Technology Manager of IT Department	Managing Director Assistant	Director of Enterprise Planning department	Assistant Manager of Regional Coordination
Work Experience	20 years	10 years	3 years	8 years	12 years
Job Content	Information technology and strategy	IT support and monitoring	Conference arrangement	Conference planning	Conference coordination
Global Virtual Collaboration Experience	7 years	7 years	3 years	7 years	7 years

We have conducted an in-depth interview for all the interviewees. Each interview took around 2 hours. The design of the interview questions were based on the theoretical basis of former researchers (Cheng & Macaulay [19]). The interview data was transcribed and coded. We then analyzed the data manually. The transcribed texts were coded independently by three members in our research team to ensure accuracy. Keywords were extracted from the transcribed texts and summarized as sub-factors linked with main trust factors. Trust factors influence trust. So sub-factor is also called second-level factor. Besides, frequency of those keywords was coded as indicators of the importance of a certain factor. Several factors that were thought to be insignificant have been eliminated from further investigation.

4 Results and Findings

4.1 Job Requirement is a Key Factor that Weakens Other Factors' influence

In our case study, we did not find strong relationships between certain trust factors that previous research identified. First, *interest* appears insignificant in our context. For instance, one interviewee mentioned "This is my job, it is independent with interest". Second, *effort* does not appear important in this context either. As someone reported "I have tried my best. If you are effortless, you can't finish your job and reach your goal." Third, *motivation*, which is related to trust in other contexts, does not appear to have significant influence on trust in this study. Some interviewees argued 'The best motivation is the success of an electronic

meeting job task". Fourth, *cooperation* also weakens as an influence factor, as some stated "we cooperate well which may result from the job responsibility of an individual". Fifthly, *friendship* is also ignored as a factor in this case study, as some interviewee stated "We are friendly with each other when we are working". Last but not least, interviewees generally thought that *time difference* is not an influence factor, someone reported that "I have to finish my job no matter how late at night or how early in the morning". Therefore, we argue that the "*job requirement*" factor can be considered a key factor in weakening the influence of other factors we found in previous research.
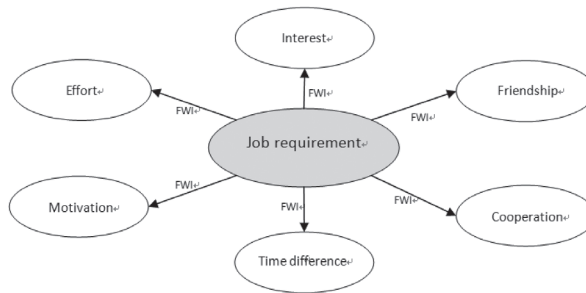
Fig. 1. Job requirements weaken other factor's influence.

4.2   Risk, Power, Benefit and Skill are Four Remaining Main Trust Factors

Previous studies in online business communities identified 6 factors [12] and in student teams even 7 additional factors [16]. However, in this case study, some factors were not found to have a significant influence. We were only able to confirm 4 main trust factors which are risk, power, benefit, and skill. Additionally, we also obtained some new trust sub-factors in our case.

For Risk, we have found it is associated with sub-factors technique problem, distraction and emergency change. Please see table 2 for more details and examples of comments.

Frequency of the comments suggests the percentage of each sub-factor identified by the interviewees. Three analysis outcomes are presented below. Keywords that acquire frequency over 40% can be counted as a sub-factor.

Table 2. Trust factors table-Risk and its sub-factors.

Main factors	2nd level Sub-factors	Comments examples	Frequency of the comments		
Risk	Technical problem	I2: *Software maintenance is our major task, we are worried that something uncontrollable would influence the online meeting.*	Coder1	Coder2	Coder3
			80%	100%	80%
	Distraction	I4: *We may develop an App to increase their engagement, in order to prevent them from sleepy.*	Coder1	Coder2	Coder3
			60%	60%	60%
	Emergency change	I2: *For this kind meeting, one thing is the process, another is the sudden change of personnel.*	Coder1	Coder2	Coder3
			60%	60%	40%

For Benefit, we have found it is associated with sub-factors enrich experience. Please see table 3 for more details and examples of comments.

Table 3. Trust factors table-Benefit and its sub-factors.

Main factors	2nd level Sub-factors	Comments examples	Frequency of the comments		
Benefits	Enrich experience	I3: *We have learned from each other, which broaden our vision. I can learn a lot according to the electronic collaboration.*	Coder1	Coder2	Coder3
			80%	80%	80%

For Power, we have found it is associated with sub-factors job position and professional skill. Please see table 4 for more details and examples of comments.

**Table 4.** Trust factors table-Power and its sub-factors.

Main factors	2nd level Sub-factors	Comments examples	Frequency of the comments		
Power	Job position	I2: *I don't have power because I'm not the leader.*	Coder1	Coder2	Coder3
			80%	80%	80%
	Professional skill	I3: *If someone is excel in something professional, he is powerful.*	Coder1	Coder2	Coder3
			40%	60%	40%

For Skill, we have additionally found it is associated with sub-factors professional skill, communication skill and team management skill. Please see table 5 for more details and examples of comments.

Table 5. Trust factors table-Skill and its sub-factors.

Main factors	2nd level Sub-factors	Comments examples	Frequency of the comments		
Skill	Professional skill	I1: *Professional skills are important because we're in the information department.*	Coder1	Coder2	Coder3
			80%	80%	80%
	Communication skill	I4: *Top of all is professional skills. Communication skills are also important.*	Coder1	Coder2	Coder3
			80%	80%	100%
	Team management skill	I1: *I haven't been to those branch offices for two years, but I can still manage them through the internet.*	Coder1	Coder2	Coder3
			40%	60%	40%

Therefore, in order to better understand the relationships between trust factors and their sub-factors, we have used the cognitive mapping [22] method, and combined the findings into a cognitive map (see figure 2). All factors and sub-factors here are positively correlated.
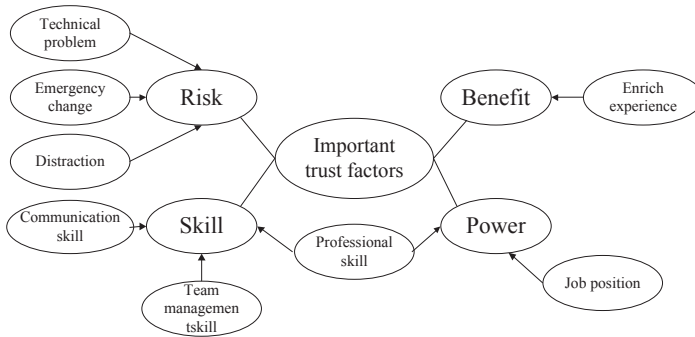
Fig. 2. Cognitive mapping model of trust factors and sub-factors.

4.3   Some Trust Sub-factors are Similar With Previous Studies and Others are New

In this case, we found 4 sub-factors that are similar from previous studies. For example, the *technique problem* in the risk factor, *Professional skill* in the power factor appear to have the same relationship as in previous research in the student context [16]. However, we found *team management skill* exists as a sub-factor of skill in our company context but exists as a sub-factor of benefit in the previous student context. Meanwhile, the sub-factor *communication skill* is a sub-factor of skill in our company context but it exists as a sub-factor of power in previous studies in the student context.

Nonetheless, 3 other sub-factors (i.e. enrich experience, distraction, emergency change) were found in this case as new factors. They do not exist in previous student-focused research in the global business hybrid team context [16].

5 Conclusion

Therefore, our analysis leads to some interesting findings. First, we found that trust factors in global hybrid virtual team collaboration are different from those found in previous descriptive studies in other context. The factors found in the Chinese firm have some difference with the previous results either from business online communities' context of British companies [12] which are using virtual collaboration, or the British student context which are using hybrid virtual collaboration. We can also confirm that different contexts may have different trust factors, which has been stated by some scholars in the past [16, 17].

Second, we have not only confirmed some previous factors but also identified some new trust factors, which offers new insight of the defining key trust factors across contexts. According to our analysis, we have confirmed 4 main trust factors and 4 trust sub-factors from previous research [12, 16]. Furthermore, 2 of the 4 sub-factors keep the same relationship with their main factor as in previous studies [16] while 2 appear to be related to a different main factor. Meanwhile, we also found that risk, benefit, and power which exists in other contexts [12, 16] could also be considered as key trust factors in virtual collaboration. Specifically, skill could be considered as a key factor in two hybrid collaboration contexts, which are our global business collaboration context and student computer mediated collaboration [16].

Third, for the special context of this case study, we have defined the negatively correlated trust factors weaken model and the positively correlated trust factors cognitive mapping model. In the first model, job requirements is identified as a new significant factor that has weakened the influence of the other trust factors in our case study, meaning that interest, effort, time difference, motivation, cooperation, and friendship are not that significant in influencing their trust in the hybrid business virtual team. Therefore, this should raise the attention of future work, especially for Chinese context. In the second model, we can easily see the trust relationships including the confirmed and newly found trust factors. This model could facilitate a better understanding the main trust factors and their second level sub-factors. This finding could also help studying the factors further.

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Comparing Collaborative Information Technologies Assimilation and Impacts across Australian and US Organizations: An Exploratory Study

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Abstract. We deploy an IT assimilation framework to identify four states in the diffusion of collaborative information technologies (CIT). Data collected from 73 organizations in Australia and 385 organizations in the USA is used to compare similarities and differences in CIT assimilation and their perceived impacts across the two regions. Our findings suggest that there are significant differences in the level of CIT access and use between the two regions. There were very few significant differences in the perceived impacts of CIT between the two regions. However, there were many significant differences in the perceived impacts of CIT as their assimilation progresses in both the study regions.

Keywords: collaborative Information technologies, e-collaboration, IT assimilation, IT impacts.

1   Introduction

The proliferation of IT applications that have the capability to support collaboration continues to be popular in organizations around the globe. Commonly known as Collaborative Information Technologies (CIT), these applications support teams (co-located or virtual) working together to accomplish common tasks irrespective of time, distance, and organizational barriers. The market share for these technologies has been steadily increasing over the years. The recent advent of intelligent hand held devices and increasing popularity of virtual communities of practice provide opportunities to collaborate using social and enterprise networks while mobile. These enterprise and social collaborative software solutions are expected to increase at an annual rate of 61%, reaching US$6.4 billion in 2016 as compared with $600 million in 2010 [1].

There are many options of CIT available on the marketplace. Our study focused on four clusters of CIT that include: *Conferencing technologies* (for example, GoToMeetings, WebEx, MS office Live Meeting, CU-SEEME, Evoke, Skype, Windows Live Messenger, AIM etc.), *technologies supporting online communities* (for example, Intranets, Listservers, Newsgroups, Blogs, eGroups, Open Topics etc.), *proprietary groupware* (for example, IBM Lotus Notes when used beyond email, Novell GroupWise, Oracle Collaboration Suite, MS SharePoint etc.), and *electronic meeting systems* (GroupSystems, MeetingWorks, Facilitate.com etc.).

Collectively, the four clusters have the capability to provide a wide range of support in collaboration. Despite the widespread range and reach of CIT, there is scarcity of research aimed at exploring their impacts across global regions. Our research attempts to fill this void. We deploy an IT assimilation framework [2] to systematically explore the assimilation patterns of CIT and compare similarities and differences in perceived impacts of CIT across Australian and US organizations. The two regions were selected because of their geographical dispersion and similar dominant language. The rest of the paper focuses on our theoretical framework, the study methodology, data analysis, and a discussion of our findings along with implications for practice and research. We conclude by pointing out some of the limitations of our research.

2   Assimilation Framework

The theory of innovation diffusion has been a popular premise to explore the adoption and implementation of IT [3]. According to Myers and Goes [4], the diffusion of IT is a process where assimilation is set in motion with the initial awareness to full utilization and insti-tutionalization of IT. Based upon the level of IT access/availability and its utilization, the assimilation of CIT can be viewed as a four stage model [2] (see figure 1).
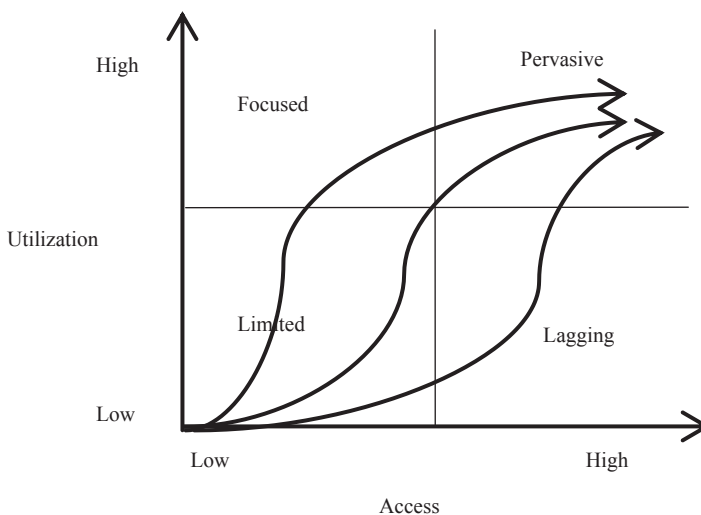
Fig. 1. Assimilation Framework and CIT Diffusion Patterns.

Limited assimilation represents a state where the level of CIT access and utilization is low. *Lagging* assimilation represents a state where the level of access of CIT is high but utilization continues to be low. *Focused* assimilation represents a state where the level of CIT access is low but utilization is high. Finally, *pervasive* assimilation represents a state when both, CIT access and utilization are high in organizational settings.

Given the four states, CIT diffusion patterns may vary in organizations. Figure 1 shows three possible diffusion patterns depicting various shapes of Rogers [5] "S curve". CIT diffusion may propagate from *limited* to *lagging* and then from *lagging* to *pervasive* states. It may also propagate directly from *limited* to *pervasive* states, or from *limited* to *focused* and then from *focused* to *pervasive* states. In Rogers [5] view, successful diffusion of innovations represents an end state of pervasiveness.

3 Research Methodology

We first undertook four case studies to understand more about collaboration, CIT use in organizational settings, and their potential impacts. Next, we embarked upon a review of the appropriate literature [6, 7, 8, 9, 10, 11]. These undertakings provided inputs to develop a survey instrument to collect data on access and use of the 4 CIT clusters including: Conferencing technologies, technologies to support online communities, proprietary groupware, and electronic meeting systems. A five point scale (1 = no one, 2, 3 = some people, 4, 5 = everyone) was deployed to assess the proportion of end-users that had access to each of the four clusters of CIT and the proportion of end-users that were using the 4 clusters in their respective organizations. We also collected data on 14 potential impacts of CIT assimilation including: Improvements in existing products/services, improved relationships with customers, improved relationships with suppliers, improved relationships business partners, improvements in existing business processes, structural changes, time savings, quick reaction to changes, speed of decision-making, increased productivity, appropriate responses to changes, facilitation of innovations, improved quality of decisions, and marketing the right products/services. A five point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree) was used to measure the level of agreement with each of the impacts resulting from CIT assimilation. The survey instrument was then pilot tested in three organizations. Feedback from the pilot test was used to slightly modify the survey instrument for clarity of the item measures. Data was collected in Australia and the US from 2008 to 2011.

The questionnaire was mailed to the CIOs of the top 500 Australian organizations. In the US, an electronic mailing was sent to member organizations of Ziff Davis, Inc. A cover letter accompanying the survey identified the broad purpose of the study and requested the recipients to forward the survey to the person most knowledgeable about IT-supported collaboration in their respective organizations. Clear instructions and definitions of terms and concepts were provided on the survey to assist and guide respondents. Multiple mailings and reminders were sent out to boost response rates in both the regions.

4 Data Analysis and Results

Overall, 73 organizations from Australia and 385 organizations from the US responded to our survey. Almost 94% of our respondents from Australia were top level executives and managers compared to 75% in the US. We conducted non-response bias tests between the early and late respondents and found no significant differences in the mean values of most of the item measures. Since many clusters of CIT can support collaboration, adoption choices may vary amongst organizations. As such, organizations may choose to adopt one or more of the CIT clusters. Therefore, CIT assimilation can be viewed from a single CIT cluster or multiple clusters perspective. Here, we focus on the access and use of all the four clusters of CIT collectively. Accordingly, based on the overall level of access and use (as computed by taking the mean across all the four CIT clusters), we developed our assimilation framework (as shown earlier in figure 1). For simplicity, midpoints of the measurement scales were used as the cut-off points for low and high levels of access and use of CIT. Only the organizations that indicated a level of CIT access and use greater than zero could be classified in the assimilation framework in both the study regions. Figures 2 and 3 show the levels of CIT access and use in both the study regions. Significant differences were detected in CIT access (as computed by t tests) between access of ITs supporting online communities and electronic meeting systems in the two regions. As for CIT use, significant differences were detected in conferencing technologies and ITs supporting online communities in the two regions.
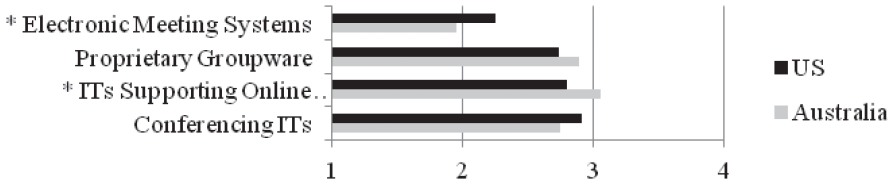
*p <= 0.10

Fig. 2. CIT Access in Australian and US Organizations.
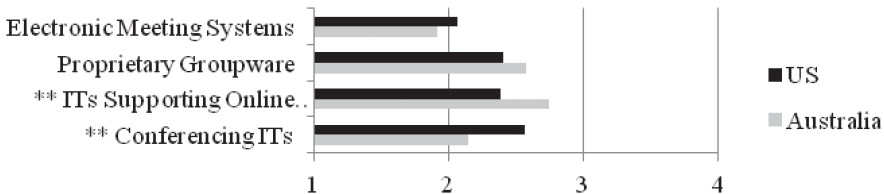
* p <= 0.05

Fig. 3. CIT Use in Australian and US Organizations.

Figure 4 shows the proportion of organizations (i.e. percentage of the organizations) in each of the assimilation states for the four CIT clusters included in this study. In this paper, we will focus on the two extreme end states of the CIT assimilation (i.e. *limited* assimilation and *pervasive* assimilation).
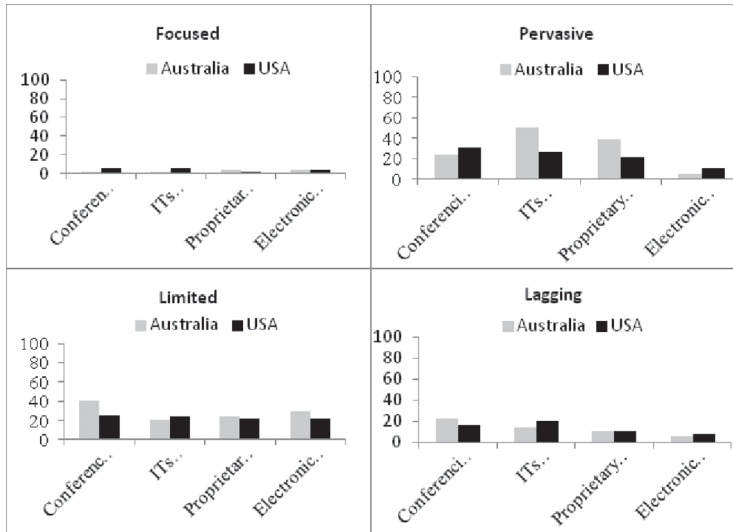

Fig. 4. Assimilation of CIT.

The mapping suggests that higher proportion of Australian organizations had assimilated conferencing technologies, proprietary groupware, and electronic meeting systems in the *limited* state than their US counterparts. Similarly, higher proportion of Australian organizations had assimilated ITs supporting online communities and proprietary groupware in the *pervasive* state than their US counterparts.

We next explored for any significant differences (as computed by t tests) in the means of the perceived CIT impacts in the *limited* assimilation state between the two study regions. Significant difference was detected in only 1 of the 14 impacts. Respondents from organizations in Australia perceived to have higher agreement on improvements in existing business processes from the use of CIT than their US counterparts. However, when exploring differences in perceived impacts of CIT use in the *pervasive* assimilation state, significant results were observed in 4 of the 14 impacts. Respondents from organizations in the US perceived to have higher agreement that CIT use resulted in improvements in existing products/services, improved relationship with customers, quick reaction to changes, and increased productivity than their Australian counterparts.

In order to explore any differences in the perceived impacts of CIT between the *limited* and *pervasive* assimilation states in the 2 study regions, we compared the means on all the 14 perceived impacts resulting from CIT use. Significant differences were detected in 8 of the 14 perceived impacts between the two assimilation states in Australian organizations and in all of the 14 perceived impacts in US organizations (see figures 5 and 6).
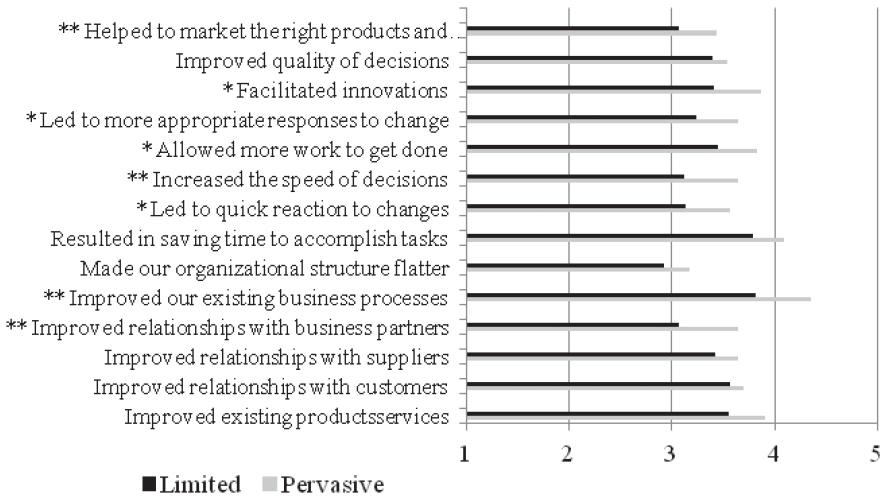
** p <= 0.05, * p <= 0.10

Fig. 5. Differences in Perceived Impacts in Australian Organizations.
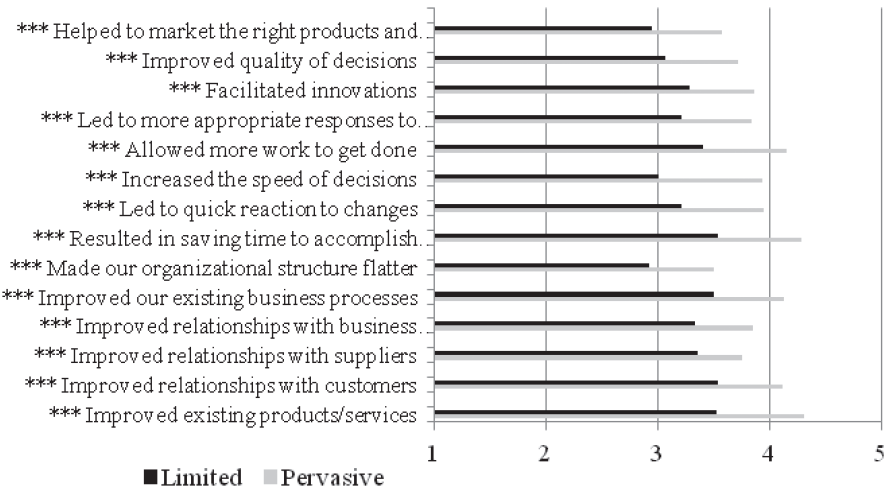
*** p <= 0.001

Fig. 6. Differences in Perceived Impacts in US Organizations.

Our findings have implications as they related to IT-enabled collaboration. From the standpoint of CIT impacts, our findings indicate interesting insights. There do not appear to be any regional differences in the perceived impacts of CIT when they have *limited* assimilation and very few differences in perceived impacts of CIT when they have *pervasive* assimilation (significant differences were detected in only 4 of the 14 impacts between the

study regions). However, when comparing the perceived impacts between the two end states of CIT assimilation, there are significant differences in both the regions (more so in the US than in Australia). Moreover, the majority of the CIT impact means are above the "neutral" score of 3, suggesting that the impacts identified are perceived positively by our study respondents and are relevant outcomes of organizational level CIT use.

Business executives and IT professions must recognize the potential of CITs from a strategic standpoint. The 14 impacts identified are both, internal and external impacts of CIT use. The internal impacts (time savings, increased productivity, quick reaction to changes, speed of decision-making, improvements in existing business processes and existing products/services, improved quality of decisions, facilitation of innovations, and structural changes) can enhance the efficiency and effectiveness of the organization. External impacts (improved relationships with suppliers, customers, and business partners, and marketing the right products/services), on the other hand can lead to better competitive positioning.

Despite the contributions, our research has some limitations. First, our research is exploratory in nature and we have not proposed any hypothesis to confirm causal relationships. Second, the data was collected over a long period of time and there could be some lag effects of CIT assimilation in the study regions. Third, a single respondent was used to collect data in each organization. While we made every effort to reach the respondent most knowledgeable about CIT assimilation in each organization, our survey could have been misdirected. Never-the-less, our study furthers research on CIT assimilation and their impacts in Australia and the US.

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9
Market Mechanisms
and Their Users

First-price package auctions
in a principal-agent environment

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Abstract. We analyze multi-object markets where bidders are firms and there is a principal-agent relationship within the firm with the bidding team as the agent. The agent wants to win the most valuable package but does not take payments into account in his utility function. However, his bids are constrained by an allowance set by his principal. We will first derive equilibrium strategies of agents in first-price sealed-bid package auctions with two units and two bidders. For this, we investigate markets where bidders have overall allowances for one and two units, and use the results to rationalize markets where bidders get different budgets for the two packages. Interestingly, not bidding on a single unit is the unique and non-truthful ex post equilibrium for the agent when facing an overall allowance. The principal can enforce bidding on one unit only by the use of a distinct allowance for one unit that exceeds the allowance for two units.

Keywords: Auctions, Principal-Agent Relationships, Equilibrium Analysis.

1 Introduction

Auction theory is traditionally based on the assumption of quasi-linear utility functions. This simply means that bidders want to maximize their payoff as the difference between their valuation and the price they have to pay. In many markets, this utility model might not be appropriate and as a consequence equilibrium strategies are quite different.

In this paper, we focus on multi-object markets where bidders are firms and there is a principal-agent relationship within the firm with the manager representing the bidding team (agent). The agent receives a *budget*, this means an *allowance* to bid up to a certain amount of money, from the board of directors (the principal), representing the shareholders, to win in the auction. The principal wants to maximize expected profit, while the agent wants to win the most valuable package as the budget is provided by the principal. Empire building motives are a wide-spread reason for such behavior of agents in the principal-agent literature [1].

1.1 Motivation

In spectrum auctions, national telecoms have distinguished preferences for different packages of spectrum licenses based on the corresponding net present values of business cases. These billion dollar net present values may exceed the financial capabilities of the local telecom by far, but not those of its stakeholder, a multinational. Thus, the stakeholder provides the local telecom with allowances for individual packages based on the underlying net present value.

It is well-known by practitioners that there often is a principal-agent relationship between the board of the firm and the bidding team [2]. Both parties determine the valuations of different allocations and the principal then sets allowances based on these valuations, which describe how high the agent can bid in order to win a package. Shapiro, Holtz-Eakin and Bazelon [2] argue that such pre-determined budgets have to do with capital rationing [3]. For agents, these allowances are like sunk costs but they have preferences for the packages. As a consequence, they do not maximize profit but try to win one of the most valuable packages.

Unfortunately, there are no simple means to align incentives of the principal and the agent in these auctions. Profit-sharing is often suggested in the principal-agent literature. However, net present values determined at the time of the auction are only an estimate of the real values of packages realized many years later, and even then it is almost impossible to determine the impact of a particular spectrum allocation on the overall profit of the firm. It is also impossible for the principal to control or discuss every decision of the agent during the auction. The agent has to live with the outcome and therefore he bids in the auction.

Engelbrecht-Wiggans [4] argued that such principal-agent relationships can also be observed in sales of mineral leases, defense systems, and construction contracts. For example, in bidding for mineral leases, the principal ''may wish to maximize expected profits while its bidder feels it should maximize the firm's proven reserves.'' The basic organizational structure of our model is actually wide-spread when firms participate in auctions.

1.2 Contributions

It has been shown that truthful dominant-strategy mechanisms are impossible in this environment independent of the number of items or bidders [5]. There might always be a possibility to shade the allowance for one package in order to raise the chances of winning a higher valued package. In this paper, we will analyze the equilibrium strategies of agents in a simple first-price sealed-bid package auction with two units and two bidders (aka. the 2×2 auction). We investigate bidders with overall allowances for one and two units first, in order to subsequently rationalize the assignment of different budgets for the two packages. This rationalization can then serve as managerial advice for practitioners on setting optimal allowances in order to incentive align principals and agents.

We show that not bidding on a single unit is the unique and non-truthful ex post equilibrium for the agent when facing an overall allowance. The principal can enforce bidding on one unit only by the use of a distinct allowance for one unit that exceeds the allowance

for two units. Due to space constraints, we will only provide an outlook on the equilibrium strategies of the principals and conclude with some remarks on larger markets.

2 The Model

In our model we consider 2 ex-ante symmetric firms $i, j \in I = \{1,2\}$ competing in a first-price sealed-bid package auction for 2 units of a homogeneous good $l \in L = \{1,2\}$, which we denote by 2×2 auction. Each firm i faces cardinal ex-interim net present package values $v_i(l) \in V \subseteq \Re \ \forall \ l \in L$, where $v_i(l)$ is the net present value of firm i for the bundle of l units. The vector $v_i = [v_i(1), v_i(2)] \in \Re^2$ contains the net present value draws for the two packages of any firm i. We assume net present values that are strictly monotone increasing in the number of units for a firm i: $v_i(1) < v_i(2)$. The values are normalized with $v_i(0) = 0 \ \forall \ i \in I$.

Given the standard symmetry assumption, each firm i's vector of valuation draws v_i is a priori distributed according to the same monotone increasing joint cumulative distribution function $F(v) : \Re^2 \rightarrow \Re$. The corresponding monotone increasing marginal distribution functions $F_1(v(1))$ and $F_2(v(1))$ have support of $[\underline{v}(1), \bar{v}(1)]$ with $\underline{v}(1) < \bar{v}(1)$ and $[\underline{v}(2), \bar{v}(2)]$ with $\underline{v}(2) < \bar{v}(2)$ respectively. The relationship between the different supports is $\bar{v}(2) < \bar{v}(2)$ and $\underline{v}(1) < \underline{v}(2)$.

Each firm consists of a principal-agent pairing, in which the principal provides the manager with monetary allowance(s) for spending at the auction. An agent bids in the auction on behalf of the principal. The net present values of the packages are common knowledge among principal and agent within each firm, but private information between different firms. The corresponding probability distributions are ex-ante common knowledge within and between companies.

Let agent i's bid on a bundle of l units be denoted by $\beta_i(l) \in \Re \ \forall \ l \in L$, which results in a vector of package bids $\beta_i = [\beta_i(1), \beta_i(2)] = \Re^2$. We will refer to the best responses of opponent j as best bids β_j. In our model illustrated in Fig. 1, the principal wants to maximize expected profit $\pi_i(l) = v_i(l) - \beta_i(l)$ of any package of l units and sets respective allowances of $\alpha_i(v_i(l))$ to discipline the agent, where $\alpha_i : \Re \rightarrow \Re$ is a monotone increasing function in package values $v_i(l)$.

The agent has ordinal preferences $(\succcurlyeq_i)$ over both packages, reflecting the valuations $v_i(l)$, such that the more valuable package is preferred.[1] We assume the axioms by Von Neumann and Morgenstern [6] (VNM) to hold for agents such that we can describe their preferences by a VNM utility function, $u_i(l) = w_i(v_i(l)) \ \forall \ \beta_i(l) \leq \alpha_i(l)$, where $w_i : \Re \rightarrow \Re$ is some monotone increasing function in package values $v_i(l)$. The agent independently decides on the amount of money bid on each package. As long as the bid for a bundle of l units is weakly lower than his respective monetary allowance of $\alpha_i(l)$ he obtains utility of $w_i(v_i(l))$. For agent i any allocation with $\beta_i(l) > \alpha_i(l)$ is an unacceptable outcome. For example, he might get fired if payments exceed the allowance.

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[1] There might also be a disagreement on the ranking of packages between the principal and the agent. We restrict our attention to environments, where both parties agree, which is a mild assumption in a multi-unit auction with free disposal.
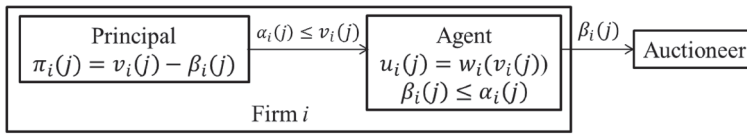
Fig. 1. Illustration of a model with a firm bidding in an auction.

Note, the agent does not consider the payments, because it is the principal's money and any budget not invested in this auction would go into some other investments of the principal, not relevant to the agent. For example, residual budget might be spent in another country or another subsidiary.

The assumption of ex-ante *symmetric* firms implies all principals to use the same allowance function $\alpha(\cdot)$ and all agents to face an identical value maximizing motive $w(\cdot)$, which is common knowledge within and between firms.

This environment can be modeled as a dynamic game of incomplete information consisting of two separate stages. First, nature determines every firm i's vector of cardinal net present package valuation draws v_i. In *stage 1* each principal decides on an allowance $\alpha(l) \leq v_i(l)$ with which to provide his agent. In *stage 2* agents compete against each other and decide on a bid $\beta_i(l) \leq \alpha(l)$ in the auction. The risk-neutral auctioneer selects the revenue maximizing set of packages, where each firm can win at most one package from its two package bids. The auctioneer has a reservation price of zero for the items.

We can apply backward induction starting at the second stage and then continue with the first in order to find all Perfect Bayesian Nash Equilibria of this game. In this paper, we only focus on the strategies of agents and simply give an outlook on the equilibrium strategies of the principals without explicitly modeling their profit-maximizing functions.

We will first analyze environments, where the principal can solely set an overall allowance i.e. a single monetary number for both packages. We assume this overall allowance $\alpha(v_i(2))$ to be a non-decreasing function in the net present value of winning the bundle of 2 units.[2] As any bidder can win one package at most it is reasonable to assume an optimal overall allowance to be a function of the greatest obtainable net present bundle value in the auction. The higher this value, the more money in total the principal is willing to provide his agent, because the greater are the possible gains of winning the biggest bundle.

The overall allowance permits the agent to bid up to the same amount of money on both packages of the 2×2 auction simultaneously. The implications of this overall allowance then enable us to rationalize independent allowances for the two different packages in order to align the incentives of the agent with those of the principal.

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[2] The overall allowance could also be modeled as a further random variable a. The same approach as in section 3 applies, but with different results depending on the specific realization. This model, however, would imply asymmetries between principal and agent of the form mentioned in footnote 1. Moreover, the analysis in section 4 would not be possible.

3 Equilibrium Strategies of Agents

We will first make two useful observations.

Lemma 1: *It is a weakly dominant action for any agent i to submit his overall allowance on the two-unit bundle in the principal-agent first-price sealed-bid package auction model with an overall allowance: $\beta_i(2) = \alpha(v_i(2))$.*

Proof: For opponent j's fixed best bids β_j, suppose agent i bids strictly less than his overall allowance on the bundle of 2 units. Increasing his bid to $\beta_i(2) = \alpha(v_i(2))$ does not reduce his payoff; he still obtains utility of $w(v_i(2))$ when winning. However, this action strictly raises the probability of winning the respective bundle, which comes at the opportunity cost of proportionately lowering the chances to win the one-unit package. Since we assume strictly increasing values $v_i(2) > v_i(1)$ and agent i's utility function $w(\cdot)$ to be some monotone increasing function in the net present package value $v_i(l)$, the smaller package offers less utility than the larger package. Hence, the benefits of a higher bid on the greatest package do outweigh the costs. Submitting a bid in excess of his overall allowance on the two-unit package cannot be optimal for any agent as it would be an unacceptable outcome in case of winning. **QED.**

Lemma 2: *Any agent i's optimal bid on the one-unit package must be either zero or equal to the overall allowance in the principal-agent first-price sealed-bid package auction model with an overall allowance: $\beta_i(1) \in \{0, \alpha(v_i(2))\}$.*

Proof: Any single-unit bid of agent i, $\beta_i(1)$, from the range of $(0, \alpha(v_i(2))]$ does not affect payoff when winning the one-unit bundle; he receives utility of $w(v_i(1))$. Given his opponent j's fixed best bids β_j, a bid of $\beta_i(1) = \alpha(v_i(2))$, however, maximizes the probability of coordinating on the small bundle and thereby minimizes the chances of winning the two-unit package. Moreover, a bid of $\beta_i(1) = 0$ cancels the possibility to win the respective package and maximizes the chances of winning the two-unit package. If the small package is preferred, a bid of $\beta_i(1) = \alpha(v_i(2))$ is a weakly dominant action. If it is not preferred, the bid $\beta_i(l) = 0$ is a best response. Any bid from within the range of $(0, \alpha(v_i(2)))$ neither maximizes nor minimizes the chances of obtaining the one-unit package and therefore cannot be optimal. Again, any bid greater than the overall allowance is an unacceptable outcome. **QED.**

Before deriving the equilibrium bidding strategy of the second stage, some further notation is needed. From firm i's point of view, opponent j's values correspond to an unknown vector of random variables $\tilde{v}_j = [\tilde{v}_j(1), \tilde{v}_j(2)] \in \Re^2$ and his overall allowance is denoted by the random variable $\alpha(\tilde{v}_j(2))$. The 2×2 auction then gives rise to the following proposition.

Proposition 1: *It is the unique symmetric ex-post equilibrium for any agent i to always submit a vector of bids $\beta_i = [0, \alpha(v_i(2))]$ in the second stage of the principal agent first-price sealed-bid 2×2 package auction model with an overall allowance.*

Proof: According to Lemma 1, agent i's optimal bid on the package of both units is $\beta_i(2) = \alpha(v_i(2))$ and by Lemma 2 he has to choose from $\beta_i(1) \in \{0, \alpha(v_i(2))\}$. Analogue, for opponent j it must be true that $\beta_j(2) = \alpha(\widetilde{v}_j(2))$ and $\beta_j(1) \in \{0, \alpha[\widetilde{v}_j(2)]\}$. These findings enable us to construct the following payoff matrix for agent i in **Table 1**, in order to determine his optimal choice of $\beta_i(1)$:

Table 1. Payoff matrix for agent i in 2×2 package auction with overall allowance.

Payoff matrix for bidder i		opponent j	
		$\beta_j(1) = \alpha(\widetilde{v}_j(2))$	$\beta_j(1) = 0$
bidder i	$\beta_i(1) = \alpha(v_i(2))$	$w(v_i(1))$	$w(v_i(2)) \cdot F_2(v_i(2))$
	$\beta_i(1) = 0$	$w(v_i(2)) \cdot F_2(v_i(2))$	$w(v_i(2)) \cdot F_2(v_i(2))$

If both agents submit bids in height of their respective overall allowances for one unit, each wins a single unit, and bidder i obtains utility of $w(v_i(1))$ with certainty. The sum of both agents' overall allowances exceeds each agent's overall allowance and thus their respective bids on the package of two units. For all other bid combinations where at least one of both agents does not bid on the package of one unit, the sum of both agents' single-unit bids cannot exceed both agents' bids on the bundle of two units (their respective overall allowances). Thus, only the agents' bids on two units compete against each other.[3] Agent i receives utility of $w(v_i(2))$ only if his allowance exceeds opponent j's allowance, $\alpha(v_i(2)) > \alpha(\widetilde{v}_j(2))$ i.e. $v_i(2) > \widetilde{v}_j(2)$, which occurs with probability of $F_2(v_i(2))$.

Suppose opponent j randomizes for his bid on the single unit between the elements of $\{0, \alpha(\widetilde{v}_j(2))\}$ with fixed probabilities. Using **Table 1**, agent i's expected utility of bidding his overall allowance on one unit exceeds the expected utility of not bidding on one unit iff the following inequality (**I**) holds:

$$w(v_i(1)) \geq w(v_i(2)) \cdot F_2(v_i(2)) \tag{I}$$

However, suppose $v_i(2) = \overline{v}(2)$, then inequality (**I**) reverses to $w(v_i(1) < w(\overline{v}(2)) \; \forall \; v_i(1) \in [\underline{v}(1), \overline{v}(1)]$, because $F_2(\overline{v}(2)) = 1$ and $\overline{v}(1) < \overline{v}(2)$. As the product of $w(\cdot)$ and $F_2(\cdot)$ is monotone increasing in net present package value by assumption, inequality (**I**) cannot hold for any two-unit package value of $v_i(2) \in (\dot{v}(2), \overline{v}(2)]$, where $\dot{v}(2)$ is defined by $w(\overline{v}(1)) = w(\dot{v}(2)) \cdot F_2(\dot{v}(2))$. Any agent i with value for two units of $v_i(2) > \dot{v}(2)$ will never bid on one unit.

Similarly, opponent j can only bid his overall allowance on one unit, if he has a valuation of $\widetilde{v}_j(2) \leq \dot{v}(2)$. Adjusting agent i's beliefs in **Table 1** accordingly, his expected utility of bidding his overall allowance exceeds the expected utility of not bidding on one unit iff inequality (**I'**) is true, where the probability of agent i winning is now conditioned on opponent j having a value of $\widetilde{v}_j(2) \leq \dot{v}(2)$:

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[3] We implicitly assume any agent to bid at most marginally below his overall allowance on one unit. Otherwise his single-unit bid would compete with his two-unit bid even if the opponent does not bid on one unit. Note that this assumption does not alter any results.

$$w(v_i(1)) \geq w(v_i(2)) \cdot F_2(v_i(2)|\widetilde{v}_j(2) \leq \dot{v}(2)) \tag{I'}$$

Assume agent i to have package value for two units of $v_i(2) = \dot{v}(2)$ as defined above and some corresponding valuation for one unit of $\dot{v}(1)$. Then, inequality (**I'**) becomes $w(\dot{v}(1)) \geq w(\dot{v}(2))$, because $F_2(\dot{v}(2)|\widetilde{v}_j(2) \leq \dot{v}(2)) = 1$, which again contradicts the assumption of strictly monotone increasing net present values in the number of units $\dot{v}(1) < \dot{v}(2)$. As this reasoning is true for any value $\dot{v}(2) \in [\underline{v}(2), \widetilde{v}(2)]$, full shading on one unit is optimal for any vector of valuations v_i.

Note that in this equilibrium no agent i would want to deviate from his equilibrium strategy $\beta_i = [0, \alpha(v_i(2))]$ even if he knew the opponent's type. Therefore, the proposed equilibrium strategy constitutes the unique ex-post equilibrium of this first-price sealed-bid 2×2 package auction with agents facing an overall allowance. **QED.**

Intuitively, any agent i's opponent would only be willing to coordinate on one unit if his overall allowance was low. In this case, it would be a best response for bidder i not to coordinate, but try to win the package of both units independent of both agents' actual values and allowances. This result is robust to any risk aversion of the agents.

Corollary 1: *Proposition 1 implies agent i not to bid on one unit if receiving a lower allowance than for two units.*

Proof: An agent does not bid on the single unit when able to spend the overall allowance. Therefore, he will not do so if facing a tighter monetary restriction. **QED.**

4 Outlook on Equilibrium Strategies of Principals

As an obvious implication of Proposition 1, an agent can be coordinated on bidding for two units only, by simply assigning him an overall allowance, if the opponent faces the same allowance scheme. In Proposition 2 we now analyze how a principal can redirect his agent on bidding for one unit too. Note before, that any principal i can provide his agent with an arbitrary amount of money $\hat{\alpha}(v_i(l))$ for the package of l units by defining a proxy net present value $\hat{v}_i(l) \in [\underline{v}(l), \overline{v}(l)]$ and assigning a respective allowance of $\alpha(\hat{v}_i(l))$ such that $\alpha(\hat{v}_i(l)) = \hat{\alpha}(v_i(l))$. Remember, $\alpha: \Re \rightarrow \Re$ is a monotone increasing function in its argument.

Proposition 2: *Given the opposing agent j bids $\beta_j = [0, \alpha(\widetilde{v}_j(2))]$, any principal i can direct his agent to bid on both packages in the principal-agent first-price sealed-bid **2 × 2** package auction model by assigning him different allowances of the form $\alpha(\hat{v}_i(2)) < \alpha(v_i(1))$ for two and one unit respectively, where $\hat{v}_i(2)$ is defined by the following inequality (**II**):*

$$w(v_i(1)) \cdot F_2(v_i(1)) \geq w(v_i(2)) \cdot F_2(\hat{v}_i(2)) \tag{II}$$

Proof: Given Corollary 1, the allowance for one unit must exceed the double-unit budget to direct an agent on bidding for the former. Suppose, principal i chooses a single-unit allowance in excess of the two-unit allowance $\alpha(v_i(2))$. This is not optimal, because $v_i(1) < v_i(2)$ is true for any firm i and implies an optimal single-unit package allowance of $\alpha(v_i(1)) < \alpha(v_i(2))$.

Remember from Lemma 1, that any agent will spend his entire double-unit allowance. Hence, agent i can only be coordinated on bidding for the single unit too if his two-unit allowance is reduced below optimum to $\alpha(\hat{v}_i(2)) < \alpha(v_i(1))$ by choosing a corresponding two-unit proxy value $\hat{v}_i(2) < v_i(1)$ satisfying inequality (**II**). As opponent j bids $\beta_j = [0, \alpha(\widetilde{v}_j(2))]$, the inequality ensures agent i's expected payoff from winning one unit with his single-unit allowance $\alpha(v_i(1)) > \alpha(\widetilde{v}_j(2))$ to exceed the expected payoff of winning two units with his reduced double-unit allowance $\alpha(\hat{v}_i(2)) > \alpha(\hat{v}_j(2))$ and not bidding on one unit. **QED.**

As an immediate consequence of Proposition 2, the principal can direct his agent to submit solely one bid on the single-unit package by simply providing him with no allowance for two units at all and with an optimal one-unit package allowance of $\alpha(v_i(1))$. Note that agent i does not actually try to coordinate with his opponent, but bids on the single unit, because this maximizes the chances of beating his adversary, who is only interested in two units. Be aware that Proposition 2 assumes opponent j to bid nothing on one unit and his overall allowance on two units. This might not be his best response if he knows that principal i tries to direct his agent on cooperation. Indeed, in this setting coordination by both firms on one unit each is possible.

5   Conclusions

The results in this paper show that agents with overall allowances in the 2×2 market would never coordinate on an allocation with two single-unit winners. Interestingly, principals can only redirect their agents by assigning a higher respective allowance than for the two-unit package, which comes at the cost of providing a double-unit allowance that is below optimum. Moreover, our ongoing research on larger markets with 3 firms and 2 units, for example, indicates that bidding on one unit too can be part of an equilibrium strategy for agents, even if both face overall allowances. Given this coordination, the truthful reporting of optimal package-dependent allowances might be implementable. In this context we consider analyzing even larger multi-agent models with simulations to make predictions in more real-life markets. Future research will then also try to include the principals' profit-maximizing behavior into the model.

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Airbnb: How the characteristics of apartments drive the apartments' prices

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Abstract. Using a standard regression model, this paper examines how the characteristics of Airbnb apartments (e.g. distance to city center, room type, number of reviews, rating etc.) can be associated with the apartments' prices. The data contains all apartments from 86 major German cities. It is found that around 36% of the prices' variation is explained by the model. Some variables also significantly distinguish between each other in terms of how big their impact on the price is.

Keywords: Airbnb, Sharing Economy, peer-to-peer markets.

1 Introduction

The sharing of unused items, like accommodations and cars, in return for a fee has been significantly growing over the last few years [1]. Today's technology made it possible to reduce transaction costs and to collect more data about people and things and is thus making the so-called *Sharing Economy* extremely scalable. Rachel Botsman estimated the value of the peer-to-peer market to $26 billion [2] whereas Forbes approximated the annual revenue to $3.5 billion in 2013 [3].

By connecting more than a total of 25 million guests to their hosts in over 190 countries, Airbnb is the most well-known Sharing Economy company [4]. Founded in 2008 as a startup in San Francisco, it has grown significantly over the last seven years, making its annual number of bookings comparable to big hotel chains like InterContinental and Renaissance [5].

This paper addresses the research question how characteristics of Airbnb apartments (e.g. distance to city center, room type, number of reviews, rating etc.) affect the apartments' prices.

Since Airbnb is a quite emerging company, research on prices in peer accommodation is sparse. There exist, however, several recent attempts. [5, 6] for instance, assessed the impact of Airbnb on the hotel industry. [7, 8] identified the failure of Airbnb's reputation system. [9] explored the reasons for the failure of the reputation system. [10] examined the benefits and risks associated with using a service like Airbnb. [11] researched on how discrimination

affects the apartments' prices. [12] concluded in their research that hosts divert their reputation into the apartment's price and that hosts may set a price below the market price in order to choose their tenants from a wider pool. In his research, [13] provides an overview of the Sharing Economy in general.

The remainder of this paper is organized as follows. In Section 2, information about the dataset is given and the results are represented. In Section 3, the results are discussed.

2 Dataset and Results

The data has been obtained by using a web crawler that collected all the necessary information by reading every apartment's webpage. In total, the data contains the information of 17,019 apartments.

In a first analysis, the correlation between the price and the variables *Room Type*, *Guests*, *Center Distance*, *Rent Price* and *City Population* is calculated with a linear regression. Assuming that every host will find his equilibrium price after some bookings and to filter out non-active members, apartments with a number of reviews less than 3 have been sorted out. Consequently, the number of analyzed apartments was cut down to 8,674.

The apartment's price says how much renting the offered space costs per night in USD. The price is independent of the number of guests, meaning that whether or not one or more guests will stay in the apartment, the price remains the same.

The factorial variable *Room Type* takes 3 values: whole apartment, single room, and shared room, which are coded with the values 2, 1, and 0, respectively. The variable *Guests* states how many guests are maximally allowed to stay for the given price. *Center Distance* has been determined by obtaining the geo data of every apartment (as provided by Airbnb) and calculating the distance to the city center (as provided by Google Maps) in kilometers. The variable *Rent Price* shows how much renting one square meter costs in the apartment's city in EUR. *City Population* is given in millions.

The median of the price is 64 USD and the mean is 75.6 USD.

Table 1. Results of the linear regression with 8,674 apartments analyzed.

Variables	Coefficient	Standard Error	T-Value	Cohen's f
(Intercept)	−44.10***	2.32	−19.01	–
Room Type	26.50***	0.85	−31.37	0.1135
Guests	10.33***	0.26	40.17	0.1862
Center Distance	−4.45***	0.41	−10.99	0.0139
Rent Price	5.15***	0.16	32.76	0.1238
City Population	1.78***	0.33	5.46	0.0034
$R^2 = 0.3606$				

***: $p<.001$; **: $p<.01$; *: $p<.05$.

Using coordinates provided from Google Maps for the city centers might not be the very best fit to calculate *Center Distance*. Therefore, repeated regression analyses are carried out, varying both latitude and longitude in step sizes of 100 meters around the original city center as provided by Google Maps. Figure 1 illustrates the resulting R-squared values for selected cities (Berlin, Hamburg, Cologne, Munich).
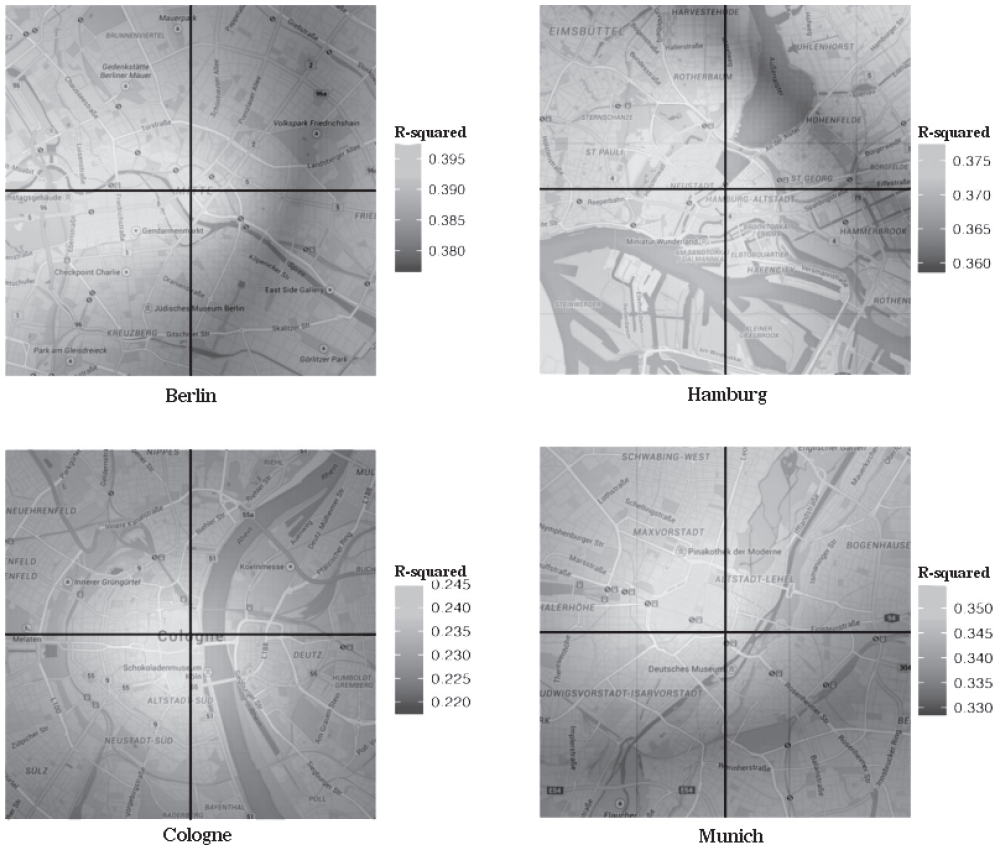
Fig. 1. R-squared values plotted for the cities Berlin, Hamburg, Cologne and Munich. The city centers (as provided by Google Maps) are located in the middle of the maps.

3 Discussion

With a coefficient of 26.5 the variable *Room Type* covers over 40% of the price median (64) and, therefore, has a significant impact on the price. The variable *Guests* with a coefficient of 10.33 also seems to affect the price substantially. Both variables can be interpreted as

a measurement for the size of the apartment, which would explain their great impact on the price. Apartments are located 2 kilometers away from the city center on average. With a coefficient of −4.45, the variable *Center Distance* therefore has a moderate but distinct impact on price. The coefficient of *Rent Price* states that if the city's rental price for one square meter is increasing by 1 EUR, the Airbnb apartments' prices will increase by 5.15 USD. For instance, the Airbnb price difference between Berlin (9.14 EUR/m^2) and Munich (15.61 EUR/m^2), resulting from general housing price levels, is thus 33.3 USD. With an increase of 1.78 USD per million city population, the variable *City Population* has a minor effect on the price.

Figure 1 shows that the city center coordinates as provided from Google Maps are located considerably close to the coordinates with the maximal R-squared and, consequently, fit very well for the calculation of *City Distance*.

Cohen's f value is being used to measure the effect size and therefore how well the particular variables explain the variation of the price. When comparing the Cohen's f values it is clear that the variables *Guests*, *Rent Price*, and *Room Type* have the biggest impact on the R-squared, whereas the variables *Center Distance* and *City Population* are relatively dispensable.

The R-squared is 0.3606, the *p*-value is less than 0.001 and $F_{5,8668} = 965.00$. As a conclusion it can be said that the model of this first analysis is, with its few variables, already well explanatory.

Future work in this paper will include variables that express, i) how the host is representing his apartment (e.g. number of pictures provided by the host, length of the description text), ii) how the host represents himself (e.g. host's response rate and time, verified ID), and iii) the quality of the apartment (e.g. rating, amenities).

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Whom to Trust? Assessing the Role of Profile Pictures on Sharing Economy Platforms

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Abstract. Trust in other users is one of the crucial factors in building and sustaining relationships on peer-to-peer markets and particularly in the Sharing Economy. Consequently, providers of Sharing Economy platforms focus on promoting trust by e.g. implementing reputation systems or user profiles. In order to better understand the impact of profile pictures on the perceived trustworthiness of user profiles, as well as booking intentions on Sharing Economy platforms, we propose and discuss a research model based on field data from Airbnb. We plan to test our model based on two separate online surveys in future research.

Keywords: C2C, booking intention, sharing economy, trust.

1 Introduction

In recent years a phenomenon often referred to as the "Sharing Economy" has experienced a rapid and strong growth. A new generation of peer-to-peer market platforms like Airbnb, Blablacar, Uber etc. report substantial increases in profits as well as in numbers of users and even challenge the traditional industries [1, 2].

The peer-to-peer platform Airbnb is a prime example for the success of Sharing Economy market platforms. Since its foundation in 2008 the platform has mediated more than 25 million overnight stays all over the world [3] and is estimated to be worth about $13 billion [4]. However, recent publications in media and science sup-port the supposition that Sharing Economy offers are not yet attracting the full potential customer base worldwide [2, 5].

Trust is one of the most crucial factors for the success of an e-commerce platform and therefore plays a key role in research on e-commerce (see e.g. [6] and [7], or [8], [9] and [10] in a C2C context). Consequently many peer-to-peer Sharing Economy platforms providers have already established means of increasing trust towards their platforms. Insurances and professional support, but also safety notices are often pro-vided for both customers and providers to overcome initial concerns of potential users. As on peer-to peer market platforms trust not only towards the platform, but also towards the individual transaction partner needs

to be established [11] (especially in the context of overnight stays) [12], user profiles with different verification concepts and rating systems (i.e. reputation systems) as well as means of communication are also usually implemented. The role of reputation systems, profile pictures, and the interaction of both have already been investigated in a general as well as peer-to peer e-commerce context and in experimental settings in the context of online gift giving [13–19]. However, the actual role and impact of profile pictures on Sharing Economy platforms in the field and especially the resulting implications on booking intentions have not been investigated so far. In order to shed light on how trust is formed during booking decisions on a Sharing Economy platform, and if those decisions can be predicted by the trustworthiness of a profile picture, we plan to conduct an experimental online survey based on profile data from Airbnb Germany. In particular, we propose the following research question (RQ):

RQ: How does the trustworthiness of profile pictures and names on Sharing Economy platforms influence the perceived trustworthiness of user profiles and also the booking intention?

The remainder of this short paper is structured as follows: In Section 2 we intro-duce our research model and hypothesis. Furthermore we present a brief summary of related literature. Section 3 comprises the current preliminary description of our experimental design. Finally, in Section 4 we discuss our expectations regarding the contribution of our study and give a short outlook of our future research.

2   Research Model and Related Literature

Based on the literature presented in the introduction section, we derived the following research model (see Fig. 1.). Our model focuses on the perceived trustworthiness of user profiles, the trustworthiness of corresponding profile pictures and names, and the influences on the booking intentions towards the respective offer on Airbnb.
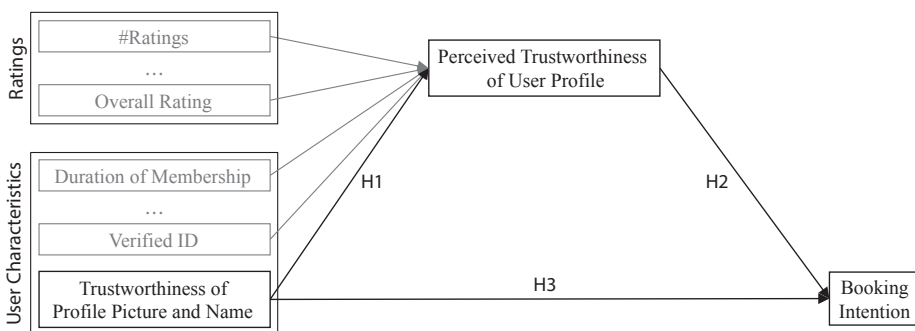
Fig. 1. Research Model.

Furthermore we consider a set of existing ratings and user characteristic variables in our model, which correspond to the information users would be able to collect from the Airbnb website (depicted in grey).

Previous studies have shown that the mere presence of profile pictures and names can be beneficial regarding the formation of trust and reciprocity based exchange in an experimental market, and also that the presence of names that are regarded as likable or trustworthy in another context can influence trusting behavior [16, 20]. Furthermore the influence of seller photos and reputation scores on trusting and purchasing behavior has been demonstrated in a standard trust game [15]. Consequently we expect the trustworthiness of profile pictures and names to positively influence the perceived trustworthiness of user profiles in our setting.

H1: *The trustworthiness of profile picture and name has a positive influence on the perceived trustworthiness of the user profile.*

As described in the introduction, trust plays a key role in e-commerce regarding the formation of users purchasing or booking intentions and attitudes. This has be shown not only in the context of traditional e-commerce [7] but also in studies that focused on C2C market settings [9, 11, 21]. In line with those findings we also hypothesize that the booking intention in our experimental setting is positively influenced by the perceived trustworthiness of the respective user profile.

H2: *The perceived trustworthiness of a user profile has a positive influence on the booking intention of other users.*

Derived from the influence of facial dynamics on the choice of interaction partners in situations with financial stakes [22] we furthermore expect a direct positive effect of the trustworthiness of profile pictures and names on users' booking intentions that occurs independent from the trustworthiness perception of the whole user profile.

H3: *The trustworthiness of profile picture and name has a positive influence on the on the booking intention of other users.*

In addition to the hypotheses that were subsequently presented, we also expect several additional effects resulting from the rating and user characteristics variables that were collected on Airbnb (depicted in grey). Other studies based on Airbnb data support that supposition [23–25]. Within the scope of this short paper however, we focus on the three main hypotheses **H1–H3**.

3   Experimental Design

As a basis for our study we chose a dataset of 88 offers from Airbnb Germany, including profile pictures and names as well as information about ratings and user characteristics. Our

sample comprises data from Airbnb offers in Berlin[4] which correspond to the following search criteria: Place – Berlin-Kreuzberg, Date – none, type of the room – private room, and price range – 41€–58€. From the resulting set of search results, we propose to consider the following attributes for each listing: the price for one night, the total number of text reviews, the total number and average value of overall reviews, the average rating of all existing rating categories (accuracy of description, communication, cleanliness, location and check-in), ID verification, response rate and time, and duration of membership. Furthermore, we plan to work with the provided profile pictures and names[5].

In two separate online surveys, we want to firstly determine the trustworthiness of profile pictures and names provided by different users and secondly determine the perceived trustworthiness of the profiles as well as the corresponding booking intentions. We plan to use ORSEE[6] [27] as a recruiting tool for participation. Consequently, we are able to realize a complete between-subjects design for our two surveys. We assume that participants from our pool are already inherently motivated to truthfully answer to our survey. However, we also plan to provide an incentive for truthful participation in the surveys, by raffling Airbnb overnight stays in Berlin. All participants will be informed about the fact that the winner's accommodation will be determined by her specification of booking intentions or perceived trustworthiness of profile picture and name, respectively.

Survey 1: In the first of our two surveys, a group of participants from our pool will be asked to rate profile pictures from our dataset that are labeled with the host's name with respect to their trustworthiness. After an introductory briefing and instruction about the survey, the participants will receive an overview of all profile pictures to be rated. Hereby we want to avoid anchoring as well as order effects and make sure that the participants are able to establish an overall personal ranking of the different pictures before evaluating each by itself. Afterwards, derived from the approach of [28], participants will be shown separate profile pictures and names in a randomized order, which they have to judge on a 7-point rating scale, running from 1 (extremely untrustworthy) to 7 (extremely trustworthy).

Survey 2: In the second survey, a different group of participants will be asked to judge the trustworthiness of a stylized Airbnb user profile, including picture, name and reputation scores, according to the same procedure as applied in survey 1. In addition to that, we will inquire the booking intention of the participants by three items adapted from [29]. Fig. 2. depicts an exemplary stylized Airbnb profile for survey 2.

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[4] Berlin is one of the cities with the highest number of overnight stays in accommodation facilities in Germany according to a study of the German Tourism Association [26]. Since we plan to raffle overnight stays in the target city of our study in order to incentivize participation, Berlin should consequently serve as an appropriate travel destination.

[5] Pictures of the offered rooms were also considered but were deliberately excluded from our experiment, in order to reduce complexity.

[6] ORSEE is an online recruitment system for economic experiments, which was introduced by Ben Greiner [27].
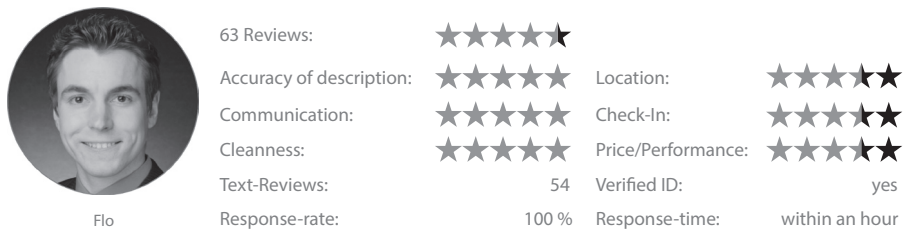
Fig. 2. Information Display in Survey 2.

4 Discussion and Outlook

We proposed a research model, which is designed in order to investigate the impact of the trustworthiness of profile pictures on the perceived trustworthiness of user profiles and booking intentions. Within our model we concentrate on three main hypothesis (H1–H3), which primarily focus on profile pictures labeled with names and will be tested based on the two presented online surveys. However, further information like pictures of offered rooms are available on Airbnb Germany. In line with recent research that focuses on field data in the context of B2C markets [30], we expect that pictures of C2C offers, such as rooms on Airbnb, also play a significant role regarding the formation of booking intentions in the Sharing Economy. In a first attempt we consciously eliminated the pictures of rooms from our surveys to reduce complexity. Nevertheless, we are aware of this abstraction and are planning to consider the potential influence of those pictures on booking intentions in future studies.

We furthermore plan to ask the participants of our surveys for specific background information (like forename, gender, age etc.). This data will be used for further analysis of our findings, e.g. for investigating possible cues to trust [31] that might occur between the person to rate and the rating person or for the identification of structural discrimination [24].

With our future work we want to contribute to a better understanding of the role of profile pictures and their impact on the perceived trustworthiness of profiles on Sharing Economy platforms. From an IS point of view, this might help Sharing Economy platform providers to promote trust between users, e.g. by offering profile picture guidelines or even evaluation services to their user base.

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Happy Birthday! Emotions and Cues to Trust on Consumer-to-consumer Market Platforms

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Abstract. Previous research indicates that emotions impact trust, a crucial factor for decision-making in C2C markets. While market engineers try to integrate heuristic cues to trust, such as pictures or user profiles, in order to increase initial trust in market participants, the effect of independent (i.e. seemingly irrational) cues to trust on the emotional state of market participants has hardly been taken into account. In the current research, we derive a research model, wherein the relations between cues to trust, trust, emotions, and purchasing intentions are investigated. Hence, it serves as a foundation for future examination of the emergence of emotions and their impact on trust and decision behavior in C2C markets.

Keywords: Emotion, Trust, C2C Market, Decision Making.

1 Introduction

Trust is a crucial factor for interaction on Consumer-to-consumer (C2C) market platforms like Couchsurfing, Carpooling or Airbnb [1]. Individual purchasing intentions on C2C platforms are influenced by trust in the website or vendor and by trust in the members of the respective virtual community [2]. In addition to the three trust antecedents in business-to-consumer (B2C) e-commerce, namely knowledge-based, institution-based and calculative-based trust [3], interaction on C2C platforms is based on initial trust [4] as well. Due to the high number of private vendors on a C2C market, purchasing interactions might often occur without prior experience with the respective interaction partner and therefore will also be based on disposition to trust or specific cues [4]. Complementary to a transfer- and performance-based cue approach [5], such cues might be heuristic and even subconscious predictors of trustworthiness (e.g. interest similarity [9], resemblance, gaze cues and other facial cues [6–8]) or even independent and seemingly irrational cues, such as names of either trusted or liked people [9]. Here, we define *independent cues* as information that is completely independent from and has no logical connection to the actual decision problem, whether another person

is trustworthy or not. Independent cues might arouse incidental emotion [10], which in turn can influence trusting behavior [11].

Within the scope of this extended abstract we will discuss possible influences of independent (i.e. seemingly irrational) cues to trust on emotions and purchasing or booking intentions on C2C market platforms.

2 Research Model and Related Literature

We outline our research model (Figure 1), which builds on the constructs of (i) independent cues to trust, (ii) initial trust, (iii) emotions, and (iv) purchasing intention.

Independent cues often play a central role in human decision making. One example for such independent cues is a person's name. A name, which is given to a person at the date of birth, cannot contain any reasonable information about the person's trustworthiness. However, people tend to trust others with names of either trusted or liked people significantly more [9]. Other examples for such cues might be the conformance of others' birthdays, either with birthdays of trusted and liked people or with the own date of birth, the conformance of star signs etc. *Hence, we introduced A, the influence of independent cues on initial trust in our research model.*

Previous research (e.g. [11, 12]) showed that trust is influenced by the emotional state of a market participant. While emotions with positive valence, such as happiness or gratitude, increase trust, negative emotions, like anger, led to a decrease in the level of trust [11]. In other words, a happy market participant might have a higher level of initial trust towards other participants, than one who is shaking with anger. *We incorporated the described relation between emotion and initial trust in our research model through B.*

On many C2C platforms, purchasing decisions that require a high amount of trust towards the provider of the respective offer (e.g. in the context of C2C ridesharing or hospitality exchange) have to be made based on a small amount of information and particularly without previous experiences with the provider [1]. Consequently users often have to rely on initial trust while developing their purchase intention. *The influence of initial trust on the purchase intention is included in our research model in the relation C.*

According to the somatic marker hypotheses by [13], emotions play an important role in the decision-making process. This view on emotions and economic decision behavior, such as purchasing or bidding behavior, is widely acknowledged among economists [14–17]. *Therefore we included D, the influence of emotions on the purchasing intention in our research model.*

Emotions are caused by emotion eliciting stimuli within the environment [18, 19]. We assume that in a C2C market, independent cues to trust, such as information about the birthday or the name of another member, can be such emotion eliciting stimuli. An independent cue to trust, like discovering that oneself and the trading partner are born on the same day, might result in an emotion with positive valence. Based on this assumption we derive our research hypotheses:

H: Within a C2C market independent cues to trust can arouse or influence emotions.
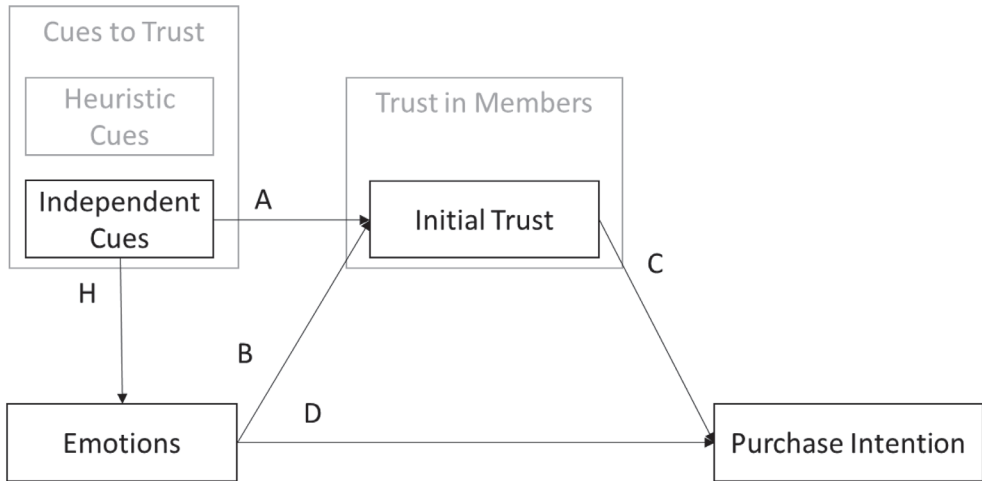
Fig. 1. Research model.

3   Discussion and Future Research

We herewith propose a model to examine the influence of independent cues on trust forma-tion, in the context of C2C markets. In order to verify the hypothesis, a controlled laboratory experiment could be designed, with a play C2C market like implemented by [20, 21]. Using recruitment tools such as ORSEE [22], participants with specific characteristics (of the same age, studying the same course, born in the same month, and if possible, born on the same day) could be invited. Based on the information available, subjects would then be exposed to two treatments, with and without independent cues, and matched with different people in a session, to observe whether there are differences in how trust is formed, and how it translates into purchasing intention. The difficulty in this approach lies in filtering and selecting participants beforehand, which might not be available for all registered participants. The alternative is to have a more flexible approach, by inviting participants without any criterion, but simulating artificial profiles in the lab. This artificial information will then be provided about the other consumer, to examine their impact on trust formation. While this method is more flexible in terms of the type of independent cues that can be tested, the obvious drawback is the real--world validity aspect – whether participants would react the same way as with real profile data. The merits and demerits of these approaches would hence have to be analyzed by means of pilot studies. Besides initial trust formation, independent cues might also be important components of partner loyalty, and long term C2C relationships, and further work needs to examine these relationships. We hence postulate that understanding and quantifying the influence of independent cues on trust is an important component to foster C2C markets, as well as in determining their stability.

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Leveraging the Potential of NeuroIS for Business Analytics

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Abstract. Recent technologies have helped transform data to meet customer expectations in unparalleled ways and to optimize business operations as well. Companies leverage business analytics for individualization of products and services, targeting customers, optimizing operational processes, and supporting financial and HR planning. Very often, data about customers and employees is involved. While data on employee and customer behavior can be obtained using techniques such as clickstream analysis, assessing specific metrics of the cognitive and affective state of the customer or employee, such as emotions or workload poses a challenge. Furthermore, business analytics software could benefit from live feedback of user--data in order to adapt to the user's current state, e.g. adapt the level of information. NeuroIS methodologies are indispensable in this context: to assess specific metrics of users, such as emotions, or workload levels while making a particular decision, while using a product or service, or while using business analytics software. In this paper we propose a framework to blend the potential of NeuroIS methodologies for enhancing existing Business Analytics methods.

Keywords: Business Analytics, Business Intelligence, NeuroIS.

1 Introduction

The growing importance of business analytics, and their subfields, such as business intelligence drew attention from information systems (IS) research and practitioners during the past years [1]. Subfields such as data warehousing, data visualization, classical statistics, data mining, mathematical optimization, and simulation applied in a business context have been subject to research for achieving competitive advantages, both from a technical and management perspective [2]. These tools and methods are turning to be vital to understand and

meet customer ends to an unparalleled degree, and hence staying competitive as a business provider.

However, little research on business analytics has been conducted in a user-centric approach, and in particular from a Neuro-Information-Systems (NeuroIS) perspective. Formally stated, NeuroIS leverages neuroscience and neurophysiological theories, methods, and tools in order to better understand the development, use, and impact of information technology [3]. NeuroIS complements traditional methods of IS research with data captured directly from the human body (such as brain activity, eye movements, heart rate, mouse pressure, pupil diameter, skin conductance response) and enables the measurement of human responses when they interact with IS [4, 5, 6].

In this paper, we present a conceptual framework that leverages the potential of NeuroIS tools, to enhance business analytical methods, in a coordinated manner. We hence propose a method to enhance user experience by supplementing existing business analytics methods with user-specific data, such as emotions, workload, or attention level. We also propose neuroadaptive systems for the decision-makers, who view a significant amount of data, causing potential information overload [7], and hence poorer decisions. Hence, by leveraging NeuroIS methods, we propose to adapt a system to the user abilities, based on the desired information level of the user. In order to achieve the above two, it is essential to test these settings in the lab, and hence we propose a laboratory and experimental integration of analytical methods and NeuroIS experiments. These three elements form the pillars of the framework, which is detailed in the next section, followed by conclusions and directions for future research.

2   A framework for Business Analytics with NeuroIS Methodologies

Figure 1 depicts the proposed conceptual framework for enhancing business analytics with NeuroIS methods. We identify three possible ways of integrating the potential of NeuroIS methods: First, NeuroIS data could be used to enhance analytics of individual and group data from customers and employees (Figure 1, 1). Second, NeuroIS data could provide live biofeedback to Business analytic systems in order to build user-adaptive BI and BAO systems, wherein the user of the BI system is the decision maker as well (Fig. 1, 2) [8]. Third, experimental setups should be implemented in order to understand the user interaction of BI and BAO systems and NeuroIS data (Fig. 1, 3). In the following, we explain the above three possibilities in further detail.
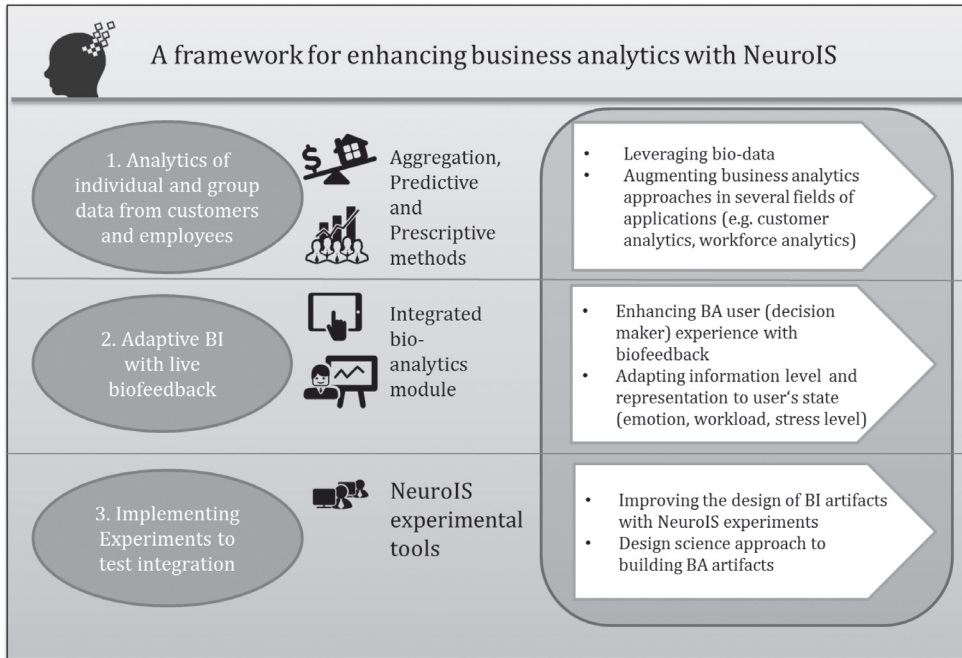
Fig. 1. A framework for enhancing business analytics with NeuroIS methodologies.

2.1 Analytics of Individual and Group Data

In 2011, it was shown that 58% of the companies interviewed in a study conducted by IBM [9] leverage Business Analytics to achieve competitive advantages. The importance of Business Analytics is still growing, as today companies utilize analytics throughout their organizations to enable better decision-making, drive faster actions and optimize outcomes [10]. Companies apply business analytics in several fields, such as managing customers, human resources, strategy, operations and finance [9]. Those different fields could be augmented through NeuroIS, by adding bio-data of customers or employees as features for analysis.

An example for an established field where NeuroIS is used in customer analytics is eye tracking of consumer advertising [11]. With the increase of devices that capture bio-data (e.g. Sony Smart-Band), companies will gain access to customer bio-data they can integrate into customer analytics. This will allow companies to better shape their offering according to the current customer situation (e.g. music service providers adapt the music to the current state of the customer, marketing campaigns adapt to the state of the customer, location based services recommend locations according to the location and the state of the customer). On the other hand, business analytics could not only benefit from bio-customer data but also from bio-data from employees. The area of workforce analytics could benefit from NeuroIS in order to make sure employees are in a good condition in order to maximize productivity. Especially in standardized working environments, such as call centers, analyzing employee

productivity and correlating the dataset with employee bio-data could help determining the right workload for each employee. Using these findings for call center routing could help improving call center productivity. On the other hand, even fields of applications that are less obvious could benefit from employee bio-data. Employee bio-data could support financial planning: Assessing the state of forecasters could help assessing a lack of objectivity which could support debiasing of corporate cash flow forecasts (c.f. [12]).

2.2   Adaptive Business Analytics with Live Biofeedback

In the context of trading, incorporating bio-signals in information systems has been proven to be beneficial to regulating specific states, such as emotions, by inducing effective emotion regulation methods, and enhancing decision-making [13]. Other biofeedback studies illustrate that it is possible to determine trader state, and provide live biofeedback, and hence supplement the existing information available to the trader [14]. Also, it is possible to adapt interfaces to desired user states, in order to obtain a specific user state, such as lesser information overload, or different methods of presenting analysis reports, such as dynamic graphs, trees, for instance These concepts could be vital to integrate in business analytics systems, wherein the analyst needs to pursue large amounts of data at the same time, and potentially make decisions in a limited amount of time, impacting a large number of customers with the click of a button [15]. As more and more business decisions are based on data (not only top management), middle-management and operational staff leverages tools to analyze data on their own, therefore a distinction between business analyst and decision-maker is questionable [2]. Today, data analysis is moving towards ad-hoc and real-time data exploration using sophisticated techniques, therefore adaptive systems are gaining in importance [16]. Hence, such crucial decisions of the decision-maker, or the analyst could be enhanced by providing decision support through live biofeedback of the current user state, before and during decision-making. If required, the interface could be adapted to present "thinner" information, or present the same information in different styles (e.g., from text to visual) based on the analyst's information overload levels. However, the impact of live-biofeedback on decisions, and adaption of interfaces is a point warranting further investigation, depending on the degree to which it can support decision-making for different types of users. Finally, based on the historical data of the analyst, it might also be possible to proactively predict decisions based on his/her biofeedback data, and hence avoid potentially hazardous decisions, by means of warnings [17, 18].

2.3   Integration of Business Analytics and NeuroIS through Experiments

Designing an analytical tool that supports decision-makers using the bio-signal data can be a challenging task [14, 19, and 20]. We propose that, in order to achieve the above two objectives, it is essential to understand the impact of bio-data on user state, and how exactly users (customer, or business analyst) perceive the bio-information. A possible approach is to design and develop business analytic systems with experimentation in the lab, hence enabling to

understand the impact of NeuroIS data on decisions. Specific constructs of decision-makers, such as information perception, attention levels, information overload levels, can be examined in controlled laboratory settings, to understand if decision performance of the analyst improves by the provision of bio-data. It might also be possible to simulate the accuracy with which customer's neuro- and bio-data supplements the analytics, and what optimization techniques are needed to improve operations. Depending on these needs, the interface can be designed iteratively to arrange large amounts of data, and using the right optimization algorithms, with a user-centric approach that facilitates ease-of-use, easy interpretation of, as well as access to customer information.

3 Conclusion and Future Work

We herewith propose a conceptual framework that could enhance customer satisfaction and create value by integrating NeuroIS methods in business analytical approaches. In addition, decision-making processes of analysts could be enhanced by biofeedback and neuroadaptive systems, thereby decreasing the occurrence of costly mistakes and losses due to subsequent operational and transaction costs. We also foresee that the integration of the user-centric analytic approach could increase customer trust in online businesses, since these enhanced intelligence tools take the customer's state and satisfaction with a particular product into account.

There are several limitations related to our proposed approach. Firstly, collecting bio-data in a reliable way at reasonable costs and acceptable comfort can pose a technical challenge for firms, particularly in the scenarios illustrated in section 2.1. Producing neuro sensors and devices that are user-friendly and low cost is therefore a key requirement. Secondly, user acceptance is required for combining NeuroIS with Business Analytics. Particularly when it comes to monitoring customer or employee bio-data, data protection and data privacy needs to be ensured. Lastly, the additional business value and return of investing into NeuroIS technologies in the context of Business Analytics is yet to be done.

In our future research, we will first conduct an extended literature review on the potential of NeuroIS for Business Analytics in order to identify white spots. We will then conduct interviews with managers and technicians of analytics-savvy companies in order to (1) understand the decision-making scope of analysts, and (2) assess the potential of the different white spots with regards to integrating customer's bio-data for business analytics. Lastly, we will prototypically implement an example application or experiment at the interface between Business Analytics and NeuroIS.

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Doctorial Consortium

Effects of Information Representation
on Cognitive Biases in an Auction Framework

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Abstract. This extended abstract gives an insight about my doctoral thesis concerning information representation effects on cognitive biases. The advancement of the Internet technology and increasing globalization effects resulted in different forms of procurement in the B2B level. Internet auctions offer a variety of choices in the auction design and completion. One aspect, which hasn't been researched, is the effect of information presentation format on bidding behavior in auctions. My doctoral project aims to investigate the effects of amount and presentation form of information on the bidders on a behavioral level.

Keywords: Auctions, cognitive biases, information representation.

1   Introduction

The increasing amount of Internet usage in business life combined with the different globalization benefits opens new possibilities in procurement strategies. As a preferred instrument, auctions also take place in this global electronic environment in various forms. Auction theory has been widely studied in the literature. Although revenue equivalence theorem states that the four main auction types, which are first and second price sealed bid, English and Dutch auctions, should deliver the same results [1], evidence from the experimental studies in the literature show that different auction types, result in different outcomes [2, 3, 4, 5]. This experimental evidence shows that the underlying rationality assumption in the auction theory, doesn't work in the exact manner as it was intended, since bidders are bounded rational [2].

Given the discrepancy between the theory and experimental results, it is interesting to investigate the reasons for the divergence. Experimental auction literature concentrates mainly on self- selection phenomena [e.g. 6] and bidding determinants [e.g. 7, 8]. Articles from these both strands concentrate mostly on bidding behaviors and amounts, however to my information there is no study conducted concerning the effect of information representation on bidding behavior that is given in the auction before the bidding process. This unstudied field will be the main focus of my dissertation project.

The term, bounded rationality has first come into play by Herbert Simon, where he based his definition of bounded rationality on the satisficing principle [9]. According to Simon the complicated part of the human decision making process' description was the two – way interpretation of the term bounded. On one hand the term bounded can be considered corresponding to the limitations in the environment (e.g. information costs). On the other hand the same term can also be interpreted in a corresponding way to cognitive limitations of humans [10]. Simon's arguments have found an active research field in the 1970's and 1980's by Daniel Kahneman and Amos Tversky. Their main argument was that the human decision--making process systematically departs from unbounded rationality. They showed that such differences result from the cognitive capability limitations [11].

In the later years dual process models gained significance in decision making studies. Even though components of the human mind are still an open discussion field [12], such models share a common specialty, namely two distinct modes of cognitive processing [13]. Cognitive biases are the mistakes between both processing modes.

As in all decision-making processes, cognitive biases keep their importance in terms of auctions. Such biases cause overbidding behaviors [16], misjudgments in winning probabilities [17, 18], false anticipations concerning regret [19, 20] and many more irrationalities.

2 Cognitive Biases

The cognitive biases that I want to concentrate are: framing/anchoring, overconfidence and winner's curse. However, if the latest can be considered as a pure cognitive bias is open to discussion. I will explain my motive for taking winner's curse among cognitive biases in the following part. The reasons, why the focus lies on the given list of biases are as follows:

Framing/Anchoring: Framing [21] and anchoring [22] are widely researched phenomena in psychology and negotiations. Kahneman and Tversky define the "decision frame" as the decision maker's conception of the acts, probabilities associated with a particular choice and outcomes. Framing is the alternative "decision frame" choice by an individual, when she is confronted with a decision situation. Alternative decision frame choice or in other words framing can be compared to alternative perspectives on a visual landscape [21]. Anchoring effect was first encountered during the experiments of Tversky and Kahneman [23]. Subjects of the experiment showed a bias towards overweighting irrelevant alternatives before the experiment[1]. On the other hand to my knowledge, framing and anchoring are recently beginning to be considered in electronic auctions context [24, 25, 26, 27]. Since in reversed electronic auctions a unified information source is often used, which is usually the buyer's information platform, seller's (and also in the mentioned context bidders) are prone to decision distortions based on these biases. One of the hypotheses is that with suitable text framing and a starting price framing and anchoring effects will be revealed in the bidding behavior.

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[1] In the experiment subjects were confronted with the task to estimate an exact number (e.g. percentage of African countries in the United Nations etc.). Subjects were assigned to a number between 1 and 100, which is determined by a random event (e.g. spin of a wheel). Subjects' final answers showed a bias towards the number they have given via random event.

Although anchoring effect has been researched in negotiations on a broad scope research shows that anchoring effect can manifest itself differently in an auction setting, since the underlying social setting is different [28]. On this basis including framing/anchoring in the current research question will be interesting.

Overconfidence: Overconfidence is defined as a distortion effect in the decision making process. Because of the wide usage of the overconfidence phenomenon in empirical works from different areas, overconfidence has 3 underlying sub-categories of definition being overestimation, overplacement (also mentioned as better – than –average bias in the literature) and overprecision [29]. Overestimation is judging one's actual abilities, winning chances, performance or level of control better than they really are [30]. Overplacement occurs, when individuals rate their abilities better than the median [31]. Overprecision exists, when an individual shows extreme certainty about her beliefs, narrowing her choice possibilities [32, 33]. Measuring overconfidence in this research project is interesting due to the non-diminishing nature of this bias. The reason why individuals don't seem to correct their overconfident behaviors is argued by the status enhancement theory. According to status--enhancement theory [34] overconfident individuals are "forgiven" by the other individuals justified by their social abilities in the group, because they are perceived as socially more competent individuals in comparison to the individuals, who were not overconfident[2]. Also Kennedy Anderson and Moore [34] find that; social punishment of the group is small even unjustified overconfidence is discovered by the other individuals. Because of this evidence overconfidence is not a bias, which is expected to be disappear over time and experience. Therefore with suitable information manipulation buyers may gain some advantages from overconfidence bias.

Winner's Curse: Winner's curse has originally been reported as systematic departures from rational behavior in the 1970's and 1980's in the bidding behavior of companies for oil and gas fields. However the first findings faced skeptical reactions of economists [35, 36]. It has been reported that on of the robust findings about bidding behavior is the mutual excessive bidding, which results in an expected loss after the auction terminates. This phenomenon is known as winner's curse [37]. In the literature there are two strands of work, which consider winner's curse phenomenon in a slightly different manner. In one strand, especially in the financial markets, winner's curse is reflected as an overshooting, leading to miscalculations from the ex ante information distribution [e.g. 38]. This interpretation suggests that winner's curse is not a result of an irrational behavior. In the experimental auction literature winner's curse is considered to be a failure in the Bayesian updating before bidding, leading to suboptimal bid choice [e.g. 37]. Since it is agued that the main reason for winner's curse is bounded rationality, I decided to consider it under the section for cognitive biases, because

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[2] The status-enhancement theory of overconfidence proposes that overconfidence saturates self--judgment by helping people to reach higher social status. Empirical work has found that highly confident individuals attained higher status regardless of whether their confidence was justified by actual ability. Even if the actual abilities, which were in reality lower, are manifested to the other people (e.g. colleagues, other decision makers, if there was a group decision setting) in the social group, being overconfident is not socially punished, so that it can motivate a change in the behavior [34]. Conclusively status enhancement theory proposes that being overconfident has only positive results for the individual.

if the origin of this interpretation, suggesting that the origin is the cognitive limitations of individuals. With the results of the experiments I expect to find out more about the existence or non – existence about a link and its magnitude between cognitive biases and winner's curse. It has shown in the experimental literature that winner's curse may become only with bidder's experience avoidable [39]. Judging from the experience point of view, it remains an interesting question after how much experience a diminishing effect of winner's curse will be observed. Another thrilling aspect is of course, whether winner's curse will also justified by the individuals (as it may on the overconfidence case) or will the subjects regret their previous behavior after revealing the loss they have made.

The main concentration point will be the manifestation of the above mentioned biases under different information representation settings and if there are any interaction leading to a diverging bidding behavior from the risk neutral Nash strategy. In the coming part methodological ideas to tackle the research question will be presented.

3 Methodology and Expected Results

Given the nature of the research interest I will prefer an experimental approach. Exact experimental design of the study is the active working area. The hypotheses of interest will be concerning auction duration and concerning information presentation for the above-mentioned cognitive biases.

An expected result concerning framing will be that the bidders, whose information is framed in a gain domain, are likely to stay longer in the auction. Interesting result will be, if bids from these individuals exceed risk neutral Nash strategy, when they are provided with information in the gain domain.

In negotiation setting anchoring behavior has resulted in a certain behavior that the subjects' offers move around the starting anchor. Concerning the evidence that this behavior may or may not replicate itself in auctions framework [28] keeps expected result's direction open.

Overconfidence results are expected to show themselves in accordance to auction experience, for which a control variable will be constructed in the experiment's design. Also under existence of anchoring, overconfidence is expected to be detected, since literature suggests anchoring as a cause of overconfidence. Existence of an interrelationship between anchoring and overconfidence will also make an empirical contribution, since my literature search could only find one article linking overconfidence with anchoring [40].

In the literature cause of the winner's curse is often stated as insufficient Bayesian updating [41] or overshooting [38]. Also in the experiments winner's curse effect is expected. However it is interesting, if the effects is going to be increase under the existence of above-mentioned cognitive biases or not will be the interesting question to answer. Also any effects between winner's curse and the given cognitive biases will be interesting from an interpretation point of view.

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Tactics in face-to-face negotiations in business-to-business settings

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Abstract. There is a gap in the literature regarding negotiation tactics as many scholars confuse negotiation tactics with negotiation style and/or negotiation strategy. This research proposal aims to provide a clear conceptualization about what negotiation tactics are and how various tactics contribute to the course and outcomes of face-to-face negotiations in business-to-business settings.

Keywords: Negotiation tactics, integrative tactics, distributive tactics, face-to-face negotiation, B2B settings.

1 Introduction

Negotiations are considered an important part of the company sales cycle [1] and, therefore, are essential for companies to succeed in today's business world. Companies require individual competence for successful face-to-face negotiations, which are strategically important for B2B commerce [2]. Typical managers in B2B settings spend up to 20 percent of their working day negotiating with partners [3] and the method and efficiency of these negotiations is of great importance for the effective use of time.

For companies to succeed in negotiations, they need to master both distributive and integrative negotiations, where distributive negotiations involve parties claiming value in order to get the best possible outcome for themselves [4] and integrative negotiations involve parties creating value where they are expanding the claiming value framework by adding more issues to the agreement [5], thus mutually benefitting both parties. To acquire the required skills, negotiators may reuse successful tactics from previous negotiations in order to be successful in future negotiations [6].

1.1 The Research Problem and Expected Outcome

There is a gap in the literature regarding what tactics are actually used in face-to-face negotiations in B2B commerce as most of the existing research has focused either on individual differences in choosing tactics, individual attributes [7], individual negotiation tactics [8, 9], or on individuals, usually students, in experimental settings.

The purpose of this research is to identify and evaluate the negotiation tactics used in face-to-face negotiations in B2B settings and to identify differences in tactic selection between negotiations with new or existing customers and how these tactics contribute to outcomes. The findings contribute to the B2B literature by shedding light on what role negotiation tactics play in the buyer-seller relationship and how tactics affect the business relationship over time. Furthermore, existing research on negotiation tactics has mostly used student samples and this has been identified as one of the limitations of these studies. The few exceptions are research made by Yiu et al [6] that uses industry data to research negotiators' confidence in their use of tactics to successfully negotiate desired outcomes and research by Malshe et al. [10] also using industry data investigating unethical negotiation tactics and opportunism and how they effect negotiators. B2C research on negotiations has been conducted by using industry data but none of it has focused directly on negotiation tactics as such. Therefore, there is a need to research actual face-to-face B2B negotiation tactics.

By researching companies across sectors and observing real-life negotiations between businesses, it is predicted that new tactics will also be discovered, which will ultimately contribute to the negotiation literature.

2   The Relevant State of the Art

Thompson [11] defines negotiation as a method of mutually reaching an agreement about issues or goals when it is clear that the goal will not be reached without collaboration with others. The ability to become a successful negotiator, regardless of whether agreement is reached or not, is usually not a talent people are born with. It is an ability that is learned [12] by gathering information, processing that information, matching it and estimating the results with regard to the requirements of a particular situation [11]. Many scholars argue for the importance of individual characteristics in negotiators and their behavior [13].

Business relationships are formed when at least two parties communicate [14] and through communication they generate an exchange of information [15], which formulates the underlying foundation for their business relationship [16]. B2B negotiations are key in industrial markets [17] and involve negotiating the price, delivery time, guaranteed warranties, force majeure, (which is a term used to describe uncontrollable forces such as natural disasters), quantity and quality, among other issues [18, 19]. Dwyer [20] found that when negotiation takes place between teams of two powerful negotiators, this generates more profit than if the same negotiators would negotiate one by one.

Scholars have found that negotiation success is improved through face-to-face communications in a buyer–seller context [21] as well as through flexibility and responsiveness [22]. Purdy and Nye [23] examined different types of communication between businesses and found that face-to-face communication is generally the most effective in terms of time consumption, outcome efficiency, and overall satisfaction between parties involved, and fosters long-term business relationships. Furthermore, face-to-face communication is also more likely to result in a collaborative relationship [23]. Hence, face-to-face negotiations are considered a core competence for businesses that wish to stay in business relationships [2]. Thus, it is important

to understand what behavioral factors, such as negotiation tactics, drive decision-making in face-to-face negotiations.

2.1 Culture

The role of culture cannot be overlooked when studying negotiation across cultures. Some cultures are known for tough negotiators (i.e., negotiators who make overblown first offers, few concessions, are emotional and very competitive), while others are known for softer negotiators (i.e., those who aim for win-win results and give too great concessions). The saying "When in Rome ...." can thus describe the situation when negotiators feel the urge to change their behavior to align with the culture in which they are negotiating [24].

Hofstede [25] found that there were indeed important cultural differences between countries and he introduced theories to explain these differences. Salacuse [26] identified ten areas where cultural differences might arise during the negotiation process and emphasized that knowledge within these areas is likely to be of a great advantage when doing business in different cultures.

Thus, it is important to take into account the cultural differences of negotiators when negotiating across cultures.

2.2 Clearer Conceptualization

The term negotiation tactic has been defined as a general set of behaviors, divided in two main types: (1) integrative, (2) distributive [27, 16, 9] and a third type that combines the first two, namely, (3) Equivocal [28].

Reviewing the literature on negotiation tactics, scholars are not always in agreement regarding whether they are talking about negotiation tactics or negotiation style and which behaviors or actions are applicable in different situations. In order to have a clear conceptualization about what tactics are, it is important to distinguish tactics from style and tactics from strategy. Negotiation styles are related to individual characteristics such as gender, age and personal experience, while negotiation tactics describe particular behavior in negotiations and address negotiators' concern about what to do and when [29] and what to use and when.

Negotiation strategy is what ties together negotiation style and negotiation tactics. Tactics involve verbal or non-verbal cues and there exists a tension between integrative and distributive tactics as some integrative tactics could conflict with distributive tactics [29]. However, in order be successful, all three types of tactics, integrative, distributive and equivocal, can be important and may be used in the same setting [4].

2.3 Identified Tactics

Existing literature on negotiation tactics has largely focused on individual attributes such as personality, nationality, and personal choice of tactics used [7], their priorities and preferences [9]. Weingart et al. [28] argue that awareness of negotiation tactics matters as their study on skilled negotiators and naïve negotiators showed that if a naïve negotiator received

a list of negotiation tactics, the outcome was significantly better than for those who did not receive such a list. Hence, knowledge about negotiation tactics affects which strategic approach will be chosen, which in turn affects the outcome [30]. Existing studies conclude that there is a positive correlation between the use of integrative tactics and optimal outcomes for both parties in negotiations [31, 12]. However, as stated above, those studies have all focused primarily on individual characteristics and individual attributes.

To sum up, little is known about which of the above tactics are actually used in face-to-face negotiations in B2B commerce and whether other, not yet identified, tactics are sometimes used in B2B negotiations, as there is a lack of research on this topic in actual business negotiations.

3 The Proposed Research

The proposed research aims to identify which negotiation tactics are actually used in face-to-face negotiations in B2B relationships and how the choice of tactics differs between negotiations with existing or new customers. The proposed research also aims to examine how different tactics contribute to the course of negotiations and outcomes. This research has important implications for both theory and practice, as there is a good deal of conceptual confusion about negotiation tactics. Tactics are often confused with negotiation style or with negotiation strategy. The aim is to clarify what is categorized as tactics. The findings will contribute to the negotiation literature by identifying which tactics are used in face-to-face negotiations in B2B relationships. The identification of previously unidentified tactics or combinations of tactics will also contribute to the negotiation literature. B2B negotiations have changed over time as companies face increasing pressure to save money and improve performance [32] and therefore people who are successful in negotiations have gained increased importance within companies [33]. Businesses often own significant investments and many B2B transactions involve high risks [17]. By knowing negotiation tactics, companies can reduce risk, as they can better discern what to expect form the other party. The cost of changing business partners can be high and therefore businesses seek to collaborate with business partners that they are familiar with and can trust [34]. Sharland [35] conducted research on how the negotiation process predicts the relationship outcome in B2B settings and the findings indicate that negotiation tactics impact the development of the business relationship, e.g. short term or long term. Since B2B negotiations are considered an important part of B2B interactions [18, 19] the proposed research will contribute to the B2B literature. According to recent research on what is known about buyer-seller negotiations in marketing research, there are very few studies on negotiation tactics and those that exist don't seem to have robust theoretical foundations [36]. Additionally, there will be important implications for practitioners as the use and choice of negotiation tactics can make or break business relationships.

3.1 Negotiation Tactics Used, Selection and Effects on the Outcome

The literature provides insufficient information about what tactics are actually used in face-to-face negotiations in B2B relations. For companies, it is important to know what kind of tactics are efficient and what tactics may lead to long-term or short-term business relationships. Thus, it is important to identify these tactics and how they contribute to the course and outcomes of face-to-face negotiations between businesses. Additionally, the literature provides insufficient information about whether different tactics are used when companies negotiate with new or existing customers. Important information can be added to the B2B literature regarding what tactics can be used to "seal the deal" and what tactics are used to maintain business relationships.

To summarize the discussion above the following research questions are proposed:

1) *What tactics are used in face-to-face negotiations in B2B relationships?*
2) *What are the differences in tactic selection when negotiating with new or existing customers?*
3) *How do various negotiation tactics contribute to the course and outcomes of face-to-face negotiations in B2B relationships?*

4 Research Methodology

Two research methods will be used to conduct this research: (1) case research, and (2) survey-based research.

Case research will be used to obtain a thorough understanding about what negotiation tactics are used in B2B settings. A Polish software development company will be studied using explorative case research carried out during my extended secondment at the company. The company seeks to sell the same product in different packages fitting the needs of different B2B customers. I will be present in negotiation meetings between managers of the company and customers, observing how their current negotiation process works and identifying the negotiation tactics used. Following the observations and using the findings as a basis, along with existing literature, in-depth interview questions will be designed for research in other B2B companies in Poland and Iceland to study if those companies use the same tactics as identified in the Polish software company and what additional tactics can be identified. Managers from five additional Polish companies and five Icelandic companies will be interviewed without the active participation that will be unavoidable during my secondment at the first Polish company, and the data analyzed to validate, disconfirm, or extend the findings gained from the first company. Following the case study, survey-based research will be conducted based on the findings from the case studies. The data will be gathered from a sample of at least 200 companies. Currently data is being collected.

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Model Use in Sustainability Policy:
An experimental study

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Abstract. This study investigates whether and how a system dynamic model helps decision makers create a policy that matches their stated priorities; influences decision makers to change their priorities; and influences decision makers to consider others' interests in their decision. The experiment is a serious game role-play simulation wherein participants pretend to be the Minister of Sustainability making global policy recommendations. Participants are randomly assigned to four conditions: using the system dynamics model, watching a movie about the model logic, watching movies about general renewable energy, and watching a movie that is irrelevant to the task at hand. We find that for participants with the model logic and general energy movies, the environmental preference predicts their policy outcome. However, model-users outperformed their social equity preference because they discovered the win-win nature of providing new electricity with renewable means.

Keywords: model use, priorities, policy outcomes, sustainability, role-play.

1 Introduction

Improving sustainability involves ensuring that "development meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. Development involves human choices and actions, and as such, different people can and likely will have different perspectives and opinions.

Sustainability challenges – vis-à-vis development – involve making decisions about what to change and how to change it. In order to determine what to do and how to do it, decision makers must grapple with scientific information about the physical world, as well as preferences and interests in the social world.

Mathematical models, like system dynamics models, can help elucidate the physical world [2–4] and can enable the comparison of multiple potential future outcomes [5]. Accordingly, many models have been created to aid sustainability decision making [6]. However, while many such models are now available for use in sustainability and energy-related negotiations

and decision processes, research suggests that such models are not used by decision makers as frequently as the model authors anticipated [7, 8].

One potential reason that decision makers are not frequently using models to aid in sustainability decisions is they are not aware of how model use might impact their decision. Much of the research available about model use in sustainability decisions uses case study or action research methodologies (for example, see [9, 10]). Two of the strengths of these methods are that they allow researchers to explore a particular situation in great depth and that they usually involve real-life decision makers and decisions. However, these methods are not able to compare repeated instances of the same situation.

In this study, we employ a role-play simulation as a serious gaming experiment to enable the comparison of multiple different participants making the same hypothetical decision. As such, this study complements existing studies of the usefulness of models in sustainability decisions.

In helping to create understanding on the scientific aspects of a decision, models also might provide a means through which decision makers can assess their own interests and identify those of other stakeholders. In this way, model use might also impact the decision makers' abilities to make sense of the preferences and interests in the social world.

Participants in this study use one of four sets of decision materials. These four types of materials enable us to compare model use to irrelevant materials, relevant information that is not specific to the decision at hand, and learning of the model logic via a presentation. Through these comparisons we can investigate the impact of model use on decision makers' policy recommendations, priorities, and consideration of others' interests. This will help determine whether it is important for decision makers to use a model in their decision or if explaining the logic of the model or explaining relevant but general information is sufficient.

2 Research Problem, Objectives, and State of the Art

To investigate how models impact sustainability decisions, this study addresses three questions: whether and how a model helps decision makers create a policy that matches their stated priorities; whether model use influences decision makers to change their priorities; and whether decision makers using a model consider others' interests in their decision.

We hypothesize that model use will help decision makers reach their stated priorities more readily. Models have been shown to help elucidate and educate [6]. Decision makers who use a model can explore potential policies choices and measure their impacts/outcomes [5]. These investigations will lead to greater understanding of the system in which they are making decisions and of the possible impacts of various policy inputs. Understanding of the impacts of policy inputs will enable them to control the policy inputs to create their desired outcome.

We hypothesize that because model users, compared with non model users, will have a better understanding of the decision situation, they will be more likely to change their stated priorities. As decision makers learn more about the physical world characteristics of the decision they are facing, what they learn might lead them to change their priorities. For example, they might learn that something they thought was a trade-off decision is more like a win-win.

That is, as decision makers learn that they can easily achieve more of a particular dimension of sustainability (one of the three Es: environment, social equity, or economy) without consequence to other dimensions they value, they might come to value that easy-to-achieve dimension more than they initial did. In another example, participants might discover that a dimension of sustainability that they thought would be relatively easy to achieve is quite difficult given how highly they have prioritized the other dimensions. Consequently, they might increase the proportion at which they prioritize the harder to achieve dimension in order to ensure they achieve it. Alternatively, they might decide it is not worth the extra effort required and therefore lower their prioritization of the hard to achieve dimension.

We hypothesize that because model users will better understand the decision situation, they will better understand others' perspectives and take them into account in the subsequent decision. Even when they agree on the overall objectives of increasing sustainability, reasonable people can still prioritize differently among the dimensions of sustainability [11]. For example, someone working in development might prioritize giving access to electricity over other forms of sustainability such as reducing emissions.

3   Methodology

This study is a role play simulation conducted as an experiment with four different participant experiences: using a model; watching a movie about the model logic; watching general energy movies; and watching a movie unrelated to the decision. Each of these experiences lasts about 20 minutes and the full experiment lasts about an hour.

The model used in this experiment is the SE4ALL interface of the En-ROADS model [12], which is build and maintained by ClimateInteractive.org. ClimateInteractive.org built this model to teach policy makers about the impacts of energy policies on global average temperature change, access to electricity, and the economy. The SE4ALL interface has fifteen inputs and this experiment measures three outputs as representatives of the three dimensions of sustainability: global average temperature change in the year 2100, the number of billions of people with access to electricity in 2050, and the Gross World Product (GWP) in 2100.

To begin, participants estimate their credibility, salience, and legitimacy ratings of the materials they will use in the experiment, state their de facto preferences among the environment, social equity, and the economy by allocating 100 points among the three. Next, participants either use the model for 20 minutes or watch the movies. Participants then enter policy inputs and receive the policy output, which a researcher generates using the En-ROADS model. Participants are able to enter a second policy and are given feedback on the second policy in the same manner as on the first policy. Then, they re-rate the credibility, salience, and legitimacy of the materials they used, select either policy one or policy two, restate their preferences, and respond to questions about their experience setting the policy. Among these questions are how much they took their directors' interests into account, what information was missing, which was their hardest decision to make.

4   Expected Outcome

Each research question described in section 2 will be considered in turn below. The responses herein are based on analysis of data from the initial sixty-eight participants.

4.1   Matching Policy Outcome to Priority

To investigate whether participants using the model are more successful at creating policies whose outcomes match their stated priorities, we determine how well data from participants, in each of the four experimental categories, fit (using MANOVA (Multivariate Analysis of Variance)) the regression model described in equation 1. Equation 1 is based on what is expected in the research question: if participants are able to create a policy whose outcome matches their priorities, then their outcome will be well predicted by the priorities.

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon. \tag{1}$$

In this model, Y is the vector policy outcome (temperature, percent access, GWP), x_1 is the points the participant allocated to the environmental sustainability dimension, x_2 is points the participant allocated to the social equity sustainability dimension, and x_3 is the experimental condition (model, model logic, general energy, or control). Fitting this MANOVA regression model the to data indicate that the environmental preference points and the experience are significant, as seen in Table 1 below.

Table 1. Matching Policy Outcome to Stated Priorities: Overall MANOVA Regression Results. The environmental preference points and experimental condition are significant.
Source: first sixty-eight participants in this study.

Term	Pillai	Degrees of Freedom	F statistic	P value
Env points	0.19808	3	4.6931	0.005357**
SE points	0.02185	3	0.4244	0.736265
Condition	0.39828	9	3.0106	0.002286**

Significance codes: *** = 0; ** = 0.001; * = 0.05; . = 0.1.

To investigate which outcome variables differ and on which experimental conditions, we look at the univariate F-tests for each of the variables (see Table 2). In predicting the temperature dimension of the policy output, the environmental preference points and the experimental condition were significant. In predicting the access dimension of the policy output, the experience was significant. None of the environmental points, social equity points, or the experimental condition was significant in predicting the GWP.

Table 2. Matching Policy Outcome to Stated Priorities: Differences in Policy Outcome Dimensions. The experimental condition was significant in predicting the temperature and the access dimensions. The environmental preference points were also significant in predicting the temperature dimension.
Source: first sixty-eight participants in this study.

Response	Term	Df	Sum Square	Mean Square	F statistic	P value
Temperature	Env points	1	2.7090	2.70903	11.7740	0.001103**
	SE points	1	0.0110	0.01097	0.0477	0.827895
	Condition	3	3.7025	1.23418	5.3640	0.02469**
Access	Env points	1	0.02711	0.027114	0.5225	0.472623
	SE points	1	0.05571	0.055705	1.0735	0.304378
	Condition	3	0.67904	0.226347	4.3620	0.007673**
GWP	Env points	1	1634744	1634744	0.2574	0.6138
	SE points	1	497759	497759	0.0784	0.7805
	Condition	3	16395213	5465071	0.8604	0.4668

Significance codes: *** = 0; ** = 0.001; * = 0.05; . = 0.1.

Looking at the predictive value of the points within each experimental condition category, we see that the regression model fits the best for the Model Logic and Energy Movies (see Table 3).

Table 3. Matching Policy Outcome to Stated Priorities: Differences by Experimental Condition. The model fits the data in the Model Logic and Energy Movies categories best.
Source: first sixty-eight participants in this study.

Experimental Condition	Term	Pillai	Degrees of Freedom	F statistic	P value
Model Users	Env points	0.143579	1	1.06	0.3886
	SE points	0.039628	1	0.2613	0.85
Model Logic	Environmental	0.52530	1	3.3198	0.07066
	SE points	0.18268	1	0.6705	0.59124
Energy Movies	Env points	0.39217	1	3.01095	0.06574
	SE points	0.11262	1	0.59229	0.63023
Control	Env points	0.70958	1	2.4433	0.2412
	SE points	0.26530	1	0.3611	0.7875

Significance codes: *** = 0; ** = 0.001; * = 0.05; . = 0.1.

One possible explanation for what is happening within the model-using category is that the model users discovered that the dimension of social equity is modeled as near win-win. That is, the temperature impact of giving access to more individuals can be kept low when the source of the electricity given is renewable. The median percent access for model users is 100%, whereas for the other 3 categories, the median is not above 98%. By discovering this, the model users outperformed their social equity dimension.

4.2   Pareto Front

Regardless of whether they met their own stated priorities, model users were more readily able to find policies on the Pareto Front. The Pareto Front is the set of policy outcome points where for a participant to do better in one policy dimension, he or she would have to do worse in at least one other dimension [13]. The only participants to reach the Pareto Front are those who either used the model or who watched the movie about the model logic. A higher percentage of participants who used the model (17%) reached the Pareto Front; only fourteen percent of participants who watched the movie about model logic reached the Pareto Front.

Note that reaching the Pareto Front is not the same as matching policy outcome to one's priorities. For example, one participant, whose policy outcome is [temperature = 3.7, access = 100%, GWP = 15000], did not reach his/her stated priorities of sixty priority points for the environment, thirty-six for social equity, and four points for the economy. Indeed, this participant has the highest GWP of any participant despite having rated economic growth as a comparatively low priority.

4.3   Change in Priorities

In each experimental category, half or more made a change in their priorities. A higher percentage (64%) of participants who watched a movie about the model logic changed priorities than in any other group. Model users changed priorities with the next highest frequency (54%), followed by general energy category (52%) and the control (50%).

To gain insight into why participants changed their priorities, we will analyze the qualitative responses individuals used to explain their prioritization and will compare their policy outcome to both the priorities they stated before and after the policy submission. The qualitative data will give insight into their reasoning. The comparison will give evidence of whether their priorities shifted as a result of the policy outcome.

4.4   Consideration of others' interests

Does the Minister of Sustainability consider the interests of his/her three directors when creating policy? When asked how frequently they considered their directors' interests, a larger percentage (71%) of the participants who used a model responded "often" or "very often" compared to the other categories (38% in model logic, 52% in general energy, and 57% in the control category).

When asked which were more influential in their decision, their own interests as the Minister of Sustainability, their Directors' interests, or both, more of the model users responded that their own interests were more influential than in any other category (57%). Participants in the model logic movie category were more evenly split about whose interests were more influential in their policy recommendation – their own interests alone (37.5%) or their own and their ministers' together (37.5%). Participants in the General Energy Movie category reported their directors' interests as less influential than participants in other categories (9.5%).

4.5 Confirmation of Intervention

To verify that the intervention is working, we measure the participants' assessments of the credibility, salience, and legitimacy. Credibility, salience, and legitimacy are attributes individuals ascribe to the model or movies they used in making their policy decisions. A decision maker will rate a decision tool high in credibility when she/he thinks the decision tool was accurate and valid. A high salience rating means the decision maker thought the decision tool was relevant and helped address the decision as she/he understands it. A high legitimacy rating means that the decision maker believes that the decision tool includes and allows for multiple perspectives [14]. The initial values of these ratings are similar regardless of experimental condition, indicating that the participants' expectations of the materials they were about to use were comparable across experimental conditions (see Table 4). When the participants re-rated the materials, after using them, the ratings by category decrease as relevant information decreases. This demonstrates that the treatments are working because as the amount of information pertinent to the policy creation decreased, so too did the participants' ratings.

Table 4. Credibility, Salience, Legitimacy Ratings. The participants' pre ratings of the materials they were about to use are comparable. The participants' ratings after using the materials shows that the salience and legitimacy ratings decrease by treatment category, which indicate that the treatments are working.
Source: first sixty-eight participants in this study.

Experimental Condition	Credibility Rating (Pre)	Salience Rating (Pre)	Legitimacy Rating (Pre)	Credibility Rating (Post)	Salience Rating (Post)	Legitimacy Rating (Post)
Model	3.9	4.0	3.9	3.9	4.3	3.7
Model Logic Movie	3.8	3.9	3.8	3.9	3.7	3.2
General Energy Movie	4.1	3.9	4.1	3.9	3.4	3.1
Control Movie	3.8	4.0	3.7	2	1.9	2.1

5 Stage of the Research

This research project is currently in data collection and descriptive explorations of the initial data. Sixty-eight subjects have participated to date out of the required one hundred twenty subjects. Once the data are fully collected, statistical analysis and qualitative analysis will commence.

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A Value-Creation Approach to Promote Cooperative Negotiations in Watershed Committees

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Abstract. An approach to assist Watershed Committees to manage water resources is proposed based on the idea of creating values to encourage a cooperative negotiation among the parties involved. The Committees in Brazil are composed by members with different backgrounds, expertise and conflicting objectives. They represent different segments from society. It is very important that a reliable and friendly environment is created to enhance the chance of solving internal conflicts and of a fruitful negotiation. Decisions on water resource are usually of great impact on people's life. This approach assists decision-makers (DMs) to achieve a joint gain by combining different values into alternatives while negotiating.

Keywords: water management, watershed committees, negotiation, value creation.

1   Research Problem

Water scarcity is a problem faced by a great part of the world's population. Appropriate methodologies and policies for water management is a necessity recognized by experts in water planning, researchers and governments [1].

Watershed Committees in Brazil are the closest entities to local water resources problems. The Committee is composed by 40% of government representatives, 20% of civil society and 40% of users (industrial, agro-industrial etc.) and its duties are to promote discussions, arbitrate conflicts over the use of water resource, establish mechanisms to charge for the use of water and to approve and monitor the implementation of the water resource plan from the watershed they represent.

Apart from the difficulties and complexities faced by community participation in water management, they are a significant part of a democratic decision-making, which is especially

important with environmental resources, since the consequences of the choices made are faced by all the society. Therefore, it is important to comprehend how participatory decision processes can be designed and implemented [2].

Members from watershed committees negotiate to find a solution to a problem that is accepted by the representatives from different sectors of society. They face many difficulties in structuring and solving internal conflicts. The lack of adequate means of communication aggravates the conflicts among the members. Besides this, the subjectivity of the aspects that are involved in the negotiation process such as emotion, judgment, different values, and different interests make the decision process even more complex.

The need for water, which everyone holds in common, should serve as a catalyst for cooperation, instead of conflict [3].

Value creation, the trade of relevant information, and problem structuring are key elements for integrative negotiation [4]. This brings out the importance of structuring water resources problems, before the negotiation process itself.

When value is created, the parties in conflict have found a way to enhance the number of issues that will be negotiated among them. Thus, there can be improvements for all sides. The creation of values contributes to a more cooperative environment since it enhances the chance of the parties getting what they wish out of the negotiation.

This is especially important in the context of water resource conflicts as water has a vital role in the life and development of the population, which makes the disputes in general even more fraught and severe.

Thus, it is important to develop tools that can assist Watershed Committees to engage in a more cooperative negotiation process. The resolution of conflicts should provide greater cooperation, involvement of all stakeholders, as well as the democratization of sustainable water use.

The method proposed aims facilitate turning a distributive negotiation into an integrative negotiation using a value creation approach so that the parties can rely on integrative negotiation models to reach an agreement.

2 Outline of Objectives

The main objective of this work is to design an integrative negotiation model that is based on the creation of values to assist Watershed Committees in Water Management and planning.

For this, there are specific objective that have to be accomplished. They are: i) to structure the negotiation problem identifying the decision-makers, values, and constraints; ii) to promote a cooperative environment to ease the conflicts among the negotiators; iii) to assist decision-makers to think creatively in trying to identify structure values; iv) to promote group synergy to enrich decision-makers' perception and thinking; v) to create a list of issues to be negotiated enabling tradeoffs and integrative bargaining; vi) to propose a negotiation model to assist the negotiation process itself.

3 State of the Art

The problem studied brings out the need to explore multiple methodologies to provide a theoretical basis to the model in development. For this, several findings in problem structuring methods, more specifically VFT, negotiation models and methodologies used for Watershed Management are here presented.

3.1 Problem Structuring Methods (PSMs)

Problem structuring is a process of interactive learning that searches out to construct a formal representation of a problem, which puts together the objective components of the problem and the subjective aspects of the actors [5].

SSM is a problem structuring method built to analyze complex problems. The methodology is based on constant learning. It articulates a process of questioning that leads to actions. Questioning leads to new ideas generating a learning flow. The learning process is given by seeking for solutions and by the comparison of alternatives [6, 7].

Drama Theory [8] is an interactive method that analyses the behavior of decision-makers in situations of cooperation or conflict, where emotions can lead to irrational reactions and create changes in the game. A model is built based on how the actors see the options available and how they are rated [11].

SODA is a PSM that assists the decision-maker to determine and learn about a problem and guide the decision-making process. SODA uses cognitive maps and workshops as modeling devices to comprehend and incorporate individuals' perceptions regarding a problem [9].

VFT has a more proactive way to face decision-making opportunities. The DM begins the process focusing his/her thinking on values and only after on alternatives of how to achieve these values/objectives. The method is structured to help build a list of objectives and these objectives will later help the DM identify decision opportunities [10].

The introduction of Value-Focused Thinking has brought great change to prescriptive decision theory. The method has influenced not only the practice, but the teaching of decision theory [12].

Most decision-making methods approach a decision problem by considering a set of given alternatives, then the objectives and criteria are considered. This is a reactive way to deal with a decision problem. What should drive a decision process are values [10]. From these values, decision opportunities can be identified and alternatives created.

An analyst helps the decision-maker to identify and structure objectives which is not an easy task. But, VFT techniques help promote creativity and make it possible to identify objectives. VFT aids in the discovery of unknown objectives, leading to a more efficient collection of information [13].

Because of these characteristics that differentiate VFT from other methods, researchers have been applying its techniques in the most diverse contexts of decision making.

VFT is frequently used to analyze environmental contexts [14, 15].

Merrick and Garcia [16] show a process on how to make decisions to better the quality of watersheds. VFT is used to design a model for measuring the current condition of an urban

watershed, Upham Brook, in Richmond, Virginia. The results are then compared to those for a hypothetically perfect watershed to point out gaps or shortcomings that can be improved.

VFT has also been used to analyze safety-related decisions in the oil transportation industry by [17].

VFT was also applied in the energy context to identify and define sets of objectives for energy decisions in the United States [18]. VFT has also been used in the context of technology by [19]. In the military context, it was used to assist in the choice of an automatic rifle [20].

3.2 Negotiation

The literature presents many negotiation techniques that include dialogue, mediation and facilitation, that are a different option to traditional bargaining processes, which usually lead to win-lose solution methods. This approach encourages the development of negotiation support tools which can facilitate communication, improve problem structuring and assist complex negotiations such as NEGO [21], MEDIATOR [22], PERSUADER [23] and INSPIRE [24].

The Graph Model for Conflict Resolution (GMCR) [25] is a decision support system designed not only to assist the choice of a course of action, but also to assist the preparation phase of the negotiation process.

The Interactive Computer-Assisted Negotiation Support System (ICANS) [26] is an example of a negotiation support system (NSS) applied to conflicts involving water resources. The tool helps each party to identify admissible alternatives that should be preferred by all parties when compared to a scenario in which there is no agreement. The tool also assists the parties to conduct counter-offers, i.e., allows various interactions among negotiators so that they may reach an agreement.

Kronaveter and Shamir [27] proposed an NSS to assist both parties to negotiate how to allocate the water resource they share. This tool allows them to identify and alter their functions and use the Analytic Hierarchy Process (AHP) to structure and give weights to objectives (criteria). It assists the negotiators to move towards Pareto efficient solutions, assists them in the identification of the Nash equilibrium and then to try to move this point to a temporary border, thereby creating values for both parties.

3.3 Watershed Management

Many researchers discuss the importance, difficulties and methodologies of participatory decision making regarding water management. Yavuz and Baycan [28] explore the perception of local communities regarding the problems and management strategies of the Beysehir Lake Basin. The collaboration of the local communities and the government are considered key to a successful watershed management.

Surya and Mudgal [29] use Soft Systems Methodology (SSM) in a case study from the Adayar Watershed in India, to show how SSM can be used to assist complex situations and as a problem-solving strategy for flood management in an integrated and participatory approach, including several stakeholders in the decision-making process.

Butler and Adamowski [30] employ Group Model Building (GMB) which is a method used to create models that describe environmental and socioeconomic systems with the participation of stakeholders, focusing on the marginalized communities. The method is based on the stages of problem framing, stakeholder identification and selection, workshop preparation, and workshop facilitation.

Other studies on participatory watershed management and planning are presented in [31] and [32].

4   Methodology and Expected Outcomes

A deep literature review was performed to help define the problem and the most suitable methods for this research.

The method under development aims to assist negotiators to achieve a more cooperative environment by creating issues to be negotiated. The creation of values is possible by using problem structuring.

VFT was chosen to help decision-makers think creatively and try to identify values that can be turned into issues to be negotiated. The process is to try to "expend the pie" that is going to be divided.

Note that VFT is not used for its traditional purpose. Alternatives are not being created; the main goal is to identify the different values of the interests of all negotiators such that this will enable them to think in cooperation with each other so as to achieve a joint gain by combining these values into alternatives while they are negotiating.

As a first step of the method, VFT will help DMs to think about values individually. After creating a list of objectives, the VFT structuring step will separate them between means objectives and fundamental objectives. Each negotiator will then have a list of objectives (issues) that he has an interest in negotiating.

The presence of a facilitator is needed to guide the decision-makers throughout the process.

The facilitator will aggregate the parties' lists of values into a single list. The parties meet with the facilitator to agree on a single list that will contain all items that they are willing to negotiate. This meeting takes the form of a workshop, where the facilitator can discuss with the negotiators and the synergy created can enrich the common list.

As this is a research that is still under development, models are still being studied and tested. A model for conflict resolution might be used to model the negotiation process itself, with the necessary modifications and adaptations for the context in study.

A more flexible management of issues and options is necessary so that new issues might be added to the negotiation process, should all parties agree to this. Thus, it has to be considered how to model the inclusion of issues during the negotiation, considering the effect on constraints and objectives that are already in the process and also how to model the negotiators' preferences in a more dynamic way.

The method will also be applied in a real world problem of a Watershed Committee in the state of Pernambuco, Brazil. Data and support will be provided by Pernambuco's Agency for Water and Climate.

With this method, it is expected to assist Watershed Committees to negotiate in a more structured way. It is also expected to o promote a friendlier environment where negotiators can think in cooperation, help the decision makers structure and better understand the problem they are facing, help them communicate and understand the point of views of others, and establish trust and a healthy relationship for future negotiations.

5   Stage of the Research

A framework had been developed to help structure the problem and elicit decision-makers' values and turn them into issues to be negotiated. It is presented into 5 stages in Section 5.1. Sections 5.2 and 5.3 are still under development.

5.1   Framework for Structuring Negotiators' Objectives

1. Identifying Actors: Here all actors involved in the process are identified. The DMs are those whose objectives and preferences are elicited. Each one has their own value system and usually different and conflicting objectives [33]. Whether they themselves will participate in the process or if they will give an indirect contribution by having someone else represent them during the process (a client), has to be made clear. Other actors that participate of the decision process must also be identified at this stage. In this method, for example, the presence of a facilitator is required.

2. Identifying Individual Objectives: In this stage techniques from VTF are used to identify and structure objectives. An obvious way to create value is to think in terms of the interests of the decision-makers. What do you want to achieve in this situation? Several techniques that help in the identification of objectives are shown in [13]. A facilitator assists each party to create an individual list of values to be considered in the negotiation process guided by the type of questions presented in [13]

3. Structuring Objectives: The first lists created by the decision-makers might include items that are not objectives such as alternatives, constraints and criteria. The facilitator guides the negotiators as to how to redefine these items into objectives and to classify them into means objectives and fundamental objectives [13]. Fundamental objectives concern the ends that DMs value in a specific decision context while means objectives concern how they can achieve the ends. Ends and means are context dependent.

4. Aggregating Objectives: In a next step, the facilitator aggregates the individual values into a single list identifying clusters. Similar objectives are put together in the general list while objectives not held in common will be presented to the negotiators for further discussion to see if they will make the final list or will be discarded. The workshop is used to discuss the definitions with the decision-makers, withdraw redundant objectives from the list, and with the synergy generated by the meeting, new objectives might even be considered. This is one of

the most important steps in this procedure. Not only will it be useful to define the list of issues, but it can also create a friendly environment for the negotiators as they will work together as a team with the same purpose: that of improving the quality of negotiation results.

5. Defining Attributes: At this stage, the group decides what attributes will represent the objectives that are present in the aggregated list, to enable them to evaluate how an offer could satisfy these objectives. The negotiators will then have a list of issues to be used during the negotiation process. The parties are not forced to use all objectives to reach an agreement; they could find a compromise with just a few. If they understand that they could achieve a higher joint gain by adding another issue to the negotiation that issue can be found on the list.

5.2 Cooperative Negotiation

Models for conflict resolution are being studied and tested to decide which best suits the problem and if adjustments and improvements will be needed before incorporating it to the method.

5.3 Application in Real World Problem

Some simulations have been made with simple problems to test the steps proposed. A later phase of the research is to apply the method in a real world problem. This is very important to validate the method, especially to see which changes must be made to improve the method, understand its limitation, correct its shortcomings and easy its application.

6 Final Comments

It is expected from this research to provide a structured way to assist management decisions in Watershed Committees in Brazil. The committees constantly face decision-making problems where they have to negotiate among the members that have different interests and value systems; however they lack of structured methodologies to do so. Decisions in water management have big impact on the society which makes important that further studies are performed in order to assist these Committees.

This is a work in progress as many stages still have to be developed such as the choice of a negotiation model and the application on a real world problem. Also, other aspects in negotiation might be considered in the future as for example, imprecise information and coalition.

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