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Stefan Seifert
Christof Weinhardt (Eds.)

Group Decision and Negotiation (GDN) 2006

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Editors
Stefan Seifert
Christof Weinhardt

Universität Karlsruhe (TH)
Institute of Information Systems and Management (IISM)
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Germany

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Preface

GDN 2006 is the seventh meeting organized by the INFORMS section on Group Decision and Negotiation with the EURO Working Group on Group Decision and Negotiation Support. This conference continues a successful tradition established in Glasgow in the year 2000. Like the field of Group Decision and Negotiation itself, GDN meetings are characterized by a unique blend of diversity and integration. They are as diverse as a series of conferences under the same name can probably be: Some have been held as streams within larger meetings (Istanbul 2003, Banff 2004), the others as separate conferences (Glasgow 2000, La Rochelle 2001, Perth 2002, Vienna 2005). This combination allowed us to attract new participants from other communities represented in large meetings, and at the same time create a strong sense of community ourselves. GDN conferences are also geographically diverse and were held in different locations all over the world. And perhaps most importantly, they attract researchers with very different backgrounds and from a wide variety of disciplines, from economics and game theory to social sciences and information systems.

In spite of all these differences, GDN conferences and the people who attend them share a common focus: Research on complex decision problems, which involve multiple stakeholders, their sometimes very different interests, and the different mind-sets, information, and emotions which they bring to the bargaining table. The aim of this research is not only to improve our understanding of group decision and negotiations processes, but also to support decision makers and negotiators in achieving better outcomes. Many decisions that shape our world economically, socially or politically today are made by groups; success or failure of negotiations sometimes means the difference between war and peace, between economic crisis or prosperity—or between having pizza or sandwiches for lunch. Whatever the stakes are, we hope that research presented at this meeting will help decision makers and negotiators in solving their problems, and that the interaction within our diverse, and still focused community will stimulate new ideas, establish new friendships and lead to new results which can be observed in the GDN meetings to come.

Melvin F. Shakun and Rudolf Vetschera
(General Chairs)

Foreword

In the tradition of its preceding yearly meetings, the international conference "Group Decision and Negotiations (GDN) 2006" aims at bringing together researchers in the areas of Group Decision, Negotiations, and Negotiation Support Systems. With 120 participants from 20 countries, 80 presentations, and an international, interdisciplinary Doctoral Consortium prior to the conference, this year's meeting is likely one of the larger ones of the series. We are honored to host it in Karlsruhe.

The present proceedings constitute a new element of GDN conferences. The implementation of a review process and the publication of the proceedings (both electronically and in print) acknowledge the high quality of the scientific results. At the same time, the conference seeks to provide an open and stimulating environment which supports intense discussions among the participants, the exchange of ideas as well as critical comments for further improvements. The "Creative Commons" license of the proceedings encourages authors to elaborate on their contributions based on the feedback at the conference.

These proceedings summarize the findings presented at the conference by reprinting extended abstracts of the talks. The book is organized in multiple parts: Part I starts with the keynote presentations. The following Parts II to XI comprise the invited sessions with their respective papers. Finally, the general contributions to the conference are reprinted—arranged in Parts XII to XVIII according to the tracks of the conference.

Neither the conference nor its joint Doctoral Consortium would have been possible without the help and the contributions of many people and organizations. First of all, we thank Melvin F. Shakun for the invitation to hold the meeting in Karlsruhe. We also thank the reviewers for their effort as well as the academics who served as advisors at the Doctoral Consortium. Carolin Michels and Peter Mlynczak deserve thanks for typesetting the manuscript. Financial support by SAP, InterNeg, the Deutsche Forschungsgemeinschaft (DFG) and the City of Karlsruhe is gratefully acknowledged.

Christof Weinhardt
(Program Chair)

Stefan Seifert
(Local Organization)

Part I

Keynote Presentations

Keynote
E-Negotiations Systems and Processes: Lessons from Invite Design, Development and Experiments

Gregory E. Kersten

InterNeg Research Centre, Concordia University, Montreal

The design and development of the InterNeg software to conduct on-line negotiations, in particular the Inspire system, resulted in an ongoing service to thousands of users. There were also other results, such as lessons which primarily pertained to: (1) the design, development, deployment and maintenance of software; and (2) the preparation of research instruments, and organization and conduct of experiments.

After almost ten years of running the Inspire e-negotiation system, managing e-negotiations and collecting data, we decided to design and develop a new generation of software. There were three key assumptions underlying this work: (1) the ability of the new software to be easily maintained; (2) the flexibility of the new software to be easily modified; and (3) the ease of extraction of data coming from different media.

We have been developing an Invite platform to accommodate the above three assumptions. The process has been quite arduous, requiring the search for a strong and expressive software design paradigm and adaptation of development methodologies to suit our needs and abilities. The idea of protocol-driven e-negotiation systems required theoretical work on protocol design and verification, and the design of software assuring of a very high degree of flexibility. The challenges and successes are discussed. Software implementation and use are only a part of research on socio-technical systems such as e-negotiations. With our research objectives of gaining in-depth insights into the functioning of the system and into the roles its human and technological components play, we needed to design research models and instruments. To streamline the experimental process and facilitate its management we applied a workflow approach and implemented specialized procedures and software to conduct laboratory and on-line experiments.

The research and development of the Invite platform, experiments with its systems, design of instruments and models, and the analysis of data has been an interdisciplinary team project involving researchers and students from several countries. While it is an ongoing project and there are many more problems to study and resolve, it is not only lessons that have been gained and are presented here. This paper also discusses a number of successes and ongoing research projects which have already resulted from the work on and with the Invite platform.

Keynote
Fallback Bargaining

D. Marc Kilgour

Wilfrid Laurier University, Waterloo, Canada
mkilgour@wlu.ca

"Fallback Bargaining" is the name given by Brams and Kilgour (2001) to a class of finite bargaining procedures that find a compromise using a step-by-step approach; related procedures include the Kant-Rawls Social Compromise of Hurwicz and Sertel (1999), the Majoritarian Rule of Sertel and Yilmaz (1999) and the simple majority bargaining of Brams and Doherty (1993). In this presentation, fallback bargaining will be described, its properties elaborated, and various applications and recent developments discussed.

In essence, fallback bargaining refers to a simple, flexible, and easy-to-implement procedure that enables any number of bargainers to select one alternative out of any number, producing a reasonable compromise no matter what the bargainers' preferences. While fallback bargaining procedures tend to lack some normatively desirable properties, they do turn out to be very useful descriptive and predictive models of bargaining. Recent applications of the procedure have shown that it gives useful results in a wide range of problems, some of which seem rather far removed from bargaining.

A group of bargainers is to choose one alternative from a fixed set. Each bargainer has a preference ranking over the alternatives, which for now we assume to be strict. At the beginning of the fallback bargaining procedure, each bargainer is treated as finding acceptable only his or her most preferred alternative. Then the bargainers fall back, in lockstep, by agreeing to accept less and less preferable alternatives — second choices, then third choices, etc. — until finally an alternative is encountered that all bargainers find acceptable. To distinguish it from other variants, this procedure is called Unanimity Fallback Bargaining.

Examples suggest that this fallback procedure may not only provide a useful prediction of the outcome of bargaining, but also may identify points where pre-agreement bargaining pressures may be applied. The fallback outcome is not necessarily unique; there could be a tie of several alternatives (in the worst case, the number of tied alternatives equals the number of bargainers). Nonetheless, any fallback outcome is Pareto-optimal. In fact, Brams and Kilgour (2001, Theorem 3) proved that the fallback outcomes consist of all the Pareto-optimal alternatives for which the lowest ranking assigned by any bargainer is a maximum. This property recalls Rawls's (1971) approach to justice: The best arrangement is the one that leaves the worst-off person as well-off as possible.

Brams and Kilgour (2001) considered variants of the fallback procedure that required only a qualified majority of bargainers to agree, and referred to the version described above as Unanimity Fallback Bargaining. In particular, if only simple majority agreement is required, the procedure is Majoritarian Rule, which was defined by Sertel and Yilmaz (1999) so as to encompass bargainers with weak as well as strict preference rankings. If some bargainers are indifferent among some alternatives, the decision rule may yields compromises that are not Pareto-optimal - unless, of course, such outcomes are specifically excluded.

Brams and Kilgour (2001) also proposed a modification in which a bargainer is allowed to veto any outcome below a level that he or she chooses. (This procedure, of course, risks impasse - every alternative may be vetoed by one or more bargainers.) Brams and Sanver (2006) called this consider voting systems that implement this idea. What they call "Fallback Voting" asks voters to indicate their complete preference orderings over the alternatives, as Borda count does, and also to give an acceptability threshold, which identifies the alternatives they reject.

The most general study of fallback bargaining procedures was carried out by Kýbrýs and Sertel (forthcoming), who took an axiomatic approach. They give several characterizations of the Unanimity Fallback Bargaining outcome when there are two bargainers; for instance, it is the unique regular bargaining rule that produces an outcome that is Pareto-optimal, monotonic, restricted preference replacement invariant, and independent of non-individually rational alternatives. They also show that there are fundamental structural reasons why this basic fallback procedure cannot be extended to situations where there are infinitely many alternatives.

Brams et al. (2004) studied a multilateral bargaining problem with multiple binary issues. In such a problem, the alternatives are all possible combinations of Y's and N's on each issue. One simple way to represent such an alternative is as the subset of issues on which the decision is Y. A bargainer's preference (Y or N) on every issue determines the bargainer's most preferred outcome. Beginning with this most preferred outcome, Brams, Kilgour, and Sanver proposed a way to rank all other outcomes based on the so-called Hamming distance between subsets, which equals the number of elements (in this case, issues) in one of the subsets but not the other. Assuming that preference ranking depends simply on distance from the most preferred alternative, they applied Unanimity Fallback Bargaining to find an outcome, or subset of outcomes, which would be "most acceptable" inasmuch as the most unhappy bargainer would be as happy as possible.

Brams, Kilgour, and Sanver then applied this approach to data from the 28 states that negotiated over four binary issues as they achieved the Convention on the Prevention of Oil Pollution of the Sea in 1954. This study led them to identify a fairness or centrality issue - choose a minimax outcome, which minimizes the maximum distance to any bargainer, or choose a minisum outcome, which minimizes the average distance to all bargainers. They also demonstrated that the minisum outcome would be achieved by simply allowing the bargainers to determine the treaty by voting on an issue-by-issue basis.

Brams et al. (2005) addressed voting in a more specific way. They considered how a representative committee might be elected using approval balloting (Merrill and Nagel, 1987), in which each voter votes Yes or No on each candidate - in other words, indicates which candidates he or she approves of. Again using Hamming distance to determine distances between possible committees, they compared minimax and minisum committees, and identified some properties of each. Minimax committees are not sensitive to duplicate ballots - in other words, the minimax committee depends only on which different ballots were cast, and not only how many voters supported each particular ballot.

They also identified an issue relating to relative influence, and suggested that steps should be taken to ensure that "extreme" voters, whose preferences were far from most others, would have less influence in determining the winning committee. Recalling the characterization of the minimax outcome as the Unanimity Fallback outcome, they suggested a modification of the fallback procedure in which acceptability sets grow at different rates, depending on the number of duplicates of a ballot, and its "centrality". Later, Kilgour et al. (2006) developed an efficient computational scheme to implement such a weighted fallback procedure.

Committee elections can be thought of as taking place on a hypercube, a particular (undirected) graph. The two methods of determining outcomes, based on minisum and minimax, recall the two methods of finding the center of a graph; the techniques for finding the center of a weighted graph may be new, although similar methods of determining the center of a weighted graph have been proposed in the branch of OR known as Discrete Location Theory (Mirchandani et al., 1990). Perhaps a more important contribution of this study of committee elections may be the suggestion that some restrictions on the composition of the committee may be done away with. The computational scheme of Kilgour et al. (2006) works equally well if the committee size is not fixed in advance (although it may be restricted - for example, between 4 and 10 of 24 candidates to be elected). Restrictions on possible committees that ensure representation of certain subgroups are equally easy to implement.

Some general comments about fallback bargaining are appropriate as a conclusion. Some of the features of fallback bargaining — for example, its ordinal nature — can be seen as both benefits and flaws. For instance, it is vulnerable to some forms of misrepresentation, but avoids others. Fallback Bargaining captures some fundamental ideas of fairness and inclusiveness that are natural requirements for bargaining outcomes and social decisions. Of course, there are competing principles that are perhaps at least as compelling; what Fallback Bargaining does is to bring these issues to a new context. In fact, there may be good ways to combine criteria, such as minimax and minisum, by applying them in sequence, by finding comparison methods, like leximax, that include them both.

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Keynote
Connectedness, Spirituality, and Rationality in GDN

Melvin F. Shakun[1]

Leonard N. Stern School of Business, New York University, 44 West 4 Street, New York, NY 10012-112
mshakun@stern.nyu.edu

One represents all there is. **Two** manifests from one as agents. An **agent** constitutes energy/matter/consciousness integrally bound. Agents may be natural or artificial. Here we focus on **human agents** with some comments on other agents. **Connectedness** is a dynamic subjective experience of consciousness of an agent. An agent may experience connectedness with another agent; otherwise non-connectedness. An agent may also experience connectedness or non-connectedness with One. Connectedness of an agent with One constitutes **spirituality**. We discuss **rationality** (reasonableness, based on reason – in science empirically verified by scientific method) of a purpose 1 with regard to producing a purpose 2. We extend rationality to **connectedness/spiritual rationality** discussing its applicability in group decision and negotiation (GDN).

New Directions in Automated Negotiation*

Katia P. Sycara

School of Computer Science, Carnegie Mellon University
katia@cs.cmu.edu

The recent advent of e-commerce has given new impetus to interest in automated negotiation schemes. Most formal work in negotiation to date has formulated the problem as one where two parties negotiate on a single issue, typically price. However, most realistic negotiations include multiple attributes that must be simultaneously negotiated and on which agreement must be reached. For example, an employer and a union usually need to simultaneously negotiate wage level, working time length, and working conditions because those issues together determine the utility of the final contract; similarly, a supplier and a buyer usually need to negotiate price, quality, quantity, and delivery time at the same time. Moreover, people may introduce multiple issues into their negotiation because they may benefit from trading of these issues when negotiators have different preferences. For instance, when selling automobiles, dealers usually want to add insurance, warranty, etc., into the contract rather than a single price of the automobile. With some discount on the insurance and warranty, which is cheaper for the dealers than to directly lower the price, buyers are more willing to accept the automobile price. On the other hand, buyers also find it beneficial to negotiate such a package because the price of buying insurance individually may be much higher. Such situations make multi-attribute negotiation important since they have the potential of "win-win" agreements, i. e. agreements where both negotiators are better off.

Regardless of the necessity or benefit, there are a number of challenges that make multi-attribute negotiations more difficult to model than single attribute ones. First, each player's decisions are made based on his/her preferences over each attribute. Such preferences in general may be interdependent and non-linear, thus making it difficult to construct their mathematical models over the whole space. It is well known that preference elicitation is a laborious and error prone process. Second, in a multi-attribute negotiation, achieving a "win-win" solution is important. Since there exist multiple issues and agents may have different preferences on the issues, given an offer in the negotiation, both agents may be better off by trading off the values of some issues. An offer is Pareto optimal if and only if no agent can be better off without sacrificing the other's utility. However, it is difficult to seek Pareto optimal settlement between

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self-interested agents without knowing each other's preferences in an n-dimensional ($n > 1$) space.

Most prior work on multi-attribute negotiations usually assumes that (a) agents have relatively simple utility functions on the attributes (e. g. linear additive utility functions (Faratin et al., 2000; Fatima et al., 2004a,b), or (b) focuses on issue-by-issue negotiations (Bac and Raff, 1996; Busch and Horstmann, 1997). The work that addresses complex utility functions and Pareto optimality, either assumes complete information, cooperative agents, or makes the assumption that attributes have binary values (Klein et al., 2003; Robu et al., 2005).

In this talk, we present two models for automated multi-attribute negotiation (Lai et al., forthcoming, 2006). Both models incorporate simultaneously the following issues: (a) work for complex utility preferences in continuous negotiation domains, (b) assume incomplete information where the players know neither the utility function nor the negotiation strategy of their opponent, (c) the players do not know even their own utility functions on the whole space, but, given a limited set of offers they can rank them to determine whether an offer is acceptable or not, and (d) both models considers Pareto optimality of the negotiation outcome.

In the first model, we assume the presence of a non-biased mediator that helps the agents overcome the difficulties of incomplete information and achieve Pareto optimal solutions Our approach reduces the negotiation complexity by decomposing the original n-dimensional negotiation space into a sequence of negotiation base lines. Agents can negotiate upon a base line using rather simple strategies. Experimental results show that near Pareto optimal agreements can be reached efficiently.

In the second model, we remove the presence of the mediator and allow the agents to negotiate in a totally decentralized fashion. The model is based on an alternating offer protocol. In each period, the proposing agent is allowed to make a limited number of offers. The responding agent can choose the best offer or reject all of them. In the case of rejection, agents exchange their roles and the negotiation proceeds to the next period. To make counteroffers, an agent first uses the heuristic of choosing, on an indifference curve (or surface), the offer that is closest to the best offer made by the opponent in the previous period, and then taking this offer as the seed, chooses several other offers randomly in a specified neighborhood of this seed offer. Experimental results show that this model can make agents reach near Pareto optimal agreements in general situations where agents have complex preferences on the attributes and incomplete information.

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Keynote
Future Opportunities for Group Decision and Negotiations

Murray Turoff

Information Systems Department, New Jersey Institute of Technology
turoff@njit.edu

Imagination is more important than knowledge.
Albert Einstein

1 Introduction

This is a normative forecast for the future of this discipline that resulted from current work in Emergency Management Information Systems. As such it is an imaginative collection of scenario elements, extrapolating current trends to their extreme, based upon the normative assumption that the practitioners of this discipline will rise to the challenges offered and make the appropriate decisions to take advantage of the opportunities offered. We stand at a point in time where the theories and methodologies in the GDN field can become extremely pervasive in the society and integrated with ease into the everyday operation of organizations. It results from a conjunction of factors which reinforce one another and are still viewed as separate independent factors, when in fact they complement one another and set the society on a very distinctive path to the future.

The underlying factors driving change that will be discussed are:

- Emergency Management as Communication and Negotiation Processes
- The unintended consequences of the Sarbane Oxley act (SOX)
- The growing attention to Emergency Preparedness for Business Continuity
- Virtual (Predictive) Stock Markets and the Delphi Process
- Virtual Teams, Distributed Command and Control, and the realization of Dynamic real time matrix management or decision support social systems
- Distributed Planning and Enterprise wide integration of Information Systems

2 Observations, Hypotheses, and Speculations

Because of the above factors this presentation will lend support to the following observations and trends:

1. Emergency Information Systems do not work unless they are used all the time for normal operations.
2. The process of Emergency Management is a real time negotiation process.
3. Individuals must act in roles that carry defined responsibilities and obligations as well as various levels of decision authority and accountability that need to be made explicit to all who are involved.
4. There exist mini emergencies in all organizations that occur all the time that force the creation of teams (or committees) to handle these events and to make decisions or recommendations for decisions that meet some deadline.
5. There are positive as well as negative emergencies and many negative emergencies produce opportunities.
6. There are needs to create HRO's (High Reliability Organizations) in teams and in organizations where virtual systems will replace the role of physical systems, such as nuclear power plants.
7. Virtual teams are a new opportunity for making "matrix management" realizable with the proper information and support system.
8. SOX will force organizations to track all aspects of the decision making process and keep all those involved in a decision of a given type apprised what has been studied, analyzed, recommended, documented, which specific steps in the process have been completed, and what remains to be accomplished by what role and current person or teams/units in the organizations.
9. The same monitoring, tracking and reporting process for the workflow in a decision is increasing by being required in enterprise-wide systems such as SAP, ERP, etc.
10. Tracking of the decision process and explicit determination of its status is required of emergency decision making systems as well as being a form of auditing required by SOX.
11. Virtual markets are an ultimate Delphi process as Norm Dalkey would have defined it, but in this context they are an excellent way to visualize and dynamically track the degree of consensus reached and negotiations required in the choice of decision alternatives.
12. Since group negotiation is required in all decisions (involving some degree of subjective input, multiple perspectives of different roles/stakeholders, and tradeoffs in opposing value criteria), the support tools developed in GDN for dealing with these situations may now easily be integrated into the decision tracking systems that will be brought into existence from other requirements such as SOX, emergency management, and enterprise-wide applications design.
13. Real emergency preparedness by the society as a whole will require the audit of the emergency preparedness activities and status of all organizations.
14. The development of a true transactional decision tracking system which definesd all the roles and responsibilities for the different types of decision processes will make it relatively easy to incorporate group decision support and negotiation tools as direct aids to those involved in the process.

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Keynote
Collaboration Engineering: Current Directions and Future Opportunities

Gert-Jan de Vreede

College of Information Science & Technology, University of Nebraska at Omaha
gdevreede@mail.unomaha.edu
Delft University of Technology

Organizations form to create value (such as services and goods) for their stakeholders that the stakeholders cannot create for themselves as individuals. By collaborating members of an organization they can accomplish more than they could as separate individuals. To create value effectively, people must develop, sustain, and adapt effective collaboration processes fueled by accurate and timely information and supported by state-of-the-art information and collaboration technology. A well-designed collaboration process is ineffective without access to the right information in a timely fashion. Critical knowledge cannot be distilled from available information resources without the right technology. Efficient communication between key personnel in dispersed locations is difficult if not impossible without groupware technologies.

Yet, achieving effective team collaboration is easier said than done. Collaborative efforts can be far more effective and efficient if they are explicitly designed, structured and professionally managed so as to minimize cognitive load and maximize the focus of purposeful effort. This is referred to as facilitation—the structuring and management of collaborative efforts. Facilitation not only provides structures with which people can work together, it also supports people in using available collaboration technologies. Field research at IBM, Boeing, BP, EADS, and ING shows that reductions of over 50% in terms of labor costs and project time can be achieved by applying collaboration technologies to carefully designed collaboration processes. Unfortunately, reaping the benefits of collaboration and collaboration technologies is difficult. Organizations struggle to make collaboration work. They often resort to implementing technologies, yet experiences show that technology alone seldom is not the answer. What is needed is the conscious design of effective collaboration processes followed by the design and/or deployment of new collaboration technologies to support these processes.

Collaboration Engineering is a design approach to designing, and deploying collaboration processes for recurring high-value collaborative tasks that are executed by practitioners without the ongoing intervention of professional facilitators (Briggs et al., 2006). The field of Collaboration Engineering is located on a crossroad of disciplines, such as information systems, computer science, systems engineering, organization science, organizational behavior, and cognitive psychology. Collaboration Engineers combine insights from these disciplines to design a collaboration process once such that it can be transferred to groups that can be self-sustaining in these processes using collaboration techniques and technology. In other words, the process can be carried out by people involved in the process without additional support.

To this end, Collaboration Engineering advocates the use of collaboration process design patterns. Design patterns were first proposed by Alexander et al. (1977): "a pattern describes a problem which occurs over and over again and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice." Collaboration Engineering design patterns, called thinkLets, have the same purpose: to provide proven solutions in terms of techniques, methods, and tools to recurring collaboration problems (Kolfschoten et al., 2006). They comprise of best practices for collaborative activities, and codify these in such a way that they can be re-used in recurring situations to enable the rapid development of sophisticated, integrated, multi-layered collaboration processes that can improve the productivity and quality of work life for teams (de Vreede et al., 2006).

Collaboration Engineering primarily focuses on mission-critical collaborative tasks. A mission-critical task is one which creates substantial value, or which reduces the risk of loss of substantial value for organizational stakeholders. Collaboration Engineering further focuses on processes for mission-critical tasks that must be executed by teams rather than individuals, that must be executed frequently, and that have a high payoff if successful. A specific example of such a recurring collaboration process is described in Textbox 1.

Textbox 1: Collaboration Engineering example.

Following industry guidelines, a large international financial services organization was faced with the challenge to perform regular operational risk assessments. The organization's management opted for a collaborative approach, where operational risk managers would work with business unit employees directly to help them identify and assess operational risks and define mitigating controls. The implication was that the organization was faced with the need to perform hundreds of operational risk management (ORM) workshops. They requested the development of a repeatable collaborative ORM process that operational risk managers could execute themselves. Based on the experiences and the requirements from the ORM domain experts, collaboration engineers developed a first prototype of a repeatable collaborative ORM process, the Risk & Control Self Assessment (R&CSA) process. This process was evaluated in a pilot project within a particular business unit, leading to a number of modifications to the definition of the overall process in terms of collaborative activities, their interdependencies, and the facilitation techniques used. The resulting collaborative ORM process was shown to a group of 12 ORM experts. During a half day discussion, the wording and order of activities was modified and the proposed collaborative activities where tested with a number of chosen facilitation techniques. In the period that followed, about 300 ORM practitioners were trained to execute this process. To date, these ORM practitioners have moderated hundreds of workshops where business participants identify, assess, and mitigate operational risks.

Other examples of recurring collaboration processes can be found in various sectors, for example financial services, defense, and software development: Financial services Collaborative risk assessment Collaborative service product development Collaborative Sarbanes-Oxley assessments Marketing focus groups Government Collaborative crisis response Collaborative situational awareness Collaborative course of action analysis Collaborative document creation and review Software development Collaborative requirements negotiation & specification Collaborative usability testing Collaborative requirements inspections Collaborative code inspections

Collaboration Engineering researchers focus on recurring processes rather than ad-hoc processes for two reasons. Firstly, if we improve a repeated process, then the organization derives benefit from the improvement again and again. If we were to focus on ad-hoc processes, then the value of each process improvement would be obtained only once. Secondly, if we improve a repeatable process, practitioners of the process do not have to be professional facilitators. They can learn to conduct the repeatable process successfully without having to learn the complete suite of facilitation skills.

While the Collaboration Engineering approach is still in its infancy, it is advancing rapidly. Processes designed by collaboration engineers have now been implemented successfully in a number of commercial, government, and military organizations where practitioners conduct the processes for themselves without the ongoing intervention of professional facilitators. Examples of various applications specific to organizations or domains include, but are not limited to: ING Group, the Netherlands, conducts collaborative Risk & Control Self Assessments processes in all of its branches across the world (Verhaar et al., 2004; de Vreede and Briggs, 2005). It uses a derived version of this process for Sarbanes-Oxley (SOX) assessments. The U.S. Army's Advanced Research Lab uses a repeatable collaborative testing and refining a thinkLets based approach to mission analysis (Harder and Higley, 2004; Harder et al., 2005). The European Aeronautic Defense and Space company (EADS) developed a repeatable process for Manufacturing Project Knowledge Elicitation (de Graaff et al., 2005). The Rotterdam Port Authority has used Collaboration Engineering techniques to support crisis response training and operational execution (Appelman and van Driel, 2005). A process for collaborative usability testing was successfully employed for the development of a governmental health emergency management system (Fruhling and de Vreede, 2005). A collaborative software code inspection process based on Fagan's inspection standards was successfully employed at Union Pacific ()[Koneri 2005; Vreede et al. 2006]. A telecom company used a repeatable collaboration process to define and explore new mobile services (Bragge et al., 2005). Dozens of groups engaged in effective software requirements negotiations using the EasyWinWin process (Boehm et al., 2001; Grünbacher et al., 2005). A process for collaborative standards writing and review was employed by a large number biocontainment experts to derive the draft of a national standard for the planning, operation, and management of biocontainment units (de Vreede and Smith, 2006). Standards for military course of action development were proposed to facilitate disaster relief operations (Steinhauser and de Vreede, 2006). Researchers created and applied a repeatable process to define scenarios collaboratively for policy analysis workshops (Enserink, 2003).

This keynote will provide a detailed overview of the Collaboration Engineering design approach. We will discuss current advances that have been made in this area and outline a number of promising avenues for future research. Acknowledgments The development of the Collaboration Engineering approach has been the result of ongoing efforts by a substantial number of international colleagues, in particular Robert Briggs, Gwendolyn Kolfschoten, and Douglas Dean.

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Part II

Invited Multi-Session Track Facilitation and Collaboration Engineering of Group Decision Making & Negotiation

Invited Multi-Session Track
Facilitation and Collaboration Engineering of Group Decision Making & Negotiation

Gert-Jan de Vreede

College of Information Science & Technology, University of Nebraska at Omaha
gdevreede@mail.unomaha.edu
Delft University of Technology

Session Chairs

Fran Ackermann, University of Strathclyde
Robert Briggs, University of Alaska Fairbanks, Delft University of Technology
Colin Eden, University of Strathclyde
Gwendolyn L. Kolfschoten, Delft University of Technology
Gert-Jan de Vreede, University of Nebraska at Omaha

Facilitation is an important factor in the success of technology supported collaboration. Design or preparation specifically is addressed as an important aspect of successful facilitation. Contributions can contribute new insights on facilitation techniques, how to design collaboration processes and (the effect of) facilitation itself. In extension of this, Collaboration Engineering aims to create recurring collaboration processes that support the execution of high-value organizational tasks and can be transferred to self-sustaining groups using collaboration techniques & technology using facilitation techniques and methods. Its goal is to create simple, effective collaboration process designs with predictable success. These designs should be used in self-sustaining groups. A key focus within Collaboration Engineering is the design and evaluation of re-usable and predictable collaboration design components called thinkLets.

The session particularly addresses behavioral aspects of Group Decisions and Negotiations. Themes and topics of relevance to these sessions include, but are not limited to:

Design approaches for collaboration processes:

- Measuring the efficiency and effectiveness of collaboration processes
- Theories and guidelines for designing collaboration processes
- Strategies for designing collaboration processes
- Modeling techniques for collaboration and information exchange in groups
- Theoretical foundations for quality measuring constructs

Bringing Group and Negotiation support together:

- Repeatable processes for supporting group negotiation
- Understanding how groups get to say "yes"
- Theoretical and practical approaches to build group consensus
- Modeling conflict, misunderstandings, and disagreements
- Incorporating negotiation modeling in a group setting

Facilitation techniques and methods:

- Studies on the effectiveness of existing and new techniques for divergence (brainstorming), convergence, organization, evaluation, and consensus building
- ThinkLets (collaboration process building blocks) – development, field experiences, laboratory evaluation

Facilitation support for collaboration and negotiation processes:

- Effects of facilitation interventions on group performance
- Styles of facilitation
- Embedding facilitation support in collaboration and negotiation technology
- Facilitation of dispersed collaboration and negotiation processes
- Facilitation guidelines for different socio-cultural environments
- Ethical issues around facilitation

Supporting Negotiation — A Licence to Move Forward

Fran Ackermann and Colin Eden

University of Strathclyde, Business School, Glasgow

Using electronic/computer Group Support Systems (GSS) to assist teams *in negotiating agreements in relation to 'messy' problems and strategy development* is not new (Ackermann and Eden, 2001). These situations often demand the need for anonymity (to manage conformity pressures), productivity and equivocality. The systems have also been used when working with teams focusing upon developing a case for litigation - where evidence for causality and quantum is necessary for the negotiation of an agreed upon settlement (Ackermann and Eden, 2005). In addition they have been used for working with multi-organizational collaborations where many different and competing views exist and thus assist in developing a shared view of the world and from this agreed upon objectives (Ackermann et al., 2005).

This paper discusses a case where the system was involved in aiding the resolution of a more obvious conflict between two organizations. A regulator and licensee wished to work more cooperatively and with less conflict that was seen as dysfunctional to both organizations aims. This objective was regarded as realistic, despite both having to work within a legally imposed environment which naturally put them in conflict. Each organization had importantly different organizational cultures, each a product of their history, business contexts, and the character of their senior managers. Both organizations had also seen recent changes of their Chief Executives.

The process involved interviewing senior staff in each of the organizations, and in one organization undertaking an organizational development workshop involving the use of the GSS. The objective was to surface and structure the concerns of each organization independently and in a 'natural' manner. The process was expected to capture emotional frustrations, 'genuine complaints, and also internal 'dirty washing'. Cause maps/models were built for both parties and the authors recommended those parts of the two separate models that might be the basis for a 'joint model' that could be used to facilitate negotiation - either with each organization separately or preferably with the senior managers of both organizations in the same room. Subsequently the models were then "reviewed" and integrated to form a single model.

The independent work helped each organization reflect on their own positions and so begin to understand its own strengths and weaknesses. They were each able to agree what was important both for their own organization and for working together, and agree what should be shared with the other organization. In fact remarkably little of the recommended material was set aside, and in both instances included our recommendation to display 'dirty washing'.

Reviewing the two models revealed a number of areas where the views were more similar than we knew each party recognised — including astute recognitions of one another's and their own weaknesses. These provided a valuable starting point for a one-day workshop involving both sets of senior managers meeting on neutral ground.

The use of the networked computer technology inherent with the GSS facilitated management of the conflict and resulted in a joint agreement about ways of mutually enabling each party to meet its own objectives. Having a comprehensive model depicting the related but different views along with their context enabled *new ways of working to be constructed together* (in the manner suggested by Fisher and Ury, 1982).

This paper will explore and discuss the process used, consider some of the possible critical episodes and methodological consideration that appear to have facilitated the success of the negotiation. Both parties had not expected success or even any agreements about how to proceed. However, it has yet to be shown that enough of the commitments will be realized to be assured of less dysfunctional working. Commentary will focus on project design, critical incidents, managing the processes of group negotiation, use of the GSS technology, modelling the data, and the nature of the jointly developed set of agreements.

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Supporting the Collaborative Collection of User's Requirements

Carlos E. Acosta and Luis A. Guerrero

Department of Computer Science, Universidad de Chile
caacosta@dcc.uchile.cl
luguerre@dcc.uchile.cl

Most of the software system development processes carry high risks for technological companies and service organizations. Some of these risks may ultimately produce delayed or failed projects with low quality software products. The Standish Group in 1999 presented the "Chaos Report"[1], which determined through a large scale scan on IT projects in northern hemisphere corporations that the software development industry continued to be marked by low quality products and services. According to this report, the main causes of failed projects during 1994 were the following: incomplete requirements (13,1%), little users participation (12,4%), lack of resources (10,6%), non-realistic expectations (9,9%), insufficient executive support (12.4%), changes in requirements and specifications (8,7%), lack of planning (8,1%), little administration of information technology (6,2%), technological incomprehension (4,3%), others (9,9%). It is important to note that a high percentage of errors are related to definition and administration of requirements and little user's participation. Even though this study was performed some years ago, most of the current software projects are still dealing with the same risks. In this context, it is clear that any improvement in requirement engineering may substantially reduce the high risk that menace the quality of decision taken during the negotiations of the user's final requirements.

Requirement engineering includes the following steps (see e. g. Nuseibeh and Easterbrook, 2000):

- Collect requirements: identify the stakeholders and obtain their requirements.
- Model and analyze the requirements: build abstract descriptions for a better interpretation.
- Communicate the requirements: transfer the knowledge among the stakeholders.
- Come to an agreement on the requirements: negotiate the requirements with the stakeholders.
- Evolve the requirements: manage changes not only in the requirements but also in the environment, or changes generated by the stakeholders.

[1] See: http://standishgroup.com/sample_research/PDFpages/chaos1999.pdf

Requirement engineering is a highly collaborative process that involves many stakeholders. During the past few years, we have observed an increased importance in the role of collaboration for organizational value creation with a significant improvement in the collaborative work through the use of Group Support Systems (GSS) tools. However, the success of collaborative efforts is not assured. Because of the limitations of the human mind, many collaborative efforts consume time and resources without creating substantial value (e. g. de Vreede et al., 2003). Collaboration Engineering is a newly emerging field that seeks to bring the value of facilitated interventions to people who do not have access to facilitation.

To counter this problem Briggs et al. (2001) have been proposed a new unit of analysis, labeled thinkLets as an approach to produce far more predictable and repeatable results. ThinkLets describe in detail how a certain activity can be realized and can be used for collaboration engineering. ThinkLets can be attached to basic activities in Collaboration Engineering in order to create a successful repeatable process.

One of the principal problems present in the acquisition and the analysis of requirements is the externalization of knowledge that the stakeholders have about the context and the business experience, that is to say, about the reasoning of the business. Our hypothesis indicates that to improve the communication of knowledge in a compilation process of requirements, it is possible to use an activity called Group Storytelling.

This activity has been studied by many disciplines, e. g.linguistics, sociology, management, education and artificial intelligence. This technique is commonly used to elicit and communicate knowledge. Recently, group storytelling has been proposed within the community of Computer-Supported Cooperative Work (e. g. Perret et al., 2004; Schäfer et al., 2004).

Group storytelling is a collective activity of sense-building, with many individuals contributing with their recollections and interpretations about shared experiences. Methods, techniques and tools have been developed to capture, register and retrieve stories in many research fields such as education; knowledge management and artificial intelligence (Thomas et al., 2001, e. g.).

Bearing in mind the goal of improving the externalization of knowledge in the context associated to the requirements discussed by stakeholders in an organization we propose a collaborative process design based on the technique of group storytelling. This process is constituted by clearly identified activities of thinklets, in order for the process to be repeatable and predictable.

The first activity consists in selecting the members of the group according to their expertise in the different areas of business knowledge to be considered, compatibility with the other participants and their will to communicate their experiences on the areas of the business.

Then Group Storytelling begins, which exploits the group context and the description of organizational scenery on behalf of the stakeholders; technique that is not unusual to the stages of acquisition and the analysis of requirements by the established development of software processes.

Some processes of software development like RUP or XP, use the settings or contexts of the users (RUP) and users' stories (XP) as input information to establish the requirements of future developments in further detail.

The following step in this process consists in the generation of solutions for the conflicts present in the commentaries given by the group members. To accomplish this it is used the LeafHopper thinkLet (de Vreede et al., 2003). Here the members that originate the comments are in charge of explaining the fundamental ideas that originated that commentary. Solutions are given to the problems raised by means of the commentaries and a validation takes place.

In the following step, the approach of the group is focused on the solutions to unsolved problems. All likely solutions existing are displayed in a presentation to the complete group. During this redefinition of solutions the participants will initiate the proposal of solutions including the valid viewpoints of the other participants, in order to create a solution with the venue of group. To carry out the set of actions previously described, the thinkLet One Up (de Vreede et al., 2003) is used. In this thinkLet, the participants identify the ideas of high quality, while they explain why one idea is better than some of the previous proposals. The explanation of these ideas bears information of great value for the purge of the requirements exposed by the organization.

Finally with the incorporation of the Expert Choice thinkLet (de Vreede et al., 2003), we look for a participant who is able to organize the set of ideas proposed in the previous step. Hereby we obtain information that is clear and consistent, which will allow the final improvement of the requirements and its specifications.

Based on the Collaborative Engineering paradigm, we have designed a support collaborative process to obtain and analyze requirements in a software development process. This process implements Group Storytelling technology as an activity to support the transference of the implicit knowledge between the stakeholders and the analysts.

With the implementation of the previous activity and the identification of some thinkLets a repeatable process was designed to achieve the purge of requirements. To accomplish this goal, an initial list with little or no purge is taken as an entry, and a document of requirements is originated with a greater deal of details and a better understanding of the participants.

To support the proposed process, we have elaborated a tool that consists in an application developed on Microsoft platform .NET. One of the main goals of this tool is the support of knowledge representation associated with the requirements of the stakeholders, which are generated through Group Storytelling by means of conceptual maps.

This way, the construction of conceptual maps by means of a collaborative software tool can support the externalization of the knowledge when a technique of group storytelling is used to define and capture the requirements.

Our hypothesis is that Group Storytelling within the context of each of these processes would help to make the reasoning of business and the implicit internal conflicts of it explicit. Using this technique and the mentioned thinklets we can define a collaborative methodology to create, refine and complete a requirement list in a Software Development Process.

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Collective Causal Mapping Methodology ANCOM2: Aggregating or Filtering? (A synthesis of several case studies in management sciences)

Tatiana Bouzdine-Chameeva

Bordeaux Business School, France
tatiana.chameeva@bordeaux-bs.edu

1 The Two Streams of Collective Causal Mapping Techniques

Causal mapping is well-known as a technique that is used to elicit and represent domain knowledge in the form of a causal map. A broad range of research has investigated a collective perception reflected in a causal mar using the ideographic approach (e. g. Eden et al., 1992; Cossette and Audet, 1992). Another large stream of researches based their studies referring to the nomothetic approach (e. g. Sheetz and Tegarden, 2001). Several recent research studies suggest systematic procedures and methodologies that combine these two approaches (Nadkarni and Nah, 2003; Scavarda et al., 2006). An idiographic approach used for building a causal map is consent to capture subjective knowledge and individual perception using in-depth interviews, it is not bound by predefined variables. The obtained causal map can be validated then by the use of nomothetic methods with a purpose to confirm a priori determined, widely accepted assumptions relating to the domain (Nadkarni and Nah, 2003).

The ANCOM-2 methodology used in our studies refers to this stream of research. The basic process for creating a cognitive map is based on principles of content analysis and results in a final set of variables. Using this common set of variables the individual knowledge of subject-matter experts is captured in a form of a causal map elicited individually. The variables linked by arcs represent beliefs of experts about the causal relationships among the concepts. Each causal arc is assigned a weight to indicate relationship's strength. Once causal relationships are evaluated a causal map can be represented by an association matrix, which represents the set of causal weights for all pairs of variables. The use of a common set of variables (the nomothetic approach) permits to perform comparisons among the individual beliefs. Finally, individual maps are combined into a collective causal maps to obtain a comprehensive view on the matter. Deriving a collective causal map based on individual perceptions puts forward a question of analysis and comparison of the individual maps and the appropriate level of their aggregation or filtering (Wang, 1996). This question is in the focus of our research studies.

2 The ANCOM-2 Methodology: Aggregating and Filtering

The idea of the ANCOM methodology (ANalyse and COmpare individual Maps) applied in several management studies (see for example, Chameeva et al., 1996; Bouzdine-Chameeva, 2005; Scavarda et al., 2006) consists in building a collective causal map on the basis of a comparative analysis of individual causal maps. The idiographic approach is used to elicit and aggregate the individual knowledge of subject-matter experts and the nomothetic approach to validate the elicited knowledge in a form of a final consensus collective map. This three-phase ANCOM methodology is summarized in Figure 1.

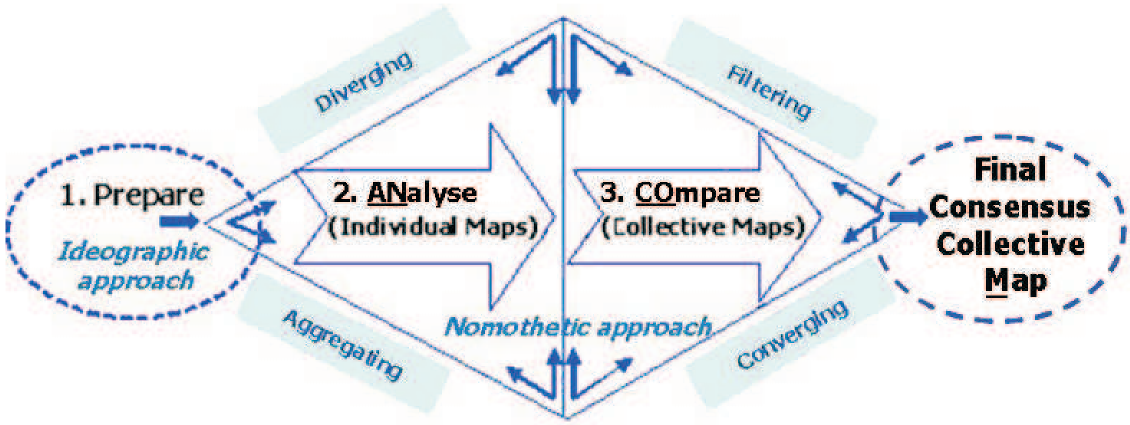

Figure 1: The three-phase ANCOM-2 methodology.

Each of the three phases of data collection and analysis (Prepare, ANalyse and Compare Maps) has the three steps. The purpose of the PREPARE Phase is to capture the individual knowledge of subject-matter experts to create a set of variables. An ideographic approach used at this point has proved to be of success in exploring a new domain and expressing the new issues that the study question addresses. The purpose of the ANALYSE Phase is in the analysis of relationships among the variables reflected in the individual causal maps. The purpose of the third and final COMPARE MAPS Phase is to construct and interpret consensus collective causal Map to answer the fundamental study question.

The ANCOM-2 combines the individual beliefs of all respondents into a consensus causal map. The four dominant consensus causal maps are built: an aggregated map; a map of unanimity; a map of majority and a map of enlightened majority that contains concepts and links chosen by the majority of respondents, the concepts and that are the most important for each respondent and the links of the highest weight in each individual map. The divergence of experts' opinions is reflected in a consensus collective map by means of a threshold value which is arbitrarily pre-determined at the mean value between the lowest and highest ratings by the ANCOM-2 software. This makes available a rational aggregation of several causal maps into a final consensus collective causal map to reach the prolific understanding of the problem.

3 Applications of the ANCOM-2 Methodology in Management studies

In the last five years several management studies have been performed using the presented ANCOM-2 causal mapping technique. The studies focused on the aggregation of individual knowledge in the operations management domain (Scavarda et al 2006), in organisational studies for the SMEs recruiting policies, in the analysis of strategies in wine sector (Bouzdine, 2006), in examining the sponsoring effects in brand core's identity of a sportive event (Ferrand et al., 2006) and filtering this individual expert's knowledge to develop a consensus collective map addressing the research question.

The research focused on the understanding of a relationship value seen from a customer's perspective (Bouzdine et al., 2004) applied the ANCOM-2 methodology to capture individual differences of the value perceptions, aggregate them and visualize in a map to present the collective perception of the value. The value of the same business relationship had different meanings for managers of one of the major French firms in the space industry. The divergence in the value perception manifested in the individual causal maps that could be partially explained by their individual domain knowledge. A final consensus collective map (a map of enlightened majority) prompted this variety of views.

Another research study where the ANCOM - 2 technique has had a success was undertaken to answer the fundamental research question "What should students learn in an MBA-level introductory operations management course?" (Scavarda et al., 2006). The developed inductive Delphi-like, Evocative Causal Mapping Methodology (CCM), a web-based asynchronous data collection technique employed a data-based approach for building a normative model by evoking "if-then" statements from a group of subject matter experts. The ANCOM-2 proved to be efficient in the construction of a final consensus collective map (using several different cut-offs) of 262 managers and academics.

The ANCOM-2 methodology has been enhanced in the research study examining the effects of sponsoring in brand core's identity of a sportive event (Ferrand et al., 2006). The work focused on the extraction a collective perception of a brand core's identity in the form of a consensus causal map. A preliminary set of variables elicited by a group of subject-matter experts was used by a group of 30 fans meeting the audience profile to evaluate the three brands, Sony Playstation 2, Ford and Master Card, and build individual brand causal maps. The ANCOM-2 was used to construct a final consensus collective map for each brand. These brand causal maps were then matched with a similar map built by the fans for a sportive event, the UEFA Champions' League (UCL). The different cut-off values were used to filter the aggregated consensus collective maps of the four types in this study. The filtering allowed observing the evolution of the collective maps and analysing the convergence between individuals and the divergences among the groups of fans (clusters). Segmentation of groups based on the causality cognition appeared to be a reliable tool in understanding of sponsoring phenomenon.

Using of consensus collective causal maps to tackle a fundamental research question and reflect the experts' knowledge has proved to provide a valuable support to the development of a shared foresight on the studying problem. Capturing the key issues and structuring the major lines of reasoning, analysing and comparing individual views via causal maps, and finally exploring the four different types of collective cause maps using different thresholds results in an enhanced understanding of the problem setting. The process of developing and refining the final collective cause map applying the ANCOM-2 methodology can be compared with a diamond cut process when a jeweller cuts the excess to reveal the fundamental nature of a stone.

The causal mapping methodology ANCOM-2 presented in this paper contributes in many ways to existing research on eliciting knowledge from a group of experts. It combines the strengths of the idiographic approach used to capture the individual knowledge and the nomothetic approach used to validate variables and relations through a final consensus collective causal map. Another advantage of the method worth mentioning is the capacity to elicit knowledge from a group of experts without relying on group interaction and minimising therefore biases associated with group decision-making. The creating of the four collective causal maps of a group's view on the studying problem, the use of different cut-offs to ensure the richness of the collective perception of a studying question in a final consensus collective map, the possibility to perform a segmentation of a group of experts based on cognitive linkage present the major advantages of the ANCOM-2 methodology that have been confirmed in a broad range of the managerial studies.

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The Value Frequency Model: Toward a Theoretical Understanding of Organizational Change

Robert O. Briggs

University of Alaska Fairbanks, Center for Distance Education, College of Rural and Community Development
Delft University of Technology, The Netherlands, Faculty of Technology Policy, and Management
Bob.briggs@uaf.edu

1 Introduction

Much of an organization's intellectual capital rests in its work practices — the standard ways that its members conduct their high-value tasks. If an organization can find ways to improve its work practices, it can gain competitive advantage. However, deliberate attempts to change the way people do business are not always successful. Sometimes people resist a new practice, even when evidence suggests that the new practice might benefit both the organization and the individuals involved. Other times they move to a new work practice, only to abandon it a short time later. There are also cases where people abandon current practices in favor of new ones that may not be in the best interests of an organization. Several researchers have proposed models for specific aspects of organizational change. For example, Davis, (Davis, 1986) proposed the Technology Acceptance Model (TAM) as a way to predict whether users will adopt a new technology after their first exposure. However, given the cost and risk of changes-of-practice, it may be useful to have a general theory to explain the stability of work practices and the technologies used to support them; why sometimes people refuse to change, while other times they change very quickly; why sometimes a change sticks, gathering a self-sustaining and growing community of practice, while other times a change is mercurial, followed almost immediately by another change. This paper proposes the Value Frequency Model (VFM), a causal theory in the logical positivist tradition to explain changes-of-practice. VFM is derived from Technology Transition Model (TTM) (Briggs et al., 1999). Although TTM was proposed to explain technology transition, its propositions may apply equally to other kinds of transitions-of-practice. While TTM has received some support (Agres et al., 2005), it is incomplete, in that its propositions have not yet been rigorously derived from a set of underlying axioms; the assumptions underlying its propositions have not yet be articulated. VFM therefore extends TTM by articulating a set of assumptions from which its propositions could be derived, and by adapting its constructs and propositions to explain the more general construct, changes-of-practice.

2 The Logic of the Value Frequency Model

Individuals hold multiple goals, ranging from drawing their next breath to achieving their next professional promotion. A goal is a desired state or outcome (Locke and Latham, 1990). Because human attention, time, and resources are limited, individuals can neither not attend to nor pursue all their goals simultaneously. They must therefore select among them. VFM posits cognitive mechanisms that may have evolved among individuals who selected and pursued goals in ways that were more likely to lead to survival and reproduction. Goals that are currently in working memory are said to be salient. VFM Assumes that that:

A 1: Utility Ascription. There is a cognitive mechanism that automatically and subconsciously ascribes some level of utility to attaining a salient goal

However, if ascribed utility were the only mechanism for selecting among goals, individuals might exclusively pursue high-utility goals that were impossible to reach, and so perish. VFM therefore assumes further:

A 2: Likelihood Assessment. There is a cognitive mechanism that automatically and subconsciously assesses the likelihood that a goal will be attained.

A 3: Yield Perception. There is a subconscious cognitive mechanism synthesizes an expected yield for a goal based on ascribed utility, but reduced in proportion to assessed likelihood. The relationship between utility ascriptions, likelihood assessments, and goal yield could therefore formally be modeled as a multiplicative function:

$$Y_g = U_g L_g \tag{1}$$

Where Y = Yield for Goal g; L = Likelihood assessed for Goal g, and U = Utility ascribed to Goal g. The collection of goals currently in working memory is called the set of salient goals. That collection, each with its current likelihood, utility, and yield ascriptions is called a goal state. An individual is always in some goal state. Any changes to likelihood or utility ascriptions of goals in the salient set would constitute a yield shift for the set as a whole, and so would bring about a new goal state. Likewise, attending to a different goal that was not currently in the salient set would constitute a new goal state. VFN assumes:

A 4: Yield Shifts for the Set of Salient Goals. There is a subconscious cognitive mechanism that tracks the current yield of the salient set of goals as a whole.

A 5: Impact Projection. There are conscious and subconscious mechanisms that project the impact actual or proposed events might have on the set of salient goals, producing a contemplated goal state.

A 6: Goal State Comparison. There is a subconscious cognitive mechanism that synthesizes a perception of difference between actual and contemplated goal states.

Where a goal is a desired state or outcome, a value is a goal which one is willing to take action to attain or preserve (Locke and Latham, 2002). If, as VFM posits, individuals project future goal states from proposed events, and if, as the theory posits, a goal state comparison mechanism signals the individual as to a difference between actual and contemplated goal states, then the degree to which individuals are willing to change their practices would be a function of the magnitude of the difference between current and contemplated goal states. If that difference is positive, they may be willing to make the change. If that difference is negative, they may be unwilling to make the change. If an individual expects to attain value more than once from making the change, then the utility attaining that value would be increased by the frequency with which the value would be attained. Thus, Change-of-Practice would be a multiplicative function of both Perceived Magnitude of Value (PMV) of the proposed change and the Perceived Frequency with which that Value would be attained (PFV) (Figure 1).

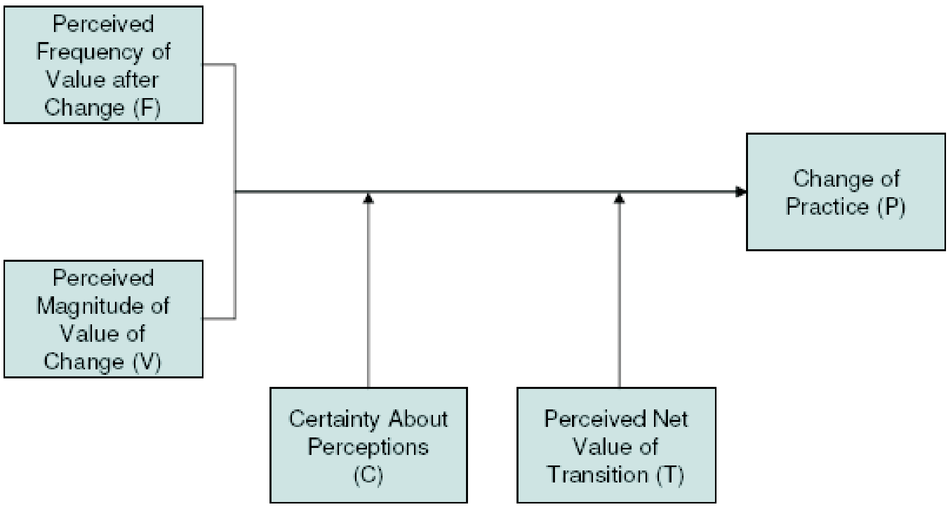

Figure 1: Parameters affecting Change-of-Practice

However, the PMV and PFV constructs address only the Utility ascriptions assumed by VFM. While an individual may perceive value with some frequency by changing a practice, they may not ascribe full likelihood to those perceptions. Therefore, the net utility of the comparison of current to contemplated goal states would be reduced in proportion to the likelihood assessments. Thus, the causal relationship Frequency and Value have with Change-of-Practice may be moderated by the certainty people ascribe to their Value and Frequency perceptions (Figure 1). Finally, there may be some positive or negative value associated with the transition from the current practice to the proposed practice. For example, the transition might require tedious training (negative affective and cognitive value), but the training might take place in Hawaii in January (positive value). If the perceived net value of the transition is sufficiently negative, it may overwhelm any perceptions of positive value that one might attain once the transition is complete, and so diminish an individual's willingness to make the contemplated Change-of-Practice. Thus, the causal relationship that Frequency and Value have with Change-of-Practice would be moderated by the Perceived Net Value of Transition (PNVT) (Figure 1).

To summarize, then, VFM proposes that Change-of-Practice is a multiplicative function of two constructs: PMV of Change and PFV after Change. The PMV construct is defined the degree to which an individual judges that that the proposed change will be instrumental in advancing the salient goals of the individual. PMV may be perceived along many dimensions, e.g. economic, affective, social, political, physical, and cognitive. The theory does not posit that an individual consciously evaluates each dimension of value for each salient goal. Rather, it posits that a subconscious mechanism generates an overall perception of the degree to which a proposed change would constitute an overall positive or negative yield shift for the set of salient goals.

The PFV construct is defined as a judgment of the frequency with which an individual expects to attain value after the change. VFM proposes that the direct causal relationship between Value*Frequency and Change-of-practice is moderated by two constructs: Certainty about Perceptions and PNVT. The less certain an individual is of the Value and Frequency perceptions, the lower will be the impetus to change. Certainty would be a function of exposure to the new practice, in the form of testimony, observation, or experience. The lower the value an individual derives from the process of changing from the current practice to the new practice, the lower will be the impetus to change. For example, if the change required training in Hawaii, an individual might regard the transition value as higher than if the change required training elsewhere. VFM may be a useful basis for explaining seemingly conflicting results in the organizational change literature, and it may be a useful basis for detecting in advance whether people are likely to transition to or resist an innovative work practice and predicting whether a recent change is likely to result in a sustained community of practice. It may also be a useful basis for deriving structured methodologies for innovations of process and technology within an organization.

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Experiences in Attempting to Combine Group Support Methods

Colin Eden[1], Fran Ackermann[1], John Bryson[2], Charles Finn[3], David Andersen[4], and George Richardson[4]

[1] University of Strathclyde, Business School, Glasgow
[2] HHH Institute, University of Minnesota
[3] Empire State College, Albany
[4] State University of New York, Albany (SUNY)

All of the authors of this paper are experienced at using different forms of group support to help management teams reach agreements about how to deal with complex strategic issues. Ackermann and Eden use cause mapping and computer support (e. g. Eden and Ackermann, 1998), Andersen and Richardson use interactive System Dynamics modelling (e. g. Richardson, 1991; Andersen and Richardson, 1997), and Bryson and Finn use oval mapping and pay particular attention to leadership and process in creating change (e. g. Bryson, 2004). The group decided that it was important to extend their repertoire by learning about theory and practice from each other. By meeting regularly over the past 10 years the discussions have led to an interesting set of issues about the clash of theories and the difficulties of merging practice.

In this paper, these issues are explored because they have important implications for improving group support. The common threads across the group are a focus on:

(i) an approach that both encourages originality, synthesis of issues and ideas, but also challenges in terms of practicality and effect; developing robust and flexible models that help understand and plan for changes over time;
(ii) Causality (hierarchical and feedback);
(iii) Making use of word-and-arrow diagrams to develop shared meaning and ownership;
(iv) and the use of visual interactive models as dialectical force.

These sound trivial, but turned out to be the practical realization of common theories and understanding about people, problems, and organizational change.

However, apparently irresolvable issues dominate the wish to progress:

(a) Technical rationality versus political rationality;
(b) Theory to practice versus practice to theory versus manager as pragmatist keen to reach agreement on what to do, manager as reconciler of competing theories/rationalities/views; including the increased demands on facilitator and manager.
(c) Boundary object v transitional object;

(d) Precision v equivocality (Belton and Ackermann, 1997)
(e) Reaching out for numbers to build the model versus negotiating meanings gradually (techniques for promoting convergence),
(f) "my position is lost" in among the aggregated individualism; and violation of KISS to a point of real concern.

The presentation will illustrate each of these points with examples from organizational interventions, theoretical conflicts and discussion.

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Participant-Driven Group Support Systems to Support Large, Distributed Group Facilitation

Joel H. Helquist, John Kruse, and Mark Adkins

Center for the Management of Information
jhelquist@cmi.arizona.edu
wkruse@cmi.arizona.edu
madkins@cmi.arizona.edu

Facilitating large (over 50 participants), asynchronous, collaborative groups that are geographically distributed presents numerous difficulties. As the size of the group grows, so does the volume of comments generated by the group. Both the participants in the collaborative session as well as the meeting facilitator must synthesize these comments in an effort to identify and understand the key issues that were surfaced. However, as the group reaches a certain size, the number of comments generated by the participants overwhelms the entire group. The time required to read, process, and respond to all of the input becomes a limiting factor.

Another challenge with facilitating large groups is the difference in time zones. It may not be economically feasible for members of a large, distributed group to convene for a synchronous group support systems (GSS) session. As such, the system must accommodate users that are logging onto the system at disparate times as their schedules permit.

Lastly, current GSS do not possess the tools to enable the facilitator to efficiently shepherd a large number of users through the collaborative process (Adkins et al., 2003; Schwarz, 2002). Facilitators must have the tools to monitor the group and ensure the flow of the collaborative session is followed.

This paper proposes a framework called the participant-driven GSS (PD-GSS). The purpose of this framework is to move toward facilitation of large groups during collaborative sessions. PD-GSS presents an approach to effectively handle both the volume of information generated during a large group GSS as well as the asynchronous, distributed nature of the session. PD-GSS provides the structure whereby large groups are able to convene asynchronously via a web-based system.

Previous research has examined the ways to harness the benefits of collaborative work in a large group setting (Adkins et al., 2004, 2003). This research advances the idea of utilizing technology to help mitigate the volume of information. Linguistic analysis tools could be used to help process, summarize, consolidate, and cluster the input from a GSS session during the convergence process. We, however, believe that given the current state of automated linguistic tools humans are better suited to handle the information processing and summarization tasks than automated systems. Humans have the ability to better identify related concepts and ideas while automated techniques struggle to handle such things as synonyms and varying layers of abstraction. PD-GSS provides a new framework for divergence and convergence that addresses the difficulties of large group work.

First, there must be a mechanism whereby divergence is controlled such that the quantity of "noise" in the system is significantly reduced. The PD-GSS design utilizes a peer review system that allows peers to edit and clarify brainstorming input such that brainstorming input is read and evaluated prior to being submitted to the overall brainstorming pool for the group at large. The goal of this input filtering is to reduce the quantity of brainstorming input, increase the quality of the input, and not hinder the overall creativity of the group. In this fashion, the collaborative session can harness the experience and knowledge of the larger group while reducing the potential for information overload.

PD-GSS provides a new approach to address the problem of convergence in a distributed, large-group environment. Instead of the group working serially through a facilitator, the team is able to continue working in parallel to synthesize the brainstorming input. To achieve this, the participants work in parallel at their workstations to perform the convergence necessary to coalesce the brainstorming input. This iterative process consists of users receiving discrete units of work from the system and working in concert with other group members, thereby providing the force necessary to move toward convergence. Depending on the current status of the collaborative process, the system may focus the human resources on clustering, evaluating, or ranking the categories of brainstorming input. PD-GSS presents a framework whereby the system directs the human capital to where it is needed most.

The phrase "participant driven" does not mean that the facilitator is completely removed from the process and that the practitioners are forced to conduct the collaborative work. Rather, "participant driven" means that the participants complete more of the evaluative and subjective tasks in parallel rather than in a serial fashion with the facilitator. The system directs human efforts to the areas of the collaborative process that need work, where the human resources have the greatest payoff. This research initiative has the potential to markedly improve large group facilitation, especially for asynchronous and geographically distributed collaborative endeavors.

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Collaboration Process Design Transition to Practitioners: Requirements form a Cognitive Load Perspective

Gwendolyn Kolfschoten and Sandra van der Hulst

Delft University of Technology, Faculty Technology, Policy and Management
G.L.Kolfschoten@tudelft.nl
S.J.Vanderhulst@student.tudelft.nl

1 Introduction

Collaboration and group work is challenging, and in many situations groups will benefit from collaboration support, such as facilitation and Group Support Systems. One approach to the sustained implementation and use of collaboration support is the Collaboration Engineering approach. In this approach the facilitation task is divided into two roles; the collaboration engineer and the practitioner (Kolfschoten et al., 2006b). A facilitator both designs and executes a collaboration process. Alternatively, in Collaboration Engineering (CE) an expert facilitator named Collaboration Engineer designs a collaboration process and transfers this process to a practitioner in the organization. A practitioner is a domain expert in the organization who, as part of his tasks executes this single process on a recurring basis. This approach thus offers reusable collaboration support for a recurring task that requires a relatively small investment in the training of the practitioner and limits the use of external expertise to the creation and transition of a collaboration process design.

The added value of the Collaboration Engineering approach is that the benefit of the supported process can be reaped each time it is executed, while it requires only a single training. However, the approach also implies a challenge. The skill and expertise required to execute this single process needs to be transferred to practitioners in a short comprehensive way. Facilitation is typically learned by experience (Clawson and Bostrom, 1996). For Collaboration Engineering the facilitation expertise focused on the execution of one specific process, should be captured for transition to a practitioner. We call the document in which this transition information is captured a CE collaboration process design.

The aim of this paper is to gain insight in the requirements of the CE collaboration process design to enable the transition of a collaboration process and to support the practitioner in executing this particular process.

A perspective to analyze the transferability of a collaboration process design is offered by the Cognitive Load Theory (Sweller, 1988). This perspective allows us to assess the complexity of the practitioner task, and it offers methods to reduce the cognitive load of both the task (activity) and the CE collaboration process design itself (object), to increase the transferability of the required skills and knowledge.

These insights will:

- Offer design guideline for collaboration engineers.
- Enable the further development of design support.
- Advance insight in the challenge of training practitioners to replace facilitators for a specific recurring process.

2 Task Transition and Cognitive Load

The Collaboration Engineer designs the collaboration process. He performs the design task of a facilitator. When we eliminate these design tasks, the remaining facilitation tasks have to be executed by the practitioner, but can be limited to those involved in a single recurring task. The task of the practitioner can be split in preparing and organizing the different instances of the process, executing the design, and dealing with the dynamics of the group process.

Most of these tasks require improvising and experience, which practitioners do not have; therefore this task will come down to the skill and flexibility of the practitioner. This makes the execution of the design a complex task (Pollock et al., 2002), which requires sufficient background information to understand the intended effects of the process design. Therefore, to support the practitioner, the key quality dimensions to the CE collaboration process design are (de Vreede and Briggs, 2005):

- Predictability; the execution of the CE collaboration process design leads to as little unpredictable events as possible, so the practitioner can prepare himself well.
- Transferability; the cognitive load of understanding and using the CE collaboration process design is as low as possible, so the practitioner has sufficient free mental capacity to improvise when needed and to be receptive to signals of the group.

The collaboration process design offers the information that is used for the training of the practitioner and during the first couple of times the design is executed. We assume that once the process is executed several times, the practitioner will internalize the design and will not need supporting material anymore.

To reduce the cognitive load, which is of particular importance, during the execution and learning task we can use the insights of several techniques to reduce cognitive load:

- We can reduce redundancy by offering a parsimonious design (Mayer and Moreno, 2003).
- We can reduce split attention by offering inclusive self-explanatory information components(Mayer and Moreno, 2003).
- We can reduce the internal complexity of the information by offering it in components that can be linked to an overview of the process. Such presentation can

also increase the quality of the memory schema that the practitioner will develop to remember the process (van Gog et al., 2004).

- We can support the execution of the process design by offering a memory aid like summaries of the information for the key steps and instructions that need to be performed (van Merrienboer et al., 2003).

Summarizing, the design of a collaboration process for transition according to the CE method, has four main components:

1. A self-explaining overview of the process in the form of a process model (Kolfschoten et al., 2006a; de Vreede and Briggs, 2005), in which the sequence of activities is captured with sufficient expressive power to be self-explanatory.
2. The scripts for each activity (thinkLets); detailed but parsimonious descriptions of the different steps in the process with explanatory information on the rationale behind the procedures and their effects in small, simple and complete components.
3. The description of relevant assumptions on which the design is made, like the goal, the task, the group characteristics and the assumed resources that offer the reference framework for the practitioner to offer how and why information.
4. ThinkLet summaries on cue cards for use as memory aid during execution of the process.

3 Expert Session

The expert session was held with 4 expert facilitators and 4 practitioners / inexperienced facilitators. The experts were all familiar with the original thinkLet concept but not with the other design elements. The experts were asked to describe which information they would transfer to a (novice) practitioner. The novices were asked which items they would want to know before facilitating a GSS session.

A few elements described above were not indicated by the facilitators. First, the assumptions document was not mentioned. We think that such a document is required to enable practitioners to prepare the process and to serve as a basis for all communication about the process. The facilitators did indicate the need the information about most of the assumptions listed, but did not indicate the specific type of transition for this information. Furthermore, several trivial elements of the components were not indicated, such as aspects for their identification of the components and for classifications of their effects. All participants were familiar with the thinkLet concept and thus might have taken these elements for granted. The facilitators did indicate that they wanted to know what would happen and the effects of the thinkLet in general.

4 Conclusions

The session with the facilitators indicated that most of the elements of the revised CE collaboration process design were also identified by the facilitators in the expert session. This confirms the need for the information listed and the transition methods indicated. The resulting design format should support the practitioner especially in the training phase, and during the execution of the design. In these phases the practitioner constructs and automates the schemas that help him to make predictable interventions that support the group in achieving their goal. Furthermore it should support the practitioner in being receptive and responsive to group dynamics that can occur in different instances of the recurring process. A next step in this research will be to measure and observe the transition of CE process designs as described above to practitioners and the quality of the collaboration process executed by the practitioner to test its applicability. Successful transitions of collaboration processes with low cognitive load offer an important basis for the justification of the Collaboration Engineering approach for sustained implementation and use of collaboration support in organizations (Briggs et al., 2006; de Vreede and Briggs, 2005).

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Choice Criteria for Facilitation Techniques: A Preliminary Classification

Gwendolyn L. Kolfschoten[1] and Etiënne A. J. A. Rouwette[2]

[1] Delft University of Technology, Faculty Technology, Policy and Management
G.L.Kolfschoten@tudelft.nl

[2] Radboud University Nijmegen, Nijmegen School of Management
E.Rouwette@fm.ru.nl

1 Introduction

Collaboration and group work is challenging, and in many situations groups will benefit from collaboration support Facilitation has the objective to increase the quality of collaboration and its outcomes. Besides supporting the group in using tools and methods, it is also the task of a facilitator to prepare the collaboration process, and in many situations this process is critical for the success of the collaboration process (Clawson and Bostrom, 1995; Hayne, 1999). A group effort is difficult to plan, and when it is not effective and efficient, time, effort and resources are wasted. Therefore, a facilitator must make sure that the right techniques are chosen and that they are used well (Dennis et al., 2001; de Vreede et al., 2003).

Using creative design or problem solving as an example, we can identify the following general steps in the design of a collaboration process: identification of the issue, analysis of the task, finding (and evaluating) alternative facilitation techniques, choice between facilitation techniques and implementation. An important step in this design process is the choice among facilitation techniques, in which a decision is made on the approach to the problem. This step is based on and bounded by analysis and identification of alternatives techniques in the previous steps. One of the key tasks of a facilitator is thus to analyze the issue at hand, identify alternative, appropriate tools or techniques to support a collaboration effort and to choose among these (Andersen and Richardson, 1997; Dennis et al., 2001; Vennix, 1999; Zigurs and Buckland, 1998).

There are several libraries of facilitation techniques available in literature and on websites (Briggs and de Vreede, 2001; Jenkins, 2005). However, choosing techniques from these libraries remains a challenging task. While several taxonomies of tools and techniques are available and used (Jenkins, 2005; Kolfschoten et al., 2004; Zigurs and Buckland, 1998), we are uncertain about their completeness. In order to make an optimal choice, both functional requirements and quality constructs should be taken into account. This paper will first present the criteria that are used to choose among facilitation techniques, which were identified in previous research. The objective of this follow-up study is to further examine the relative priority or order of choice criteria, and guidelines for the consideration of conflicting criteria to develop a preliminary classification. We expect these objectives will:

- Give insight into the complexity of the choice for a facilitation technique when many alternatives are available, or when it is difficult to find a suitable technique for a complex situation.
- Better support facilitators in designing a collaboration process, for instance through the development of more sophisticated choice support tools.
- Give insight into the aspects of a facilitation technique that should be documented in order to support the choice between techniques.
- Offer a method to select facilitation techniques from large libraries (e. g. Briggs and de Vreede, 2001; Jenkins, 2005).

2 Choice Criteria

To identify these criteria we took several steps. First we send out a questionnaire to a large group of facilitators to identify information they considered during their design effort (Kolfschoten and Rouwette, 2006). In a next step we organized a session in which facilitators shared the reasons to choose for a specific technique (Kolfschoten and Rouwette, 2006). In a last step we conducted 8 interviews with facilitators, in which we asked them to tell us how they would support a group with a task described in a case. For the different steps they proposed we asked further questions to understand why they choose these techniques. The resulting criteria were classified in six main criteria for which different indicator criteria. These six criteria are: predicted effectiveness, predicted efficiency, task requirements, group requirements, context of technique and process and facilitators' best practices. Using the list of criteria in table 1 we asked the people we interviewed to fill in several questionnaires. We got a response from 4 of the facilitators we interviewed. We verified the use of the criteria and asked them about the priority of criteria above others, the trade-offs between criteria and the way they used these criteria when choosing between facilitation techniques.

3 Discussion and conclusions

Despite the need for additional data gathering and verification, we can identify an interesting pattern in the use of choice criteria which is displayed in the preliminary model in Figure 1.

We Identified four key trade-offs that need further corroboration. First, the required result is the most important criterion for selection but it can be negotiable; if it is not in balance with the constraints of the process, the expectations can be managed to increase the likelihood that predicted results (by the facilitator) will meet the expectation of the client. However, in the end, the facilitator depends on the participants and

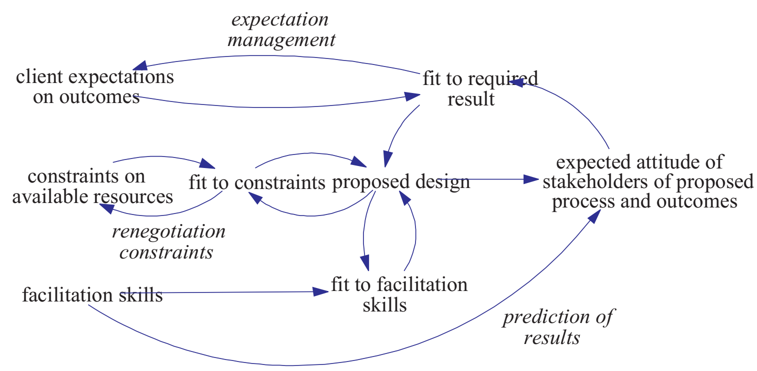

Figure 1: Balance between choice criteria in the selection of choice criteria to design a collaboration process.

stakeholders to produce the intended result. This represents a more complex tradeoff. The facilitator should use his own skills and capabilities to get participants to create the required results. In the design phase, the facilitator develops an understanding of the group and creates an expectation of their attitude towards the process designed and the outcomes intended. From this expectation of the attitude of stakeholders on the proposed process and outcomes the facilitator can derive inferences on the expected result. The constraints with respect to resources such as time, money, technology and other physical resources, and knowledge, mostly represented by the people involved, but also by the information available to the group. Some of these constraints are negotiable, other represent the key boundaries and limitation of the design.

Concluding, a facilitator has to create a design based on clear constraints on one hand, managed expectations on the other, and often difficult to predict results and attitude of the group. With the skills available he will try to create a design within the limitations of the resources, that creates the expected result and that will be accepted by the stakeholders both in terms of process and outcomes.

A next step in this research is to gather more data to further increase our understanding of choices. Clearly some criteria are treated differently than others. Further insight in these relations will help us to support a facilitator in creating a more predictable process design that will create results that answer the most important requirements set.

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A Training Approach for the Transition of Repeatable Collaboration Processes to Practitioners

Gwendolyn Kolfschoten[1], Gert-Jan de Vreede[1,2], and Leah R. Pietron[2]

[1] Delft University of Technology, Faculty Technology, Policy and Management
G.L.Kolfschoten@tudelft.nl
Gdevreede@mail.unomaha.edu
[2] University of Nebraska at Omaha, College of Information Science & Technology
Lpietron@mail.unomaha.edu

1 Introduction

Although collaboration has become a key practice in organizations, it is not without challenges. Groups might not be able to overcome such challenges by themselves and thus might benefit from the use of collaboration support. Expertise is required to help groups in using the appropriate tools and techniques. One of the most common type of experts in this field are called facilitators. While hiring external facilitators is often possible, especially for recurring tasks, costs will mount up. Yet, internal facilitators are difficult to sustain as their skills are also required in management functions and therefore they get promoted away. This makes it difficult to implement sustained facilitation support into an organization (see e. g. Agres et al., 2005).

Research on Collaboration Engineering (CE) proposes an approach to collaboration support where practitioners in the organization are trained to execute a specific collaboration process (with the use of tools and techniques for collaboration support) on a recurring basis (Briggs et al., 2006; de Vreede and Briggs, 2005). The transition of a repeatable collaboration process presents a number of specific challenges. The transition should enable the practitioner to execute the process with similar results as a professional facilitator. This sets specific requirements to this transition. This paper will focus on the requirements and best-practices for the transition to practitioners. Insight in the transition will help us to

1. Formalize the transition approach for Collaboration Engineering
2. Gain insight in the (im-)possibilities of practitioner facilitation
3. Advance the research on Collaboration Engineering
4. Offer support for Collaboration Engineers in the field

2 Task Transition and Cognitive Load

Clearly, just handing over the design document is not enough to transfer the knowledge and skills required by the practitioner to execute the design. There is a need for additional transition of tacit knowledge and skills. Practitioners need to perform part of the task of a facilitator. Facilitation is a skill, and thus practice and copying from the expert is important(Ackermann, 1996; Post, 1993), which requires a training approach in which practitioners and the Collaboration Engineer meet. Furthermore, it is important that the practitioner develops self efficacy about his task, which is difficult to transfer though a manual for instance. Such transition, and the confirmation that there is sufficient self efficacy, requires face to face contact between the collaboration engineer and the practitioner. Therefore we will focus our approach on the training of expert methods and guidance in the appropriate execution of those methods like in group training, coaching and simulation. Furthermore, an important part is discussion between the trainer and the practitioner so the latter has the ability to raise concerns and doubts.

Bearing the above in mind, the transition of a repeatable collaboration process then represents a learning continuum which roughly consists of the following phases(Wilson et al., 1998): First, there is an awareness phase in which the need for the collaboration process is recognized, in which the collaboration engineer designs the process, and in which practitioners are selected. Once the practitioners are selected they will be trained by the collaboration engineer in an intensive training in which the process is explained and simulated and in which challenges and concerns are discussed with the trainer. In this phase the basics and literacy are developed. After the training the practitioner will run a first session. In this phase the process execution is evaluated and improved to enable the practitioner to develop his own style. After one or a few sessions, the practitioner will gain experience and will be able to run the sessions by himself. In this last phase the sustained use of the process will develop.

To support this learning process in a training, we need to accommodate methods that help us to transfer the information required in a way that supports practitioners in memorizing and understanding the process. We draw these methods from cognitive load theory . The resulting training approach consists of 10 steps and is discussed below and implemented at an international finances organization.

3 Training Approach

1. Lecture & self study: Introduction to collaboration and Collaboration Engineering. A practitioner should be able to explain to the participants in the collaboration process why a collaborative approach is used. For this a basic understanding of 'what is collaboration' and 'why collaboration support is useful' is required.
2. Lecture & self study: Process overview. The process and task for the collaboration process will have a goal, a deliverable, several requirements and a set of activities that need to be performed to obtain the required results. This basic introduction

of the process does not jet specify each group activity and the thinkLets to execute each activity are not yet explained.

3. Lecture & self study: The thinkLet concept. The Collaboration process design is build up out of thinkLets. Before the thinkLets are explained, a brief introduction to the concept and the elements and representations of the thinkLet is required.
4. Lecture & self study: Introduction of the thinkLets used. In order to enable the practitioners to self construct the collaboration process with the thinkLets, they should be introduced before.
5. Group Training: Construction of the process. In this step the practitioners are encouraged to think about the sequence of activities and the thinkLets used for each step. This will increase the understanding of the role of each thinkLet, the contribution and the order of thinkLets. In an interactive group setting the sequence can be built and adjusted to gain understanding in the process and the rationale behind the sequence of steps.
6. Lecture & self study: ThinkLet explanation. Once the full process is understood, the details of the thinkLets can be transferred. The script is discussed and the purpose of each rule and instruction is explained. This can be done in a lecture setting, but step 6, 7 and 8 can be performed for each thinkLet in sequence to avoid a long presentation.
7. Group training: Discussion and imagination of challenges. Once the thinkLets are discussed, it is important that the practitioner can imagine himself executing the thinkLet. To establish this, we can ask the practitioner what do you think can go wrong when you do this, what seems difficult. Known challenges and questions can then be discussed and suggestions and guidelines for solutions can be offered.
8. Simulation: Simulation of the process. To practice the key challenges and pitfalls the process can be simulated during the training. For this simulation mini simulation cases/scenario's can be presented in which the practitioner is asked "what would you do if"
9. Self study. The training might despite the techniques to reduce cognitive load, consist of a lot of information. Re-reading the documentation might help the practitioner to further construct his memory.
10. Execution. To support the execution, the procedural information and the challenges and solutions should be available on the cue cards. This removes the need of spending precious training time on rote-learning the script. When possible, the practitioner should be supported during the first execution by a coach, being the collaboration engineer or a more experienced practitioner.

4 Conclusions

This paper provides a structure and blue print for the transition of (GSS-supported) collaborative work practices in organizations through a training program. The training approach is focused on the transition of a single work practice in a short efficient training in which the cognitive capacity of the practitioner is optimally used to focus them on learning only the skills and knowledge essential to execute their task. With this training, practitioners at ING now perform the required risk assessments as a standard work practice. The training of a single recurring task for collaboration support offered an affordable way to implement collaboration support for a recurring critical task in the organization.

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A Favourable Knowledge Management Context: Application of the Causal Mapping Technique

Rania Labaki[1,2], Valérie Pallas[2], and Tatiana Bouzdine-Chameeva[1]

[1] Bordeaux Business School, France
tatiana.chameeva@bordeaux-bs.edu
[2] University of Montesquieu Bordeaux IV - CREFF Banque, France
pallas@u-bordeaux4.fr

Knowledge management significantly influences economic effectiveness of organisations. Recent research demonstrates that knowledge management becomes the most expensive factor of economic development. In 2005, the world market of knowledge management services is estimated by 13 milliards \$ (www.idc.com). At the same time, the appropriate elaboration of effective knowledge management strategy could reduce the expenses by more than 50% (Bian, 2000). Resource based theory (e. g. Barney, 1991; Nevis et al., 1995) and organisational knowledge based theory on one hand (e. g. Grant, 1996; Nonaka and Takeuchi, 1997; Wells, 1999), a social capital theory together with a network theory on the other hand (e. g. Granovetter, 1974; Burt, 1995; Tan and Hunter, 2002), form the basis for examining the principles that underline knowledge management phenomenon in organisations. Understanding the mechanisms, measuring the effectiveness of these principles have become one of the central factors in organisational studies.

Knowledge management must not only be viewed as a compilation of technological tools but also as a process that instigate a transversal logic of construction and sharing of knowledge within the organisation (Pallas and Labaki, 2004). In order to be orientated towards knowledge management, an organisation requires a specific context. Four components of a context facilitating the creation and transfer of knowledge within the organisation are identified: human, organisational, cultural/managerial and technological (Pallas and Labaki, 2004, 2005). Hence, knowledge management measurement issues deal with the analysis of the different context components of organisations orientated towards knowledge management.

The objective of this research is to invoke a framework which aims at facilitating management for improving business process. The study explores the orientation of organisations towards knowledge management through the empirical validation and measurement of the four theoretically identified components of a favourable context for knowledge management in organisations.

Within modern management thinking, measurements need not to be quantitative in nature (Turban and Tan, 1993). Qualitative assessments based on subjective impressions can provide a feedback for deriving improvement of the business processes (Nevis et al., 1995; Kululanga and McCaffer, 2001). Traditional techniques used to elicit the perception from individual experts focus on nomothetic methods (e. g. Rush and Wallace, 1997; Winch, 1995). The methodology used in this study combines the nomothetic and idiographic approaches based on causal mapping. The individual perception of knowledge management principles applied in organisation is elicited through the idiographic approach (in a form of a causal map). An idiographic approach is consent to capture unique, subjective knowledge and individual perception using in-depth interviews, thereby minimizing biases imposed by the facilitator (Eden and Ackermann, 1998). Causal mapping is known as a technique that is widely used to elicit and represent knowledge domain of individuals in the form of a causal map (Eden et al., 1992).

The obtained causal map is validated further on by the use of nomothetic methods. The purpose of nomothetic approaches is to confirm a priori determined (Nadkarni and Nah, 2003), widely accepted and generalized assumptions relating to a specific domain, while the purpose of an idiographic approach is to explore a new or unfamiliar domain. Empirical analysis of the components of a favourable knowledge management context has received little recognition to date. The use of a methodological approach including the causal mapping technique offers an interesting attempt to compare possible empirical components with identified theoretical components.

The empirical procedure consists of aggregating the perception of individual experts on knowledge management principles implied in the organisation and analyzing the individual causal maps into a collective causal map (CCM) (Scavarda et al., 2006). The analysis of this collective causal map is performed by ANCOM-2 software which combines qualitative and quantitative measures (Bouzdine-Chameeva, 2005). The detailed analysis of causal maps makes available a rational aggregation of several causal maps into one collective causal map to reach the prolific understanding of the problem (Bouzdine-Chameeva, 2005; Scavarda et al., 2006). The empirical field where the methodology is applied is rooted in the banking organisation. The banking environment proves to be a promising empirical source as it is characterized by a well defined administrative and hierarchical structure where the context of knowledge creation and transfer is interesting to be analyzed.

The insights of our research are twofold: methodological insights in combining nomothetic and idiographic approaches in causal mapping to validate the identification of four main theoretical components of a favourable context for knowledge management in the organisation, and practical insights of the empirical approach analyzing the favourable knowledge management context in the banking sector.

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Towards a Group Decision Support Framework for Complex Issues

Paulo Melo[1], Francisco Antunes[2], and João Paulo Costa[1]

[1] Faculty of Economics, Coimbra University, INESC Coimbra, Portugal
pmelo@fe.uc.pt
jpaulo@fe.uc.pt

[2] Department of Management and Economics, Beira Interior University, INESC Coimbra, Portugal
francisco.antunes@ubi.pt

This communication presents the state of an on-going research towards a computer support framework for complex group decision. This framework is grounded on several research and implementation efforts, which are also reviewed, and presented as a series of statements on needed functionalities and technology.

The AGAP GDSS (Aid to Groups of Analysis and evaluation of Projects) was implemented supporting both synchronous and asynchronous usage for enhancing the communication and data sharing among group elements. It provided three levels of support (individual, interpersonal, and collective) and integrated a set of economic measures that can be used as criteria in several multicriteria decision aid methods.

Building on AGAP lessons, another GSS was then developed — the Collaboration Studio — that tried to enhance the structuring activities through refining the data and communication's structure and the overall system architecture, in order to enable group elements to change a common working area. It supported persistent information on both idea integration and ownership discrimination.

Among others, this support for structuring activities was applied to enhance the information required to provide a mathematics-based representation of differences among a decision group engaged in evaluation tasks involving multicriteria models. The computational implementation of this representation — the TriGDist GDSS (ELECTRE TRI for Distributed Groups) — allows the creation of a shared task structure, while anchoring the individual preferences that distinguish group members. The TriGDist uses a distributed collaboration model based on two stages, one for group structuring (communication), and another for individual discrimination (appropriation). These stages can alternate as each individual learns on other group members preferences, to accommodate other inputs and preferences, or to explore the problem. In order to do so, information differences regarding group members' positions and the changes that would be needed to achieve the same results are provided by the system.

Finally, the data and communications structure was refined in order to allow divergence in data repositories, as the manipulation of two or more copies of a given "document" (either quantitative or text data). There is an integration process that aims to detect information divergence and achieve a common information block, by either using human intervention or automated processes. A software tool — the Divergent Information Management System, or DIMSys — was implemented to overcome the limitations of previous solutions and also to test these ideas.

An Exploration of How Men and Women Differ in Using Contextual Cues to Make Attributions during Virtual Collaboration

Ruth Ter Bush and Daniel Mittleman

DePaul University CTI
ruth.terbush@gmail.com
danny@cti.depaul.edu

1 Why we care

Gartner Research (Gartner Research, 2003) estimates that eighty percent of knowledge work in global enterprises is being accomplished virtually. It is not a surprise, then, that recent group support systems (GSS) and computer-mediated communication (CMC) research have focused on virtual team and virtual meeting technologies. Occasionally, the gender of the virtual meeting participants is considered as a variable in these studies as marketing, communication, and group psychology research indicate men and women process communication information differently.

Ter Bush (2006) found, as a tangential finding, significant gender variations in team member ability to accurately attribute causes of silence behavior during virtual collaboration. In this paper, we return to that finding to further investigate the differences noticed and to model why those gender differences exist.

2 Attribution Accuracy and Gender

Attribution is the assignment of meaning to our own behaviors and behaviors of others (Kelley and Michela, 1980). The process of attribution has many characteristics; the one we are most interested in is accuracy. Accuracy is how closely the attribution of behavior matches the actual cause of behavior. In this study we examine how same-time virtual collaborators attribute silence behaviors of collaboration partners. What is the attributed reason (a dependent variable) for the silence? And what is the real reason (a manipulated independent variable) for the silence? That is, we manipulate the real reason for silence during a virtual collaboration session and then query the collaborators for their attribution about that silence. We then map the accuracy of the collaborators' attributions.

Several researchers have looked at differential behaviors in group collaboration by gender. Hess and colleagues found that women exhibit more focused attention onto task than men (Hess et al., 2006). But Hess and her colleagues do not differentiate among the potential constructs (social focus, other observant, or detail processors) as the causal agent in their model. This research posits that differential information processing mechanisms, by gender, are the actual causal constructs.

Information processing strategies are multi-stage cycles starting with memory encoding and recognition assessment. There are two alternative strategies employed in the recognition assessment process: detailed and schema-based. Research has shown that females are more likely to use "detailed elaboration" of message items than males (Meyers-Levy and Sternthal, 1991), and that they are more likely to represent these items more strongly in memory. This suggests that females use the detailed strategy for recognition, while males use the schema-based approach once the threshold level has been reached. Meyers-Levy and Maheswaran (1991) confirmed that females tend to use a "comprehensive strategy" while attempting to integrate all available cues. In addition, they found that when there is a gender difference in recognition processing it is that males apply a message theme or schema-based approach to recognition while females use a detailed strategy.

This research uses contextual cues about information access and distraction to inform attributions of silence among team members in experimental conditions, while providing no cues in control conditions. As this is a post facto investigation (we already saw the data and that is what triggered us to look at the gender literature), we offer no new hypotheses. However, we do code the data by gender, discuss how the results map to previous literature, and extend the findings of the previous literature.

3 Methods

Student volunteers participated in three and four member teams working on team intellective task. Team members were randomly assigned to work at stations in different computer labs. One team member per group was randomly selected for a treatment. This treatment resulted in the silence of that team member. Since the actual reason for the silence was manipulated in the study, there existed in each case a correct answer to the reason for silence. Therefore, it was possible to measure the accuracy of the attributions made. A total of 21 groups were conducted with a combined total of 76 participants.

The CMC groupware allowed us to provide a back channel chat function. The experimental manipulation was achieved through the use of a dashboard panel that contained different contextual information by experimental condition representing the independent variables: information access level, and environmental distraction level. Control groups saw a dashboard without additional context information.

4 Results

The dependent variable in this research was attribution accuracy (see Figure 1). That is, were the participants accurate in making an attribution about the meaning of silence for their virtual partners? Initial investigation of gender differences found significance ($p < .001$) and a 2.5 to one odds ratio that women are more likely to make a correct attribution than men. Given that finding from the original study (Ter Bush, 2006), further investigation was undertaken for this study. New findings are that women are 3.2 times as likely to make accurate attributions when presented with interface cues ($p < .019$), but that men are 2.4 times less likely to make accurate attributions when presented with interface cues ($p < .016$).

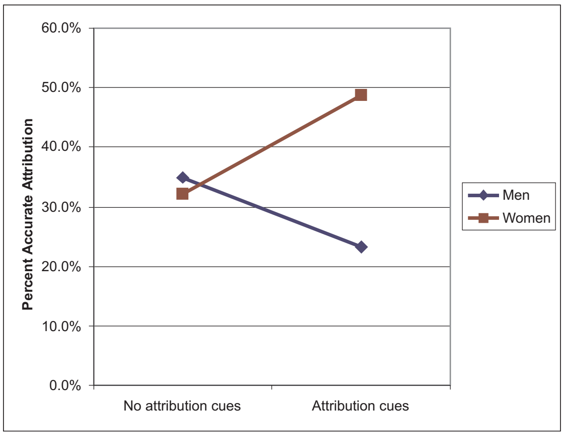

Figure 1: Attribution accuracy

5 Discussion

This study demonstrates that gender plays a role in the formation of silence attributions and suggests the mechanism by which gender influences attribution formation has two aspects. First, it has a mediating effect on how contextual information is encoded into memory. Second, there is a mediating effect impacting how much memory processing (recall) is done.

From the results present, this study suggests the existence of a threshold level of contextual cues at which both men and women move from using schema for memory recall processing into detailed memory recall processing. And, the data confirm the Meyers-Levy and Maheswaran (1991) finding that the threshold level differs for men and women, i. e., it seems higher for men, Men may require specific information about inconsistencies, making them more salient and therefore more strongly encoded in memory. It may well be that providing more contextual cues via a dashboard, visual interrupts, or other HCI affordances impacts men differently than women.

The questions participants were asked suggest that males most likely relied on schema-based processing and females on detailed level processing. The specific responses bear this out. Males were less accurate than females most likely because they failed to strongly encode cues into memory. Because females tend to operate in a more detailed manner, they made better associations.

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Part III

Invited Session
GSS Assimilation: Issues and Impacts

Invited Session
GSS Assimilation: Issues and Impacts

Deepinder S. Bajwa and L. Floyd Lewis

Western Washington University, Bellingham, WA 98225
deepinder.bajwa@wwu.edu
floyd.lewis@wwu.edu

GSS have the capability to significantly enhance group processes. The first paper in this session addresses GSS issues from decision quality standpoint. The second paper synthesizes past empirical studies on GSS to identify six key issues for GSS researchers. Finally, the third paper provides a research model and case evidence of post-adoption impacts of GSS and other related collaborative technologies that have the capability to support group work.

Post Adoption Impacts of Collaborative Information Technologies: Research Model and Case Evidence

Deepinder S. Bajwa[1] and L. Floyd Lewis[2]

[1] Western Washington University, Bellingham, WA 98225
Deepinder.bajwa@wwu.edu
[2] Western Washington University, Bellingham, WA 98225
Floyd.lewis@wwu.edu

1 Introduction

Collaboration to gain a competitive edge is becoming increasingly popular in modern day organizations as more and more information technology (IT) tools to support groups continue to emerge and become available to organizational end-users. We don't have to go too far to predict the explosion of collaborative IT tools to support teams. It is increasing at such an overwhelming pace that a quick search on "collaboration software" on Google results in more than 1.5 million links.

Not only are teams expected to collaborate within the enterprise but recent growth in supply chain and e-commerce initiatives require groups across organizations to collaborate in order to integrate value chain activities. The growing importance of team work (virtual and/or face-to-face, synchronous or asynchronous) in modern organizations coupled with the availability of IT tools to support collaboration has spawned many research investigations. However, in most cases, past research investigating IT based collaboration has focused on performance of groups with little attention to organizational impacts. Moreover, the subset of collaboration tools under investigation has been limited. To fill the void in the literature, we propose a research model to highlight the post adoption impacts of collaborative technologies at the organization level. As such, our study aims to understand organizational impacts of IT based collaboration within the enterprise and the organizational impacts (on the focal firm) of inter-organization collaboration as various entities engage in supply chain management and e-commerce initiatives.

2 Background

Information technology (IT) attributes as organization variables in empirical investigations has been widely researched. While approaches as to how to conceptualize IT as an organization variable have varied with the objectives of past research investigations, a categorical approach of conceptualizing IT has the advantage of focusing on a specific IT category/attribute under investigation (Robey and Kling, 1981). Common categorizations of IT include, amongst others: transaction processing systems (TPS), decision support systems (DSS), collaboration systems etc. Our research focuses on collaboration systems. We refer to these systems as Collaborative Information Technologies (CITs). Traditional collaboration systems were designed to improve performance of group members or teams by supporting communications and the flow of information. However, modern day CITs have the capabilities to support not only communication and information flow but also the computing needs of teams/groups engaged in accomplishing tasks/projects.

Several technologies can support collaboration (for a review of key studies, see Bajwa and Lewis, 2003). To identify the myriad of collaboration tools on the market can be a daunting task. Although many of them support limited functionality for collaboration, integrated e-collaboration tools are beginning to emerge to support a range of functionality required in collaborative efforts (Munkvold and Zigurs, 2005). For efficient and effective collaboration, software tools should support multiple functionality including: brainstorming, voting/polling, prioritizing, organizing, monitoring, communicating, interacting (conferencing), knowledge sharing, report writing, file sharing, data manipulation, data mining, data modeling, project management, workflow design, and calendaring.

While IT impact, in general, on organizational performance has been widely researched and the evidence critically debated (for a review see Dedrick et al., 2003), the organizational impacts of CITs specifically have not been explored. Most of the past CIT-related impact studies have investigated the performance of IT-supported groups and there is no dearth of such studies as 100s of articles have been published in the area of GSS and other computer-mediated computer systems supporting group work. Recent trends in global competitiveness, mass customization, and faster responses to turbulent environments has also resulted in the emergence of computer supported virtual teams that are capable of accomplishing work in distributed environments. In this area too, a review of the literature identifies several studies that have investigated virtual team inputs, socio-emotional processes, task processes, and their impact on team's satisfaction and performance (Powell et al., 2004) but not organizational impacts.

3 Model Development

Extensive use of an IT can lead to greater net positive benefits for the adopting individual, unit, or organization. However, the use of an IT and the consequences it produces are context specific (Orlikowski, 1993). At the organizational level, past research suggests that in a reorientation context (i. e. when an organization is undergoing radical change), IT is used to facilitate radical strategic and structural changes while in a convergence context (i. e. when an organization is undergoing incremental and evolutionary change), IT is more likely to be used to support existing strategy and structure (Freeman and Cameron, 1993). Thus in the context of intra-organization CIT use, organizational impacts are likely to be moderated by the firm's context in terms of its strategic orientation. For example, in a reorientation context, IT use is more likely to focus on "effectiveness" related impacts while in a convergent context, IT use may focus on "efficiency" related impacts.

The popularity of supply chain initiatives suggests that many organizations also engage in IT based inter-organization collaboration. When CITs are used across supply chain entities for inter-organization collaboration, the relationships between their use and organizational impacts are likely to be moderated by the extent of integration of the value chain in which the focal firm participates/operates. Firms that have stronger relationships with their external entities (suppliers, business partners, customers etc.) operate in tightly coupled value chain activities and are likely to use CITs to greater extent and therefore realize more benefits than those where relationship ties are weak and value chains are loosely coupled.

Given the abundance of CIT products available today, organizations have many choices for adoption. As a result, rather than identifying popular CIT products, based upon the past and current research we focus on a "range" of a set of collaboration functions that have the capability to support most collaborative tasks. To capture intra and inter-organization CIT use, we also consider the "reach" of CITs (enterprisewide and inter-organization) and their intra and inter-organization impacts. While there is limited research on the organizational impacts brought about by deploying CIT tools, the IT impact literature suggests performance related influences that are either efficiency or effectiveness related. Overall, we propose that the relationships between CIT utilization for collaborative tasks and their organizational impacts are moderated by value chain integration and the organization's strategic context.

We have already conducted several interviews at a mid-sized organization in the northwest US to test the face validity of our research model. In our presentation, we will discuss our preliminary results and the implications of our findings for future research and practice.

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A Team Decision Framework for Quality Decision Outcomes

Des Klass[1], Olive Schmidenberg[1], and John de Reuck[2]

[1] Curtin University of Technology, Perth, Australia
Des.Klass@cbs.curtin.edu.au
Olive.Schmidenberg@cbs.curtin.edu.au
[2] Taylors College, Perth, Australia

1 Introduction

This research outlines the Team Decision Framework (TDF) which follows on from our previous work on optimizing the quality of decision-making in groups. The TDF is proposed as a model of the skills and abilities which we have termed ‘intelligences’ that should ideally be present in order for groups making decisions to achieve their full potential.

In our previous publications we have argued that, for groups involved in formal strategic planning activities in work organizations, certain procedures and principles need to pertain, for that group to make the very best decisions of which its members are capable at that time (de Reuck et al., 1999, 2000, 2003). According to the General Decision Assurance Methodology developed by the authors, “best bet” decision making of this kind requires an environment that allows for authentic communication which in turn is promoted by such factors as the encouragement and serious examination of diverse views, respect for the individual, acceptance of the possibility of fallibility, a democratic decision-making milieu, and agreement to accepting the authority of the better argument as the final arbiter in debate.

In this paper we again address the issue of decision quality assurance for groups making strategic decisions. We turn our attention this time to the “intelligences” which should ideally manifest themselves in the group in order to maximize the group’s decision-making potential and thus ensure the quality of the decision outcomes. We conceptualize “intelligences” as interdependent and interactive clusters of abilities and skills. The degree to which the intelligences are present in the group and how they are utilized determine the group’s effectiveness in adapting to the demands of their decision-making environment. The intelligences thus define the conditions for the quality of the group’s performance in decision-making. We suggest that measurement of the intelligences could provide a group diagnostic profile with implications for the education, training and development, and the selection and composition of teams of strategic decision makers.

This paper presents a Team Decision Framework (TDF) comprising the following interdependent and interactive Decision Intelligences: Informed Intelligence, Communicative Intelligence, Critical Intelligence, Creative Intelligence and Decisive Intelligence, all moderated by Group Emotional Intelligence.

2 The Team Decision Framework

Following traditional formulations like that of Simon (1976) and Radford (1978), the TDF represents a three-phase conceptualization of decision making, i. e.inquiry, analysis and choice, but extends this model by including the intelligences that support the phases. The decision-making cycle would typically be initiated by the surfacing of some degree of doubt, dissatisfaction or concern about the current situation, or simply by a prudent review of the status quo. The process is iterative, rather than linear, which allows the decision-making team to move back and forth between the phases.

3 The Decision Intelligences

It should not be assumed that because we are applying the concept of intelligence as previously defined to a group situation that we conceive of the group as having a single "mind". We view decision-making groups in work organizations not as holistic entities, but as collections of individuals, each with their own roles and responsibilities within the organization and their own views and intentions. From the perspective of the TDF, it is therefore important that all the intelligences are represented in the group membership but even more so that the intelligences are drawn out and utilized to their best advantage in the group's proceedings and processes. For example, it is not in the groups' interests to have in their midst individuals who are highly creative without making the most of that creative intelligence in the process of problem solving.

Several clusters of abilities, capabilities and attributes make up the intelligences included in our framework. It must however be noted that the intelligences are interdependent and the components of one might influence the action of another to a greater or lesser degree.

4 Group Emotional Intelligence (GEI)

Following Goleman (1998), TDF sees Group Emotional Intelligence as an overarching intelligence that moderates the potential benefits the group can achieve from the inherent intelligences present within the group. Group Emotional Intelligence (GEI) addresses the emotional, personal, social, and survival dimensions that need to be present to allow the decision team to fully realize it's potential. Ideally, individuals within the decision-making team not only need to understand themselves but also need to understand and be sensitive to other team members and be able to adapt and cope successfully with the pressures associated with group decision-making. The extent to which a group is capable of this represents its emotional intelligence.

The TDF recognizes several dimensions that impact on the status of a group's emotional intelligence. These dimensions are a subset of the Bar-On (2004) Emotional Quotient Inventory instrument and include interpersonal (empathy and social responsibility), intrapersonal (self regard, independence, and self-actualization), adaptability (flexibility and problem solving), and stress and general mood (impulse control, optimism, and happiness) dimensions.

The BarOn Emotional Quotient Inventory (EQI) defines *empathy* as the ability to be aware of, to understand, and to appreciate the feelings of others and sees *social responsibility* as the ability to demonstrate oneself as a cooperative, contributing, and constructive member of one's social group.

On the other hand, *self regard* is defined as the ability to respect and accept oneself as basically good. Respecting oneself is self-acceptance and self-liking. *Independence* is the ability to be self-directed and self-controlled in one's thinking and actions and to be free of emotional dependency. Finally, *self-actualization* pertains to the ability to realize one's potential capacities.

Flexibility in the EQI instrument is the ability to adjust to one's emotions, thoughts, and behavior to changing situations and conditions while *problem solving* aptitude focuses on the ability to identify and define problems, as well as to generate and implement potentially effective solutions.

Impulse control is the ability to resist or delay the impulse, drive, or temptation to act. *Optimism* is the ability to look at the brighter side of life and to maintain a positive attitude even in the face of adversity, and *happiness* in the BarOn EQI is defined as the ability to feel satisfied with one's life, to enjoy oneself and others, and to have fun.

In this presentation, we will describe the intelligences, outline the clusters of abilities, capabilities, and attributes that make up the intelligences. We will also discuss the instrument development process and the preliminary findings from empirical evidence gather to validate our TDF.

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Key Issues for GSS Research

Graham Pervan[1] and David Arnott[2]

[1] Curtin University of Technology, Perth, Australia
Graham.Pervan@cbs.curtin.edu.au
[2] Monash University, Melbourne, Australia
David.Arnott@infotech.monash.edu.au

1 Introduction

This paper reports on the content analysis of 319 GSS articles published in 14 major journals from 1990 to 2004. In order to be included in the sample the paper had to involve an IT-based *system* which supported group work. The first, descriptive, results on GSS were presented at the Group Decision and Negotiation conference in Vienna, Austria in 2005 (Pervan et al., 2005) and the overall results on DSS in general have been published in Arnott and Pervan (2005). The aim of this paper is to integrate the conclusions of these strands of the project into a set of key issues that can assist researchers in the development of research agendas that are important for both theory and practice.

2 Key Issues

Issue 1: The Relevance of GSS Research

The analysis reveals that overall, only 6.6% of GSS research is regarded as having high or very high practical relevance and 55.8% of GSS research was regarded as having no or low practical relevance. Even though the high and very high practical relevance statistics vary over time periods, the figures are so low as to constitute a potential crisis in the GSS discipline. We believe that most of the factors identified by Benbasat and Zmud (1999) are in play in GSS research. Most GSS research has been conducted in the laboratory (Fjermestad and Hiltz, 1998) where rigorous, tightly-controlled experiments, with artificial problems solved by student groups can be carried out. The relative lack of exposure of academics to contemporary professional practice is a particular problem for GSS. For GSS research to be relevant to professional practice, and more importantly, to influence the direction and nature of professional practice, researchers need to reassess their agendas ad focus on how these technologies are utilised by real stakeholders tackling their own, real, problems.

Issue 2: GSS Research Methods and Paradigms

The empirical papers in the sample were coded for research paradigm. GSS research is found to be overwhelmingly dominated by the positivist paradigm with 87.4% of empirical studies following that approach. This finding is supported by studies which include pre-1990 data such as Pervan (1998). Chen and Hirschheim (2004, 's) Chen and Hirschheim's (2004) study of general IS research from 1991 to 2001 reported that 81% of papers had a positivist orientation with 19% using an interpretivist approach. GSS research is more dominated by positivism than general IS research, though other DSS research is even more positivist-dominated than both GSS and IS.

Just over one-quarter (27.6%) of GSS research is non-empirical, with three-quarters (72.4%) empirical. Chen and Hirschheim (2004, 's) Chen and Hirschheim's (2004) analysis of overall IS research reported a different split between non-empirical (40%) and empirical (60%) research. GSS research, therefore, is significantly more empirical than general IS. The low non-empirical portion of GSS research reflects a lower emphasis on conceptual papers and so perhaps a lack of solid theoretical foundations for GSS research.

The next most common method was the 12.8% in the empirical-objects category where GSS researchers describe systems and tools that are novel and/or important is supporting group work. This is part of what is now called design science (Hevner et al., 2004) and GSS researchers have something to offer the current debate on IS design science methodologies.

Issue 3: The Theoretical Foundations of GSS Research

Research in GSS should be grounded in quality judgement and decision-making research. In analysing GSS papers, special care was taken to distinguish between merely citing reference theory in introductory or focussing discussion and actually using the reference theory in the design of the research and interpretation of results. Only the second, integral, use of reference theory was coded in this project. Almost 30% of GSS papers cited no references, which indicates there are theoretical weaknesses in some GSS research.

Issue 4: The role of the IT Artifact in GSS Research

GSS research has embraced both micro and macro IS research traditions. Given that GSS research is focused on supporting and improving group work, it is positive to see a healthy 49.5% on the macro issues of decision outcome, organisational impact, and the decision-making process. Research on the micro issues of systems development and the technology comprises 23.5% which is also healthy, but of some concern is the significant decline in GSS focus on the technology from 25.9% in the early 1990s to 14.3% in the late 1990s to only 7.1% in the 2000s. While it could be argued that this might be expected with a maturing technology, it may also imply that few innovations are being developed.

Issue 5: The Funding of GSS Research

The analysis of the funding of GSS research identifies those papers supported by major competitive grants from national agencies, cash funding by industry, and internal university schemes. As a field, GSS research is poorly grant-funded. Only 24.1% of GSS papers in the sample received any acknowledged grant funding; only 16.6% received any external funding at all. The 319 papers in the sample from 14 major GSS, DSS and IS journals should represent the best of GSS research. However, 75.9%

of papers do not acknowledge any funding. Further, only 16% of these 'best' GSS papers attract the prestigious competitive grant funding which enhances a department or school's reputation and attracts further infrastructure funding from governments. It is apparent that most GSS research is implicitly funded, that is, funded as an integral part of the standard work of an academic and the recurrent budget of the academic's department. However, in the current global academic environment, any discipline that relies on implicit funding of research will not prosper, simply because implicit funding no longer provides adequate support for an academic's research career. As a result, the relatively low level of grant funding represents a potential problem for the GSS field. To add to the grant-funding problem, GSS has also been relatively unsuccessful with industry funding with only 7.5% of papers reporting industry support, but far more worrying is the tie trend as the industry funded papers have fallen from 17.6% in the early 1990s to zero in the 2000s. Industry is no longer interested in GSS research. underlineIssue 6: GSS Exposure in "A" Journals

In all 'A' journals, GSS research occupies only 1.2%, much less than the 7.8% in 'Other' journals. This large differential is a poor result for the GSS field as it shows that GSS researchers have a poorer publishing record than the rest of the IS discipline. When considering general IS journals only, GSS research performs a little better. Further splitting the general IS category into US and European categories shows most GSS researchers publish in US rather than European journals. However, the overall analysis indicates a need to significantly increase quality in GSS research such that it can be published in 'A' level journals.

3 Implications

The analysis of the six key issues constitutes a cause for reflection, revision, and evolution of GSS research agendas. Our intention of the analysis is to illuminate problems in the field so that we may change our research behaviour in way that significantly improves our work. It should be remembered that despite its current problems, GSS has a long, albeit declining, history of success in scholarship and practice. Nevertheless, the six key issues identified by our research demand careful attention. In our presentation, we will discuss our analyses and findings in greater detail. Some of the problems for GSS are clear. The field is seriously disconnected from practice, has relatively little impact on the highest level of journals, has low competitive grant success and even lower industry support, and is based on a limited theoretical foundation.

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Part IV

Invited Session
Perspectives of Supply Strategies: Theoretical and Experimental Considerations

Invited Session
Perspectives of Supply Strategies: Theoretical and Experimental Considerations

Karl-Martin Ehrhart

University of Karlsruhe
ehrhart@wiwi.uni-karlsruhe.de

On a variety of markets, suppliers face different types of institutions and structures which induce them to decide and act strategically (e. g. decisions on technology, market institutions, and supply mechanisms; specification of price and product policy on oligopoly markets). In this session we focus our interest on three characteristic perspectives of supply strategies:

- Network technology adoption: strategic sponsoring of switching customers and community building.
- Auction mechanism design: relevance of variational bidding behavior (caused by auction fever and endowment effects) in theoretically equivalent auction formats.
- Supply chain management: strategic role of the supplier in the supplier-retailer-relationship.

The presented studies base on theoretical considerations as well as on experimental evidence.

An Experiment on Auction Fever

Susanne Abele[1], Karl-Martin Ehrhart[2], and Marion Ott[2]

[1] Miami University, Oxford
abeles@muohio.edu
[2] University of Karlsruhe
ehrhart@wiwi.uni-karlsruhe.de
ott@wiwi.uni-karlsruhe.de

Auction fever is usually defined as a "disease" that induces bidders to bid over their preselected bidding limit. The fact that many Internet auction providers advice bidders to protect themselves against this disease and to avoid suffering from auction fever indicates that auction fever seems to be a widespread phenomenon.

Possible explanations for the occurrence of auction fever are auction dynamics, a pseudo- or quasi-endowment effect, competitive arousal, and escalation of commitment. By auction dynamics we mean a multi-stage and multiple-bid process where bidders observe an increasing price in the auction and have the opportunity to raise their bids during the auction. The term pseudo-endowment effect describes an effect similar to the endowment effect (see e.g. Kahneman et al., 1991) but with the difference that there is no real ownership of the item. Nevertheless, the current high bidder might develop a psychological ownership of the item and thus have an other valuation for the item than without being the current high bidder (see e.g. Ariely and Simonson, 2003; Heyman et al., 2004). The competitive arousal hypothesis states that diverse factors in an auction (e.g. rivalry, time pressure) impact the decision-making of bidders due to increasing arousal. Escalation of commitment results from the justification of previous decisions by investing more instead of leaving the auction (Ku et al., 2005).

We conduct a laboratory experiment to test the hypothesis that the pseudo-endowment effect and the dynamics of auctions cause auction fever, that is, auction formats which allow for the possibility of pseudo-endowment and dynamic auctions result in higher bids and, thus, higher prices. Subjects participate in auctions in the computer laboratory and are paid after the auction depending on the result. Every subject participates in one auction with two other bidders (i.e. groups of three bidders).

Our experiment consists of four treatments with twelve groups per treatment. In all treatments we conduct private value auctions where the bidders have private but incomplete information of their valuation for a hypothetical good; i.e. they know that their valuation lies within a given interval, is uniformly distributed, and private information for the bidder. The valuation of the winning bidder will be realized right after the auction has ended. All three bidders in a group have different distributions of their values (i.e. different intervals) and they know that they are different. The intervals of the three bidders in the experiment are the same in all four treatments and are given by $[512, 712]$, $[517, 717]$, and $[552, 752]$. When the auction ends, the winner's valuation is drawn and he is paid his valuation minus the price plus a lump sum payment that all subjects receive. Prices are determined as second price plus one increment or a small variation thereof, such that the incentives in the four treatments match.

In the first treatment participants are asked to submit their upper bidding limit only once (T1). A bidding mechanism will then outbid the bids against each other like in an English auction. This is the benchmark for the other treatments. In the second treatment (T2), we introduce dynamics to the auction design. During the auction the price increases incrementally and bidders are asked at every stage if they accept the current price level. In the third treatment (T3), a high bidder is randomly chosen out of the set of accepting bidders at every price level in this type of dynamic auction. Thus, in this treatment, we allow for the pseudo-endowment effect as the current high bidder might feel a bit like already owning the item and thus might have a higher valuation for the good than before. In the fourth treatment (T4), the bidder who first submitted the bid at a given auction price is designated as high bidder. In this treatment the high bidder gets his position not by chance as in T3 but by being the fastest bidder in a stage. We expect this to evoke a stronger pseudo-endowment effect. Table 1 gives an overview of the four treatments.

Table 1: Overview of the four treatments T1–T4

T1	T2	T3	T4
benchmark	dynamics	dynamics & weak pseudo-endowment	dynamics & strong pseudo-endowment

Our hypothesis is that the auction prices increase from treatment to treatment, as T1 and T2 differ with respect to auction dynamics, T3 includes auction dynamics and the possibility of a pseudo-endowment effect and in T4 we expect an even stronger pseudo-endowment effect, as bidders influence becoming the current high bidder by being the fastest bidder in a stage of the dynamic auction.

From a theoretical point of view a rational bidder is expected to behave in the same way in all four different auction formats, i.e. he will submit the same (maximum) bid in all four treatments. To show this, let $u_i : \mathbb{R} \longrightarrow \mathbb{R}$ denote bidder i's von Neumann/Morgenstern utility function and let $F_i(v)$ and $f_i(v)$ denote the cumulative distribution function and the probability density function, respectively, of bidder i's valuation $v \in [\underline{v}, \bar{v}]$. Note that the valuation of the item for bidder i is determined after the auction in case bidder i is the winner. Hence, bidder i does not know the exact value of the item when he participates in the auction but it is assumed that he knows the distribution of the value for him $F_i(v)$. Furthermore, the distribution $F_i(v)$ is private information of bidder i and thus not known by the other bidders and bidder i does not know other bidders' distributions. Therefore, bidder i can build subjective beliefs only about other bidders' valuations and their bidding behavior in the auction. His beliefs may depend on the auction format. For example a bidder might be induced to update his beliefs during the course of a dynamic auction like the auction formats in T2, T3, and T4. Let bidder i's belief about the distribution of other bidders' highest bid β be characterized by the distribution function $G_k(\beta)$ and density function $g_k(\beta)$ where $k \in \{T1, T2, T3, T4\}$. Bidder i's decision variable b_i is the (highest) bid he is willing to submit. The maximization of bidder i's expected utility in auction k is given by:

$$\max_{b_i} \int_0^{b_i} \int_{\underline{v}}^{\bar{v}} u_i(v-\beta)\, f_i(v)\, g_k(\beta)\, dv\, d\beta$$

The first order condition leads to the following expression: $\int_{\underline{v}}^{\bar{v}} u_i(v-b_i)\, f_i(v)\, dv = 0$.

We see that the solution does not depend on the distribution $G_k(\beta)$ and $g_k(\beta)$. As a result, bidder i's optimal bid b_i^* has to be the same in all four auction formats T1–T4.

For example, a risk neutral bidder i, whose utility is given by the difference between his valuation v and the price p he has to pay in case that he wins the auction (i.e. $u_i(v-p) = v-p$) bids his expected valuation (i.e. $b_i = \int_{\underline{v}}^{\bar{v}} v\, f_i(v)\, dv$).

We find that the prices in the treatments differ significantly. Mean prices increase from treatment to treatment (see Table 2). Comparisonsbetween pairs of treatments

Table 2: Average auction prices (in Experimental Currency Units)

T1	T1	T3	T4
608	621	631	653

reveal that prices in T3 are significantly higher than in T1 and prices in T4 are significantly higher than those in all other treatments (significant at the 5% level, one-tailed).

We conclude that both the pseudo-endowment effect and the dynamics of an auction have an impact on bidding behavior. However, the pseudo-endowment effect is more important than dynamics for auction fever. Particularly in the case that bidders have influence on becoming the high bidder (T4) the pseudo-endowment effect is crucial.

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Collaborative Software Networks Competition in the Presence of Sponsored User Orientation: A Game Theoretic Analysis

Christian Hoppe

WiOR, University of Karlsruhe, 76128 Karlsruhe, Germany
hoppe@wiwi.uni-karlsruhe.de

1 Introduction

Collaborative software (groupware) is social software that applies to common labour activities. It exhibits, for example, communication devices, shared calendars, project scheduling as well as document, workflow and knowledge management. Commercial producers as Lotus (Notes) and Novell (Groupwise) stand vis-à-vis Open Source (or similar) licences as OpenGroupware.org. Such systems help profitably on maintaining consistency of data and procedures for intra-organisational, but also inter-organisational business relationships. This analysis investigates diffusion patterns and upcoming market structures of groupware technology in the presence of marketing strategies where sponsors (as producers of groupware technologies) try to align groupware adopters with their product.

Essentially, a sponsor can influence user orientation by either fostering collaboration of his technology's users due to increased business contacts between them (building a "community"), or by incentivising adopters of the competitors' technologies to switch groupware.

2 Model and Market Solution

The strategic analysis of the sponsors' marketing behaviour is based on the analysis of the users' adoption dynamic. Groupware technologies exhibit positive network effects; the more firms and organizations use the same technology the easier is the collaboration at an inter-firm level in case of joint projects or supply chains. Furthermore, adopters of groupware face switching costs due to expensive and inchoate data conversion to another groupware.

Marketing actions are fixed for some time and introduced by farsighted sponsors. The homogenous population of adopters, however, is assumed to change faster and to preferably imitate recently successful users. The initial adoption is at random.

Diffusion without marketing actions is modeled as a dynamic evolutionary game where adopters randomly collaborate with other users from time to time. Because of the network effects the (periodical) payoffs from a joint project are described by a symmetric normal form coordination game, represented by

$$M = \begin{pmatrix} b_A - p_A + n_A & b_A - p_A \\ b_B - p_B & b_B - p_B + n_B \end{pmatrix},$$

where $b_i > 0$ denotes the base utility from implemented groupware technology $i \in \{A, B\}$, $p_i > 0$ is the periodical, exogenously fixed price an i-adopter pays to the sponsor of groupware i. For a pricing analysis see Hoppe (2006). n_i denotes the network gains when two i-adopters meet, where the probabilities for such a collaboration correspond to current market shares s_A, $s_B \in [0, 1]$ where $s_A + s_B = 1$. In the degenerate case one technology dominates the other one, i.e. payoffs from a certain groupware are always higher for adopters, no matter what groupware the other user applies. Due to the users' tendency of imitating successful groupware adopters the growth rates of groupware market shares can be represented by the replicator dynamics equation

$$\dot{s}_A = s_A \cdot \left((1, 0)\ M \begin{pmatrix} s_A \\ s_B \end{pmatrix} - (s_A, s_B)\ M \begin{pmatrix} s_A \\ s_B \end{pmatrix} \right),$$

where the dynamic starts in the initial market shares, s_A^0.

Apart from the sinks $s_A = 0$ and $s_B = 0$ there is an unstable interior fixed point $s_A^{int} \in [0, 1]$ in case M represents a coordination game, shared markets only result in case $s_A^0 = s_A^{int}$. Efficient de facto standardization, thus, depends on initial market shares.

When sponsors build up communities, organizations using the same groupware get in closer contact to each other and the probability of exclusionary intra-groupware collaboration increases, represented by δ_A, $\delta_B \in [0, 1)$.

It is possible to note the new dynamic like a replicator dynamics equation, where fixed points remain qualitatively the same, but M is replaced by $\tilde{M}$.

$$\tilde{M} = \begin{pmatrix} (b_A - p_A + n_A) \cdot (\frac{\delta_A}{s_A} + (1 - \delta_A)) & (b_A - p_A)(1 - \delta_A) \\ (b_B - p_B)(1 - \delta_B) & (b_B - p_B + n_B)(\frac{\delta_B}{s_B} + (1 - \delta_B)) \end{pmatrix}.$$

Obviously, for δ_A, $\delta_B \rightarrow 1$, the dynamic converges to the de facto standard $i \in \{A, B\}$ where surplus $b_i - p_i + n_i$ is highest, representing the efficient fixed point of the dynamic. This result corresponds qualitatively to the symmetric formulation in Oechssler (1999).

Switching costs $w_{ij} \in R$ occur for a switch from groupware $i \in \{A, B\}$ to $j \in \{A, B\}, i \neq j$. Thereby, some users switch arbitrarily, indicated by the rate $\alpha \in [0, 1]$. Only arbitrary switching can alter the interior fixed point in position and existence. Thus, switching costs can change the resulting de facto standard. Incentivising switching can be interpreted as negative switching costs. Then the interior fixed point can also change from a repelor to a global attractor when switching to at least one technology is highly incentivised. Hence, the dynamic can change from a coordination to an anti-coordination structure.

Groupware producers know about the impact of marketing strategies on the market shares' development, as analysed above. Marketing measures are limited by a periodical budget restriction. The sponsors' expenses (switching incentives vs. community building) are strategies in a non-cooperative (repeated) game where payoffs are determined by adoption. In case of de facto standardization the losing sponsor retreats and the winning sponsor can phase out marketing measures.

The subgame perfect Nash Equilibrium of the game particularly depends on arbitrary switching (α) and network effects (n_A,n_B); For $\alpha > n_j$ sponsor $j \in \{A, B\}$ prefers switching incentives (lowering w_{ij}) to community building ($\delta_j > 0$). Thus, sponsors can apply different marketing measures. Eventually, there are three different kinds of equilibrium market structures.

- For low marketing budgets adoption mostly results in de facto standardization, depending on initial market shares. Shared markets can only result in initial market shares. This type of equilibrium does not apply if there is a dominant technology even without marketing measures.
- The only groupware with high marketing budget becomes de facto standard, independent of initial market shares.
- For high marketing budgets and a high degree of arbitrary switching, shared markets with constant or temporally oscillating market shares are stable. Initial market shares are not crucial. At least one sponsor incentivises switching.

3 Conclusion

Switching incentives and community building affect groupware adoption dynamics. A sponsor prefers the latter when network effects are strong. Thus, groupware sponsors can use different marketing actions to win the standards war. De facto standardization results mostly when all sponsors' marketing budgets are low, depending on initial market shares. Otherwise, shared markets with probably oscillating market shares result which is not efficient due to network effects and switching costs. Banning switching incentives and fostering groupware communities lead to a high intra-groupware collaboration level and efficient de facto standardization when prices tend to sponsors' costs. These conditions are fulfilled rather for Open Source producers.

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Experimental Investigation of Supplier-Retailer Contracts

Claudia Keser and Giuseppe Paleologo

IBM T. J. Watson Research Center and CIRANO, Montreal
ckeser@us.ibm.com
gappy@us.ibm.com

1 Motivation

We present the results of an experimental investigation of a simple supplier-retailer contract in a world of stochastic demand.

The contractual relationship between the wholesale supplier and the retailer of goods has been the subject of intense theoretical study in recent years. The reason is that for a simple contract, known as the “wholesale price contract”, the predicted equilibrium is inefficient. In this contract, the supplier specifies a unit wholesale price for whatever number of units the retailer is going to order. The retailer chooses his order quantity based on this price. The inefficiency of the wholesale price contract arises because decentralized decision-making results in a total profit for the supply chain that is smaller than what could have been obtained with a centralized decision. This result is of practical interest because the wholesale price contract is widely used in practice.

The existing literature takes inefficiency of the wholesale price contract as the starting point and tries to identify more complex contracts that achieve efficiency, preserving decentralized decision-making. An example is a “buy-back” contract; in which the supplier commits to buy back any unsold items from the retailer (Pasternack, 1985). For an extensive survey of this literature see Cachon (2003).

We suggest an empirical investigation of the wholesale price contract. There are three advantages to such an approach. First, it provides empirical validation to the theoretical prediction. Second, it reveals features of behavior induced by this kind of contract that are not dealt with in the theoretical literature but are relevant to actual instances of the contract. Finally, it provides guidance in the design of more sophisticated contracts aimed at increasing efficiency. Due to the difficulty in obtaining field data for the contract in its pure form, we pursue an experimental economics approach. This implies the examination of real human behavior in a controlled laboratory environment and with monetary incentives.

2 Method

In our simple game-theoretical model, a single supplier sells to a single retailer. In the first stage of the game, the supplier specifies the wholesale price per unit. In the second stage of the game, the retailer is informed about this wholesale price and decides on the number of units he orders from the supplier in advance of the selling season. The retailer faces a "newsvendor problem": he sells a product, at a given retail price, in a short selling season with a stochastic demand. Demand is known to be uniformly distributed on a given support. After receiving the retailer's order, the supplier produces at a fixed unit production cost and delivers at the start of the selling season. The retailer has no replenishment opportunity during the selling season.

Participants in our experiment play 30 repetitions of this game. The finitely repeated game has a unique subgame perfect equilibrium solution.

The experiment was run at the Center for Experimental Social Science (C.E.S.S.) computer lab at New York University. We organized three experimental sessions with ten participants each. Five of the participants in a session were randomly allocated the role of a supplier, and the remaining five were allocated the role of a retailer. Each participant in the role of a supplier was randomly and anonymously matched with one of the other participants in the role of a retailer, with whom he or she interacted over all 30 rounds of the experiment. This yields us five statistically independent observations per session, fifteen in total.

In the beginning of a session, written instructions were distributed and read aloud by the experimenter. Then, the participants had to go through a computerized questionnaire, which tested the understanding of the instructions. Only after each of the participants had answered to each of the questions correctly could the computerized experiment begin. Each participant was seated at a computer terminal that was isolated enough from the other participants' terminals so that participants could make their decisions in anonymity. None of the participants knew with whom they were interacting. At the end of an experimental session, each participant was paid cash based on his or her individual success in the experiment. The average payment was $30 for an experiment that lasted about 90 minutes.

3 Results

We observe that the wholesale price contract yields an efficiency that is not significantly different from the game-theoretical prediction (sub-game perfect equilibrium) under the assumption of the retailer's risk neutrality. The observed behavior of suppliers and retailers is very different, though, from the subgame perfect equilibrium. Participants in the role of a supplier charge lower wholesale prices than predicted by the subgame perfect equilibrium. Similarly, retailers order less than would be their best response to those wholesale prices.

Although the resulting total profit is not significantly different from the equilibrium prediction, the individual profits are more equitably allocated among suppliers and retailers. This is due to the suppliers' tendency to offer wholesale prices that would imply an equitable profit allocation if demand were deterministic.

Retailers tend to anchor their quantity decision on the previous combination of wholesale price and order quantity and, from there, adapt to changes in the wholesale price, such that a wholesale price increase (decrease) leads to a decrease (increase) in the order quantity.

Our experiment relates to the one by Schweitzer and Cachon (2000), which is confined to the examination of the retailers' decision making. Our results with respect to the retailers' decisions are only partially in keeping with theirs. In particular, we do not observe retailers to "chase demand", which would imply an increase in the order quantity after unsatisfied demand and a decrease in the order quantity after overstock. This might, in part, be due to the retailers' direct interaction with their suppliers in our experiments, where we observe a predominant influence of the suppliers' change in pricing on the retailers' quantity decision.

Our future research agenda involves the comparison of the observed behavior and efficiency of the wholesale price contract to participants' behavior and efficiency in more sophisticated contracts, as for example the buy-back contract. The latter, according to theory, should lead to full efficiency. (The full paper is available at `http://www.cirano.qc.ca/en/bottin/cv.php?coderelation=1373`.)

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Part V

Invited Session
Advances in Graph Model and Negotiation Technologies

Invited Session
Advances in Graph Model and Negotiation Technologies

D. Marc Kilgour[1] and Keith W. Hipel[2]

[1] Wilfrid Laurier University, Waterloo, Canada
mkilgour@wlu.ca
[2] Department of Systems Design Engineering, University of Waterloo, Waterloo, Canada
kwhipel@uwaterloo.ca

The availability of convenient high-speed communication and computation has opened up new opportunities to assist individuals and organizations facing strategic decisions. Graph Model technologies support the analysis of strategic conflicts using the Graph Model for Conflict Resolution, a system that shows how options and preferences are translated into decision choices in a multi-party, multi-objective setting. The Graph Model is not only a communication device, but also a source of strategic insights and a guide for structuring conflicts. Negotiation technologies support negotiators by intervening in bilateral negotiations, suggesting reasonable compromises and Pareto improvements on tentative agreements. This session will emphasize new developments and applications in these rapidly advancing fields.

Bilateral Negotiation Using Case-based Distance Methods

Ye Chen[1], D. Marc Kilgour[2], and Keith W. Hipel[1]

[1] Department of Systems Design Engineering, University of Waterloo, Waterloo, Ontario, N2L 3G1, Canada
kwhipel@uwaterloo.ca

[2] Department of Mathematics, Wilfrid Laurier University, Waterloo, Ontario, N2L 3C5, Canada

A decision support system that uses case-based distance methods to support bilateral negotiations with multiple issues (criteria) is constructed and applied to compare various distance metrics in terms of the negotiated outcomes they produce. Bilateral negotiation is understood as a form of multiple criteria decision analysis (MCDA), which in turn is seen as consequence-based preference aggregation, where preferences depend on both values (of consequences) and weights (of criteria). A negotiator's preference for an offer (alternative) is modelled as depending on distance from the negotiator's ideal point; optimization programs are employed to generate descriptive criterion weights by assessing case sets provided by each negotiator. The decision support system helps the negotiators evaluate offers and reach a compromise. The advantages of the proposed method are that negotiators can easily understand and accept distance-based preference representations, that they are willing to negotiate using these distances, and that the difficulty of acquiring negotiators' preference information directly is overcome. The objective of the comparison is not only to demonstrate the proposed method but also to evaluate its performance using different measures of distance.

Perceptual Graph Models

Amer Obeidi[1], D. Marc Kilgour[2], and Keith W. Hipel[1]

[1] University of Waterloo, Waterloo, ON N2L 3G1, Canada
kwhipel@uwaterloo.ca
[2] Wilfrid Laurier University, Waterloo, ON N2L 3C5, Canada
mkilgour@wlu.ca

A fundamental tenet of the Graph Model methodology is that all decision makers (DMs) have identical sets of states. To account for DMs' inconsistent apprehensions of outcomes, a standard graph model is perceptually mapped to create an (integrated) graph model for each DM. A perceptual graph model system expresses each DM's perception of the conflict, and each DM's viewpoint, which reflects the awareness of states that are inconspicuous to other DMs. Hence, each perceptual graph model in the system is a sub-model that shares some features of the standard graph model. Furthermore, conclusions drawn when analyzing a graph model system must depend upon who is doing the analysis (and with what information). Perceptual stability analysis accommodates DMs' subjective renditions of the underlying decision problem by keeping track of which graph model is being analyzed and what each DM knows. A case study illustrates how perceptual graph models are constructed, and how they are analyzed for the 2-DM case is presented.

Negotiations over the Caspian Sea: A Preliminary Graph Model Analysis

Majid Sheikhmohammady[1], D. Marc Kilgour[2], and Keith W. Hipel[1]

[1] University of Waterloo, Waterloo, ON N2L 3G1, Canada
kwhipel@uwaterloo.ca
[2] Wilfrid Laurier University, Waterloo, ON N2L 3C5, Canada
mkilgour@wlu.ca

The Caspian Sea, a salt-water body of area 376,000 km^2, separates the Caucasus from Central Asia. Until the collapse of the Soviet Union, the Caspian Sea was shared by the USSR and Iran. Two treaties between USSR and Iran governed the Caspian, one (dating from 1921) guaranteeing both parties the right of free navigation, and the other (dating from 1941) establishing that each state's territorial waters extended ten miles from its shoreline and guaranteeing it exclusive fishing rights in these waters.

But after the Soviet Union collapsed at the end of 1991, there were five littoral states to the Caspian Sea, Kazakhstan, Turkmenistan, Iran, Azerbaijan, and Russia. Disputes over the legal status of the Caspian Sea arose in short order, and no division of Caspian waters or seabed has been agreed upon to date. This issue is becoming more important as energy prices rise, as the Caspian Sea contains a proven reserve of up to thirty-three billion barrels of oil and about 232 trillion cubic feet of natural gas. In addition to values derived from fossil fuels, the geographical location of the Caspian region is another factor that has increased its strategic importance.

In an attempt to reach agreement on the status of the Caspian Sea, the five littoral states have met at the presidential, ministerial, or expert level on 25 occasions since 1992; the most recent meeting was in Moscow on February 20, 2006. Unfortunately, no agreement has yet been reached on the legal status of the Caspian Sea, nor on how to divide its waters or its seabed. Among the factors contributing to the difficulty of reaching agreements on the Caspian are the following:

- The number of disputants is relatively large, and their interests are quite diverse;
- Many external parties have an interest in the region, including world powers like USA and China, regional powers like Turkey, and oil industry multinationals; and
- The geographical classification of the Caspian Sea is disputable, making it uncertain which body of international laws applies.

Our objective is to use the Graph Model for Conflict Resolution to gain insight into the following issues:

- Why did the conflict over the Caspian Sea emerge, and why does it continue?

- What can the main parties to the conflict do to achieve a resolution, and what features might a resolution be expect to possess?

The main point of disagreement among the five littoral states is that some prefer division of the Caspian Sea, while others prefer a condominium regime under which no littoral country could claim any exclusive "natural" zone within the Caspian — either on the surface or the seabed. The condominium concept would imply that all decisions on the development of the resources of Caspian Sea would require the approval of all five littoral countries. Iran and Russia, which possess other economic opportunities, argue that no state should be granted an exclusive economic zone in the Caspian Sea basin, within which it could conduct operations without agreement from all other littoral states. Other Caspian basin states, principally Azerbaijan and Turkmenistan, but also Kazakhstan, are looking to the resource-rich Caspian seabed as an engine for economic development. But each of these states wishes to establish exclusive control over a portion of the seabed before harvesting these resources and exporting them to the world market. Thus, these states argue for an agreement that accords each state an exclusive economic zone, and in particular total control of its portion of the Caspian seabed.

This deadlock was in place by 1997 when Russia changed its priorities. In an apparent effort to be more pragmatic and constructive, it started to cooperate with all littoral states by promoting mutually beneficial projects in the energy sphere, and dropped its opposition to the de facto alliance of Azerbaijan, Turkey and the USA. It further suggested that the two historical USSR-Iran treaties were still valid. However, Russia also argued that the Caspian seabed should be divided among the five littoral states according to the modified median line method, although seabed division was not mentioned in the existing treaties. Some observers suggested that Russia's new negotiating strategy was aimed to ensure that oil pipelines were located on Russian soil.

Iran initially rejected division of the Caspian Sea based on the median line method, which would give it a share of only 13.6%. But in 2000, feeling that it lacked the power to overcome the opposition of the other states, Iran indicated that it would agree to division of the Caspian Sea provided certain conditions were met. These conditions were stated by President Khatami as follows:

- Iran's share should be not less than 20
- The division of the sea surface and of the seabed should match exactly.

Russia and Turkmenistan indicated general agreement with the proposal of Iran, but Azerbaijan and Kazakhstan made clear their opposition. Then Russia suggested a dual-purpose regime, in which the seabed would be divided into exclusive national zones, but at the same time a condominium regime would prevail on the surface. This outcome would be more preferable to Azerbaijan and Kazakhstan.

Another suggested resolution of the Caspian Sea dispute is division based on Soviet maps. Immediately after the Second World War, the Soviet Union decided to divide the benefits of Caspian oil projects among the five Soviet Republics which touched the

Caspian Sea. The lines of division were based on the internal borders of the Soviet Union, between Azerbaijan, Turkmenistan, Kazakhstan, Dagestan and Klmikia Blkar.

In summary, since the collapse of the Soviet Union, there have been five major proposals for the legal status of the Caspian Sea, as follows:

A1- **Condominium** regime
A2- **Division**; based on International Law of the Sea
A3- **Division**; based on equal shares
A4- **Division**; based on the Soviet maps
A5- **Division** of sea bed combined with **condominium** regime on the surface

In case of division, each country's shares depend on the different rules as follows:

Country	(A2) International Law of the Sea	(A3) Equal shares	(A4) Based on Soviet maps
Iran	13.6%	20%	11%
Russia	19%	20%	19%
Turkmenistan	18%	20%	19.2%
Azerbaijan	21%	20%	22.4%
Kazakhstan	28.4%	20%	28.4%

The preferences of the five littoral states are as follows ("$>$" means "is preferred to"; "$=$" means "is indifferent to"):

Iran:	$A1 > A3 > A2 > A5 > A4$
Russia:	$A1 > A5 > A4 > A2 > A3$
Turkmenistan:	$A3 > A4 > A2 > A5 > A1$
Azerbaijan:	$A4 > A2 > A5 > A3 > A1$
Kazakhstan:	$A2 = A4 > A5 > A1 > A3$

We applied Graph Model for Conflict Resolution, using its associated decision support system GMCR II, to gain model and analyze the negotiation deadlock over the legal status of the Caspian Sea, and to gain insight into the nature of the conflict and its possible resolutions. We found one equilibrium, or potential resolution; we offer an interpretation and possible scenario for this equilibrium and several alternatives. We believe that economic necessity will eventually drive the littoral states to this equilibrium or to an outcome very similar to it.

Part VI

Invited Session
Empirical Research on Electronic Negotiations

Invited Session
Empirical Research on Electronic Negotiations

Sabine Köszegi[1] and Stefan Strecker[2]

[1] University of Vienna, Faculty of Business, Economics, and Statistics, Vienna, Austria
`Sabine.Koeszegi@UniVie.ac.at`

[2] Information Systems and Enterprise Modelling, University Duisburg-Essen, Germany
`stefan.strecker@uni-duisburg-essen.de`

In this session, we invite studies on empirical research on electronic negotiation support systems. In order to fully exploit the benefits of electronic negotiation support, we need to understand how different systems with distinct support features and underlying support philosophies influence negotiation processes and outcomes. Furthermore, we need to understand how situational and contextual factors influence electronic negotiation processes. Through experiments and empirical research we are able to systematically analyze the effects of system design as well as situational and contextual factors on negotiation process and outcomes.

Assessment of an Electronic Auction System: Beliefs about Usage, System and Institution on Intention to Use

Eva Chen[1] and Ilka Weber[2]

[1] John Molson School of Business, Concordia University
eh_chen@jmsb.concordia.ca
[2] Institute of Information Systems and Management (IISM), Universität Karlsruhe (TH)
ilka.weber@iw.uni-karlsruhe.de

In presence of the digital economy, electronic auction systems are becoming more prevalent in facilitating the transactions between buyers and sellers. Auction websites such as eBay, Amazon, or more sophisticated platforms such as Moai and Frictionless-Commerce have increasing transaction volume by offering tailored auction protocols to specific customer groups. meet2trade[1] is a generic, flexible trading platform facilitating an easy creation and automation of auction-based markets (Weinhardt et al., 2005). Moreover, it is coupled with an experimental tool and a simulation tool, both of which support the testing of the deployed electronic market ensuring a high level of quality of the designed product. Hence, it can potentially work in many different domains by providing adjusted protocols to meet the needs of participants in targeted segments of the market. Whether auction systems, such as meet2trade, can enfold its potential depends on users' perceptions.

In information systems (IS) research, the technology acceptance model (TAM) has dominated the field in the assessment of user perceptions. Over the years, researchers have, on one hand, acknowledged the contribution made by Davis (1989) in eliciting the two main beliefs (i.e., perceived usefulness and perceived ease of use) governing the behavior to use an IS in an organizational setting. On the other hand, the results from TAM have been considered too general to provide prescriptive information that can enrich systems design. Wixom and Todd (2005) proposed an extension to TAM and showed that the intention to use a system is not only influenced by the beliefs about the behavior, but also the beliefs about the system. Thus, an investigation of users' perception of auction systems needs to include the beliefs regarding the technical aspects, which may provide valuable information to system designers.

Furthermore, certain IS are not implemented in an intra-organizational setting specific to TAM. Market systems are of this type: they serve to manage the interaction between buyer and sellers, which can span across many organizations (Malone et al.,

[1] http://www.meet2trade.com/

1987). One particular characteristic of auction systems is the mechanism presiding over the exchange among participants. The mechanism constitutes the regulative institution that affects the method in which information is communicated and more notably the conditions for trade (e.g., market price) (Smith, 1982). From an individual perspective, the institution influences beliefs on uncertainty and risk associated to employing the auction system to transact in the market (McKnight et al., 2002). Therefore, the evaluation of auction systems must also include perceived measure of the institution shaping the exchange.

In order to assess the behavioral intention to use auction systems, this study proposes an integrative model to relate not only the beliefs about behavior from TAM, but also beliefs from the institution (i.e., more specially, the regulative beliefs concerning the manner in which the auction awards the winner) and the technical aspects. As a means of measuring the proposed model, the research method consists of a laboratory experiment involving meet2trade as a platform for implementing a second-price sealed-bid auction (Vickrey, 1961). Ninety students were recruited to participate in the experiment in a Western European university. The results serve to demonstrate that the beliefs about system characteristics affect intention to use through intervening beliefs on the institution and usage, which in turn provides specific advice to market engineers on the technical aspects influencing users' behavioral perceptions.

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Phase Analysis of Behavior in E-Negotiations Emphasizing the Effect of Negotiator Relationship

Eva-Maria Pesendorfer[1], Andrea Graf[2], and Sabine T. Koeszegi[1]

[1] Faculty of Business, Economics, and Statistics, University of Vienna, Bruenner Str. 72, A-1210 Vienna, Austria
Eva-Maria.Pesendorfer@UniVie.ac.at
Sabine.Koeszegi@UniVie.ac.at

[2] Faculty of Business, Economics, and Information Systems, University of Regensburg, Universitätsstraße 31, 93053 Regensburg, Germany
andrea.graf@wiwi.uni-regensburg.de

1 Introduction

Within the last decade, the significance of electronic interaction in organizations has increased substantially. Managing difficult situations and conflicts via e-mail, chat, or more sophisticated communication technologies is a daily business for managers in international organizations. Although the process of negotiation has gained major attention in definitions, the way in which negotiators communicate in their search for an agreement has received less research attention than have inputs and outcomes of negotiation. As a consequence, recent literature about negotiations insistently invites researchers to conduct phase analysis with process data to enhance knowledge about the development of conflicts in reference to negotiation behavior (Adair and Brett, 2005; Olekalns et al., 2003; Weingart and Olekalns, 2004). The purpose of this paper is to gain insight into e-negotiation processes helping to better understand how conflict can be resolved when interpersonal cues are not at hand.

Indeed, in order to save money a lot of companies forbear from face-to-face meetings in the course of electronic negotiation processes (Kirkman et al., 2004). Therefore, there is a need to analyze negotiator relationship and its impact on both negotiation process and outcome. Consequently, this study emphasizes the effect of prior personal relationship between negotiators in two conflict settings (weak and severe conflict). In the experiment design, half of the participants know each other personally, the other half of negotiators has no interpersonal relationship, respectively has never met.

2 Theoretical Background and Methodology

We conducted a laboratory experiment and applied content and phase analysis to transcripts of 55 electronic negotiations. For a classification of negotiation behavior, we used the typology developed by Weingart et al. (2002) and Olekalns et al. (2003) because it comprises four strategy clusters based on two important dimensions, strategic orientation (distributive and integrative) and strategic function (information exchange and action). The four clusters are: create value, claim value, integrative information, and distributive information. Most negotiators tend to prefer a certain negotiation strategy and apply this strategy consistently in negotiations (Weingart et al., 2002). Nonetheless, theory assumes changes in behavior throughout a negotiation process. Figure 1 shows the two phase approaches included in this study: a two-phase model developed by Walton (1969) and a four-phase model suggested by Adair and Brett (2005).

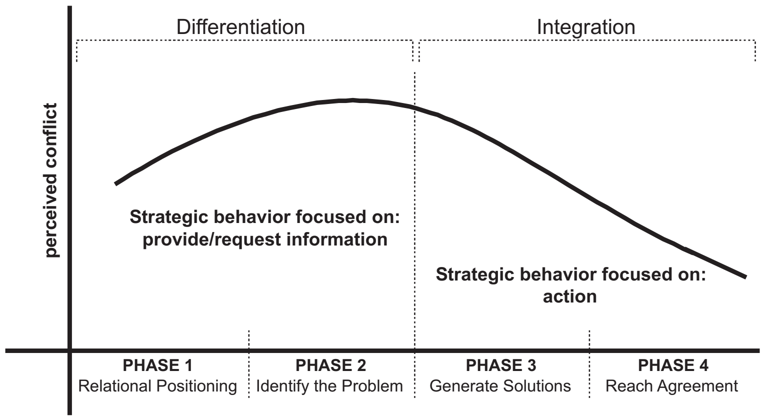

Figure 1: Negotiation behavior over time in a face-to-face setting

Following Adair and Brett's (2005) argumentation, we decided to use a stage model with four phases to include current empirical results and to benefit from a more nuanced transactional process flow (than when using only a two or three-phase model). Furthermore, we use an interval-driven approach dividing the negotiation process into four equally long phases referring to the phases identified by Adair and Brett (2005). We assume that negotiation phases as such exist and used four quarters with exogenous interval-boundaries, which tend to map the phases found in face-to-face research.

We ask whether the two-phase as well as the four-phase model identified in face-to-face settings can also be found in electronic negotiations. Furthermore, another research question is whether there is a shift in behavior according to the four strategy clusters mentioned above. Based on the personal relationship focus it is interesting whether negotiators with/without personal relationship use different behavior i. e. integrative or distributive behavior and how this relationship and the intensity of the conflict affect the negotiation process as well as the outcome.

3 Results and Discussion

As negotiation theory suggests, we find two distinct phases, a differentiation phase followed by an integration phase (see Figure 1). Within the two phases, there is a shift in strategic function, i. e. from providing information in the differentiation phase towards strategic action in the integration phase. Moreover, negotiation behavior can also be mapped in a more differentiated four-phase model (see Figure 1). An interesting finding is that similar to the findings by Adair and Brett (2005), the focus of the first phase is to get acquainted with each other. Our results indicate that participants begin negotiations with "relational positioning", that is to say that negotiators contend for power and influence using relatively more sequences involving affective and off-task comments than in other stages. This is interesting since computer-mediated communication is said to entail a lack of social as well as personal cues and one could assume that this leads to less relational positioning.

With regard to agreements, we find a significant impact of prior negotiator relationship on overall agreement rate ($p = .04$). When running χ^2-tests in both groups, the low and the high conflict intensity setting separately, we find a significant effect of relationship only in severe conflicts. Given a severe conflict, negotiators who have no personal relationship are most likely to end in an impasse ($N = 52$; $p = .003$). In low intensity conflicts, negotiator relationship has no impact on agreement ($N = 58$; $p = .458$). In addition to this, for participants with prior relationship the outcome of negotiation (agreement vs. impasse) was predictable based on their strategic behavior (logistic regression models). Consequently, it seems that they are better able to anticipate the partner's reactions. We conclude that practitioners can manage conflicts better being aware of different phases in negotiation processes. Moreover, we recommend offering kick-off meetings for electronic negotiations in order to strengthen interpersonal relationships between negotiators.

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An Empirical Study on the Use of Communication Media in Electronic Negotiations

Mareike Schoop, Frank Köhne, and Dirk Staskiewicz

Information Systems I, University of Hohenheim, Germany
schoop@uni-hohenheim.de
fkoehne@uni-hohenheim.de
staskiew@uni-hohenheim.de

1 Introduction

Negotiation is a communicative process (Schoop et al., 2004; Weigand et al., 2003). Philosophers such as Habermas (1981) argue that the very purpose of communication is coordination which is what we see in business transactions and resource allocation today. Despite the dominance of research in the area of negotiations based on decision theory and game theory, flawless communication is a precondition and, therefore, its contingencies and possible breakdowns during business transactions need to be addressed. Although research on web-based electronic negotiation support systems is advanced, their application in real-life business negotiations is limited and empirical data on the reasons are scarce. Our aim is thus to research the use of different electronic media in B2B negotiation practices. In particular, we want to investigate which media are used for what purposes and why (cf. Poole et al., 1992, who review the beneficial and harmful impact of media on negotiations). These insights are the prerequisite for developing electronic negotiation systems that will be used in practice.

2 Methodology

In order to evaluate the appropriation of electronic negotiation media in practice, we follow a two-step multi-method approach. In a first step, a broad survey study in different industry branches across Germany has been conducted, addressing marketing as well as sales representatives in order to capture the status-quo of technology application in business negotiations. Survey studies are not suitable to answer the question why the pattern of technology application emerged and what the role of negotiation technologies in organisation actually is as these issues can be expected to be context-dependent. The results of the survey study are thus taken as a starting point for the second step, namely further investigations with a more open grounded theory driven study that takes the context of application into account. This second step is currently ongoing.

3 Selected Results

Negotiation skills are seen by the companies participating in the survey as a crucial success determinant in electronic negotiations. On a 5-point differential (from not important (1) to very important (5)), the median answer is 4, i. e. 83.9% of all respondents selected either 4 or 5.

While most of the companies stated that electronic media are used for negotiations, the extent to which different media are used in the three phases of negotiations (namely pre-negotiation, core negotiation, and post-negotiation) differs significantly. Our survey concentrates on e-mail and e-markets, see table 1.

Table 1: Use of electronic negotiation channels in negotiation phases

	e-mail	**e-markets, eRfQ etc.**
Pre-negotiation phase	71.0%	16.8%
Core-negotiation phase	55.0%	10.7%
Post-negotiation phase	70.2%	9.2%

(n=131, with multiple selections)

One of the most surprising findings is the high percentage of e-mail usage in all negotiation phases. Even for the core negotiation, 55% of all participants rely on electronic mail. Interestingly, the automotive industry is more technology-oriented than the IT sector with 75% compared to 59%. For preparation and later clarification, electronic mail is used even more often. From a media richness point of view, this does not make sense. However, electronic mail seems to be the benchmark for evaluating electronic negotiation support systems.

The success of electronic marketplaces offering electronic requests for quote (eRfQ) and auction functionality is limited to areas in which catalogues and standards exist. Negotiations carried out through such systems are highly structured and efficient in an economic sense but not in a communicative sense. In multiple interviews, marketplaces are projected as barriers rather than enablers of interactions as the following two quotes show:

- "That's just another intermediary that kind of gets into the way."
- "What I like most about them is that the final decision is not made there but between two humans afterwards."

Note that both statements are from companies selling tangible goods through catalogues. A finding from the questionnaire study also points into this direction: negotiators that employ strict deadlines in their negotiation processes face re-negotiations significantly more often. For a given deal, there seems to be a fixed need for clarification that cannot be reduced by protocol design.

4 Conclusion

Although research on electronic negotiation support is advanced with many sophisticated systems being available, the use of such systems in business practice is still limited. To understand this apparent gap, we conduct an empirical study on the use of electronic media in B2B electronic negotiations. One result was a high degree of use of e-mail in negotiations. Follow-up interviews provide in-depth information about positive and negative experiences with different electronic negotiation media and reasons for the choice of particular media in business negotiations. For example, the choice of e-mail as a rather simple medium for complex negotiation processes needs explaining. The interviews are on-going and results are promising with respect to detailed requirements for negotiation support systems that are both useful and useable in real-life electronic business negotiations.

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Part VII

Invited Session
Invite Negotiation Platform and Experiments

Invited Session
Invite Negotiation Platform and Experiments

Simone A. Ludwig and Eva H. Chen

John Molson School of Business, Concordia University, Montreal, Canada
sludwig@jmsb.concordia.ca
eva_chen@jmsb.concordia.ca

The session focuses on the development and research in the area of electronic negotiation platforms, in particular on the Invite system. Invite is a software platform capable of providing a flexible and highly customizable environment for different transaction mechanisms. This platform introduces the concept of manager-selected protocols, in that it does not implement a single, fixed negotiation protocol, but rather a set of prefabricated modules from which a negotiation manager is able to compose a personalized protocol suitable for his or her needs. Invite allows the manager to establish a sequence of mandatory and optional steps imposed to govern the negotiation process. This concept of constructible protocols expands the field of e-negotiation systems to allow researchers and practitioners the ability to create their own customized system to support their specific research or business requirements.

Negotiation Agreement Modeling Using SEM*

Réal Carbonneau[1], Jamshid Etezadi-Amoli[2], and Gregory E. Kersten[2]

[1] Department of Management Sciences, HEC Montréal
real.carbonneau@hec.ca
[2] John Molson School of Business, Concordia University
etezadi@jmsb.concordia.ca
gregory@jmsb.concordia.ca

Negotiation is by definition a process which attempts to bring two or more parties into agreement. Based on this concept, the current research examines a model which includes both partners of a negotiation (buyer and seller) and simultaneously evaluates a central agreement factor. The central agreement factor represents the agreement level between both sides of a negotiation on various topics, including most importantly, the negotiation outcome. In addition to modeling the central agreement factor, a negotiator's own evaluation of bargaining style and the evaluation of the partner's bargaining style are included in the model. This will provide insight into the accuracy of the partner evaluation since it may be measuring the partner's bargaining style or something else such as the central agreement of the negotiation.

Using Structural Equation Modeling (SEM), the effects of the central agreement factor on various measurements, such as the evaluation of the partner's bargaining style and the evaluation of the negotiation are estimated from a large set of negotiation experiments, specifically, the Inspire e-negotiation dataset (Kersten and Noronha, 1999a,b; Kersten et al., 2003). The measurement of the central agreement factor is particularly valid and reliable since it considers both sides of the negotiation including even the negotiation outcome. The empirical results indicates a model which fits reasonably well and provides indication that factors which are supposed to measure such things as the partner's bargaining style are in fact mostly measuring the central agreement factor. The results also show that the evaluation of the partner's bargaining style is not only strongly influenced by the central agreement factor, but that the partner's own bargaining style evaluation only has a very weak and negative effect on the partner's partner evaluation (incorrect perception).

These findings lead to questions involving gender, since one gender may be much better at perceiving the partner's bargaining style. Theory would indicate that females may have an advantage in accurately identifying their partner's bargaining style. Contrary to expectations, the males have less incorrect perceptions of their partner's bargaining style and these models had a better fit than the female ones. However,

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this may not be directly related to their perception accuracy, but may be related to a more direct negotiation style or other such complicated phenomenon which cannot be isolated in the current model. Either way, neither gender subset indicated a partner's bargaining style evaluation accuracy which was interesting relative to the large impact of the central agreement factor on partner's bargaining style evaluations.

In summary, the central agreement factor model fit the empirical data reasonably well. From this model, a strong effect of the central agreement factor on the partner's bargaining style evaluation was identified, while at the same time the own bargaining style evaluation had little and negative effect on the partner's partner bargaining style evaluation. These results are important for future research since the strong effects of the central agreement factor in negotiation may have to be accounted for before interpreting other relationships.

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An E-negotiation Experiment on the Effects of Integrativeness on the Negotiation Process and Outcome

Eva H. Chen and Simone A. Ludwig

John Molson School of Business, Concordia University, Montreal, Canada
eva_chen@jmsb.concordia.ca
sludwig@jmsb.concordia.ca

Over the years, the issue of integrativeness has become an important topic in negotiation. Pruitt (1981) defined integrative negotiation solutions as those that reconcile, or integrate, the two parties' interests, thereby expanding the total available pool of value. Most negotiation situations carry some potential for integrative agreements, or trade-offs in which both parties fare better than they would have under a simple compromise solution (Pruitt, 1983). Integrative agreements are considered to be optimal negotiated outcomes because they expand the total pool of available value and create high levels of satisfaction for all the parties, and thus are often more stable than non-integrative agreements.

Measuring joint profit has been widely discussed and rejected by theoreticians. The major objection is that in many negotiation settings joint profit confounds distributional elements with its measure of dyadic performance by establishing optimal allocations of resources, meaning that the measure is not distribution-free. The only negotiation setting for which joint profit is distribution-free is where the Pareto frontier is a straight line with slope equal to -1. Due to this shortcoming, theoreticians have turned to other measures of joint performance based on the idea of integrativeness (Clyman, 1995).

The best-known measures are the integrativeness quotient proposed by Lax and Sebenius (1987) and the measure of Pareto efficiency proposed by Tripp and Sondak (1992). The former defined the integrativeness quotient (IQ) of an agreement to be 1 minus a ration of areas, whereby the numerator of the ratio is the area of agreements that are Pareto superior to the agreement (S) and the denominator of the ratio is the total area under the Pareto frontier (P). The quotient is given by

$IQ = 1 - \frac{S}{P}$.

They furthermore proposed a Pareto efficiency measure of joint performance. This Pareto efficiency (PE) measure uses for the denominator of the ratio the sum of the areas that are Pareto superior (S) and Pareto inferior (I) to the particular agreement, rather than P (entire area under the curve)(Lax and Sebenius, 1987).

Tripp and Sondak (1992) measured the joint outcome differently. It is not a normalization of the area S like in Lax and Sebenius, but unlike P, which is a constant, the sum of the areas S+I is not. The area I is akin to the Nash bargaining solution, a multiplicative version of joint profit obtained by multiplying each party's expected utility rather than adding them.

Both measures are based on integrativeness, whereby each uses its own measurement of distance to quantify how far particular agreements are from the Pareto frontier. In essence, the agreements closest to the frontier indicate greater dyadic performance and all settlements on the frontier are accorded equal and maximal measures of joint performance.

Unlike measures of joint performance, Axelrod's measure (Axelrod, 1967) does not measure the ranking of particular agreements, but rather one that compares negotiating settings. The measure is based on a series of reasonable conditions that Axelrod proposed any such measure satisfy, and it is the unique solution satisfying that set of conditions. The Axelrod's measure is calculated as follows. Each party's utility function is rescaled so that the maximum utility accorded either party is equal to 1. Therefore, the utility space representation of the negotiation fits inside a unit square. Then the area inside the unit square above the Pareto frontier is measured. This is the perspective that we have adopted for this paper.

We aim to study the effect of integrativeness on both the negotiation process and outcome, in terms of economic and behavioural measures. Our research design consists of a control (i. e., fix offer space) and a treatment (i. e., negotiators can manipulate the offer space) to examine the consequence of integrativeness on the individual's satisfaction with the negotiation process. As for the impact of integrativeness on outcomes, either economical or perceptual, we analyse the relationship between the area inside the utility space and the outcomes (economic: joint performance and individual performance, and perceptual: satisfaction with outcome and perceive relationship with the counterpart).

The methodology entails a laboratory experiment using an e-negotiation platform (Invite[1]) that allows student participants to bilaterally negotiate a multi-issue contract case over the web. Their perceptions are captured by a questionnaire and the economic outcomes are calculated from the utilities achieved through the agreements.

Our results show that there is a significant and positive relationship between the integrativeness and outcome variables, as expected, but not that between integrativeness and satisfaction with process. The degree of integrativeness is not linked to the individual's perception of the process. We further investigated this phenomenon by dissecting the actual negotiation process in terms of the offers exchanged among the negotiators. We found that despite the offer space, individual followed a similar pattern of offer exploration and exploitation (Weingart and Prietula, 2005).

[1] http://invite.concordia.ca/ (Strecker et al., 2006)

The contribution of this work is to demonstrate that integrativeness has a significant and positive impact on both economic and perceptual measures of outcome, but it does not affect the process of negotiation.

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A General Parametric Function for Utility Assessment*

Jamshid Etezadi-Amoli and Tak Mak

John Molson School of Business, Concordia University, Montreal, Canada
etezadi@jmsb.concordia.ca
takmak@vax2.concordia.ca

Most negotiation support systems (NSS), including Inspire, provide tools to assess utility of a multi-attribute outcome. The assessment is either based on holistic or decomposition procedures. To assess the multi-attribute outcome using a decomposition approach, it is essential to first evaluate the utility function for each attribute. In negotiation systems, this evaluation is usually done through a graphical or numerical method which anchors the lowest and the highest value of the utility function to two fixed values such as zero and one respectively. A variety of methods for the assessment of unidimensional utility function based on numerical methods are available. For an overview of the utility assessment methods we refer the readers to Keeney and Raiffa (1976),Farquhar (1984) and von Winterfeld and Edwards (1986)[Keeny and Raiffa (1976), Farguhar (1984), and Von Winterfeld and Edwards (1986)]. A serious deficiency in these methods, however, is their lack of attention to measurement error. That is, the modeling of the individual utility functions is based on the premise that individual preferences can be numerically evaluated without any error. This deterministic view and treatment of preference assessment is based on the fact that in Keeney and Raiffa's 1976 expected utility theory, preferences are assumed to be deterministic and known with certainty. In other words, the expected utility theory lacks an error theory. In addition, for continuous variables, due to practical limitations, the unidimensional utility function is assessed for a limited number of points. Consequently, assessment of a new scenario within the continuum requires a new set of assessments, which would not be practical to conduct during the course of negotiation.

This paper is based on the premise that regardless of the methodology used, utility assessment is error prone. We introduce a general measurement model to account for error in assessment of utility and a flexible nonlinear function with two parameters to approximate the unidimensional utility function. The proposed function is bounded between zero and one and can approximate a variety of utility functions including exponential and logarithmic functions. An estimation procedure based on the least-square principles is provided and the R language is used to estimate parameters of

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this function. Simulation studies demonstrate that with only 3–4 assessments, in a variety of situations, the proposed function and its estimation procedure can provide an accurate estimation of the underling utility function.

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The Effectiveness of Complex Bargaining Styles in Dyadic Negotiations

Xianhua Huang, Gregory E. Kersten, and Simone A. Ludwig

John Molson School of Business, Concordia University, Montreal, Canada
xianh_hu@jmsb.concordia.ca
gregoryjmsb.concordia.ca
sludwig@jmsb.concordia.ca

Bargaining style is the pattern of individual behaviours that reappear under conflict situations (Gilkey and Greenhalgh, 1986). It is also known as conflict management styles, behaviours, orientations, strategies, and modes. Researchers (Graham and Mintu-Wimsat, 1997) have found that bargaining style had important influences on the negotiation process and outcomes since it reflects people's predispositions toward negotiation. Therefore, bargaining style is the most frequently used variable in negotiation studies. Early researchers (Deutsch, 1949, 1969) focused on the simple dichotomy of bargaining styles with the assumption that conflict behaviour can be categorized either as competitive or cooperative. However, in real life, there are rarely pure competitive or cooperative conflict situations.

Thomas-Kilmann conflict mode (Thomas and Kilmann, 1974) provides researchers with more accurate tools to describe bargaining styles in terms of competing, collaborating, accommodating, avoiding and compromising. Traditionally, researchers have often two underlying assumptions when considering the effectiveness of styles. The first one is that style use is mutually exclusive and the second one is that negotiators use one particular style throughout the process of the negotiation. Nevertheless, they overlook the fact that people usually employ the combination of more than one style in conflict situations. Since each style has its weakness and strength in different situations, negotiators may switch their styles according to the progress of the negotiation and their opponent's interactions. Therefore, the negotiation process and outcomes are jointly determined by the overall bargaining styles rather than individually (Van De Vliert, 1997; Munduate et al., 1999).

This study examines the effectiveness of the complex bargaining styles by measuring the dependent variables of success rate, individual outcome, joint outcome, contract balance, and number of offers proposed respectively. Each negotiator's bargaining styles are captured by the Thomas-Kilmann Instrument in the pre-negotiation stage. Cluster analysis is used to identify the typical patterns (combination of styles) used by negotiators. Then the relationships between dependent variables and patterns are compared and analyzed.

According to negotiator's overall bargaining styles, this research is unfolded from two perspectives: The first is the number of strong styles in a pattern. A style is regarded as a strong style if its score falls into the high 25% specified by the Wharton grid (Shell, 2001). Usually, negotiators prefer to use the strong styles because they feel at ease with these styles. A larger number of strong styles are believed to increase the success rate, number of offers proposed, and individual outcome because of the greater flexibility of changing behaviours in conflict settings. The second perspective is the integrative and distributive score in a pattern. A higher integrative score is assumed to be able to increase the success rate and joint outcome; while a higher distributive score is assumed to influence the individual outcome and contract balance. The results indicate that the number of strong styles alone can not explain the effectiveness of patterns, while the integrative and distributive score provide a good perspective in understanding the pattern effectiveness.

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Issues in Developing ENS for Negotiations and Auctions

JinBaek Kim

Institute for Information Systems Engineering, Concordia University
jbkim@ciise.concordia.ca

The contexts of face-to-face and electronic negotiations are different from case to case. This implies that flexibility is essential to generic e-negotiation systems. One way to achieve flexibility is to separate the negotiation protocol model from the platform that executes it. In our previous work, we proposed a framework for formally and explicitly modeling negotiation protocols which are logical and detailed enough to be deployed on a generic platform (Kim et al., 2005). In this framework the negotiation protocols are approached from the component-oriented perspective and they are represented in terms of rules which control invocation and execution of software components at the page-level activities. The framework provided the theoretical foundations for a software platform, called the Invite platform, which can execute various negotiation protocols. The platform is developed using the model-view-control (MVC) design pattern. The use of MVC allows for the achievement of a high degree of the code re-usability and maintainability (Kim et al., 2006).

We have been developing prototypes of various ENS including multi-bilateral negotiations and multi-attribute auction based on the framework and Invite platform. We will illustrate those systems and investigate reusability of the software components - at the page level and at the sub-page level. Among them, two systems were used for laboratory negotiation experiments involving more than 100 users. We will briefly present the outcome of the experiment focusing on the system usability. Through implementations, we found that the previously proposed framework together with the Invite platform can be used to develop ENS for multi-bilateral negotiations and multi-attribute auctions. However, we also found that certain degree of usability and functionality may need to be sacrificed when sticking to the principle of the strict separation of page routing and page content considered in the framework. We will present these findings and discuss the extension of the framework.

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Part VIII

Invited Session
Group Decisions, Negotiation and Emotion

Invited Session
Group Decisions, Negotiation and Emotion

Bilyana Martinovsky

Institute for Creative Technologies
martinovski@ict.usc.edu

The panel on group decision, negotiation and emotion invites studies on the role of emotion in negotiation. Progress in disciplines such as communication theory and neurology point to the intricate connections between cognitive processes (e. g. planning and decision taking) and emotion. Theory of Mind draws attention to socially realized emotions e.g. empathy, which function and realization in negotiations is still unclear.

The integration of emotion in the negotiation process opens the possibility for discovery of the Other (Buber) which then may affect the decision process. Thus the panel invites also views on negotiation as a non-fusion process (Levinas), as an opportunity for the ethical.

Investigating Mind Markers in Design Meetings

Dirk Heylen

University of Twente
heylen@ewi.utwente.nl

In the context of the European AMI[1] project, "Augmented Multiparty Interaction" more than one hundred hours of video and audio data have been collected of groups of four people engaged in a meeting with the task to design a new remote control. The collection of meetings is being annotated on several layers, ranging from speech transcripts to emotion annotation. The main purpose of this data collection within the AMI project is to train, through machine learning techniques, automatic recognizers and interpreters of the data that would be able to deliver automatic meta-data which can be used in browsing and retrieval of new recordings. Besides this technological goal, the data collection will also be useful for the social sciences, particularly for the study of small group interactions.

In this paper I will introduce the some of the annotation schemata that I and several other people have been working on and present an outline of the kinds of research programmes that we are currently pursuing and intend to pursue in the future. Three annotation layers that are of particular importance to the discussion of "emotion" and the process of negotiation in the design meetings are presented in this section. These are the layer that we refer to as the dialogue act annotations, the argumentation scheme and the so-called "emotion" scheme. Each of these layers capture something of the argumentation and negotiation process on the one hand and of the affective dimensions of what is going on, on the other hand.

The *dialogue act coding* manual for the AMI corpus states "Dialogue act annotation is about marking up the transcription according to speaker intention—that is, what kind of thing each person is trying to achieve by what they say." The scheme in its current form consists of four groups of dialogue acts. These are: (1) Acts that are about information exchange (inform, elicit-inform); (2) Acts about some action that an individual or group might take (suggest, offer, elicit-offer-or-suggestion); (3) Acts that are about commenting on previous discussion (assess, elicit-assessment) and (4) Acts whose primary purpose is to smooth the social functioning of the group (be-positive, be-negative)

The original discussions about the dialogue scheme considered classical dialogue act schemes such as the MRDA scheme (Shriberg et al., 2004) or DAMSL (Core and

[1] This work was partly supported by the European Union 6th FWP IST Integrated Project AMI (Augmented Multi-party Interaction, FP6-506811, publication).

Allen, 1997). But the main inspiration for the scheme came from a social-psychological perspective: the Bales' Interaction Process Analysis scheme (Bales, 1950). This scheme has 12 categories that classify "*how* the persons communicate, that is *who* does *what* to in the process (time order) of their interaction" (Bales, 1950, p. 92). This comprises the positive actions (1) seems friendly, (2) dramatizes, (3) agrees; the attempted answers (4) gives suggestion, (5) gives opinion, (6) gives information; the questions (7) ask for information, (8) ask for opinion, (9) ask for suggestion; and negative actions (10) disagrees, (11) shows tension, (12) seems unfriendly. One can see that to an important extent the parameters of the Bales scheme are reflected back in the AMI scheme.

What is particularly interesting about this scheme is that instead of from a philosophical tradition it derives from a social scientific perspective. Categories such as "show tension" or "dramatizes" are not particularly studied by Austin or Searle, although they may refer to such stylistic and interpersonal variables in their discussions.

The dialogue act scheme captures aspects of the various actions involved in negotiation and argumentation. It captures some of the typical linguistic actions together with the more ritualistic elements of how people deal with each other on a social level (Goffman, 1981). One could say that it is situated within the point of view of linguistic pragmatics and partly in social psychology. The argumentation scheme, which we will present next, deals mainly with semantic concerns..

We designed an *argumentation scheme* (Rienks et al., 2005) with the intention to capture some of the argumentative relations between the various utterances that make up an argument as part of a negotiation or persuasion round. The nodes in our model consist of "issues" and "statements". An important aspect of statements that needs to be captured is that they can vary in the degree of force and scope. To be able to represent this we introduced the label 'weak statement'. Utterances labelled as "issues" function as a direct request for a response, in the same way as a question is generally followed by an answer. We distinguish three subtypes: the 'Open issue', the 'A/B issue' and the 'Yes-No issue'. The open issue allows for any number of possible replies; possibly revealing positions or options that were not considered beforehand. This contrasts with the A/B issue, that allows participants to take a position for a limited number of positions which are clear from the context. The yes-no issue, in line with the yes-no question directly requests whether the participants' positions agree or disagree with the issue.

The annotation scheme further consists of relations between nodes. Clarification, specification and generalisation relations hold between statements. For the relations between issues and statements we have defined several labels. A typical response to an open issue is to provide a possible 'option' for resolving this issue. For A/B issues, either a particular proposed option is chosen or one or more options are discarded. In response to a yes/no issue a statement can be either 'positive' or 'negative'. Another, frequently occurring option involves expressing 'uncertainty'. A final relation that is important to annotate relates to concessions in Toulmin's model. This we have termed the 'subject-to' relation.

The annotation scheme that is used to describe what people “feel and think” consists of a modest set of labels to describe the *mental states* that we had noticed and after some discussion, agreed upon. These are: *neutral, curious, amused, distracted, bored, confused, uncertain, surprised, frustrated, decisive, disbelief, dominant, defensive, supportive.* This list cannot be said to represent only labels for emotional states. In fact, only *amused* and *frustrated* seem to qualify as a label describing an emotion (perhaps *surprise* as well, although not everyone would agree on that). Some of the labels refer to cognitive processes or meta-cognitive states and epistemic modalities: curiosity, boredom, confusion, certainty for instance. These are important again for the argumentative process. They reflect not how one feels but how one thinks about the matter at hand. Other labels reflect some interpersonal variables: dominance and support. The “mental state” layer allows us to annotate some of the ritualistic dimensions and the affective dimensions also present in the dialogue act scheme, independently (at leas in part).

If annotators can agree on certain aspects of the mental state of another person, something that is only indirectly observable. The fact that we, as outsiders, can observe these changes in the mental state of the participants in the conversation means that we have observed particular aspects of their behaviour that we have interpreted as cues to their mental state. These behaviours can be speech acts, argumentative moves, but also facial expressions, posture shifts, head movements, eye movements and gaze, pupil dilations and all kinds of other actions. Most, if not all, of these cues were also observable and interpretable by the other participants in the meeting and will have produced some effect. In fact, they may have been consciously produced and intended to have such an effect. The mind and emotion markers will, to a smaller or larger degree, function as communicative signals, expressing the state of mind of a person with respect to how he or she values what is being proposed in terms of its effect on their beliefs, values and attitudes, motivations for actions and their concerns. The question then is how the three levels of descriptions are related.

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Emotion, Language and Negotiation

Bilyana Martinovsky

Institute for Creative Technologies
martinovski@ict.usc.edu

1 Emotion in Negotiation

Emotions play an important role in negotiation and in human life as a whole. Often we try to neglect them in order to 'get things done' but we are also in situations in which we can not get things done if we don't consider the emotional side of a negotiation. This paper is a contemplation on the relationship between emotion, language and negotiation. It suggests discourse analysis as a way of uncovering the relation between them.

There are many different kinds of emotions, some less complex than others. For instance, empathy, trust and stress are complex emotions, which involve also what are typically called cognitive processes such as memory, planning, recognizing. There are also different kinds of negotiation. One may categorize negotiations according to goals. Then we have four main types of negotiations: win-win, win-loose, loose-loose; none of the above. In human reality there are very few clear-cut situations which can be described by the above categories. In a plea bargain, for instance, the idea is that each party has to loose in order to win something based on certain almost gamble-like predictions and expectations of a jury trial. This is, in fact, one of the main characteristics of what a negotiation is: a space of uncertainty and action upon that uncertainty. In the meeting between this inherent and even essential for the activity uncertainty and the existing desires, goals and values emerge emotions. They often become motivators of actions and beliefs.

2 Ethics in Negotiation

The undefinability and the uncertainty element in real life negotiations may stimulate or suffocate the negotiation but in any case they provide an opportunity for the ethical, the ethical being a call for reexamination of the traditional, of values, of goals, of being. Negotiations are an example par excellence of the meeting with Otherness. In this sense the issue of negotiation enters a much larger space, that of communication. One of the most novel and stimulating reexaminations of the ethical in communication is given in the philosophy of Emmanuel Levinas as expressed in his important book 'Otherwise than Being or Beyond Essence' (1981). The relation with alterity bears out the tension between the temptation to reduce or transcend difference, on the one hand, and the challenge instituted by the encounter with otherness, on the other. This tension implies traversing the boundary of self and Other towards the terra incognita of alterity.. Such involvement may indeed bring one closer to the limit of communication, which entails the risk of 'failure', of communication breakdown. According to Levinas' conception of communication, however, such instances do not necessarily mark the ending of concern for the other, but rather its very beginning. Thus I propose that it is important to view language in negotiation not only as a vehicle for transmission of thought or as means of expression of emotion, but also as an ethical manifestation. Ethics emerges through and in language: beyond the contents delivered and the linguistic structure it enforces, language inspires the fundamental response-ability between self and Other. The ethical aspect of communication and negotiation gains importance also for the virtual world community.

3 Emotional Virtual Negotiators

There is a renaissance of research on emotion in negotiation initiated by computer scientist. The rapidly growing literature on the topic aims not only to communicate computational ways for integration of emotion in the so called virtual agents but also the need of emotion in these virtual agents and virtual negotiation worlds (Poggi and Pelachaud, 2001; Rickel et al., 2002; Gratch and Marsella, 2004, 2005). This is surprising, because many of the institutionalized negotiation spaces in real life disprefer 'dealing' with emotions (Martinovski, 2000). In the process of creating the virtual community and the virtual inhabitants, it became evident that all human cognitive activities and processes are heavily dependent of what we colloquially call emotions (Hudlicka, 2003). The virtual agents, which for the moment are used for training/learning to e. g. negotiate, for supporting negotiation or for practicing negotiation through gaming, could hardly fulfil their purposes if they are not coded in such a way that they connect emotions, actions, and speech. For instance, within number of projects at the Institute for Creative Technologies in Los Angeles, a life size virtual doctor in a virtual clinic (in a virtual battlefield) projected on a big screen needs to communicate stance taking to a human US soldier who needs to be prepared on how to negotiate in such stressful foreign situations. The virtual agent must then be able to perceive what the intentions, desires, emotions, and behaviors of the human are in order to respond the way a human would think is adequate (Martinovski and Traum, 2003; Conati et al., 2005). In this model, virtual agent appraises the perceived information by relating it to own goals and desires and in the process of this appraisal 'choose' emotions and then coping strategies (Lazarus, 1999; Marsella and Gratch, 2003); to deal with problems and emotions, which then may affect his own behavior, reactions, and even beliefs. In their paper on irrationality in negotiation of beliefs, Marsella and Gratch write: "Rather than motivating external action, emotion-focused coping strategies [BM: such as suppression, religion, seeking emotional support, etc.] alter beliefs in response to strong emotions. For example an individual may alter beliefs about the importance of a goal that is being threatened, thereby reducing their distress".

The theoretical models of coping with emotions in negotiation call for empirical studies and data. One way of providing such models of interaction with concrete connection to behavior is use of discourse analysis (cf. Martinovski and Marsella, 2005).

4 Discourse Analysis of Emotion in Negotiation

Besides neurosciences (Iacoboni, 2005), discourse has been found to be an 'important' source of insight on the functions and nature of cognitive-emotional phenomena (Chafe, 1994; Allwood, 1996; Edwards, 1997). This paper explores how discourse can be used for the analysis of a particular emotion, such as empathy. It utilizes transcribed negotiations of different kinds in order to map the linguistic realization and functions of empathy.

Empathy is described as a dynamic appraisal process, in which cognitive, emotive and linguistic procedures and variables are mapped into each other. The dialogue functions as a tool for collective thinking, verification, and focus. This verification is of great importance for the development and the function of the individual in the social and discursive world. The analysis shows that empathy functions as a glue between interactants; it is a cognitive and communicative resource for inter-subjective alignment. Being able to take the role of the 'empathizer' and the 'empathee' is an essential characteristic of the empathic communication. Like any other communicative act, the act of empathy can be elicited, given, and received. The reception may be either acceptance or rejection. One may reject an act of giving of empathy or reject an act of elicitation of empathy. These functions of the empathy signs may be realized in phases and different degrees. For instance, a 'fulfilled' empathy episode starts with elicitation of empathy, continues with empathy giving followed by empathy receiving. One and the same utterance can have all three functions at the same time: it could be an elicitation, an expression, and a response. Multiple linguistic features realize it in particular sequences.

Elicitations of empathy are realized by narratives, 'walking out' moves, repetitive deontic declaratives, quoting, exclamations, laughter, rhetorical questions with prolonged such as 'what do you sa:y'.

Giving empathy, on the other hand, is realized by communicative acts such as answering questions, display of non-elicited empathy, repetitions of elicited empathy, ritualistic rhetorical questions, guessing of mental state, acceptance, rebuts. All these are realized with the help of discourse devices such as personal formulations of modal expressions, quoting, and mitigators or 'softeners'. Rejection of given empathy is realized linguistically by discursive features such as refusal to release the turn, overlaps, interruptions, cut-offs, and simultaneous speech as well as by communicative acts such as explicit rejections, confirmations of rejections, rhetorical questions, imperative orders, irony, swearing, 'walking out' moves but also display of reception of given empathy followed by rejection.

The future of linguistic-pragmatic-emotive analysis is to infom formal cognitive-interactive modeling and simulation of human behavior in agent-based systems, where it would mediate agent interactions. Specifically, emotions such as empathy and Theory of Mind modules could be incorporated within virtual humans, software agents that look like, act like and interact with humans within a virtual world (Rickel et al., 2002). Such incorporation will create a bridge between natural language/dialogue module and task planning/emotion module (Gratch and Marsella, 2004; Mao and Gratch, 2004).

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Part IX

Invited Session
Electronic Participation

Invited Session
Electronic Participation

Jesus Rios

Decision Engineering Lab, Statistics and Decision Sciences Department
Rey Juan Carlos University, Madrid, Spain
jesus.rios@urjc.es

The session focuses on contributions aimed at facilitating citizen participation in societal decision processes, combining decision analysis and negotiation analysis principles implemented though web-technologies.

Themes and topics of relevance include:

- Methodologies and designing of participatory processes
- Web-based systems to support groups in societal decision making
- Issues concerning validity and effectiveness of interfaces of the web-based group decision support systems for e-democracy support
- Compared studies on participation instruments
- Experimental studies and users reactions

Participation and Food Chain Risks

Simon French, Clare Bayley, and Nan Zhang

Manchester Business School, University of Manchester, Manchester, M15 6PB, UK
simon.french@mbs.ac.uk
clare.bayley@mbs.ac.uk
nzhang@dom01.mbs.ac.uk

The literature on public participation in societal decisions is substantial: for recent reviews see Beierle and Cayford (2002), French et al. (2005) and Rowe and Frewer (2005). However, there are very few comparative studies (Bayley and French, forthcoming; Rowe et al., 2005). This paper reports an element of the ongoing RELU-RISK project (www.relu-risk.org.uk) in which, among other things, we are seeking to evaluate the use of participation processes and how they are adopted to engage stakeholders in the management and communication of risks. Past examples of such risks from which we can learn include BSE, salmonella contaminations, and the foot and mouth outbreak, where the impacts of the crises were much more diverse and far-reaching than first considered. We are seeking to provide guidance on how to ensure that the views and values of all stakeholders, particularly those in the rural community, are taken account of fully in the management process. Involving local people in local decisions may provide additional information, therefore strengthening the decision-making process and resulting in better management of the situation. Other benefits of participation might include the resolution of conflict, trust building between the stakeholder and decision-making authorities, better public awareness and understanding of risks, and more acceptable outcomes to stakeholders[1]. RELU RISK will explore three case studies, evaluating different approaches to participation on each. In this paper we report preliminary findings from the first case study.

The case study explores a potential exposure of young children to pesticides. Pesticides are sprayed onto fruit at various times during growing and washed off at other times, both by rain and washing, between growing and consumption. Nothing is perfect, so sometimes a little too much pesticide is sprayed and equally sometimes the washing does not remove all the pesticide. Thus there is a very small theoretical risk that a particular piece of fruit may have pesticides on it which exceed government recommended levels. Given the millions of pieces of fruit consumed and the millions of people consuming them, there is a smaller theoretical risk that someone may consume several pieces of fruit in sequence all of which have higher pesticide levels than recom-

[1] When we refer to stakeholders we mean anyone who may be—or believes that they may be - impacted by a decision and therefore wants to be involved in the decision making process. They include experts, representatives of different interest groups, or members of the general public.

mended. For young children the recommended levels are lower, so this theoretical risk is slightly higher though still very small. The issue is whether further action is needed to control pesticide residues in some way.

The process of decision making and risk management may be divided into three phases of activity: issue formulation, assessment and analysis and evaluation (Bayley and French, forthcoming). We have structured the participatory process similarly (see Figure 1).

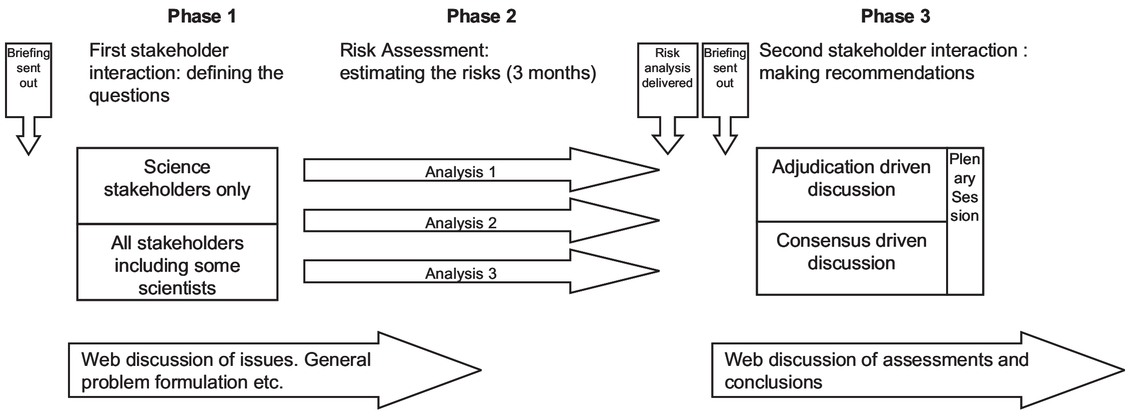

Figure 1: Outline of comparative participation study

Phase 1: Issue Formulation – Defining the Questions

Traditionally, the issue formulation phase has been done by experts and regulating agencies without significant input from stakeholders. One of the arguments for public participation is that the public bring more information and a wider set of perspectives to the discussion. We are exploring this through two stakeholder interaction groups with a different mix of stakeholders. In one workshop, the participants will be 'technical advisors',i. e.scientists who might well serve on a government advisory committee set up to consider the issue. The participants in the other workshop will be drawn from a much more broadly based population of stakeholders. In addition to this, we are running a web-based discussion forum to formulate issues from a wider section of the population. We will compare the questions raised and information provided by the three interactions in terms of range, quality or emphasis.

Phase 2: Risk Assessment – Estimating the Risks

The information gathered in the issue formulation phase about what is important to the stakeholders and their questions concerning risks is being taken forward to the analysis phase. Analyses will be conducted to build a range of perspectives on the pesticide issue and provide information for the evaluation phase. For this initial case study, the analysis is being conducted without further stakeholder interaction.

Phase 3: Evaluation – Deciding Upon Recommendations

We will then hold a second stakeholder interaction at which participants deliberate the risk assessments and strategies presented to them. We wish to explore and compare two general methods of interaction, one of which will deliberate with an adjudication method and the other will deliberate more informally to reach a consensus. In the case of adjudication, analysts will present the group with the outcome of the studies undertaken in phase 2, and questions from the participating stakeholders and public will follow. The participants will deliberate without the presence of the analysts and make a recommendation on the way forward. Typical adjudication workshops are often called citizen juries. In the consensus driven interaction, the group will deliberate and come to a consensus where a generally accepted decision is made. Discussion will be more free-ranging than adjudication and all participants and analysts can interact throughout. Such events have often been called stakeholder workshops in the past. Alongside the face-to-face interactions, we will run another web forum to discuss the assessments.

The web interactions in both the first and third phases will extend over an extended period of a week or a fortnight, starting on the day of the workshops.

Our objectives in this case study are both to offer informed comment on the pesticides issue and to compare different participation instruments. Currently we have just run phase 1 and are analysing out observations from the interactions. At GDN2006 we will report our preliminary findings from phase 1 and progress on phases 2 and 3.

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Supporting the Elaboration of a Participatory Budget Over the Internet

Jesus Rios and David Rios Insua

Decision Engineering Lab, Statistics and Decision Sciences Department
Rey Juan Carlos University, Madrid, Spain
jesus.rios@urjc.es
david.rios@urjc.es

1 Introduction

Participatory budgets constitute an attempt to allow citizens to have a word on deciding and approving how part of the public budget, mainly in municipalities, is spent; whether (and how much) in transportation, culture, education, urban development, health, ... They constitute a budget allocation approach based on dialogue and citizen participation, which diverges from the current predominant representative model in which citizens choose representatives for four years, with practically no other direct opportunity to influence council policies. In a sense, participatory budgets are transforming the idea of a representative democracy, in which the citizens' preferences are considered just at the moment of elections, through voting, to move closer to a participatory democracy, based on direct participation and discussion of issues.

Though previous experiences are mentioned, as those of Kerala, Lajes, Boa Esperança, Diadema or Vila Velha, the most known, for its longevity, initial experience of participatory budgets comes from Porto Alegre in 1989, which was definitely consolidated in 1992. Since then, participatory budgets are becoming increasingly popular in many other municipalities, all around the world. As an example, in 2003, approximately 200 municipalities undertook such experiences, not only in South America, but also in Italy, France, Germany, Belgium and Spain.

There are, however, several criticisms to be made, stemming from the experiences undertaken in such processes. From an information technology point of view, we appreciate that, except at a few experiences which use discussion fora to collect suggestions for project proposals, there is little use of new technologies, as processes are based on discussion and physical meetings, and preferences are usually established through voting, very frequently just by raising hands. From the point of view of the little decision technology employed: no formal modeling of preferences of citizens is undertaken and no use of formal negotiation or group decision support tools is used. To sum up, there is little methodology available.

2 A Framework to Support Participatory Budget Elaboration

We have modeled the participatory budget problem as one of limited budget resource assignment in which citizens attempt to maximize their own budget value in view of multiple criteria, subject to other possible constraints. In the general case, there will be various individuals involved with different values and, consequently, different optimal budgets. Therefore, an agreement should be sought as a joint decision over those non-dominated budgets. To do so, we propose a negotiation approach and suggest a general methodology to support participatory budget elaboration. This methodology consists of the following phases:

1. *Preparation phase.* The problem is structured before a final list of proposals is identified. In this phase, we structure criteria, elaborate an initial list of projects, together with their associated costs and technical features, and identify constraints.
2. *Discussion and consolidation.* Participants propose new projects and criteria, supervised by a decision analyst to consolidate a final list of proposals.
3. *Preference communication phase.* We extract the participants' preferences to guide the negotiation. As a byproduct, we may determine the optimal budget for each participant.
4. *Negotiation phase.* Participants will be able to make offers and discuss them through a forum associated with each offer. Participants are allow to vote in favor or against each offer. The offer with more percentage of acceptance among participants will be implemented if this percentage is sufficiently high, otherwise no offered budget will be globally accepted.
5. *Voting phase.* If the previous negotiations fail, a voting session allows for choosing a budget. We use approval voting over the projects to compute the winning budget, although other voting schemes could be used.
6. *Post-settlement phase.* Depending on the voting scheme and the negotiation method chosen, it could happen that the winning voted budget or the agreement will be jointly improvable. In such case, participants should try to improve it in a negotiated manner.

We would like to point out two important issues. First, our scheme can end up with voting, if phase 5 is reached. This is the usual mechanism used to decide participatory budgets, with the conceptual advantage that the participants would vote with a deeper knowledge of the problem. Second, and something that is usually ignored, it could happen that the winning budget obtained by voting, the traditional method used in the elaboration of the participatory budget, were suboptimal according to the Pareto order. Our methodology contributes with a mechanism to verify whether a budget is dominated and, in such case, improve it.

3 Supporting Participatory Budget Elaboration Over the Internet

We have developed PARBUD, a web-based group decision support system (GDSS) which implements our methodology through the web. Rather than using physical meetings with voting mechanisms, PARBUD promotes virtual meetings in which participants can discuss the problem and explore the consequences as an integrative methodology, confidential revelation of preferences to the system, and mediation for conflict resolution. The system supports problem structuring, preference modelling, problem solving for each individual, and allows for conflict resolution through arbitration, guided multiparty negotiations and/or voting mechanisms. The models and tools that we have developed aim at overcoming conceptual and technical difficulties that the participatory budget experiences are facing in their current physical non-web based implementations around the world.

4 A Case Study

We have conducted a simple experiment within the above framework with a group of lecturers and students from the Rey Juan Carlos University who wanted to participate in deciding in which proposals to spend an annual departmental grant of 10,000 Euros. Some researchers have previously complained about decisions being made without having consulted them. Hence, this experiment enables to incorporate them in the decision process.

Graphical Visualization Tools in AHP-Group Decision Making

Alberto Turón and José María Moreno-Jiménez

Grupo Decisión Multicriterio Zaragoza, Faculty of Economy, University of Zaragoza, Spain

1 Abstract

During the course of the last few years a number of graphical representation techniques for multidimensional sets of data have been developed to explore the world, to interact with the environment and to extract knowledge that can be processed by our brain. Graphical visualization of information improves our response time and enables us to extract knowledge from this information more quickly. The rapid developments that have recently taken place in the areas of information and communication technologies make it possible for us to tackle increasingly complex decisional problems, either concerning the amount of data or its organisation and structure. In fact, the development of information processing technologies (data mining, data warehousing, artificial intelligence ...) is facilitating decision making in both complex or poorly structured situations, making possible the creation, representation, storage, spreading and management of the knowledge regarding the problems being considered. Against this background, it is necessary to give the decision maker tools that allow him to explore the flexibility, creativity and analytical ability of the human mind in order to effectively extract, encode, classify and manage the different forms (tacit, explicit, etc.) and types (text, character strings, sounds, audio, rules, models, etc.) of knowledge. To that end, this paper presents a set of graphic visualization tools oriented towards the detection and identification of patterns of behaviour in group decision making when the analytic hierarchy process (AHP) is used to priorise and select between a discrete number of alternatives in a multiactor and multicriteria environment. These tools have been implemented as part of the spreadsheet module AHP-GDM developed with Microsoft Excel and Visual Basic. This set of tools favours the perception of consensus paths between the actors involved in the resolution of the problem, the interpretation of the results, and the extraction of the underlying knowledge associated with the decisional process useful in the subsequent negotiation processes.

2 Introduction

The complexity of the decisional problems that arise in the Knowledge Society, together with the greater specialisation required of individuals in this new context, calls for the use of approaches that allow multiactor decision making to be more open and flexible than has traditionally been the case. These approaches must capture the philosophical (holistic vision of reality), methodological (integration of the intangible) and technological (communication networks) changes that have taken place over the course of the last few years.

In response to the need to integrate the wide variety of aspects that make up reality (the small with the large, the individual with the collective, the objective with the subjective, the linear with the circular, the deterministic with the stochastic,...) and the different perceptions of this provided by the actors involved in the resolution process we use one of the most commonly employed multicriteria approaches, namely the Analytic Hierarchical Process (AHP), proposed in the mid-1970s by Thomas Saaty.

The flexibility and adaptability of AHP has allowed it to be used effectively in the resolution of high complexity problems characterised by the existence of multiple scenarios, criteria and actors. To increase the effectiveness of this methodology in the resolution of high complexity problems, our research group, the *Grupo Decisión Multicriterio Zaragoza (GDMZ),* has been developing different graphical visualization tools for the AHP-Group Decision Making that favour: (i) the perception of consensus paths between the actors involved in the resolution of the problem; (ii) the interpretation of results and, finally, (iii) the extraction of the underlying knowledge associated with the decisional process.

3 Graphical Visualization Tools for AHP-GDM

Graphical visualization tools are a set of instruments that allow us to analyze multidimensional sets of data to help us to understand the world around us. That is to say, to detect and identify patterns of behaviour in group decision making when the analytic hierarchy process (AHP) is used to priorise and select between a discrete number of alternatives in a multiactor and multicriteria environment. They also allow us to incorporate the perceptual abilities of the human brain into the Decision Making Process. These tools try to facilitate the analysis and interpretation of the results obtained. We are going to present the graphical visualization tools corresponding to the decisional tools developed by our group when analysing the following topics (Moreno-Jiménez et al., 2005a,b,c):

1. Relaxation of the deterministic principle usually considered in the resolution of problems. The incorporation of uncertainty is especially appropriate when working with intangible and subjective aspects. In this group of visual tools associated with preference structures we include:
   - *Value Paths for Preference Structures* (VPPS): they represent the evolution of the probability of each preference structure for different Consistency Ratios
   - *Value Paths for Alternatives* (VPA): they show the evolution of the probability that each alternative was selected as the best for different Consistency Ratios

- *Radial representations for preference structures* (RRPS) and *alternatives* (RRA): they map all the preference structures or alternatives to a planar polygon

2. Consistency: in this group we include visual tools developed to analyse some aspects related with the consistency of judgements:

   - *Judgement inconsistency density plot* (JIDP): each of the elements of the judgement inconsistency matrix is substituted by a colour. It is used to locate the judgements which exhibit more inconsistency

3. Searching for Consensus. These tools deal with the detection of agreement and disagreement points between the different decision makers involved in decision making. In this group we include:

   - *Localization of Preference Structures Diagram:* the distances between decision makers and the different preference structures are represented mantaining the proximity ratio between the latter
   - *Ternary diagram:* they represent the individual priorities and the consensus priorities of each group. The assigned groups are drawn in different colours and their consensus priorities are represented by circles
   - *Preference structures/decision makers location plot* (PS & DM): shows the relative position of the different preference structures and the behaviour of the different decision-makers in a group decision-making context
   - *Consensus density diagram:* it represents the density of the spatial distribution of the different preference structures
   - *Biplot:* it represents multidimensional data in two dimensions

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Part X

Invited Session
Accounting Topics in Group Decisions and Negotiations

Invited Session
Accounting Topics in Group Decisions and Negotiations

Ephraim F. Sudit and Dan Palmon

Department of Accounting and Information Systems, Graduate School of Management, Rutgers University, 180 University Avenue, Newark, New Jersey 07102
sudit@andromeda.rutgers.edu Dan@palmon.com

The session focuses on group decisions and negotiations involving certified public accounting auditors, shareholders, boards of directors, audit committees and managers of audited firms and the financial and accounting regulators. Issues of auditors' independence, commercial insurance of financial disclosures and creativity are discussed.

A Theoretical Model of the Effect of Expertise, Judgmental Biases/Cognitive Heuristics and Affect on Auditor Independence-Related Decisions

Gary Kleinman[1] and Dan Palmon[2]

[1] Robert Morris University, Moon Township, PA 15108, USA
[2] Rutgers University, Newark, NJ 07102, USA

The importance of auditor judgment issues in corporate governance and capital allocation cannot be overstated. Kleinman, Palmon and Anandarajan, 1998 and Kleinman and Palmon, 2000 have argued that auditor independence is a complicated problem, requiring an all-azimuths approach. Kleinman and Palmon's 2001 book (hereafter KP) presented a comprehensive, multi-level model of auditor-client relationships that included individual-level variables such as auditor personality, career stage, aspiration levels; social psychological and sociological variables that included work-group-related variables, the auditor's role set, both professional and personal, the level of structuring of the auditor's work; and organizational theory and field related issues regarding the governance of CPA firms, the history of specific auditor-client relationships, the organizational cultures of audit and client firms, and such dynamic aspects as the change in the auditor-client relationship over time due to organizational learning phenomena. The theoretical framework presented by KP received substantial empirical support from the grounded theory work of Beattie, Fearnley and Brandt 2001. The latter study examined six specific auditor-client relationships. Experimental and other research cited in Nelson and Tan 2005 is also supportive of the KP model.

How appropriate, though, is this emphasis on individuals? In a financial market setting, such as that discussed by Thaler (1999) and Libby et al. (2002), an individual focus makes sense in that each investor ultimately decides for him/herself with the aggregate market reaction being set by the average investor's decision. When, as noted in the Thaler and Libby et al.'s papers, there are not enough 'rational' investors to determine the course of the market, then the outcome is not normatively rational and the efficient market hypothesis folds. KP, however, argued that individual auditors are embedded in grander systems: personal, interpersonal, professional, organizational, and inter-organizational field systems. The impact of group and office contexts on PIC decision-making in the KP book was also discussed with the obvious intent of saying that individuals can only make decisions within these broader contexts. Often, of course, the decision is seemingly made by a group but, as the work of Hoffman and Kleinman 1994 and Kleinman et al. (2003) shows, group decision-making is influenced by individual variables as well as by the social-psychological relationships between members of the group. None of this, of course, discounts group process as an important contributor to the group decision-making effort. Instead, the current focus on individual variables highlights the inputs that individuals bring to the group decision-making effort. Kleinman et al. (2003) used structural equation modeling to examine the influence of personality and other individual level variables on group choice in an auditor-client negotiation setting. Their study showed that these variables were important.

In a related vein, individual and institutional value structures have also been examined in the context of auditor-client interactions. For example, following Shakun's Evolutionary Systems Design model, Kleinman and Palmon (2000) developed a model of auditor-client interactions that drew on speculations about the value systems of various parties to their interactions, and examined how the differing value systems motivated the participants (human and institutional) to interact. Clearly, this-like KP's other work-constituted an important contribution to the field. Like their other work, however, it fell short in not taking the analysis further. The aim of this work is to take up where KP left off, hoping to further fill in the gap in understanding factors that influence the auditor independence decision, by examining how issues of expertise, cognitive heuristics, and affect shape the way that auditors understand and react to their environment in an auditor independence challenge context.

This paper draws on the relevant psychological and expert literatures to develop a cognitive model of factors, other than those addressed in Kleinman and Palmon (various dates), that may affect auditor independence decisions. A model of the effect of affect developed by Finucane et al. (2003) on decision-making is also presented to supplement the understanding of cognitive factors on auditor decision-making. As such, it provides a further basis for researchers, regulators and practitioners to understand potentially difficult situations that may impair the independence of the auditor. Suggestions for improving the reasoning process of practicing auditors in auditor independence challenge situations are presented as well.

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Commercial Insurance of Financial Disclosure: Auditors' Independence, and Investors' Protection

Dan Palmon and Ephraim F. Sudit

Department of Accounting and Information Systems, Graduate School of Management, Rutgers University, 180 University Avenue, Newark, New Jersey 07102
Dan@palmon.com
sudit@andromeda.rutgers.edu

In this paper the authors propose, for preliminary consideration and discussion, a system of Commercial Insurance of Financial Disclosures (CIFD), under which users of financial information (owners and potential owners of business enterprises) and providers of financial information (managers of business enterprises) would be able to purchase insurance policies from private insurers (commercial insurance companies). These insurance policies will be designed to protect users of financial statements from specific well-defined losses directly attributable to their use of financial information that failed to conform to contractually defined standards. To reduce their own risks, insurance companies, will likely purchase from assurance experts (e. g., certified public accountants, financial analysts, management consultants) services assuring adherence to standards. The paper discusses the dynamics of the decisions and negotiations within and among groups of investors, managers, insurers, assurors, and government regulators. The advantages of CIFD over current U. S. regulation of financial disclosure are analyzed. Those advantages include increases in the independence of external auditors, improvements in the quality of their audits, and better protection for investors are discussed. It is argued that CIFD may be capable of evolving into a very flexible system, which would accommodate alternative regulatory structures.

The paper stipulates that a transition from the present financial disclosure system to CIFD could be arduous. The disclosing firms and the CPA firms have some important vested interests in the current state of affairs. Disclosing firms often can get away with audits that are less than rigorous and lax standards to manipulate and manage earnings. The "big four" CPA firms are currently operating in an oligopolistic market for the audit of large firms. Numerous smaller accounting firms face competitive audit demand for medium and small businesses. All public accounting firms are also protected by regulation from competing providers of assurance services. For public accountants, change may bring higher uncertainty associated with new exposure to competition from non-accountants.

For their part, insurance companies may find many of the existing disclosure standards as uninsurable, and may doubt whether sufficient economic and political pressure

can be mustered to make them insurable. Large investors have grown used to rely on financial analysts and direct sources of additional financial information to retain their advantage over ordinary investors. Small investors, whose protection has been the major declared objective of congress and the accounting profession, are not well organized and therefore wield little, if any, influence.

A very bold step toward CIFD may be complete deregulation that eliminates all mandatory disclosure requirements. This could let market forces create a viable and sustainable form of CIFD. A conservative approach could use the present regulatory structure as a starting point, and proceed to make GAAP substantially more insurable. In the second stage of the conservative approach, commercial insurance companies would be permitted to sell CIFD to investors. Disclosing companies will be permitted to purchase CIFD for their investors in lieu of the current requirements of certifying their financial statements by hiring certified public accountants for the task. As a result, CIFD will be given an opportunity to evolve in parallel to the existing system.

This paper should be viewed as preliminary suggestion of an alternative to the current regulation of financial disclosure, which could possibly improve the quality of financial disclosure to all investors and, thereby, also enhance the stature of the providers of financial assurance. We present these ideas not as advocated solutions, but as one possible starting point for further discussion and study of regulatory reform.

Auditors: Designated Constructive Deviants

Danielle E. Warren

Rutgers Business School – Newark & New Brunswick, 111 Washington Street, Newark

An auditor's attempt to deliver independent, unfavorable decisions is not unlike the struggles of those who resist corrupt organizational norms for the purpose of meeting the demands of society and bettering the organization (Warren, 2003). Much like those who display principled noncompliance or try to enforce organizational rules in the face of corruption, the auditor experiences a myriad of social influences that hinder the delivery of unpopular decisions (Kleinman and Palmon, 2000; Kleinman et al., 2003). These influences include social and financial sanctions, which are used to align auditors with groups that desire control over auditor decisions. Unlike the average employee, the auditor possesses an obligation to remain independent and judge the financials of the firm; the auditor is formally required to resist pressures to conform to client practices when such practices depart from societal expectations. As such, auditors serve as designated constructive deviants of corporations and understanding the factors that lead to their independence is critical for society.

Analysis of such deviance is oversimplified if focused on one organization, the client firm. For instance, one may theorize that certain attributes of auditors or situations would cause an individual to resist social and financial pressures from the client firm. For instance, individuals who score high on measures of perceived autonomy may appear desirable when considering such positions. Models of auditor independence, however, become more complex when a second organization, the accounting firm, is considered (Kleinman and Palmon, 2000; Kleinman et al., 2003). As Warren (2003) notes, deviance from one group often constitutes conformity to another; while acting as deviants for the clients, the same individual may be conforming to their own organization's values. This has direct implications for assertions regarding individual differences because the same individual difference or personality variable that predicts deviance from client influence (i. e., perceived autonomy) may also cause deviance from accounting firm influence. It appears that the auditor need not question *all* social influence and pressure to conform, just the *wrong* type of influence.

This situation is further complicated when the accounting firm's practices depart from industry practices or societal expectations. In such scenarios, auditors must deviate from their own firm practices and the client firm practices. As seen in the Enron case, Andersen allowed, if not supported, the corrupt practices of its client. If auditors working for Andersen wanted to uphold industry or societal expectations, they would need to deviate twice, from the directives of their managers at Andersen as well as the expectations of their client, Enron. In short, auditors may need to resist the influences of two corrupt organizations, their own and the client firm, in order to pursue a decision that serves society. Given what is known about the role of social influence in organizations, this appears to be a particularly difficult task.

What then causes an auditor to favor one set of practices over another or resist influence in both organizations? Auditors, like other employees, identify with different groups inside and outside the organization for a variety of reasons (shared work tasks, proximity, career path) and the strength of these affiliations motivate auditors to align themselves with the beliefs held by the workplace groups. Negative sanctions (disapproving glances, poor appraisals, warnings, penalties, and loss of relationships) play a critical role in conveying misalignment with the beliefs of these groups while positive sanctions (approving nods, awards, bonuses, demotions, promotions, and recognition) reinforce alignment (Hollinger and Clark, 1982; Warren, 2005, 2006). I assert that group identification, coupled with positive and negative sanctions, affects auditor decisions. More specifically, I theorize that sanction effectiveness will depend, in part, on the individual's desire to affiliate with the source of the sanctions. Borrowing from literature on social influence and constructive deviance, I present theory on the relationship between group identification, workplace sanctions, and auditor independence. In doing so, the influences facing auditors are better understood and recommendations for promoting independent decision-making are offered.

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Part XI

Invited Session
Agent Technologies for Group Decision and Negotiation

Invited Session
Agent Technologies for Group Decision and Negotiation

Rustam Vahidov

Department of Decision Sciences and MIS John Molson School of Business, Concordia University, Montréal, Canada

The session focuses on the advances on application of software agents in facilitating group decisions and negotiations. Agent technologies are a promising direction of research in automating negotiation- and group decision-related tasks. The contributions will elaborate on the issues of design of agent-based systems, as well as report some empirical findings.

Neural Networks-based Model for Intelligent Negotiation Assistant*

Réal Carbonneau[1], Gregory E. Kersten[2], and Rustam Vahidov[2]

[1] Department of Management Sciences HEC Montréal 3000, chemin de la Côte-Sainte-Catherine Montréal (Québec) Canada H3T 2A7
[2] Department of Decision Sciences and MIS John Molson School of Business, Concordia University 1455 de Maisonneuve Blvd. W. Montréal (Québec) Canada H3G 1M8

Electronic negotiation experiments provide a rich source of information about the relationships between negotiators, their individual actions, and the negotiation dynamics. This information can be effectively utilized by intelligent agents equipped with adaptive capabilities to learn from past negotiations and assist in selecting appropriate negotiation tactics.

In order to test the applicability of machine learning approaches to model negotiation dynamics we have used a data set from the Inspire electronic negotiation system (Kersten and Noronha, 1999; Kersten et al., 2003). In our approach the negotiation process has been modeled in a time-series fashion using an artificial neural network. In essence, the model uses information about past offers and the current proposed offer to simulate expected counter-offers. On the basis of the model's prediction, "what-if" analysis of counter-offers can be done with the purpose of optimizing the current offer. The assessment of offers and counter-offers is performed based on the user's utility function.

The neural network has been trained using the Levenberg-Marquardt (Marquardt, 1963; Hagan and Menhaj, 1994) algorithm with Bayesian Regularization (Hagan et al., 1996) as implemented in the MATLAB 7 Neural Network Toolbox (MathWorks 2005). The simulation of the predictive model on a testing set has very good and highly significant performance, especially considering the noisy data domain. An examination of "what-if" scenarios and optimization results on a selected case shows that the model can be used to generate interesting negotiation strategies. The model can provide valuable insights to a negotiator regarding the expected moves by the opponent and suggested composition of the offer.

The findings suggest that machine learning techniques may provide useful applications in the context of electronic negotiations. These techniques can be effectively incorporated in an intelligent agent that can sense the environment and assist nego-

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tiators by providing predictive information, and possibly automating some negotiation steps.

The future work will be directed towards implementing the proposed model as a core functionality of a software negotiation assistant. This would allow us to experimentally test its role in and impact on negotiations in settings involving human subjects.

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Agent-based Assistant for E-negotiations: Using Conflict Style and Reservation Values

Simone A. Ludwig

John Molson School of Business, Concordia University, Montreal, Canada
sludwig@jmsb.concordia.ca

The Thomas-Kilmann Conflict Mode Instrument is a commonly used psychological assessment tool and measures the five different behavioural classifications proposed by the Dual Concerns Model, which was introduced by Blake and Mouton (Blake and Mouton, 1964) in the mid 1960s. These five classifications are competing, collaborating, compromising, accommodating and avoiding. Thomas and Kilmann (Kilmann and Thomas, 1977) developed these five classifications to elicit and text the five conflict model posited by Blake and Mouton's model. It is a useful tool for probing bargaining styles in a classroom setting. Shell (Shell, 2001) summarized his finding of the usefulness as follows:

- relative freedom from social desirability biases in the way statements in the instrument are presented;
- conflict styles that match up with strategy concept widely used in the negotiation literature; and
- significant congruence between the classifications and their perceptions of their own behaviour across a set of simulations.

Researchers on human negotiation have determined that time is an important factor in a negotiation. The amount of time elapsed from the beginning of a negotiation creates a time pressure, which forces negotiators to reach agreements quickly. Two effects of time pressure are lower demands and faster concessions (Pruitt, 1981). When negotiators want to end the negotiations quickly, they have to sacrifice by accepting deals that are more favourable to their opponents. Raiffa (Raiffa, 1982) states that as negotiators are willing to wait longer and to appear less eager for reaching agreements, they achieve higher profits. Two types of time-dependent negotiation behaviour, namely Boulware and Conceder were identified. A negotiator with Boulware behaviour stays firm at the beginning of a negotiation, and concedes when approaching the time limit. Negotiators with Conceder behaviour concede their reservation values quickly at the beginning of a negotiation, while their concession rates become flattened as the time limits are approached.

Knowledge about conflict styles and time pressure during a negotiation are important factors in a negotiation. This knowledge is used to model an agent-based assistant. The idea of the proposed method is to model a utility concession function depending on the conflict style behaviour of a negotiator. Negotiators, prior to engage in e-negotiations, are asked to fill in a questionnaire designed to measure the conflict mode and specify their reservation levels. The software agent uses reservation levels and a concession-making model to propose the concessions and timing of offers and attributes e. g. in a multi-attribute negotiation. The concession-making model is constructed in the utility space and it is constructed using five Thomas-Kilmann measures (competing, collaborating, compromising, avoiding and accommodating).

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Part XII

Behavioral Patterns

Negotiation between e-Marketplace Operators and Participants on the Attribute of Listing Fee

Xin Chen

The Institute of Information Systems and Management, University of Karlsruhe (TH), Englerstrasse 14, D-76131 Karlsruhe, Germany
xin.chen@iw.uni-karlsruhe.de

1 Introduction

In recent years, many similar e-auction marketplaces (e. g. eBay, Amazon etc.) have been built. The sellers and buyers who want to trade via online auctions then have the opportunities to compare and select a marketplace to trade. Therefore the marketplaces operators compete with each other and have applied many methods to attract participants, among which the "Listing Fee" seems to work as an effective method.

The Listing Fee is the price that a marketplace charges for listing an item or items for sale. This fee is charged only to seller at the time of listing, and is not refundable no matter the item is sold or not. Intuitively, a seller prefers a marketplace with higher price but he also has to consider the amount of listing fee. A buyer needs not to consider the listing fee, but the price that he considers is itself a comprehensive outcome determined by bids as well as offers. Since each participant may join or leave a market at his own decision, the market structure, as an aggregation of choices by all participants, changes dynamically.

Empirically, significant influence of listing fee on the participants have been observed, which is embodies through significant changes of the market structure in Chinese e-auction industry. eBay was a de facto monopolist in China, with over 80% market share in year 2002. However, his leading position has been greatly challenged by a new marketplace operator Taobao from May 2003. One of the advantages offered by Taobao is that sellers using this marketplace are charged no listing fees at all. By September 2005, Taobao has successfully achieved 57.10% of the market share, while eBay has only 34.19%[1]. Under such circumstance, eBay start from December 2005 a series of sales promotion, including a decrease of listing fees from 50% to 100%, in order to fight against Taobao for more participants[2].

In such competition, the listing fee can be viewed as a negotiable attribute between the marketplace operators and their participants. The participants observe the amount of listing fee and show their preference by choosing marketplace. By observing partic-

[1] See http://news.analysys.com.cn/tjnews.php?id=1981
[2] See http://www2.ebay.com/aw/cn/200512.shtml#2005-12-23010231

ipants' decisions via the market structure the operators may negotiate by change the amount of listing fee. This paper uses agent-based approach to simulate such process of negotiation. A simulation model is built to study how the listing fee affects the participants' decision on selecting a marketplace, and how the market structure changes under different settings of listing fees.

2 The Simulation Model

Market Scenario
We start with a simple scenario where two marketplaces, M_1 and M_2, compete with each other for attracting participants. Every participant is considered as an agent, and is either a buyer agent a_j^B or a seller agent a_k^S. The role of being a buyer or a seller role does not change. Altogether there are n participants $\{a_1, ..., a_n\}$ allocated in the markets, in which s agents are seller agents and b agents are buyer agents. n, s, b are all constant numbers. In each market, one single-sided uniform price auction runs. It is a multiunit auction in which units offered by the sellers are sold at a "market-clearing price" such that the total demand equals the total supply (Krishna, 2002). Those two auctions run simultaneously in two marketplaces. Denote the price of an auction in M_i as $p(M_i)$. Marketplace M_i charges listing fee $l(M_i)$ to all seller agents that currently join the auction in M_i.

The auction process is organized by rounds and each round consists of 3 steps, as Fig. 1 shows. At the very beginning, all agents randomly enter one of the two markets, and then follow the steps in an auction round

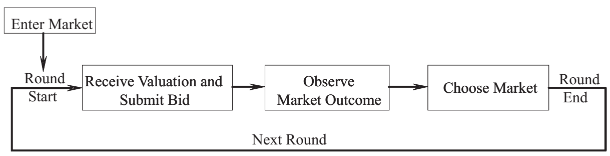

Figure 1: The auction process

Step 1: Each buyer agent receives its private valuation from a given distribution and bids with this valuation. One buyer agent submits one and only one bid in a round.
Step 2: After all buyer agents in a market have submitted their bids, the price and the winners are determined. The items are then allocated. Market outcomes are publicly known by all agents in the two markets.
Step 3: Based on the market outcomes, each agent independently decides whether to stay in the current market or to join the other market in the next round. In another word, the action set D for each agent is $D = \{stay, move\}$. One agent makes one decision in one round.
Decision-making of Agents
Agents are assumed to "boundedly rational" at decision-making (Simon, 1955). Under

this concept, agents evaluate the markets and make decisions with only the information that is publicly known and only the information from the current round.

A buyer a_j^B calculates his payoff in market M_i considering the price $p(M_i)$ and his private valuation $v(a_j^B)$ (see formula (1))

$$\pi(a_j^B, M) = \begin{cases} v(a_j^B) - p(M_i) & v(a_j^B) > p(M_i) \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

Denote the market that agent a_j^B is currently located in as M_x, and denote the other market as M_y. Thus, the payoff difference for buyer a_j^B is

$$\triangle\pi(a_j^B) = \pi(a_j^B, M_x) - \pi(a_j^B, M_y) \qquad x, y \in \{1, 2\} \tag{2}$$

A seller a_k^S is assumed to value zero for his offered item, thus his payoff is calculated by the price $p(M_i)$ and the listing fee $l(M_i)$ he pays (see formula (3)).

$$\pi(a_k^S, M_i) = p(M_i) - l(M_i) \tag{3}$$

The payoff difference for a seller a_k^S is given by

$$\triangle\pi(a_k^S) = \pi(a_k^S, M_x) - \pi(a_k^S, M_y) \qquad x, y \in \{1, 2\} \tag{4}$$

The preference for sellers and buyers are defined in formula (2) and (3) respectively.

$$D(a_j^B) = \begin{cases} \textit{stay}, & \triangle\pi(a_j^B) \geq 0 \\ \textit{move}, & \triangle\pi(a_j^B) < 0 \end{cases} \tag{5}$$

$$D(a_k^S) = \begin{cases} \textit{stay}, & \triangle\pi(a_k^S) \geq 0 \\ \textit{stay}, & \triangle\pi(a_k^S) < 0 \end{cases} \tag{6}$$

As assumed, agents are not purely rational. Therefore by decision *move* they may follow rationally with only a probability of $p_m \in [0, 1]$. p_m is not statically hold but rather variance with the difference of the ratios of two markets, according to formula (7) and (8).

$$p_m(a_j^B) = \mu \left| \frac{2\triangle\pi(a_j^B)}{\pi(a_j^B, M_x) + \pi(a_j^B, M_y)} \right| \tag{7}$$

$$p_m(a_k^S) = \mu \left| \frac{2\triangle\pi(a_k^S)}{\pi(a_k^S, M_x) + \pi(a_k^S, M_y)} \right| \tag{8}$$

μ is a coefficient in the field of [0,1]. This is reasonable: when the level of competition in two markets differs significantly, agents are more willing to move.

3 Simulation Results

The simulation model has been implemented on the support of meet2trade platform (Chen et al., 2005; Weinhardt et al., 2005). Simulations are executed under two settings: one setting of competing markets with identical parameters; the other is of competing markets that differ with each other in respect to listing fee. With the first setting, simulations show that the market structure may for equilibrium on duopoly, in which no agents would prefer the other market than the current market. At such equilibrium the prices of the two markets almost equals. With the second setting, simulations show that equilibrium on market duopoly may still exist, in the case that one market charges listing fees but the other market not. However, the price difference of the two markets at equilibrium almost equals the difference of the listing fee.

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Intercultural Negotiation Patterns: An International Study of Computer-Mediated Negotiations

Andrea Graf[1], Sabine T. Koeszegi[2], Eva-Maria Pesendorfer[2], and Katharina J. Srnka[2]

[1] University of Regensburg, Faculty of Business Administration and Economics, Department of Management and Organisation, Regensburg, Germany
andrea.graf@wiwi.uni-regensburg.de

[2] University of Vienna, Faculty of Business, Economics, and Statistics, Vienna, Austria
Eva-Maria.Pesendorfer@UniVie.ac.at
Sabine.Koeszegi@UniVie.ac.at
Katharina.Srnka@UniVie.ac.at

The increasing importance of electronic negotiations in global management has led us to explore the significance of cultural influences in computer-mediated negotiations. In this research, we analyze the implications of two cultural dimensions, individualism/collectivism and hierarchy/egalitarianism, for negotiators from the Asian, North American, and European cultures. Asia, Europe, and North America are three major cultures that have been found to differ fundamentally in preferred configurations and coordinating mechanisms in the organizational context.

Our research questions are as follows:

Research question 1: What is the relationship between the cultural dimension of individualism/collectivism and electronic negotiation strategies?

Research question 2: What is the relationship between the cultural dimension hierarchy/egalitarianism and negotiation behaviours depending on the role (buyer/seller) in electronic negotiations?

In this study, we use data from negotiation experiments conducted at the National Sun Yat-Sen University (Taiwan), the John Molson School of Business at Concordia University Montreal (Canada), and the University of Vienna (Austria). Students at all three universities participated in the same seller-buyer negotiations experiment. In total, we analyze the data of 170 subjects. Participants simulated a seller-buyer negotiation based on a case dealing with the supply of bicycle parts. The case is designed as a multi-attribute negotiation allowing for both integrative and distributive strategies. As the focus in the current study is on communication in cooperative international relationships, we developed the case to invite participants to establish a stable relationship with the negotiation members from the other culture, i. e., to look for a strategic partner.

With respect to research question 1, our empirical findings indicate that the cultural dimension collectivism/individualism affects the strategic orientation: For information exchange, we found collectivist and individualistic participants to gather and share information in different manners. Asian negotiators (as representatives of a collectivist culture) exchanged significantly more integrative information than negotiators from North America (as representatives of an individualistic culture). Individuals from countries, which differ on the dimension individualism/collectivism, also tend to adopt different strategies in their actions. North American negotiators being from an individualistic culture showed more efforts in claiming value than the collectivist Asian negotiators. Even when risking a conflict, the North American negotiators barely deviated from their position. Asian participants showed significantly less value claiming behaviour, supposedly in order to avoid potential conflict.

Referring to research question 2, we clearly found Asian negotiators (representing the hierarchical culture) to put more emphasis on power than European negotiators (representing the egalitarian culture). When being the buyer, i.e., having the more powerful role, Asian participants "took the risk" of potential conflict significantly more often than when being the seller. Asian buyers used the claiming value strategy significantly more often than Asian sellers. Obviously, power has an influence on the negotiation pattern in hierarchical cultures. In the European culture, the role has no significant influence on the electronic negotiation behaviour. We conclude that in hierarchical cultures hierarchical power seems to influence electronic negotiation patterns, whereas in egalitarian cultures hierarchical power has less impact on computer-based communication behaviour.

The findings of this study underscore the importance of cross-cultural research in electronic negotiations. Results suggest that computer-mediated negotiations — although accompanied by reduced personal and social cues — are significantly influenced by the culture the negotiator comes from. Overall, results suggest that negotiators' culture affects their strategic orientation and their focus on power in an electronic negotiation process. Altogether, we can conclude: Since the objective in business relationships is to maximize joint gains and to develop a win-win situation, negotiators need to understand the consequences of individualism or collectivism as well as the source of power and its impact on computer-based negotiation behaviour in their partner's culture. This research may in particular help to sensitize negotiators in intercultural relationships to their counterparts' communication strategies.

A Frequency based Analysis of the Language of Swedish Group Decision-Making

Magnus Gunnarsson

Department of Linguistics, Göteborg University
magnus.gunnarsson@ling.gu.se

With the advent of computers and the ability to store and process large amounts of texts (including transcriptions) electronically, linguists have been able to make their research quantitative to a much larger degree than what was possible before. Although quantitative studies cannot replace qualitative studies in linguistics (at least not at the current stage of development in computer technology), they are an important complement. In this study I set out to make a corpus based, quantitative analysis of the language of group decision-making. This is part of a larger attempt to apply linguistic methods and theories to group decision-making (Gunnarsson, forthcoming), something that can bring new insights to our understanding of how decisions are made in groups.

The spoken language corpus, i.e. a database of transcribed conversations, that was used in this study contained transcriptions of Swedish, naturally occurring conversations where groups make decisions, and it comprises more than 250 000 words. The conversations are of different types, from very formal to very informal meetings, from public administration, private companies and non-profit associations. Most of them were taken from Göteborg Spoken Language Corpus, GSLC (Allwood et al., 2003), but colleagues contributed with some recordings, and a couple of recordings were made particularly for this project. The basic principle during the collection was simply to bringing together a collection of group decision-making conversations that was as large as possible. The conversations primarily come from meetings of different kinds (project groups, committees, etc), and there are few casual conversations (e. g.three friends planning a vacation together). Further, most of the speakers are male, and although precise information about their age is unavailable, the impression is that few of them are below 30 or above 65 in age. All participants speak Swedish, and no indications have been found of any of them having a foreign background. Most of the recordings are made in and around the Gothenburg area between 1989 and 2004.

A number of word frequency measures and lists were calculated for the GDM corpus, and these were compared to the corresponding measures for two other corpora, containing informal conversations (IC) and professional/official conversations (P/O) respectively (both corpora being sub corpora of GSLC).

One conclusion from the study is that much of the word frequency differences seen in the GDM corpus compared to IC and P/O comes from the formality of the group meetings, and from the kind of groups that happen to be part of the corpus (where public administration has a large share). Group decision need not be formal, and it is by no means tied to public administration. Thus if the GDM corpus had been less dominated by formal meetings and public administration groups, much of the difference in word frequencies compared to the other activity types that was found now would not appeared.

However, some of the patterns are not as easily discarded as results of formality (argumentation linking, complex clause structure, and the prevalence of future and present tense). Further, some of the patterns found were not so much a consequence of the formality in itself, but rather the kind of formality that a group had developed. These patterns show that groups develop different patterns, and it is likely that this holds also for informal groups.

The most interesting finding, however, is perhaps that the differences were so few. Social activity is usually very clearly visible in frequency lists and similar measures (Allwood, 1996, 2001), but for group decision-making it was primarily the social institutions and the degree of formality came though in the lists. The explanation is that group decision-making is not so much a social activity in itself, as a sub activity that can be part of many social activities. This suggests that one should perhaps distinguish group decision-making in different social activities from each other, and group decision-making in formal meetings in the public administration need not have very much in common with, say, group decision-making in a high school class room.

Since all the conversations in the corpora are Swedish, it is difficult to say which of the found patterns are particular to Swedish culture. This is a problem for all studies based on mono-cultural material, and not only the present one. Hopefully, more studies will be made in the future based on material from many different cultures and languages, allowing the present material to be compared to group decision-making in other cultures.

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Part XIII

Conceptual Modeling

Configurable E-negotiation Systems for Large Scale and Transparent Decision Making

Morad Benyoucef[1] and Marie-Hélène Verrons[2]

[1] School of Management, University of Ottawa, Canada
benyoucef@management.uottawa.ca

[2] Laboratiore Leibniz, IMAG, Grenoble, France
verrons@imag.fr

Changes in the political and social environments might call for modifications in the negotiation protocol used to resolve political or social disputes. Similarly, sudden changes in market conditions might call for quick modifications in the protocol used to negotiate business deals. These changes are even more likely to happen in the open and dynamic environment created by e-government and e-business initiatives. It is therefore important that e-negotiation systems allow for quick and easy configuration of new negotiation scenarios (brought on by the changes), preferably at reduced setup costs (Neumann et al., 2003). One way to achieve configurability is through separation. Negotiation protocols should not be hard-coded into the system; the designer should be able to select a protocol from a repository and deploy it. This separation permits efficient implementation, easy testing and, last but not least, encourages reuse. The designer can actually benefit from the fact that negotiation processes contain parts that are common to all of them.

To achieve separation, negotiation protocols need to be expressed via shared ontologies (Phelps et al., 2004). This is true for e-negotiation servers as well as automated e-negotiation interfaces. The reality, however, is that most of today's e-negotiation systems support a single negotiation protocol which is usually hard-coded into the e-negotiation server and in the agent(s) that constitute the active part of automated e-negotiation interfaces (Bartolini et al., 2002). When a new negotiation protocol is introduced, then a time-consuming and complex process of implementing it on the server takes place. All users are subsequently required to adapt their automated e-negotiation interfaces to the new protocol (Rinderle and Benyoucef, 2005). Having a shared ontology of protocols will enable the interface to connect to any server, regardless of the currently implemented negotiation protocol.

A formal specification of negotiation protocols will enable their separation from the e-negotiation server (Benyoucef and Keller, 2000). This creates the opportunity for the e-negotiation designer to select a protocol from a repository (or to design a new one) and implement it on the server by the click of a button, thus encouraging reuse and ease of implementation, deployment and testing. Additionally, protocols can be consulted by human and software participants prior to engaging in the negotiation, hence contributing to the transparency of the negotiation process. On the side of the participant in the negotiation, a formal specification of negotiation strategies will enable their separation from the automated e-negotiation interface. A repository of proven and tested strategies can be created and new ones can be designed as needed and implemented into the software agent quickly and easily. Some of the requirements for a formal specification of e-negotiation protocols and strategies include: expressiveness, completeness, formalization, verification, automation (the specification must be executable), large scale acceptance, understandability, and compactness. For more on this topic, refer to (Benyoucef and Keller, 2000).

From as software engineering perspective, negotiation systems usually consist of components with well defined interfaces. Regarding the limited lifecycle of these components, they should be easily interchangeable. Instead of rewriting the entire application, only a single (or a few) components must be replaced. If the core component (the engine) is domain independent, it can be optimized in terms of scalability, security, and processing time (Neumann et al., 2003). In addition to higher process efficiency and lower transaction costs (Malone et al., 1987), users look for the following features in e-negotiation systems (Cass et al., 1999): (1) Correctness: the system should allow no errors, deadlocks or incorrect handling of exceptions. (2) Reasonability: the system must allow for adequate time for offers and counteroffers to be made. (3) Robustness: the system should continue to function properly after an interruption or improper action from the user. (4) Rapidity: the system should execute and respond relatively quickly. We believe a fifth quality should be added: traceability. An e-negotiation system should be designed with the capability to explain its actions to the user whenever the user is in need of an explanation.

We studied various design approaches and found the following features in most of them: (1) separation of protocols and strategies from the core component of the system; (2) possibility (but limited) of component reuse; (3) standardized tools to enable quick and easy configuration of negotiation applications and to deploy new protocols or to modify existing ones; and (4) proprietary languages to specify negotiation protocols and strategies. What is missing is: (1) a library of negotiation protocols and strategies defined in a standard and agreed upon format that any system can use regardless of who is providing it; (2) the possibility to "plug and play" a new negotiation protocol or strategy in the system; and (3) the possibility to easily and quickly integrate the e-negotiation application with and within other applications of the participant (business or government) or its partners.

Figure 1 summarizes the requirements we believe every e-negotiation system should address. We divided them into two categories: designer's requirements and user's requirements. All requirements are self-explanatory, so we will not explain each one individually. An effort to meet these requirements will undoubtedly create an environment of trust between the community of users and the providers of such systems. The ability of these systems to support transparent and efficient decision making through innovative negotiation protocols will create new political and business opportunities for all citizens and organizations. Benefiting from a wide access, facilitated by ICT and the Internet, citizens and organizations will be able to achieve better agreements faster and with less effort, marking a step towards e-democracy.

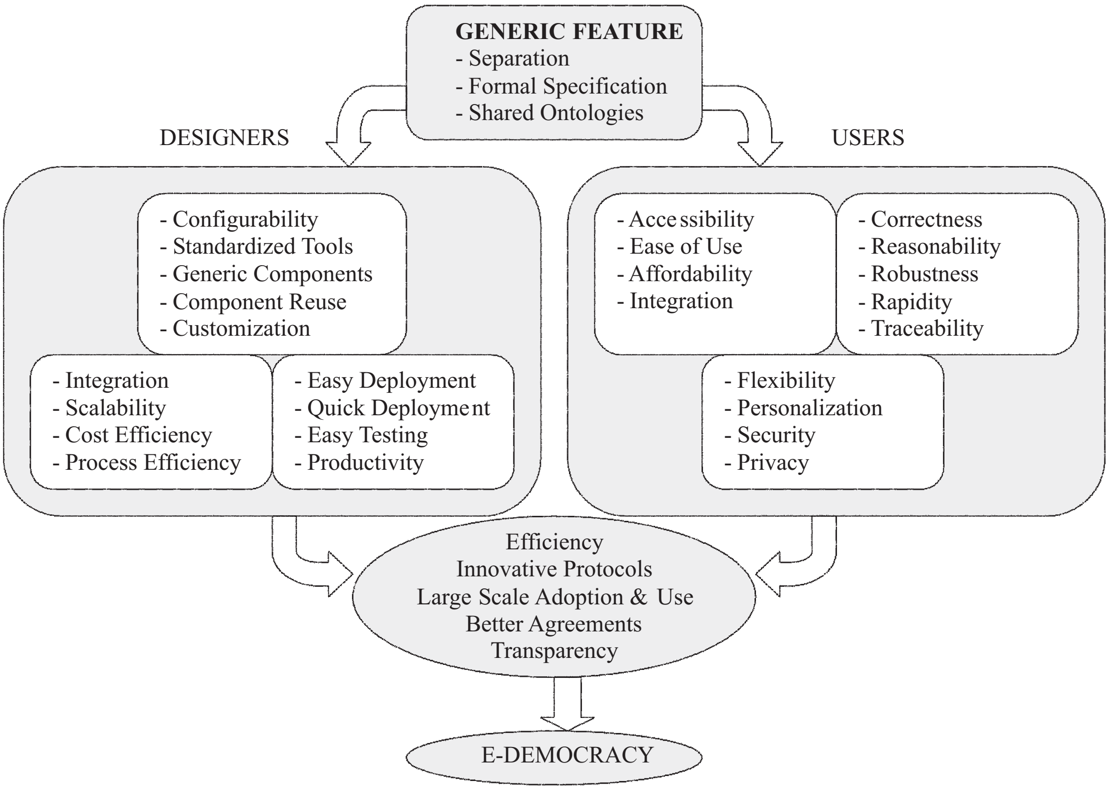

Figure 1: E-negotiation Systems: Design Requirements for e-Democracy

In this paper, we examine the leading research initiatives to devise a configurable framework for e-negotiation systems; we introduce design requirements derived from the expectations of providers and users; and we present our vision of a configurable framework for designing, implementing and deploying e-negotiation systems.

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Nego: A Conceptual Model to Reflect on Negotiations in Public Policy Development

Pieter Bots[1,2] and Niki Frantzeskaki[2]

[1] Cemagref, Montpellier Regional Centre, BP 5095, F-34033 Montpellier, France
pieter.bots@cemagref.fr

[2] Delft University of Technology, Faculty of Technology, Policy and Management, PO Box 5015, NL-2600 GA Delft, The Netherlands
N.Frantzeskaki@tbm.tudelft.nl

1 Introduction

Public policy making is by its very nature a negotiation process in which a variety of stakeholder representatives search for acceptable compromises between a range of often conflicting interests. Ideally, this negotiation process results in a feasible, viable and consensus-based policy action, but policy development processes are highly complex and proceed in fits and starts. The conceptual model we propose in this paper is intended to facilitate structured reflection on policy negotiations and to provide handholds for process design, hence its name: Nego – an allusion to the famous construction toy.

2 Conceptual Model

The Nego model has been developed on the basis of a conceptual analysis of a broad literature base. At a meta-level of analysis, we postulate that the desirable outcome of a negotiation process in the context of public policy development is a meaningful consensus: all actors agree on a policy option that has the potential to deal with the policy problem, they support its implementation, and commit to it. Agreement on policy options that are undesirable or unfeasible ('negotiated nonsense') is considered as a failure of the process.

To be able to link process to outcome, we assume that a negotiation process and its eventual outcome are governed by a weak form of determinism, based on two possible relations (*may lead to* and *may inhibit*) between three categories of factors (*preconditions, mechanisms* and *effects*). For any two factors A and B, 'A *may lead to* B' is to be interpreted in terms of Bayesian conditional probabilities as $P(B|A) > P(B)$, and 'A *may inhibit* B' as $P(B|A) < P(B)$.

Effects correspond to actor behaviors and attitudes that are relatively easy to observe in a negotiation process. Effects are the immediate determinants of the negotiation process and its outcome: in a sense they *are* the negotiation process. Effects are seen as (direct or indirect) consequences of *preconditions*. Lack of true freedom of speech, for example, may lead to masking behavior. Certain preconditions must be met for a negotiation to be started, or to make its outcome consequential. *Mechanisms* are systemic properties that emerge (become functional) as a result of specific actor behaviors under specific conditions, and function as catalysts for particular actor behaviors. Mechanisms can therefore be self-reinforcing.

While identifying and categorizing concepts, we found it enlightening to structure the model in three concentric layers. *Actor choices* lie at the core, as the objective of the Nego model is to provide explanation grounds for human behavior in negotiations and to suggest to which extent factors that shape human behavior could be managed. The *organization of the negotiation process* forms the intermediate layer. The factors in this layer constitute the basis for actor interaction while providing the actors with the rules of the negotiation. The *institutional context* is the outer layer. The institutional context provides the foundations for the design and formulation of the process rules. Institutions comprise the established environment within which individuals change their behaviors and their perceptions towards social problems.

Table 1: Elements of the Nego model

	Sectors		
Layer	*Preconditions*	*Mechanisms*	*Effects*
Institutional context	Free speech Core values protection	Participation Interdependencies	
Negotiation process organization	Openness Transparency Public awareness	Information pool Continuous bargaining Time pressure	
Actor choice	Public motivation Consistency	Dilemma of trust Dilemma of honesty Coalition formation	Professional self-constraint behavior Opportunistic entry/exit of actors Opportunistic use of power Masking behavior Constructive use of power Seeking-the-mean behavior Cooperative behavior Time pressure effects Loser's behavior Free rider's behavior Joint commitment to the outcomes

Layers Preconditions Mechanisms Effects Institutional context Free speech Core values protection Participation Interdependencies Negotiation process organization Openness Transparency Public awareness Information pool Continuous bargaining Time pressure Actor choice Public motivation Consistency Dilemma of trust Dilemma of honesty Coalition formation Professional self-constraint behavior Opportunistic entry/exit of actors Opportunistic use of power Masking behavior Rigid perception behaviors Constructive use of power Seeking-the-mean behavior Cooperative behavior Time pressure effects Loser's behavior Free rider's behavior Joint commitment to the outcomes

The generic model elements (the 'Nego blocks' listed in Table 1) have been distilled from conceptual models of negotiations and policy development processes found in different fields, notably social psychology, negotiation and policy science. These models, albeit concise and internally consistent, were found to be limited in scope and at times incompatible with each other, whereas we needed something integrative to describe and explain the policy negotiation processes we are interested in. In the full paper, we will briefly present the origins of each Nego block and discuss its position it in the conceptual model, and then present an analysis of the interdependencies of the blocks in terms of *may lead to* and *may inhibit* relations. The precise meaning and practical use of blocks and their interdependencies will be elaborated in a number of examples. In this extended abstract, we can show only one configuration to illustrate how the Nego model can be applied.

3 Illustration

The configuration of Nego blocks in Figure 1 is generic, rather than specific for one particular negotiation process. It summarizes various sources of *conflict* that can occur separately or in combination in real-life negotiations.

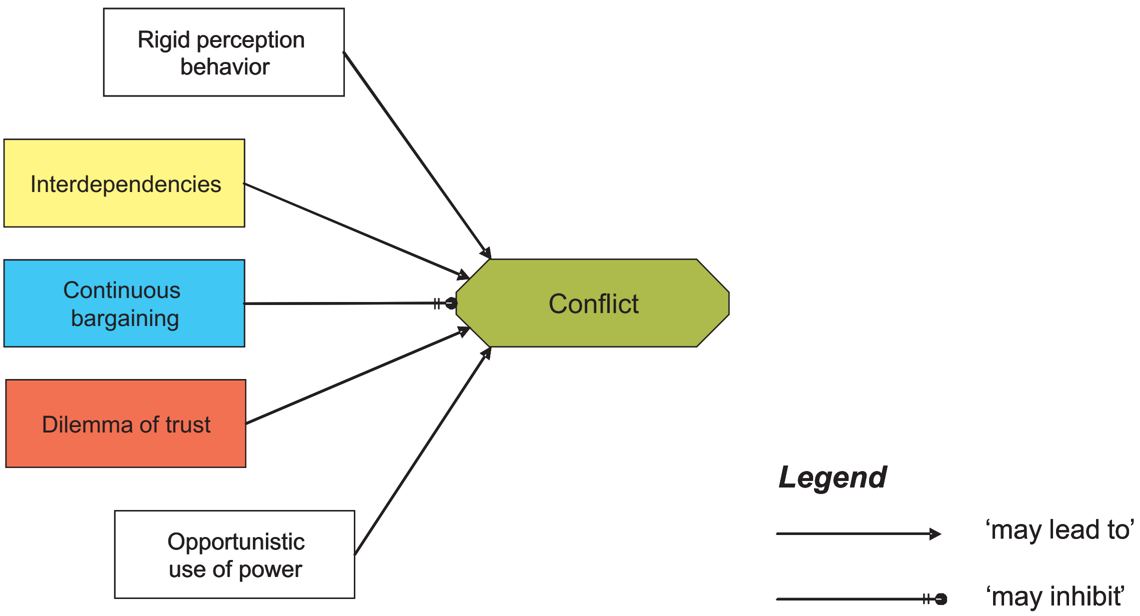

Figure 1: Nego-block configuration related to conflict setting

This generic Nego-configuration is largely based on the work by Wall Jr. and Roberts Callister (1995) on different behavioral patterns that conduct towards a conflict state. It identifies rigid perception behaviors (which include "commitment to position", "perception that other has high goals" meaning that other's success is on my cost, "other's behavior seen as harmful"), the dilemma of trust ("distrust of other"), opportunistic use of power ("hostility", "intended distributive behavior", "power struggles"[1]), interdependencies[2], and a *dysfunctional* mechanism of continuous bargaining ("low interaction") as sources of conflict.

Moreover, a conflict may evolve with time since participants bring with them their past experiences and history in the arena. There is a possibility that disappointing experiences, frustration, mistrust, prejudice, pessimism or other negative feelings having their roots in the recent history to be projected onto the present and give rise to a conflict (Abma, 2000; Wall Jr. and Roberts Callister, 1995).

4 Discussion

In the discussion section of our paper, we will contend that by mapping both controllable and uncontrollable factors, the Nego model can provide useful insights to process designers, facilitators, policy analysts, evaluators and negotiators. The model can help not only to understand actor behavior in policy arenas, but also to design processes in such a way that undesired behavioral attitudes are constrained. If anything, the Nego model can stimulate and enhance reflection on how to establish preconditions and/or empower mechanisms that can improve the probability of achieving a meaningful consensus.

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[1] Differences in power as well as differences in utilizing power cause an intentional pressure on actors that can also lead to a conflict (Larson, 2003), while a change in the level of power that is used from different actors can inflame or resolve a conflict.

[2] One of the causes of conflicts comes from the structure of the relations in the arena. As Wall Jr. and Roberts Callister (1995) argue "such interdependence can restrict or redirect the parties behavior, aspirations and outcomes and thereby generate conflict."

An Overview of Security Requirements for eBidding in the Public Sector

Karsten Dietz, Yücel Karabulut, and Peter Leidner

SAP AG
karsten.dietz@sap.com
yuecel.karabulut@sap.com
peter.leidner@sap.com

The public sector of the European Union spends 11% of the 9 trillion € Gross National Product (GNP) in public contracts per annum. In Germany the size of public contracts is about 260 billion € per annum (2002, see N.N. (2006a)). The approximate cost savings through eBidding is estimated at 10% of the total procurement costs N.N. (2006a). These promises have led to several initiatives to implement public eProcurement systems. Cost constraints force governments to re-organize their administrative processes and IT infrastructures. The public procurement sector has a financial volume that allows a fast amortization of investments. State-run institutions replace traditional procurement processes and try to bundle their market power. When employing eProcurement solutions in the public sector, both the buyers and suppliers security requirements must be taken into account. Furthermore, the legal implications stemming from laws including public procurement, digital signatures and privacy laws must be considered. Only a few of the current eProcurement projects in the public sector consider such requirements.

eProcurement can be defined as a set of tools enabling processing of procurement by electronic means. This electronic procurement covers not only traditional procurement activities like notification, tendering by suppliers, evaluation of tenders and concluding public contract with chosen party. It also supports ordering on the basis of already settled contracts and delivery and payment issues. eBidding is the execution of a bidding process via electronic tools and media, e. g.the Internet. Whereas there are no fixed rules for the private sector how to set-up an eBidding procedure, the public sector is highly regulated by legal directives. An eBidding process within the public sector can be seen from different points of view: The supplier's and the bidding institution's (buyer). For the bidding institution the process begins with preparing and publishing its bid invitation. For the supplier the process starts as soon as he gets the corresponding notification.

In the public sector there is a need for a common system, such as an Internet platform, which allows the buyer (public authority) to publish his bid invitation and the supplier to read this as well as getting contact information. Additionally, such a publication platform can offer the possibility of notification for the supplier. There are two possibilities for the continued process. First, buyer and supplier can communicate, by exchanging information or tendering, directly without using any platforms. Second, they can execute the eBidding process via the same publication platform or another central platform. In both cases, buyer and supplier have to establish a connection between their own IT systems or between their IT systems and an eBidding platform. Such a common platform can either be run by the public authority itself or by a third party.

Secure eBidding can be defined as an eBidding process that fulfills the security requirements of entities participating in a bidding scenario. More specifically, a secure eBidding process should ensure that the competitive information is protected and secured against unauthorized access and modification. In open computing environments like the Internet, the application of digital signatures plays a significant role in order to ensure the security requirements with respect to authenticity, integrity and legal liability.

When a private company publishes biddings, no special laws apply to the kind or shape of the bidding. If a company tenders to a public bid invitation, the local law and special rights (e.g., the German “Ausschreibungsgesetz”) apply to the respective company. Moreover, the public institution has to respect the law and rules when running a bidding process including the bid invitation. This means some components of an application for managing biddings of the public sector cannot easily be reused from applications for the non-public sector, since these components have to take into account the local bidding laws. Some examples for rules of the bidding law in Germany are (see N.N. (2006a)): a) a public institution has to choose one of the cheapest bids, b) it is prohibited to open bidding offers before the official deadline. In the case of eBidding for the public sector in Germany another law has to be taken into account. Because legal certainty is demanded for eBidding, the law about the digital signature (“Signaturgesetz” and “Signaturverordnung”) has to be applied. The German government regulates which kind of signature has to be used (“qualifizierte Signatur”). The private sector has no requirements in this way. Summarized the most important laws for eBidding in the public sector are: Bidding law, digital signature law and privacy laws.

The European Council has laid down the regulations for public procurement in the respective directives (Directives 93/36/EEC, 93/37/EEC, 93/38/EEC of June 1993 and the new directives 2004/17/EC and 2004/18/EC) N.N. (2006b). There are five fundamental principles of the European Community law with regard to public procurement: Non-discrimination, equal treatment, transparency (openness and predictability), proportionality and mutual recognition. As a result of these principles a public purchaser has to *publish* its bid invitations (advertising) and to *document* the entire bidding process.

Over the last decade many countries (e.g. USA, EU and some of its members) have ratified laws for using digital signatures within electronic transactions like the USA or the EU and its member states. However, only a few countries prescribe or even use digital signatures for public eProcurement and eBidding. The German project "eVergabe" N.N. (2006a) for example, prescribes the use of digital signatures in a mandatory way. Therefore, the project uses qualified signatures. In comparison to the detailed procurement law and rules of the EU or Germany the US law is very abstract and thus less strict. Also, for example, the US "e-signatures bill" is incommensurable regarding the preciseness of the contents to the German signature law. This also applies to the US procurement rules and laws.

In order to develop a XML schema the IDA XML initiative N.N. (2006c) developed a model for the eBidding process of the public sector, which includes a complete data model (containing concrete attributes and data types), a role model (containing buyer, supplier and third party instances) and a data flow model (containing used objects, relations and rules). For this purpose the IDA initiative built up their efforts on standards used internationally. The model can be used, for example, to describe which messages have to be sent by which subject at a certain time.

Buyer and supplier have different security requirements when participating in a public eBidding process. In the following, we outline the security requirements of the public eBidding process. Requirements of the buyer are: a) availability of bid invitations, b) authenticity and integrity of received tenders, and c) legal bindingness of received tenders. The supplier on the other hand has the following security requirements ensuring that his offer and other sensitive information associated with his offer are protected: 1) confidentiality of the supplier's actions (e. g., which are the bid invitations of his interest), 2) confidentiality of submitted tenders until the date of opening, 3) tenders cannot be opened until the corresponding deadline has been reached, 4) integrity and authenticity of submitted tenders and received documents, 5) legal bindingness of awarded contracts, and 6) receiving authenticated confirmations of timely placed offers and tenders.

In summary, eBidding process steps have following security requirements:

- Notification (accessing tender documents): Accessibility of the system to publish and receive bid invitations, and confidentiality
- eTendering (offer submission): Authenticity, confidentiality, integrity, legal bindingness, and time stamping of confirmation notices
- eAwarding: Restrict access to tender documents until opening deadline regarding public buyer and other tenderers
- All steps: Privacy enhanced storage of all bidding related information, and traceability which aims at documenting the progress of the award procedure

Implementing an eBidding engine includes not only solving technical and security issues but also legal issues of public eProcurement. Even in the EU there is a lack of common used standards. Signature and bidding laws of the member countries differ substantially. This is why an eBidding engine of a Supplier Relationship Management solution has to be adaptable in order to conform to local requirements of different countries.

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Classification Schemes for Contributions in Peer-Rating Online Communities: A Quantitative Assessment

Conny Kühne and Klemens Böhm

Institute for Program Structures and Data Organization, Universität Karlsruhe (TH)
ckuehne@ipd.uka.de
boehm@ipd.uka.de

1 Rating Protocol

Information communities like Slashdot or Wikipedia have become very successful in collecting voluntary contributions from their members. One of the problems in such communities is to ensure the quality of the information provided. A related problem is the design and implementation of incentive schemes, to remunerate the users and to stimulate their contributions.

To counter these problems we propose a peer-rating protocol: Users can review the contributions of their peers and rate these contributions according to the perceived quality. The current version of our protocol relies on several assumptions, in order to simplify the problem setting. In particular, we assume that a contribution, also called *data object* in the following, has an inherent value that is either *true* or *false*. We assume that a participant perceives this inherent value with some idiosyncratic error or bias and rates the data object according to her perception. We call the probability that a participant rates a data object correctly the *competence* of that participant. User ratings have a two-valued domain as well, namely *true* or *false*. To estimate the unknown value of a data object, the user ratings are combined. As a result of this combination, each data object is classified as either true or false. Up to this point, the scheme is similar to the uncertain dichotomous choice framework originally suggested by Condorcet (Marquis de Condorcet, 1785) that has become known as the Condorcet Jury Theorem (CJT). In order to assess the competence of a given participant of an online community efficiently, we propose to utilize the ratings of the other members. More specifically, to derive the competence values of the raters, we use the classification values of the data objects. Note that this procedure differs from the literature concerning the CJT that assumes the competences as either unknown or well-known.

We call the derived value of the competence of a participant i her inferred competence $ic(i)$. Given the classification of the data objects, we can calculate the inferred competence by dividing the number of the correct ratings of the participant in question by the total number of her ratings:

$$ic(i) = \frac{seeminglyCorrectRatings(\mathrm{i})}{numberOfClassifiedRatings(\mathrm{i})} \tag{1}$$

We say that *a rating is seemingly correct* if the value of the rating equals the classification value of the data object, *seemingly incorrect* otherwise.

The concern of this current work is high-quality classification of the data objects in the setting described so far. To accomplish this, we use three different methods and assess them in our context: simple majority rule, weighted majority rule and a Bayesian classification scheme. For the weighted majority rule we use the weights for the optimal decision rule identified by Nitzan and Paroush (Nitzan and Paroush, 1982). For the Bayesian scheme, we use *ic(i)* and *1-ic(i)* as likelihood that the rating of participant i is correct or incorrect, respectively. As a potential enhancement for the quality of the classification we propose a so-called expert rule. With the expert rule ratings are collected from the top n percent of the raters only.

2 Evaluation

To assess the effectiveness of the classification schemes and of the various parameter settings, we designed and implemented a simulation model of an online community. The simulation model is iterative. The simulation generates one data object per iteration step. The number of ratings per data object is determined by the rating rate r [0,1]. One can interpret this rate as the probability that a participant issues a rating on a data object. We assume that the competence of the participants is distributed between 0.5 and 1. A random guesser has competence 0.5[1].

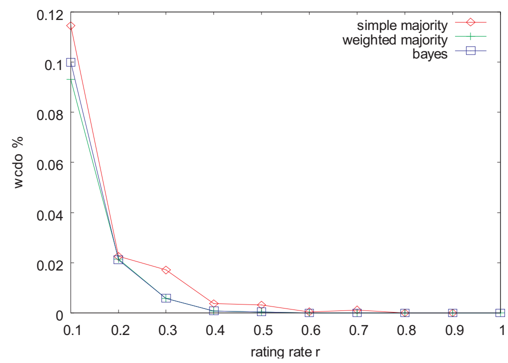

Figure 1: Rate of wrongly classified data objects

As a result from the simulations, we find that the parameter the simulation reacts to most sensitively is the rating rate per data object. Unexpectedly, neither the choice

[1] For competence(i) $< 1/2$ the performance of participant i could be enhanced by tossing a fair coin or simply reversing the values her ratings.

of the classification method nor the values of weights have a strong influence on the outcome. Figure 1 illustrates this. The simulated community consists of 50 participants. The x-axis contains the simulation steps. The y-axis shows the rate of wrongly classified data objects *wcdo*. The three different classification methods yield very similar results. For $r > 0.5$ all three methods return almost zero wrongly classified data objects.

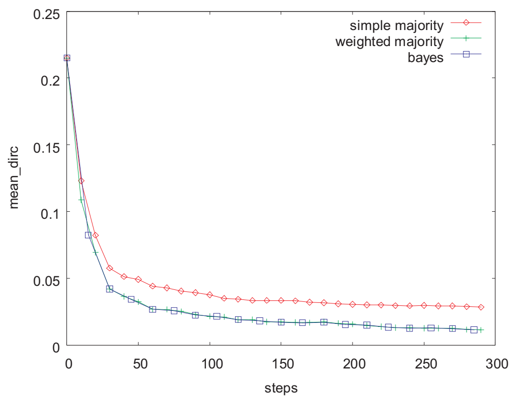

Figure 2: Mean absolute difference inferred and real competence, ($r = 0.2$)

The plots in Figure 2 show the absolute difference *mean_dirc* of the inferred competence and the real competence of a participant averaged over all participants of the community. The ideal value of mean_dirc is 0. That means that the system has inferred the correct competence for all participants. Again all three methods yield very similar results, with weighted majority and the Bayesian scheme being almost identical (the two lower lines). All three methods reach a steady state after about 50 simulation steps[2].

Figure 3 shows the effects of the expert rule. To remove the influence of the initialization phase shown in figure 2 the expert rule was not activated for the first 50 simulation steps. After its activation only the ratings of the top 10 percent of the raters were collected. The experiment shows that this enhances the quality of the classification considerably.

As future work, we plan to validate the described mechanisms and the results from the simulation experiments empirically, with human participants. Moreover, we intend to take multi-valued domains of the user ratings into account.

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[2] The community size for this simulation was again 50, the rating rate was set to 0.2.

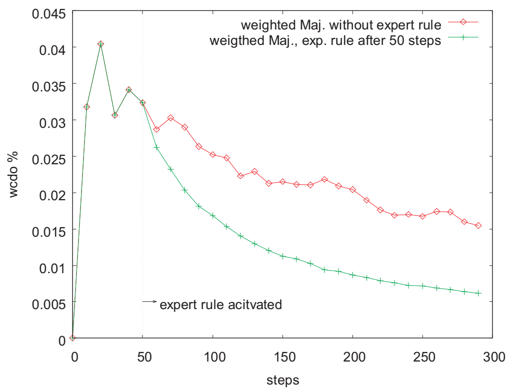

Figure 3: Rate of wrongly classified data objects with and without expert rule ($r = 0.2$)

Automated Trading Across E-Market Boundaries

Björn Schnizler, Stefan Luckner, and Christof Weinhardt

Institute of Information Systems and Management, Universität Karlsruhe (TH), Germany
schnizler@iw.uni-karlsruhe.de
luckner@iw.uni-karlsruhe.de
weinhardt@iw.uni-karlsruhe.de

1 Introduction

Online trading has become an important topic in research and general public. Auction sites such as eBay, Yahoo!, and Amazon list millions of items for sale and attract a multitude of users. At the moment, these auction sites require human interaction for participation in auctions, usually through web interfaces. Some platforms support more advanced automation and monitoring tools like proxy bidding agents. These tools do, however, only provide limited functionality and still require human interaction to make strategic decisions.

The next generation of trading platforms requires automated negotiation facilities, allowing humans to be represented by software agents. A step towards this vision is already tackled using software agents for trading in electronic market platforms (MacKie-Mason and Wellman, 2006). Agents are particularly useful in markets where trading might not have been possible otherwise, for example because a lot of information must be processed quickly or because employing human traders in 24-hour small transactions markets is not cost effective.

At the moment automated trading using software agents is still inhibited by the multiplicity of different market mechanisms implementing a variety of institutional rules. While humans can easily understand the market rules and switch between different mechanisms, software agents have to be tailored to the mechanisms at hand. Thus, the description of market mechanisms including their institutional rules has to be made explicit so that agents can understand these rules and select an appropriate mechanism according to their preferences. Another obstacle in current platforms is the lack of standard interfaces for accessing market mechanisms.

The contribution of this paper is to tailor an architecture and fundamental protocols for a technically sound implementation of automated trading systems. This is achieved by applying taxonomical negotiation descriptions and technologies derived from service-oriented architectures and the Web service community to the implementation of agents and market mechanisms.

2 Architectural Requirements

The design of a fully fledged architecture enabling the automated and autonomous trading by software agents implies several requirements upon the market discovery and the message exchange between software agents and market platforms. The following requirements can be identified:

Specification of institutional and platform requirements: An agent needs to express its institutional requirements upon the preferred mechanism as well as its preferred properties of the underlying market platform. Subsequently, an eligible market platform has to be discovered.

Interoperable invocation of market platforms: Agents require a flexible and interoperable way of accessing market platforms. As such, well-formulated interfaces and connection protocols have to be defined which regulate the seamless access to the market platforms. The interfaces and protocols have to be known by the agents and have to be implemented by each market platform.

Negotiation protocol specification for submitting and receiving bids: Having discovered and invocated a suitable market platform fulfilling the institutional and architectural requirements, the agent requires a communication protocol to interact with the market. This means that the agent needs to retrieve status information, formulate and submit bids and receive agreements.

3 An Architecture for Automated Trading

The architecture is basically composed of three major components: several Market Platforms, a Market Selector and Repository, and a multitude of Software Agents. A high level overview on the proposed architecture is depicted in Figure 1 and will be described briefly in the following.

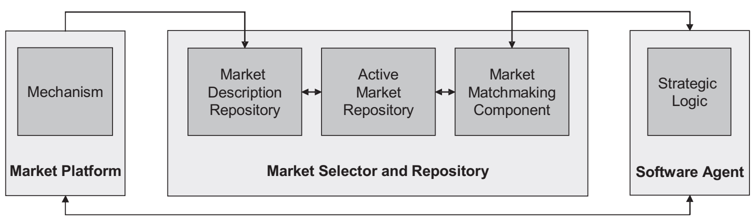

Figure 1: Architecture for an automated trading infrastructure

A *Market Platform* component is a particular market *Mechanism* including its underlying technical infrastructure. The market platform as a whole is represented as a Web service and provides interfaces for initialization, submitting bids, and receiving trading information and agreements. Thus, a flexible and interoperable invocation by software agents is guaranteed. The market platform can be described by its institutional rules (e. g. bidding rules, maximal number of participants) and its technical properties (e. g. response time, encryption standards) using the Montreal Taxonomy (Ströbel and Weinhardt, 2003) and the WS-Agreement specification language (Andrieux et al., 2005). These agreement offers, i. e. the capabilities which the market platform provides, are sent to a central *Market Selector and Repository* component in order to offer the market platform service to potential software agents.

The *Market Selector and Repository* component is responsible for storing all available market descriptions within a *Market Description Repository.* Instantiated and, thus, active market platforms are replicated in an *Active Market Repository.* The *Market Matchmaking Component* is responsible for selecting an appropriate market platform based on an agent's requirements.

Finally, the *Software Agent* component represents an autonomous trading agent. The agent has a *Strategic Logic* component which is responsible for specifying the preferences upon the preferred market mechanism. Furthermore, this component can submit bids and receive trading information and agreements. The preferences which an agent has upon a specific market platform are described using the WS-Agreement language. These specifications are submitted as a request to the *Market Matchmaking Component* which then selects an appropriate market platform in consideration of the *Market Description Repository* as well as the *Active Market Repository* and returns all relevant information (e. g. connection address) to the agent. After that, the agent can invoke the selected market platform, submit bids to it, receive relevant trading information, and, finally, receive agreements.

4 Conclusion and Future Work

The paper tailors fundamental protocols and architectural requirements for enabling automated trading systems. The approach combines taxonomical descriptions of negotiation mechanisms and technologies derived from the Web service community.

Future work will include a detailed conceptualization of the matchmaking component, especially the specification of decision rules if multiple market platforms would satisfy the requirements of an agent. Moreover, the generality and the applicability of the protocols and the architecture have to be evaluated.

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An Integrated Meta Model for Electronic Negotiations

Dirk Staskiewicz, Frank Köhne, and Mareike Schoop

Information Systems I, University of Hohenheim, Germany
staskiew@uni-hohenheim.de
fkoehne@uni-hohenheim.de
schoop@uni-hohenheim.de

1 Introduction

In a discussion of the dominance of the auction paradigm in electronic business negotiations, Kersten et al. (2000) claim that "there is a strong demand for mechanisms that allow for different types of negotiations". The questions that need to be addressed are how to characterise the different types, how to model them, and, eventually, how to integrate the different types. The negotiation phase of electronic transactions can be implemented in various forms including numerous bargaining or auction mechanisms. There is currently a gap between progressive research approaches and their application in practice. In order to close this gap, the rules of interaction must be understood by all transaction partners, humans as well as electronic negotiation agents. Thus the need for precise negotiation models is evident.

Currently, modelling approaches can be distinguished according to three research schools, namely auctions (Bichler, 2000), agents (Jennings et al., 2001), and electronic negotiation support (Kersten and Noronha, 1999). Although all of these approaches address the same process, there is no comparative view.

2 A Meta Model for Electronic Negotiations

In this paper, we will develop an integrated negotiation meta model that covers the different views and types of negotiation. Such a meta model forms the basis for the development of customisable negotiation support systems (NSSs) and eases future research comparing different negotiation model properties in different business scenarios. Furthermore, if advanced electronic negotiation systems are to be introduced to real world negotiators, rules and restrictions must be adequately presented for negotiators because only if they are understood and accepted will NSSs be applied.

For these purposes, we need a shared understanding and precise terminology for the underlying concepts and a representation for the design space of (electronic) negotiations. The first step in building such a model is to conduct a review of existing negotiation (meta) models. Köhne et al. (2005) identify requirements for building a negotiation meta model and compare several existing models according to these requirements. The result of the analysis is that none of the proposed models is sufficient according to the requirements.

The main conclusion of the comparison is the need of a new negotiation meta model that will be evaluated using a structured set of requirements identified during our review of existing research.

There are, however, several integrative ideas that could serve as a basis for an integrated electronic negotiation meta model such as the integration of communication and document view (DOC.COM) (Schoop and Quix, 2001) or the integration of a communicative view into process models by means of interactions between Petri Nets (Hung and Mao, 2002; Bons et al., 1995).

Based on the requirements identified we will develop a new meta model It extends the Silk Road design meta model (Ströbel, 2001) in order to cover negotiation models such as DOC.COM or auctions. A document view and a deontic view are the main additions. On the one hand, a negotiation model is not complete if it remains unclear what consequences or commitments certain actions have. This is a prerequisite for distinguishing e.g. reverse auctions and e-bidding (reverse auctions where the buyer is not committed to buy) and, therefore, deontic model elements are included and associated with the states of a negotiation.

Conceptual foundations such as the DOC.COM framework as well as empirical research based on interactions with practitioners have shown that negotiations are not only meant to produce contracts but essentially consist of document exchange or the collaborative work on relevant documents such as preliminary contracts , standard business conditions, and experts' reports.

Therefore, the meta model allows for the definition of document types that are to be expected in a negotiation model as well as their context in the negotiation process model.

Concepts and their relationships define domain knowledge or process-related knowledge and tie together the different meta entities introduced. Concepts can be referenced in process transitions (i. e. messages) as well as in documents or process rules. For example, if a negotiation model demands an increasing price, then this is a concept reference. Such an approach opens up a vast number of innovative semantic web driven applications (Schoop and Jertila, 2005) but is not found in any of the negotiation models. Nevertheless, the meta model consists of such concepts and relations to enable the description of all negotiation models. At the same time, we are 'aiming at a moving target' regarding the level of abstraction.

We have shown that two very different negotiation models (namely the Negoisst negotiation process representing a negotiation support system and a reverse sealed-bid auction) can be described and represented using the meta model.

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Part XIV

Domain-specific Negotiations

Investigating Participatory Modelling Processes for Group Decision Aiding in Water Planning and Management

Katherine A. Daniell[1,2], Nils Ferrand[1] and Alexis Tsoukiàs[3]

[1] CEMAGREF UMR G-EAU, Montpellier, France
[2] ANU, Canberra, Australia
ENGREF, France
CSIRO CMIT, Melbourne, Australia
[3] LAMSADE-CNRS, Université Paris Dauphine, France

Many current water resources management and planning problems are riddled with high levels of complexity, uncertainty and conflict; so-called "unstructured" (Kolkman et al., 2005) or "messy" (Ackoff, 1979) problems. These problems, which used to remain the domain of technical water managers, are increasingly entering the public policy sphere as conflicts between water users and interest groups proliferate and add a previously over-looked social dimension. The realisation that there is a need to consider the values and preferences of these "stakeholders" in decision making processes related to water management and planning has led to a multitude of new methods and processes being proposed for this process (HarmoniCOP, 2005), one of which includes "participatory modelling'" (Hare et al., 2003). Unlike traditional modelling carried out by one person or institution, which may or may not include information from other stakeholders and which is used for as a decision aid, participatory modelling allows a number of different points of view to be explicitly represented and collectively reflected upon by a group of stakeholders before a collective decision is made (Ferrand, 1997). Despite an increasing uptake of such methods, little research and investigation of the concrete advantages and disadvantages of using these methods has been undertaken.

This paper stems from the preliminary phases of a research project which aims to investigate the utility of a participatory modelling process for water management and planning applications, such as improving collective water use and fostering the adoption of more sustainable practices and/or technologies. More specifically, the objectives of the research are to: (i) determine the positive and negative aspects of using a participatory modelling approach for decision aiding in water resources planning and management applications (descriptive objective); and (ii) determine under which circumstances a participatory modelling approach is likely to be more effective than externally[1] produced models for the achievement of sustainable water manage-

[1] The definition of an externally produced model is one in which the group of stakeholders, who are to use a model to inform their decisions, are not involved in its conception, design and construction.

ment (prescriptive objective). Related to these objectives, the hypotheses to be tested include that participatory modelling: (1) helps to examine the "real" underlying problems; (2) increases trust, appropriation and understanding of the models created as assumptions and uncertainties are more likely to be explicitly identified and discussed; (3) generates greater creativity and innovation; (4) leads to an improved ability to respond to change through enhancing social capacity, adaptability, flexibility and resilience; (5) leads to greater individual and social learning; (6) produces richer and more realistic action plans; and (7) provides a greater chance of adoption or implementation of problem solutions. This paper specifically aims to outline only the first phases of this research project which include: a brief review of current understanding related to participatory modelling and the development of a "participatory modelling" classification system, as well as a couple of "best practice" participatory modelling methods. It will also briefly present a new participatory modelling methodology which has been developed based on this review and is currently in the testing and validation phase. After improvements, this methodology is planned to be used as a support for water planning and management applications to help the investigation of the above hypotheses. The methodology takes the form of six consecutive phases (likely to involve feedback loops) in which all stakeholders or participants will participate and continuous evaluation will occur:

1. Introduction and problem situation
2. Problem formulation
3. Model construction
4. Model testing and construction of rules for role analysis
5. Scenario exploration through role analysis
6. Decision or choice and implementation of options.

The design of the methodology attempts to bring together decision-aiding theories (i. e. Tsoukiàs, forthcoming), planning cycles (i. e. Holling, 1978; Deming, 1986; Strömgren, 2003) and important aspects of currently available participatory modelling protocols (i. e. Palmer et al., 1993; Barreteau, 2003; Van den Belt, 2004). Testing and validation of the methodology is currently at an intermediary stage, following a recent trial with a group of tertiary students in Montpellier, France, who examined their own water related issues at multiple (although abstract) spatial scales (their life and home, their neighbourhood or village, and their water basin or region). The trial took place in the form of seven consecutive workshops over a period of a month and a half and used a variety of methods throughout the linked phases, including cognitive mapping, an adapted version of Ackermann and Eden's 2001 "Oval Mapping Technique", UML model design and the construction and use of a role playing game. Evaluation procedures (which included 15 questionnaires and collective reflection and feedback periods) also constituted approximately twenty percent of the total process time.

Participatory modelling, in contrast, assumes the stakeholders' participation in these preliminary stages.

The utility of such a test case in terms of validating a methodology for "real-life" multi-stakeholder water management and planning processes must obviously be questioned, but for institutional reasons it was preferred due to its minimal risk. Some specific methodological choices made because of the participating group, such as paying participants for their participation costs or using a role playing game that was specifically chosen to give the students a forum and mock situation for collective decision making, are not likely to be used in other real cases. Despite this drawbacks, preliminary results from the test have provided a wealth of interesting information and have helped to uncover many useful questions surrounding: model complexity (which stems from the examination of complex problems); process complexity; if, how or when to include exterior information (from a facilitator's or outside "expert's" point of view); time management; and the importance and cost of the evaluation process. Other results of the process have included positive feedback in terms of the educational value and creativity that occurred in the problem situation and problem formulation phases. However, at this stage, for the methodology to be used for more practical purposes, it still requires further adjustment. In particular, stakeholders to be involved in a participatory modelling process applied to real water planning or management problems (those problems which exhibit a good degree of stakeholder disagreement, uncertainty and complexity) should be involved in the redefinition of the process and the methods used throughout this process.

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Supporting Negotiation for Water Pricing: The Case of the Aral Region

Mikhail Mikhalevich[1] and Ludmilla Koshlai[2]

[1] Ukrainian Academy of Foreign Trade
mmihalevich@ukr.net
[2] Institute of Cybernetics
koshlai@ukr.net

The ecological situation in the Aral region has become particularly acute during the last decades of 20$^{\text{th}}$ century due to rapid drying of the sea and deterioration of water quality in the lower reaches of Amu Darya and Syr Darya. These problems are attracting with increasing frequency the attention of the international community far outside the limits of Central Asia and Kazakhstan.

One of the obvious reasons for the present catastrophe is the uncontrolled use of water resources of the two great rivers, Amu Darya and Syr Daria, which has reduced to unacceptably low levels the inflow to the Aral Sea. This has led to a sharp increase in the salinity of sea water and to irreversible changes in the microclimate.

Since the water of Amu Darya and Syr Darya is a common resource of the countries of Central Asia and Kazakhstan, the hydroecological problems of the Aral region must be tackled by the common efforts of the countries using the water of these two rivers. The first session of the Interstate Coordination Water Commission of the republics of Kazakhstan, Tajikistan, Uzbekistan, Turkmenistan, and Kyrgyzstan was held in Nukus (Karakalpakstan) in October 1993. The activity of this Commission has now intensified. The search for economic solutions to these problems forms essential part of the subject of this discussion. In particular, possible measures may include the establishment of a joint fund with the participation of the governments whose objective will be to finance ecological improvement projects and to reduce the damage caused by the action of harmful ecological factors. The sources of funds for this institution will be provided by payments from water users. This naturally raises the question of setting the price for water.

The solution of this problem is complex for several reasons. First, in the absence of property rights in water it is difficult to develop market relations with buying and selling of water resources, and marked price formation mechanisms thus cannot be expected to provide the right signals. Second, under the specific conditions of Central Asia with its wide spread of irrigated agriculture and permanent water shortages, the utility of water for the users is much higher than the direct material costs associated with water delivery. The cost approach is therefore also inapplicable for setting water prices. Lack of information about the utility of water consumption for different users constitutes an additional set of difficulties.

Formally, the price of water may be considered as the shadow price (the dual value) of the optimal water-use program. The main difficulty is how to find the shadow prices without information about the user utility functions. The methodology developed at V. Glushkov Institute of Cybernetics in cooperation with the International Institute of Applied System Analysis (IIASA) suggests using indirect indicators of utility, such as aggregate water consumption. This methodology is based on the models of nonantagonistic game between users of water and an "agency", which establishes the price for water. The above-mentioned Interstate Coordination Water Commission may act as such an "agency". In our presentation, we construct the bargaining procedure for this game and prove its convergence to the game core.

Direct application of this procedure will obviously be a lengthy process until a nearly optimal price is set. It is therefore advisable to develop a following negotiation procedure for determining the price of water. Before the negotiations begin, an "agency" is created with the authority to set prices.

The bargaining procedure to determine the water prices can be considered as the model of negotiations between coordinating center ("agency") and water consumers. Such negotiations are organized in the following way. The "agency" announces the current water prices. Then the users, independently of one another, determine the optimal water use levels and report them to the "agency". The "agency" aggregates the incoming information and calculates the new water price using the mentioned bargaining procedure. The new price is announced to users, the described above process repeats until the equilibrium between aggregated users demand and available water resources will be achieved.

Note that these negotiations are easily organized on a computer network linking the "agency" with the users. The "agency" initially has only aggregated information; the utility of water consumption is available only to the users. The values of individual demand are received from the users directly at the network central computer, which computes the aggregated indicators. This prevents undesirable disclosure of information, which is confidential for each user. Such negotiations are also advantageous to the users because they avoid the negative effect on their economies of the high nonoptimal prices set in the intermediate stages of the price-formation procedure.

Procedures of bilateral trade of water use levels are also proposed for water users. They are similar to the procedure, analyzed in Ermoliev et al. (2000, 1996) and can be backgrounded from the viewpoint of algorithms of nonlinear optimization.

A prototype software system for managing such a negotiation procedure was developed at the Institute of Cybernetics of the Ukrainian Academy of Sciences in cooperation with the Ukrainian Academy of Foreign Trade. The considered approach was verified for real-data examples. It demonstrated that for several subregions the equilibrium price suggests that water consumption will decrease by as much as fifteen percent without, however, significant economic losses to the region.

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Auction Mechanisms for Traffic Management*

Heiko Schepperle, Christiane Barz, Klemens Böhm, Jonas Kunze,
Carolina M. Laborde, Stefan Seifert, Kendra Stockmar

International Graduate School of Information Management and Market Engineering (IME),
Universität Karlsruhe (TH)
schepperle@ipd.uka.de, barz@wior.uni-karlsruhe.de, boehm@ipd.uka.de,
jonas.kunze@em.uni-karlsruhe.de, carolina.laborde@ira.uka.de,
stefan.seifert@iw.uni-karlsruhe.de, kendra.stockmar@ira.uka.de

For many cities, traffic management is nowadays a major challenge. Advances in hardware and software development have resulted in intelligent driver assistance systems which can be used for traffic management. In principal, this allows the design of sophisticated mechanisms which also take the drivers' valuations of waiting time into account.

In this paper, we investigate a market-based approach to regulate the flow of traffic and estimate the potential efficiency gains of a simple auction mechanism which is designed in a way that minimizes legal obstacles.

1 Scenario

We consider a road traffic intersection with m directions. There is only one incoming and one outgoing lane for each direction. Vehicles arrive from all directions, cross the intersection and leave on an arbitrary outgoing lane.

For simplicity we make the following assumptions: (1) Overtaking is not possible. (2) Only one vehicle can cross the intersection at a time. (3) The time for crossing the intersection is the same for all vehicles and independent of the direction chosen by a vehicle. (4) We do not take into account physical aspects like speed and acceleration.

The exclusive right to cross an intersection for a certain period of time is given to only one vehicle at a time. We call this period *time slot*. This implies that time slots do not overlap and can be numbered in ascending order. Instead of using the period we simply refer to the number of the time slot. Thus, a smaller time slot number indicates an earlier time slot and a higher slot number a later time slot.

Every driver has a valuation of time and, thus, associates opportunity costs with waiting at the intersection. The valuation is the amount of money a driver is willing to pay if he was allowed to cross the intersection one time slot earlier and the valuations

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differ among drivers. We assume that both the valuations and the interarrival times of vehicles are given by stochastic processes $\left\{V_i^l, i \in N\right\}$ and $\left\{T_i^l, i \in N\right\}$ for all lanes $l = 1, \ldots, m$.

Since we aim at taking into account the drivers' valuations of time, we minimize the average waiting time weighted with the respective valuations. Let n_l be the number of vehicles arriving at lane l and denote the waiting time and the valuation of the i^{th} vehicle arriving at lane l by w_i^l and v_i^l, respectively. Then the average weighted waiting time ($AWWT$) is given by $AWWT = \frac{\sum_{l=1}^{m} \sum_{i=1}^{n_l} w_i^l v_i^l}{\sum_{l=1}^{n} n_l}$.

The basic idea of this paper is that vehicles are first assigned the right of way in the order of their appearance at the crossing and that they are then allowed to trade, i.e. exchange these (virtual) rights. If there is no trade, our scenario is similar (but not identical) to a U.S. American four-way-stop. We do not look at the process of negotiation and the trade itself, but assume that all vehicles are equipped with some kind of agent-based driver assistance system to which the driver has delegated the trading according to his preferences. We further assume that the negotiations as well as the trade can be conducted in real-time without interrupting the flow of traffic.

2 Legal Aspects

There are quite a few questions associated with the idea of trading the right of way. As noted above, we ignore the technical issues, however, we seek to address two major legal aspects, namely *discrimination* and *negative external effects*. From a legal point of view, any system which discriminates between drivers solely based on their valuations might be problematic. The same holds for a system in which a trade between two parties A and B potentially prolongs the waiting time of a third party C (negative external effect).

Discrimination is not given, if vehicles are assigned a time slot depending on their arrival time or lane. But if the driver's valuation is taken into account, certain drivers could be discriminated and thereby legal objections could arise. Negative external effects are best explained by an example: Imagine a mechanism in which vehicles are allowed to arbitrarily interchange time slots. If a vehicle exchanges an early slot with a later one, not only itself, but potentially also the vehicle behind him has to wait longer.

3 Mechanisms

A mechanism determines a certain order of vehicles crossing the intersection. This order implies a certain value for the $AWWT$.

3.1 Benchmark

We compare our mechanism with two benchmark mechanisms, a first in first out (FIFO) mechanism and an upper bound of the theoretical optimum. The FIFO mechanism relates to the case that trade does not take place. Note that in this mechanism all vehicles are treated independently of their valuations and trading of time slots is not possible. Thus, there is neither discrimination nor are there negative external effects.

The upper bound of the theoretical optimum is computed by a heuristic approach: if no new vehicles arrive, the problem of minimizing $AWWT$ corresponds to a job-sequencing problem with linear delay penalties and linear precedence constraints. An optimal solution for this case is given in Horn (1972). Since this algorithm takes a particular waiting queue as given and is not based on the ex-ante expected arrivals, Horn's algorithm provides only an upper bound of the theoretical optimum. Moreover, Horn's algorithm does not treat drivers equally, i.e. it is discriminative. Therefore, applying an optimal mechanism might result in legal difficulties.

3.2 A Simple Auction Mechanism

A simple auction mechanism (SAM), which adheres to the legal restrictions, can be characterized as follows: upon arrival at the crossing, all vehicles receive a time slot according to the FIFO mechanism. Once a vehicle is to cross the intersection, it can auction its slot by collecting bids from other vehicles. If the vehicle in front accepts a bid, it exchanges its slot with the winning bidder and also receives the offered monetary compensation. Since vehicles can, but need not trade their time slots, this auction mechanism is not discriminative. Rational drivers will only accept a trade if they are better-off than in the FIFO benchmark. Note that the bids are evaluated based on both the time slot offered in exchange as well as the offered price.

In order to avoid negative external effects, we impose the following (rather strong) restriction: Only those vehicles which are first in line may bid in the auction. Further, they are allowed to bid only if they did arrive at the crossing before the vehicle which is waiting behind the one auctioning its right of way.

4 Evaluation

To evaluate the SAM and compare it with the FIFO mechanism and the heuristic, we run a computer simulation for an intersection with $m = 4$ directions and the following further parameters: The time period to cross the intersection is normalized at 1 time unit. For the interarrival times of each lane $l = 1, \ldots, 4$ we use an exponential distribution with mean $\frac{1}{3.8}$. Thus, the total average interarrival time for all four lanes together is $\frac{4}{3.8} = \frac{1}{0.95}$ and thereby higher than the serving time of the intersection. For the valuations of vehicles we also use an exponential distribution with mean 1 (independent of the lane).

In every run, we start with an empty system. After an initial phase of $a = 250$ time units, the system is observed for another 1,500 time units.

Table 1 displays the average values and the standard derivations of the $AWWT$ after $n = 720$ simulation runs. Moreover conservative confidence intervals (using Tschebycheff's inequality and a confidence level of 95%) are given. The table shows that an optimal mechanisms has the potential to reduce the $AWWT$ by 2.54 time units (24%).

Since common random numbers were used in the simulation, the respective differences to the FIFO mechanism give a more concise picture on the relative performance of the SAM (Table 2). The results indicate that the rather strong restrictions, which were introduced due to legal considerations, significantly limit the potential benefits of a market-based approach for traffic management: our SAM realizes only 22% of the potential efficiency gain (or 5.2% of the $AWWT$).

Table 1: mean, standard deviation and confidence interval of $AWWT$

$AWWT$	mean	std. dev.	95%-conf. int.
FIFO	10.76	5.09	[11.61;9.91]
SAM	10.20	5.07	[11.05;9.35]
Heuristic	8.22	4.24	[7.51;8.93]

Table 2: mean, standard deviation and confidence interval of differences in $AWWT$ compared to FIFO ($\Delta AWWT$).

$\Delta AWWT$	mean	std. dev.	95%-conf. int.
FIFO vs. SAM	0.56	0.05	[0.552; 0.568]
FIFO vs. Heuristic	2.54	0.89	[2.392; 2.688]

5 Conclusion

In this paper we investigate a market-based approach for traffic management at intersections which also takes the drivers' valuations of time into account. The presented simple auction mechanism is designed such that legal problems related to discrimination and negative external effects are avoided. A numeric computer simulation shows that by applying the simple auction mechanism the average weighted waiting time can be reduced. The achieved benefits, due to the fact that our approach is still very restrictive, are rather small compared to the potential efficiency gains of an optimal mechanism. Therefore, we will continue our work by extending our mechanisms.

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Part XV

E-negotiations

The Effect of Media Richness on Negotiation Process: Strategy and Communication Perspectives

Her-Sen Doong[1], Hsiangchu Lai[2], and Wan-Jung Lin[2]

[1] National Chiayi University
hsdoong@mail.ncyu.edu.tw
[2] National Sun Yat-Sen University
hclai@mial.nsysu.edu.tw
d934020008@student.nsysu.edu.tw

The prosperous growth of the global e-business and Web-based technology has made online negotiation via the Internet become an inevitable negotiation channels. Negotiators in most online negotiation context can communicate text or figures to each other only while negotiators in traditional face-to-face negotiation context can communicate with each other through voice tones and body languages. The major difference between the two communication channels is the media richness of each channel (Barkhi et al., 1999). Researchers have indicated that media richness is a critical determinant in the negotiation process (Kahai and Cooper, 1999, 2003; Yuan et al., 2003). However, few studies examined how the media richness would impact the negotiation strategies, communication behavior, negotiation process and outcomes. Given the importance of online negotiation systems has been widely recognized, this study proposed a research framework (see Figure 1) to examine the relationships among the media richness of online negotiation systems, negotiation strategies (i. e. persuasive and cooperative strategies), social-emotional communication, and process control and satisfaction.

Empirical data was collected from an online experiment, in which the paired subjects negotiated with each other via two different Web-based negotiation systems. Text is the only communication tool. Job interview between job hunter and job recruiter was the negotiation case. It involves six issues: salary, bonus, vacation time, moving expenses coverage, insurance coverage and location. The data analysis was completed in three stages. First, EFA was conducted to determine whether the loading of each scale item was as expected. Second, CFA was applied to examine the plausibility of the measurement model for assessing research hypotheses. Third, the structural equation model was analyzed to test the hypotheses proposed in Figure 1.

Analysis result indicated that the discriminate validity, convergent validity, and reliability were all confirmed. Criteria for determining goodness-of-fit of research model were also satisfied. Figure 1 indicates the standardized path coefficients and path significances. All of the hypotheses are significant at p=0.01 except two hypothesized relationships. One is the relationship between persuasive strategy and socio-emotional

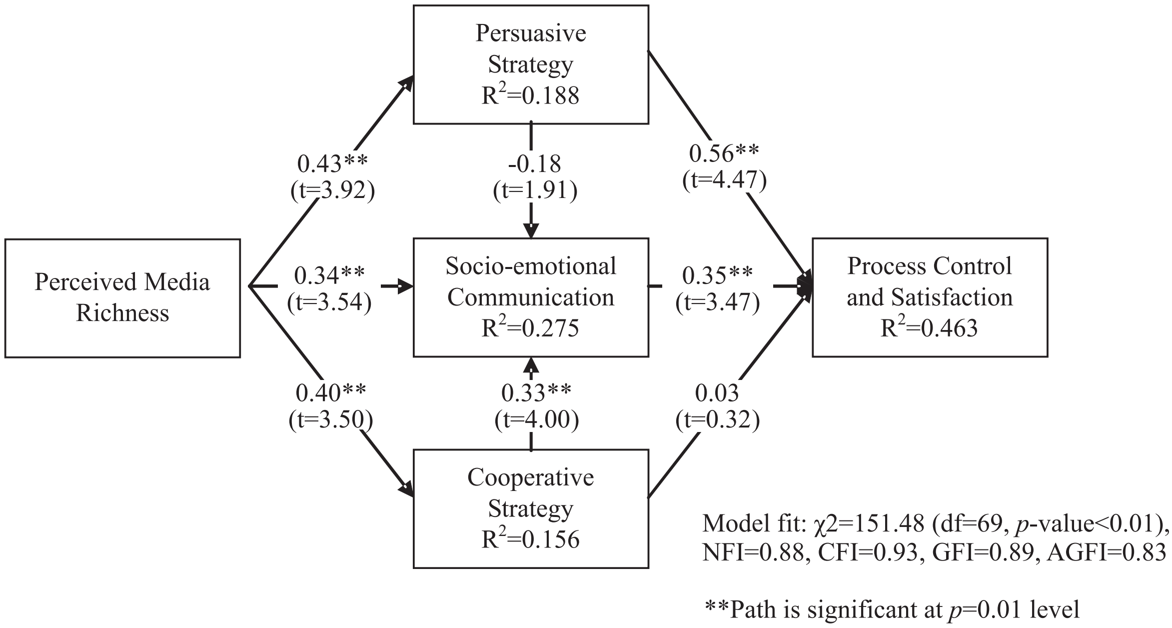

Figure 1: Research framework and analysis result.

communication; another is that between cooperative strategy and process control and satisfaction. It indicates that both the persuasive negotiation strategy and socio-emotional communication behavior significantly mediates the relationships between the negotiator's perceived media richness of the Web-based negotiation system and perceived process control and satisfaction in the negotiation. For the cooperative negotiation strategy, it is impacted by perceived media richness, and it, in turn, resulted in socio-emotional communication significantly. However, there is no significant relationship between the cooperative strategy and process control and satisfaction.

In short, this study examined the relationships between the perceived media richness and negotiation process. Findings indicated that, the negotiator might perceive more satisfactions and controls over the negotiation process when they perceive the higher media richness of online negotiation system through the mediators of persuasive strategy and socio-emotional communication. It implies that the richness of the selected communication media for negotiation might be an critical issue, especially, as the rapid development of Web-based communication technology has made various multimedia content being communicated via the Internet more feasible.

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The Influence of Bargaining Steps on the Process and Outcome of Online Negotiations

Michael Filzmoser and Rudolf Vetschera

Department of Business Studies
University of Vienna
michael.filzmoser@univie.ac.at
rudolf.vetschera@univie.ac.at

Negotiations are a dynamic process, in which the parties involved communicate to exchange offers, make concessions, raise threats or otherwise influence each other in order to reach an agreement. While it is obvious that the outcomes of negotiations are to a large extent determined by the negotiation process, existing research has often been criticized for focusing too much on outcomes, and paying only scarce attention to processes Brett et al. (1999). Our paper makes two contributions to research on negotiation processes. First, we develop a new typology of bargaining steps for multi-issue negotiations, which allows for a richer process representation. Our typology is consistently derived from possible changes in single issues and can logically be shown to be complete in the sense that all possible moves in multi-issue negotiations are covered. Second, we perform an empirical analysis of the impact of different types of bargaining steps on various outcome dimensions.

1 Bargaining Steps

Even when only few discrete values are possible in each issue of a negotiation, the total number of potential bargaining steps is huge. Thus it is not possible to perform an empirical analysis which differentiates between all possible bargaining steps and we develop a broader classification. Within each issue, a negotiator can reduce his or her demand, increase it or leave it un-changed. Since it is not possible that none of these three possibilities occurs within a bar-gaining step, we can distinguish $2^3 - 1$ possible patterns, which we group into four types of bargaining steps as indicated in Table 1.

These four categories cover all possible transitions from one offer of a negotiator to the next one. For the subsequent formal definitions of the bargaining steps we use the following notation: offers from negotiator i are denoted by $o_{i,t}$, where t is a time index. The value of issue k in offer $o_{i,t}$ is $x_{k,t}$, $u_k(\cdot)$ is the negotiator's marginal utility function for issue k. We formulate these definitions in terms of utility values, similar definitions could also be formulated using an ordinal ranking of outcomes in each issue. We call a bargaining step a **concession**, if $u_k(x_{k,t-1}) \geq u_k(x_{k,t})$ for all k

change of demand in issue			step type
decrease	no change	increase	
x			concession
x	x		concession
	x		insistence
		x	demand
	x	x	demand
x		x	trade-off
x	x	x	trade-off

Table 1: Changes of the demand in issues and types of bargaining steps

and $u_k(x_{k,t-1}) > u_k(x_{k,t})$ for at least one k. A bargaining step is called a **trade-off**, if $u_k(x_{k,t-1}) > u_k(x_{k,t})$ for at least one k and $u_k(x_k, t-1) < uk(xk, t)$ for at least one other k. We call a sequence of two consecutive offers of one negotiator **insistence** if $u_k(x_{k,t-1}) = u_k(x_{k,t})$ for all k. Finally, we call a sequence of two consecutive offers of one negotiator **demand** if $u_k(x_{k,t-1}) \leq u_k(x_{k,t})$ for all k and $u_k(x_{k,t-1}) < u_k(x_{k,t})$ for at least one k (i.e. the direct opposite of a concession).

2 Hypotheses

While the above classification of bargaining steps is logically consistent and complete, it has not yet been used in empirical studies. Adapting previous results to fit to our classification of bargaining steps we formulated the following hypotheses concerning the effects of the usage and frequent usage of bargaining steps on outcome (existence, efficiency, and individual utility of agreements) and process measures (duration, reciprocation) of negotiations:

- **Hypothesis 1:** (a) The use (b) a frequent use of concessions and trade-offs increases the probability that a negotiation dyad reaches an agreement while the use/a frequent use of in-sistence and demands reduces the probability that a negotiation dyad reaches an agreement.
- **Hypothesis 2:** (a) The use (b) a frequent use of concessions reduces the probability that a negotiation dyad reaches a Pareto-optimal agreement while the use/a frequent use of trade-offs, insistence, and demands increases the probability that a negotiation dyad reaches a Pareto-optimal agreement.
- **Hypothesis 3:** (a) The use (b) a frequent use of concessions reduces the utility of the agreement for the negotiator who uses concessions while the use/a frequent use of trade-offs, insistence, and demands increases the utility of the agreement for the negotiator who uses them.
- **Hypothesis 4:** (a) The use (b) a frequent use of concessions and trade-offs shortens the duration of negotiations, while the use/a frequent use of insistence and demands extends the duration of negotiations.

- **Hypothesis 5:** Negotiators reciprocate the perceived previous bargaining steps of their opponents.

3 Results

Our empirical research is based on an ex-post analysis of 1,087 experiments on the "Cypress-Itex" negotiation case, which were performed from 1996 to 2004 using the Internet-based negotiation support system Inspire Kersten and Noronha (1999). Utility ratings and the exchanged offers and messages were recorded by Inspire for the whole course of negotiation. Concessions are such a common phenomenon in negotiations that it is almost impossible to study negotiations which do not contain concessions. The hypotheses concerning the existence of concessions could not be tested in several cases, since only in few negotiations no concessions were made. Concerning the frequency of concessions, most of our hypotheses are confirmed: concessions lead to more agreements, lower utility of the conceding negotiator, and faster agreement. The only exception is the supposed negative influence on efficiency, which could not be confirmed, which even more underlines the importance of concessions for successful negotiations. The positive effects which the negotiation literature typically associates with trade-off bargaining steps are only partial confirmed by our results. While the use of trade-off offers does lead to more agreements, and increases the efficiency of agreements, a positive impact on individual utilities of the negotiator could not be confirmed. Moreover the use of trade-offs increased, rather than decreased, the duration of negotiations. Our results also indicate a negative impact of "hard" tactics like insistence and demands on the chances of reaching an agreement. Contrary to expectations Carnevale and Pruitt (1992), hard tactics do not improve the efficiency of agreements. Another surprising result, which lacks a theoretical explanation, is the difference between insistence and demands in their impact on reaching an agreement. While it is intuitively clear that insistence is likely to lead to a stalemate in negotiations, to our knowledge there is no theoretical model which would explain why increasing demands do not have this effect. "Hard" bargaining tactics as insistence and demand can increase the individual utility for the negotiator who uses them, but turned out to be a quite risky strategy, as they reduce the chances of reaching an (efficient) agreement and also prolong negotiations. Finally we also find a strong tendency for reciprocity between the bargaining steps of the two sides.

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The Effect of Time Pressure on E-negotiation

Hsiangchu Lai[1], Her-Sen Doong[2], and Huang-Chi Lin[2]

[1] National Sun Yat-Sen University
hclai@mial.nsysu.edu.tw
m934020027@student.nsysu.edu.tw
[2] National Chiayi University
hsdoong@mail.ncyu.edu.tw

The popularity of global e-business and the rapid development of web technologies have made e-negotiation for all kinds of business affairs become part of many managers' daily life. On the other hand, to have efficient and effective business process has become the necessity for enterprises to survive well due to the severe competition. Therefore, time pressure has become an inevitable challenge to e-negotiation. If we can understand how the time pressure affects the process and outcome of e-negotiation, it will be helpful to have a satisfactory negotiation. Although there are many researches about time pressure (Lim and Benbasat, 1993; Carnevale and Lawler, 1986), most of them were done for face-to-face negotiations. The findings cannot be applied to e-negotiation context because researches indicated that media richness would affect negotiation (Purdy et al., 2000; Yuan et al., 2003).

The purposes of this study are as follows:

1. To understand the effect of time pressure on negotiation process and strategy in the context of e-negotiation.
2. Will the change of negotiation process and strategy resulted from time pressure impact the negotiation outcome?
3. Will the conflict management style of negotiators mediate the effect of time pressure?

Many researches argued that time pressure has effects on many aspects of negotiators' strategies, process and outcome (Ahituv et al., 1998; Carnevale and Lawler, 1986; Harinck and De Dreu, 2004; Stuhlmacher et al., 1998). For the effect on strategies, researchers found that when negotiators under higher time pressure have less persuasive or demanding arguments Carnevale and Lawler (1986) also reported that negotiators are more likely to use the cooperative strategy.

Based on the interdependence among primary parameters of negotiation proposed by Holsapple et al. (1998), negotiator's strategy will decide how the negotiator moves to a new location which forms the negotiation process. Further, a negotiation strategy may result in different movements, i.e., different processes, which depend on the counterparts' responses too. It means both negotiation strategy and process will have direct impact on negotiation outcome. For the negotiation strategy, cooperation is a frequent phenomenon found in negotiation with high time pressure (Carnevale and Lawler, 1986; Stuhlmacher et al., 1998). Further, Paese et al. (2003) have pointed out that telling the truth can let the counterpart make concessions. Both cooperative and honest strategies may reduce the negotiation time to reach agreement, especially under the time pressure. However, honesty strategy is not same as cooperation although both are closely related (Paese et al., 2003). It will be worthwhile and interesting to study if the time pressure has same impact on both strategies.

For the negotiation process, negotiators may feel less control and unsatisfied due to the stress and hurry caused by the time pressure (Stuhlmacher et al., 1998; Ahituv et al., 1998). In addition, negotiators with different conflict management style will act differently (Friedman et al., 2000), and therefore mediate the effect of time pressure on negotiation strategy and then the process. Based on the research purpose and above discussion, the research model shown in Figure 1 is proposed.

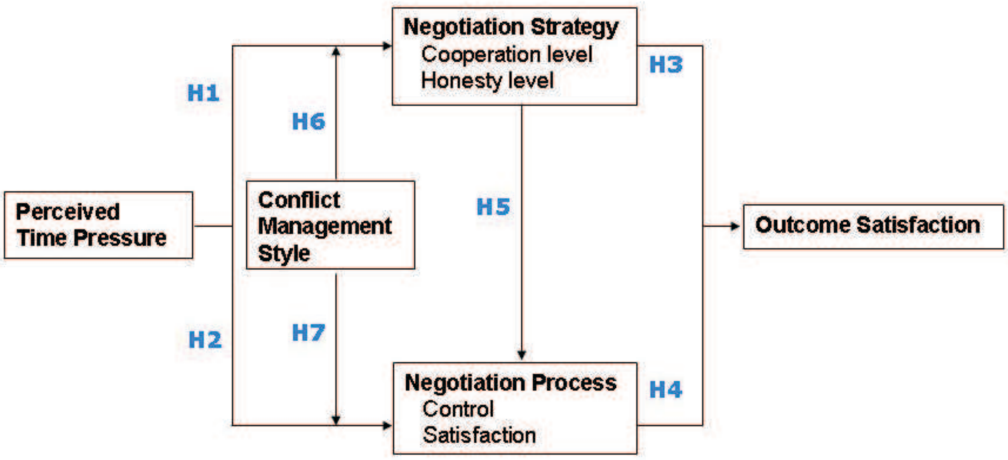

Figure 1: Research model

The research methodology was experiment. Subjects were divided into two different groups facing different time pressure scenarios. Job interview was the negotiation case which includes four issues: salary, bonus, insurance coverage and vacation time. An asynchronous web-based negotiation support system was developed for subjects to negotiate with each other in twelve days. Finally, we got 25 dyads of high time pressure context and 26 dyads of low time pressure context. Among the 25 dyads of high time pressure, 16 dyads reached agreements while 24 dyads of low time pressure reached agreements. The statistic analyses are still going on. Hopefully, the proposed hypotheses will have significant result.

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Communication Quality in Business Negotiations

Mareike Schoop, Frank Köhne, Dirk Staskiewicz, Katja Ostertag, Jens Kügler, Andreas von Vangerow, and Sebastian Weber

Information Systems I, University of Hohenheim, Germany
schoop@uni-hohenheim.de

1 Introduction

Negotiation is a highly communicative process. A good negotiator can utter his or her arguments clearly, can convince the negotiation partner of certain facts, can understand the partner and can reply to the partner's arguments. Although communication skills are an agreed upon asset for negotiators, research on the communication side of electronic ne-gotiations is still scarce (Pesendorfer and Köszegi, 2005; Weigand et al., 2003; Schoop et al., 2004). While much emphasis has been put on the economic quality of a negotiation process, we argue that this is only one success factor. The other factor that makes a negotiation successful is that of communicative quality.

Communication quality has many facets. For example, misunderstandings can lead to undesired effects and can cause lengthy processes; ambiguities in the business contract can lead to re-negotiations; an unfriendly negotiation atmosphere can lead to a termination of the business relation. All of these facets have a direct relational effect as well as an eventual economic impact. Therefore, communication quality is vital for the economic and relational success of a business negotiation.

2 Communication Quality in Business Negotiations

Quality has been defined in the ISO 9000 as the fitness for use and the degree of reaching what is expected or required. Such definition cannot directly be applied to communication quality: If the communication process consists, for example, of many misunderstanding and threats by one communication partner, then this process would not be judged to be of high quality by common sense even if the other communication partner expected such behaviour of the counterpart. There exist many definitions of communication quality. However, none is sufficient to cover the specific aspects of communication in negotiations. For example, communication in business negotiations can be seen as the process of social interaction that is ultimately meant to lead to a joint understanding and a set of commitments, usually to be explicated in a contract. Unlike in the general model of communication, communicators follow their own agendas and goals, i. e. they act teleologically. This may include the purposeful use of ambiguity and deception. On the other hand, negotiation may consist of rational argumentation and problem solving behaviour.

A further specific characteristic of communication in negotiations is the set of rules and norms that are applied. In contrast to the discourse model (where no internal or external constraints exist), negotiators are bound by constraints effecting their strategies, behaviour, and decisions as well as by standardised business processes such as RfQs, that specify communication media as well as communicated content etc. On the other hand, norms and values are constantly reinterpreted and negotiated in communication acts.

Based on communication theory, existing definitions of communication quality, and on empirical data of business negotiations, we define communication quality in business negotiations as follows:

> *Communication quality in negotiations is associated with the absence or successful management of communicative breakdowns on all semiotic layers and a high level of coherence and transparency in the process, as well as a positive evaluation of the interaction and a shared understanding sufficient to meaningfully carry out what was agreed upon.*

The contributing factors of communication quality in negotiations are as follows. Firstly, the *situation* is the foundation of communication quality. In negotiations, high quality in this part means successfully adapting the communication to situational aspects, for example to be prepared for the negotiation, to be available for the negotiation at the specified time, to avoid disturbances or noise during the negotiation etc. Secondly, there is the *self-evaluation* of each negotiation partner and, closely related as the third factor, is the *evaluation of the other partner*. It is important to consider a negotiator's personal evaluation of the process which includes the evaluation of the negotiator himself/herself as well as the evaluation of the partner. These evaluations are also based on each negotiator's own experiences and are thus necessarily subjective. High quality in these parts means a small discrepancy between the evaluations of all participants, i. e. between the self evaluation of the one partner and the evaluation of this negotiator from the point of view of the other partner. Thus, high quality is related to a consensus of self-perception and perception of and by others. Finally, since negotiation is a highly interaction process, the joint evaluation is important. For example, there can be communication problems that the negotiators fail to mention and clarify. In that case, these communication problems are co-produced jointly and we speak of joint (symmetric) evaluation. High quality in this aspect means similar joint perceptions of the interactions.

All three types of evaluation can be further distinguished into the semiotic levels of communication, namely syntactic level, semantic level, and pragmatic level (Morris, 1938). The syntactic level is concerned with the characters as the building blocks of communication; the semantic level is concerned with the characters plus the meaning of the utterance; the pragmatic level is concerned with the characters, the meaning, and the intention of the speaker, e. g. whether an utterance is meant as a promise or a threat. It is obvious that communication quality means quality on all levels since each utterance always concerns these three levels.

Communication quality is also influenced by quality criteria concerning the negotiation process as such. In her definition of communication quality, Montgomery (1988) introduces the notion of joint communication management including coherence. Coherence refers to utterances that refer back to previous utterances of the communication partner, that take up some arguments of the partner and, in general, that follow a communicative thread throughout the negotiation process. We have shown the specifics of coherence in business negotiations and their importance for effective negotiations (Köhne et al., 2005). High communicative quality concerning coherence means simply high coherence.

Finally, since negotiations are always social interactions even in a professional business context, relational aspects are important and will influence the evaluation of the negotiation process. High quality in this sense means a high level of harmony during the negotiation process which is an important asset of negotiations.

3 Empirical Evaluation

In order to test our framework of communication quality, we have conducted an experiment with around 80 negotiators who are students of economics, communication science, and agricultural science in real life. The case was a complex case with a strong economic bias, i. e. some ad hoc calculations were required. Thus, communication quality was not in the focus of the negotiators. We used questionnaires and documented the negotiations in videos. We could show real-life examples of all factors of our framework. Furthermore, we could explain all quality aspects that we found using our framework.

We are currently working towards a joint quantitative-qualitative measure of communication quality in negotiations and investigate the differences between face-to-face negotiations and electronic negotiations in terms of communication quality.

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E-negotiations: Rapport Building, Anonymity and Attribution

Benedict Sheehy[1] and Norbert Palanovics[2]

[1] University of Newcastle, Australia
benedict.sheehy@newcastle.edu.au
[2] Nagoya University, Japan
palanovicsnorbert@yahoo.com

The increasing quantity and economic value of transactions negotiated by email calls for an increased effort to understand the processes involved in and effects of the medium on negotiation. Previous studies indicate that negotiations by e-mail tend to be more difficult and more susceptible to impasse. The reasons for these problems are unclear and hence there is no clear research agenda to address the problems (McGinn and Croson, 2003).

Some research seems to suggest that this arises because of problems inherent in the medium such as lack of face-to-face communication, and more formal, distant relationships (Friedman and Curral, 2002). Others indicate that the medium facilitates some relationships, and creates more informal closer relationships (Lea and Spears, 1995). Fundamentally, all agree that the lack of face-to-face communication has an impact, but the nature and evaluation of that impact remains undetermined. What is also evident is that in a negotiation context at least, there is a negative relationship between the medium and negotiated outcomes.

This study hypothesized about the causes of the negative relationship, created three testable hypotheses, and conducted a study to see whether in an experimental context the hypotheses were proved false.

The authors proposed that three related aspects of interpersonal communication were important in understanding the relationship between e-mail as medium and negative negotiated outcomes. The authors identified; 1) rapport building, 2) anonymity, and 3) attribution of intention as being the important variables. To test the hypothesis, the authors developed a two stage study. In the first stage, individual students, unknown to each other, were assigned another student to negotiate a problem solely via email. An analysis of the communication and the negotiated outcomes was undertaken. This analysis showed the predictable breakdowns and poorer outcomes.

The second stage of the study involved a second problem also negotiated by email. Prior to this second negotiation, however, the authors providing training targeted at the three variables identified above to the students. The students were once again assigned to negotiate with students unknown to them. Analysis of the communication showed that the three identified variables did indeed have an impact on the number and quality of the outcomes. The number of positive outcomes is self-evident. The quality of a negotiated outcome, however, is not.

The quality of a negotiated outcome can be characterized as either distributive or integrative. A distributive outcome is the result of competitive bargaining, and is often considered appropriate to one time negotiations. By way of contrast, an integrative outcome which addresses both parties' needs tends to be a more desirable, more satisfactory outcome as it looks to solve the problems of both parties. To achieve an integrative outcome requires more effective communication and hence greater levels of trust. Quality, therefore, was determined by identifying integrative outcomes.

Analysis of the data indicated that rapport building improved the raw number agreements achieved, which is in line with Moore et al. (1999). Furthermore, we also found that rapport building had an effect on the integrativeness as well. These two findings confirm our first hypothesis which stated that rapport building contributes to better, integrative outcomes.

Our analysis also leads us to conclude that a reduction in anonymity did not have an effect on either the number of agreements or the integrativeness of the negotiations. Finally, our third hypothesis leads us to conclude that one of the main factors affecting integrativeness is in fact the attribution of intention. We conclude, therefore, that the two variables of attribution of intention and rapport building contribute to achieve higher quantity integrative outcomes, although for reasons set out below, this outcome is of limited generalizability.

An additional reading of the data led the researchers toward developing a fourth variable: atmosphere. They noted atmosphere was significant in achieving a high number of agreements and in achieving integrative agreements.

Clearly, research on the topic is far from being finished. Among other things, sample size limited the number of statistical tools that could be prudently used for analysis. A larger sample size could lead to a higher level of generalizability and wider range of analytical methods. Additional research needs to be done on the atmosphere variable. Furthermore, other studies could examine ways of affecting the atmosphere as well as the combined effect of the rapport building and attribution of intention variables with it.

Such work, hopefully would lead to the development of a model of the variables presented herein. In addition, study needs to be done examining these findings in a cross-cultural context and with due attention to gender and perhaps generational differences. Still, we believe our study is a step towards a better understanding and utilization of e-mail as a tool for negotiations.

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Actor-partner Effects in E-negotiation: Extending the Assessment Model of Internet Systems

Ofir Turel

McMaster University
turelo@mcmaster.ca

This study applies the Actor-Partner Interdependence Model (Kashy and Kenny, 2000) to investigate some of the relationships depicted in the assessment model of Internet systems (AMIS) (Vetschera et al., forthcoming). This is done to account for the dyadic nature of data in e-negotiations and to better understand the interdependencies between buyer and seller perceptions and behaviors in an e-negotiation context. While previous behavioral investigations of e-negotiations follow conventional statistical practices, and assume error independence, this study explores the interdependency between dyadic responses, and investigates the mutual effects that dyad members have on one another. To this end, the following paragraphs describe the motivation to study response interdependency in e-negotiations, as well as the conceptual and statistical implications it has on our body of knowledge concerning e-negotiator behaviors.

Negotiation is a social bargaining process through which participants arrive at a specific agreement under conditions of strategic interaction or interdependent decision making (Young, 1975). Simply put, parties follow a ritual of evaluating stakeholder positions; and making offers and counter-offers until a compromise is reached. To reflect the interactive communication and decision making processes involved in bilateral negotiations, these negotiations are often conceptualized as a dance (Raiffa, 1982). In this dance, parties assess each others positions and needs, make moves, and respond to their partner's moves.

In many social interactions, the perceptions and behaviors of the parties involved are interdependent. One form of interdependency describes how a change in one's perceptions and behaviors leads to changes in the perceptions and behaviors of the other. For example, using the dance analogy, when one dancer takes a lead, the other follows, when one dancer steps forward, the other steps backwards, and so on. Alternatively, both parties may be influenced together by an external entity. This is what is known as of "mutual external effect". This effect is analogous to the quality of the dance floor affecting each dancer's satisfaction with the dance.

While negotiators do not literally dance, they do follow a similar ritual of interdependent behaviors in which each party may retain some of his or her perceptions and actions, but at the same time, converge to his her partner's perceptions and actions. For example, the number of messages one party sends in an e-negotiation process is likely to be affected by the number of messages the other party sends. Additionally, when one party believes that the e-communication facilities are useful, it is likely that the other party will have a similar assessment of the communications tools, since the usefulness of the communication facilities is mostly determined by the interaction of the parties using these facilities. Overall, it is reasonable to expect that that there is some interdependency between the measurement residuals of dyad members (i. e., the two negotiators), and that the dyadic affiliation is a secondary source of variance.

The fact that e-negotiator data is nested in dyads has conceptual and statistical implications. From a conceptual standpoint, ignoring the interdependency between individual responses omits important knowledge regarding the investigated phenomena. That is, we fail to understand the structure of this interdependency and how it arises. As such, we only partially utilize the available data. From a statistical analysis standpoint, assuming the independency of individuals, and ignoring the hierarchical structure of the data, can have serious implications and lead to incorrect inferences (Klein et al., 1994). Particularly, ignored non-independence of dyadic responses can meaningfully inflate and bias the tests of significance (Kenny and Judd, 1986, 1996).

Given the aforementioned conceptual and statistical issues, it is concluded that the extant behavioral e-negotiation literature, which mostly ignores the dyadic structure of data, has neglected important analyses, and may have presented biased results. To bridge this gap, this study demonstrates the application of the Actor-Partner Interdependence Model (Kashy and Kenny, 2000) to some of the AMIS data, for which a strong correlations is detected between responses form matching negotiators. These special statistical procedures are needed since in these cases, the AMIS data violates the basic independence assumptions of standard methods of statistical analysis. The results are presented in the full paper.

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Part XVI

Empirical Studies

Reasons for Rejecting Pareto-Improvements in Negotiations

Carsten Block[1], Henner Gimpel[1], Gregory Kersten[2], and Christof Weinhardt[1]

[1] Institute of Information Systems and Management, University of Karlsruhe, Germany
block@iw.uni-karlsruhe.de
gimpel@iw.uni-karlsruhe.de
weinhardtatiw.uni-karlsruhe.de
[2] John Molson School of Business, Concordia University, Montreal, Canada
gregory@jmsb.concordia.ca

1 Introduction

Negotiation support systems offer communication channels and analytical support to negotiators. Inspire, for example, helps negotiators in reaching Pareto-optimal agreements by suggesting the respective improvements (if possible) after negotiators reached an agreement. However many negotiators reject these Pareto-improvements (Kersten and Mallory, 1999).

To understand the observed behaviour, this paper empirically studies different reasons for rejecting Pareto-improvements. The analysis is based on bilateral multi-attribute negotiations conducted on the Inspire system.

2 The Post-settlement in Inspire-negotiations

The Inspire negotiation protocol comprises three phases: (1) in the pre-negotiation phase the system elicits the negotiators' preferences in form of utility functions; (2) during the negotiation phase negotiators exchange offers and text messages until the negotiation is abandoned or an agreement is reached; (3) in the post-settlement phase Inspire offers Pareto-improvements of the negotiated agreement, if such improvements exist. Based on the negotiators' utility functions elicited in the pre-negotiation phase and potentially updated in the negotiation phase, Inspire proposes up to five different improvements. These are presented to the negotiators immediately after an agreement is reached. The negotiators then can decide to either accept or reject these offers. A more detailed description of the negotiation protocol is outlined by Kersten and Lo (2003).

Our data set comprises 2521 negotiations on the Cypress/Itex-case mostly used in Inspire; the negotiations were conducted from 1996 to 2004. Each negotiation aimed at finding a mutually acceptable agreement on four attributes: price, delivery time, payment conditions, and return conditions. A subset of 1104 negotiations was completed successfully, meaning that negotiators reached an agreement – 58% of these agreements were non-Pareto-optimal, thus Inspire offered Pareto-improvements in 641 negotiations.

The improvements were rejected by 76.6% of the users, that is, these users refused to enter the post-settlement phase. This number is puzzling on first sight, as one might expect that the analytical support offered by the negotiation support system is welcome. Users are expected to benefit from improved agreements. But only in 82 of the remaining 150 negotiations, where users accepted the post-settlement offer, a new (Pareto superior) agreement was reached. In all other cases users preferred to stick to the original agreement from the main negotiation phase.

To prepare the data for a statistical analysis, all negotiations that were either unsuccessful or Pareto-optimal are eliminated from the data set. Afterwards only non-Pareto optimal negotiations (i.e. negotiations where a post-settlement was offered by Inspire) remain. These negotiations are then further divided into two distinct sets PS_r, and PS_s. PS_r contains all negotiations, where users rejected the post-settlement offers. PS_s comprises those negotiations where users at least started the post-settlement phase by submitting one or more offers.[1]

For the empirical analysis itself, Wilcoxon rank-sum tests and χ^2 tests are used to check for systematic differences between the sets PS_r and PS_s concerning attributes like e.g. the negotiation length.

The reasons for rejecting Pareto-improvements studied here fall in three main categories: direct incentives, accumulated costs, and subjective impressions.[2]

2.1 Direct Incentives

Direct incentives are stimulants that attract negotiators to begin a post-settlement. In this category we analyze the utility distance between expected and achieved outcome as well as the distance between the reserve price and the achieved outcome. Also we examine the utility distance between the achieved outcome and the max/min/average utility of the Pareto-optimal alternatives offered by Inspire. Because utility as a measure could be problematic (Roemer, 1996) we validate our analysis using an alternative measure proposed by Vetschera (2004).

The results from testing the utility differences between the outcome achieved during the main negotiation and the automatically generated pareto superior alternatives

[1] One could argue that the group of users who successfully completed a post-settlement was in general better motivated to do so as compared to users who only started a post-settlement. Thus the comparison of PS_r with a set PS_c (containing all negotiatiations where users successfully completed the post-settlement) should result in more significant differences as compared to the analysis of differences between PS_r with PS_s. However, due to space limitations, this issue will be discussed in the full version of this paper only.

[2] Besides the aforementioned motives, there might be other reasons for negotiators not to enter a post-settlement phase. One possibility is that users adapt their preferences during a negotiation due to their counterparty's offers and without revising their utility function (Gimpel, 2005). This and other reasons have not been analyzed with the data at hand in our data set.

from the post-settlement offer vary between the both sets only marginally and are statistically insignificant. Therefore we also used an alternative measure, which is based on a dominance relation, in order to eleminate potential influences that stem from problems related to the measurement and comparison of utilities. However the results from this validation run are statistically insignificant as well. Thus, based on the underlying negotiation data, it cannot be determined if prospective utility improvements lead negotiators to more likely accept post-settlement offers.

Contrarily to this, utility differences between a negotiators' *reserve price* (elicited before the negotiation started) and the finally agreed alternative seem to have an influence on the acceptance of post-settlement offers. The utility differences in the set PS_r differ from those in PS_s on a significance level of 5%. But rerunning this analysis using *expected outcome* as a benchmark instead of *reserve price* leads to non-significant results again.

2.2 Accumulated Costs

By contrast accumulated costs are factors that prevent negotiators from starting a post-settlement. Long negotiations, e.g. could lead to some fatigue among the negotiators and thus decrease the probability that negotiators accept an offer to improve their achieved results.

To evaluate the influence of accumulated costs, the differences between PS_r and PS_s concerning negotiation length, number of exchanged offers and number of exchanged non-offer messages were analysed. Overall negotiations from the set PS_r were on average about 10% longer than negotiations from the set PS_s (12.49 vs. 10.38 days). Thus negotiation length seems to have an important influence on the acceptance of post-settlement offers. This finding is also reflected by the result of the wilcoxon rank-sum test which is significant on the 0.1% level.

Another measure for cost are the number of offers and non-offer messages exchanged. However the results from the statistical analysis of these attributes are more ambiguous: The differences between PS_r and PS_s are only weakly significant on the 10% level. When inspecting the means of both sets, it turns out that during negotiations from the set PS_r on average only 5.2 messages or offers were sent by each user wheras in negotiations from PS_s this number is only slightly higher (5.72). This result does not support the hypothesis that the number of exchanged messages are counted as a kind of cost by the users, but still is in line with findings reportet by Cray and Kersten (1999). They argue in their paper, that more offers could also be seen as an indicator that finding a compromise was difficult during the main negotiation and therefore the willingness to improve this initial agreement is high.

2.3 Subjective Impressions

Subjective impressions were gathered from the negotiators through questionnaires before and after the negotiation process. We analyze the negotiators' perceptions of their opponents in terms of persuasiveness, honesty, exploitation, cooperation, raliability, sympathy rationality, trust, kindness, fairness and flexibility and study the impact of these attributes on the acceptance of post-settlement offers. The rationale for this analysis is the assumption that negotiators who rate their opponents worse, are less likely to begin a post-settlement, e.g. to "punish" their opponent for previous (perceived) misbehaviour (Fehr and Gaechter, 2002).

For the statistical analysis Pearson's χ^2 test on independence with simulated p-values (based on 10^5 replicates) is used to test for significant differences between user perceptions in the sets PS_r and PS_s. Overall the differences were statistically non-significant.[3] Thus, based on the underlying data, it cannot be determined if subjective negotiator's impressions have an influence on the acceptance of post-settlement offers.

3 Conclusion

In this paper we analysed the influence of different factors on the acceptance of post-settlement offers in electronic negotiations. Most prominently, the length of a negotiation in terms of duration and the distance between a negotiator's ex ante reserve price as compared to the effectively negotiated outcome seem to influence users who have to decide if they accept or reject a post-settlement offer. The influence of several other factors was analysed as well but, at least for the Inspire data set analysed, they seem to play no significant role.

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[3] For the attribute *sympathy*, the χ^2 test was significant on the 10% level but the frequency distributions for both sets differ only marginally. Therefore no practical implications could be drawn from this finding.

Payoff Levels, Loss Avoidance, and Equilibrium Selection in the Stag Hunt: An Experimental Study

Nick Feltovich[1], Atsushi Iwasaki[2], and Sobei H. Oda[3]

[1] University of Houston
nfelt@bayou.uh.edu
[2] Kyushu University
[3] Kyoto Sangyo University

Game-theoretic solution concepts imply that modifying a game by adding the same positive or negative constant to all payoffs—a "change in payoff levels"—should not affect behavior. Such a change does not affect any player's rank-ordering of outcomes, so pure-strategy best responses, and hence pure-strategy Nash equilibria, are unaffected. Furthermore, it does not affect expected-payoff differences under any given set of beliefs about opponents' strategies, so best-response correspondences, and therefore mixed-strategy Nash equilibria, are also unaffected. If the game in question has multiple Nash equilibria, game theory does not rule out the possibility that payoff-level changes affect which one of the equilibria is played, but it does not predict when such sensitivity will be present, nor how it will be manifested. If the game has a unique equilibrium, game theory specifically predicts that changing payoff levels can have no effect. So, game theory is at least silent as to whether payoff-level changes affect behavior, and at most explicitly rules out such an effect.

On the other hand, there is some empirical evidence suggesting that changing payoff levels may affect behavior. In economics, this discussion dates back at least to Kahneman and Tversky (1979), who devised their "prospect theory" to account for the systematic violations of the "rational" predictions of standard expected-utility theory they observed in a large number of decision-making tasks. Although they did not look specifically at payoff-level changes, prospect theory implies they will affect decision making. More recently, Cachon and Camerer (1996) found that decisions in game experiments were sensitive to changes in payoff levels when these changes affected the *signs* of payoffs: positive payoffs became negative, or vice versa. They speculated that subjects in the experiments were exhibiting "loss avoidance", which they defined to be a tendency to avoid choices that with certainty yield negative payoffs, in favor of alternatives that could yield positive payoffs.

Cachon and Camerer's notion of loss avoidance is one way choices might be sensitive to payoff-level changes that alter the signs of payoffs. We will refer to their notion as "certain-loss avoidance", in contrast to "possible-loss avoidance", which we define to be a tendency to avoid strategies that give a *possible* negative payoff, in favor of alternatives that give a certain positive payoff. The goal of this paper is to test for these two forms of loss avoidance. We design and run a human-subjects experiment using three versions of Stag Hunt (Rousseau, 1993), a symmetric two-player game with two strategies: a risky cooperative action and a safe defecting action. These versions are shown in Figure 1 (with the strategies labeled R and S, respectively). They differ

High payoffs (SHH)

		Player 2	
		R	S
Player 1	R	7,7	1,5
	S	5,1	5,5

Medium payoffs (SHM)

		Player 2	
		R	S
Player 1	R	5,5	–1,3
	S	3,–1	3,3

Low payoffs (SHL)

		Player 2	
		R	S
Player 1	R	1,1	–5,–1
	S	–1,–5	–1,–1

Figure 1: The Stag Hunt games used in the experiment

only in payoff level, so are game-theoretically equivalent. Nonetheless, our notions of loss avoidance make predictions regarding how individuals' choices change across these games. In the high-payoff game (SHH), all payoffs are positive, so neither certain- nor possible-loss avoidance will have an impact. In the medium-payoff game (SHM), choosing S leads to a certain positive payoff, but choosing R could lead to a negative payoff if the opposing player chooses S. If an individual exhibits possible-loss avoidance, R should then be less attractive in SHM than in SHH; therefore, possible-loss avoidance implies that R is *less* likely to be chosen in SHM than in SHH. Similarly, in the low-payoff game (SHL), choosing S leads to a certain negative payoff, but choosing R could lead to a positive payoff, so that an individual exhibiting certain-loss avoidance will find S less attractive here than it would have been in SHH. So, certain-loss avoidance implies that S is less likely (so that R is *more* likely) to be chosen in SHL than in SHH.

In our experiment, subjects played all three versions of Stag Hunt, as well as the three additional games shown in Figure 2. We used four design treatments. In our

Coordination Game (CG)

		Player 2	
		R	S
Player 1	R	2,2	0,0
	S	0,0	1,1

Battle of the Sexes (BOS)

		Player 2	
		R	S
Player 1	R	0,0	3,5
	S	5,3	0,0

Prisoners' Dilemma (PD)

		Player 2	
		R	S
Player 1	R	7,7	1,8
	S	8,1	4,4

Figure 2: The other games used in the experiment

O (one-shot) treatment, subjects played each game once and the payoff matrices were publicly announced. This treatment allows us to see how individuals behave in each game before acquiring any experience in playing that game, so that their decisions are the result of deductive reasoning. Our C (complete-information) treatment was similar to our O treatment, except subjects played each game 40 times before moving on to the next game, and were matched randomly to opponents in every round. The results from this treatment allow us to see not only the consequences of subjects' deductive reasoning, but also whether and how choices change over time due to subjects' experience in playing the game—in particular, whether loss avoidance grows or decays over time. In our other two treatments, subjects were not told the payoff matrices of the games they were playing, though they were given information that would enable them to infer the payoff matrices eventually. Our R (random-matching, limited-information) treatment was otherwise similar to the C treatment: subjects played each game 40 times against randomly-chosen opponents. Our F (fixed-pairs, limited-information) treatment was like the R treatment, except that subjects were matched to the same opponent for all 40 rounds of a game. The R and F treatments allow us to see the effects on loss avoidance of the experience subjects receive in playing each game, without the benefit of any initial introspection. By comparing the results of these two treatments, we can also determine whether any learning of loss avoidance depends on whether subjects play repeatedly against the same opponent, or against changing opponents.

Our results are as follows. We find that in all treatments, there are significant differences in behavior across versions of Stag Hunt—that is, behavior is indeed sensitive to payoff levels—and in the treatments lasting more than one round, these differences initially grow over time, typically peaking between the midpoint and the end of the experimental session. Moreover, the differences we find, whenever significant, are consistent with loss avoidance: subjects are more likely to choose the risky action in SHL than in SHH (certain-loss avoidance), and more likely to choose the risky action in SHH than SHM (possible-loss avoidance). We find evidence consistent with certain-loss avoidance in one-shot games and in repeated games with limited information about payoffs, though only weak evidence in repeated games with complete information about payoffs. We do not find evidence of possible-loss avoidance in one-shot games, but do in repeated games with complete information, and to a lesser extent, in repeated games with limited information. Our results suggest that loss avoidance should be taken into consideration when forming behavioral predictions for games with multiple Nash equilibria, when these games allow the possibility of both gains and losses.

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Assessing the Predictive Accuracy of Axiomatic Solutions to Bargaining

Michael Filzmoser

Department of Business Studies, University of Vienna,
michael.filzmoser@univie.ac.at

In game theory two strands of bargaining theories—the strategic and the axiomatic theories—were developed to investigate negotiations by mathematical modelling and analysis. While the strategic theories produce equilibrium outcomes based on formalized negotiation processes, the axiomatic theories derive solution concepts from 'desirable' properties for the settlement described by axioms without specifying the bargaining process at all (Osborne and Rubinstein, 1990). In this paper we satisfy the call for research of Neslin and Greenhalgh (1986) and Gupta (1989) in comparing different axiomatic solutions for different reference points and a large data sample.

1 Axiomatic Solutions

Most axiomatic theories base either on the Nash (1950) solution concept (henceforth referred to as $N(r)$, where r is one of the five reference points discussed below) or the Raiffa (1953) solution concept. $N(r)$ predicts that the solution of a bargaining problem maximizes the product of the differences between the negotiators' utility from the solution and r. $R(r)$ predicts, that the solution equals the intersection of the Pareto efficient frontier of the bargaining problem (i. e. the set of solutions for which the utility of one negotiator cannot be increased without decreasing the utility of the other negotiator) and the line connecting r and the utopia point i. Figure 1 illustrates these two solution concepts for $r = c$ the conflict point and discrete contract alternatives. For these two solution concepts different reference points were discussed in literature:

- the conflict point c: The utility to the negotiators if no agreement is reached (used by Nash (1950) for the original Nash solution and by Kalai and Smorodinsky (1975) who mathematically formulated Raiffa's solution concept)
- the maximax point mm: the maximal possible utility a negotiator can reach if her opponent reaches his ideal outcome (used by Roth (1977) and Thomson (1981) for the Nash solution concept and by Rosenthal (1976) for the Raiffa solution concept)
- the midpoint m: The utility to both negotiators if each issue is settled at its mean value (used by Gupta (1989) for the Raiffa solution concept but obviously applicable to the Nash solution concept, too)

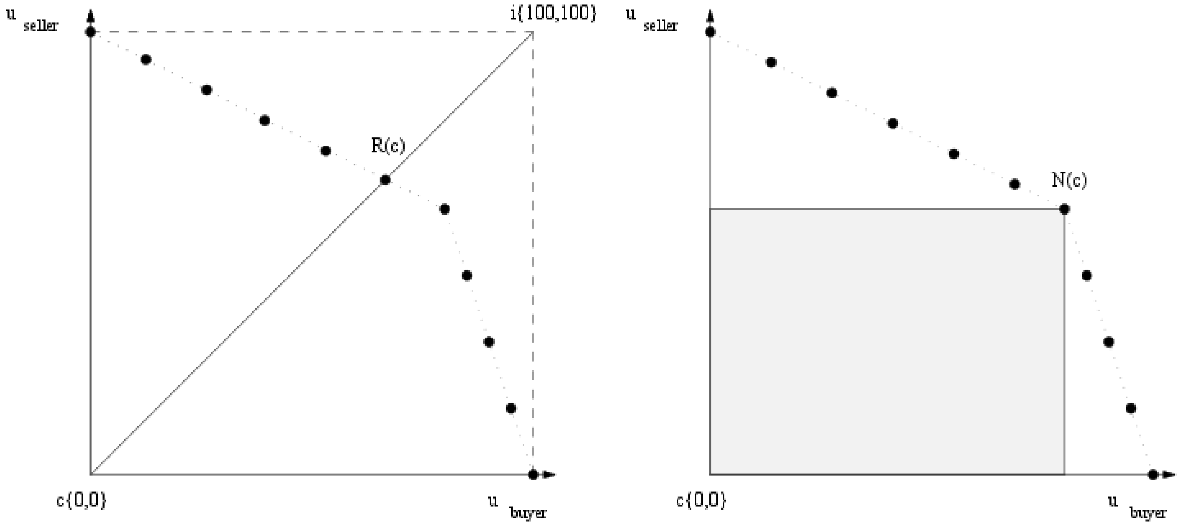

Figure 1: The Raiffa and Nash solution concepts

Additionally we consider two further reference points often argued to be important in negotiations (data about these points was collected by pre-negotiation questionnaires in the experiments):

- the reservation point r: A linear combination of the utilities of the reservation packages indicated by the negotiators
- the expectation point e: A linear combination of the utilities of the expected outcome packages indicated by the negotiators

2 Data and Measurement

The empirical study bases on the records of negotiation experiments on the 'Itex-Cypress' case conducted with support of the negotiation support system Inspire (Kersten and Noronha, 1999) from 1996 to 2004. Of the 1,807 that satisfy the requirements for this study (utility elicitation and pre-negotiation questionnaire completed) 1,338 (74.05%) reached agreements from which 659 (49.25%) were Pareto efficient.

As in multi-issue negotiations with discrete contract alternatives many packages might result in the same utility combination and axiomatic solutions might predict more than one unique solution we say that an axiomatic solution correctly predicts the actual outcome of the negotiation whenever the actual outcome shows the same utility combination as (on of) the predicted solution(s). Otherwise we calculate the Euclidean distance (in case of multiple predicted solutions the mean Euclidean distance) between the predicted solution and the actual outcome of negotiations.

3 Results

The analysis consists of in three steps. First we compare how often the actual outcome is correctly predicted by the ten axiomatic solutions discussed above. This happens in 130 (19.85%) cases for $R(mm)$ to 185 (28.24%) cases for $R(m)$, without significant differences between the axiomatic solutions.

Furthermore we compare the mean distances between actual Pareto efficient or Pareto inefficient agreements and the predicted solutions by two-sided Wilcoxon tests. For the case of wrongly predicted Pareto efficient outcomes we findd that on average $R(\cdot)$ is closer to the actual solution than $N(\cdot)$ regardless of the reference point, however these results are not significant.

For wrongly predicted Pareto inefficient outcomes also $R(\cdot)$ was closer to the actual outcome than $N(\cdot)$ on average regardless of the reference point. Here the results are significant for c and mm (p at least < 0.01). Furthermore $N(c)$ has the greatest mean distance and is significantly farther from the actual outcome than seven of nine other axiomatic solutions, while $R(m)$ on the other hand shows the smallest mean distance and is significantly closer to the actual outcome than seven of nine other solutions.

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Reputation on eBay and its Impact on Sales Prices

Moritz Mink and Stefan Seifert

University of Karlsruhe (TH), Information Management and Systems, Englerstr. 14,
76131 Karlsruhe, Germany
m-mink@gmx.de
stefan.seifert@iism.uni-karlsruhe.de

On the internet marketplace eBay, customers trade items and are thereby oftentimes unknown to each other. Since typically the buyer first transfers the money to the seller before the item is shipped, he faces the risk that upon receipt of the money the seller sends either products of minor quality or even nothing at all. In order to reduce this risk, eBay runs a reputation mechanism which allows both parties to evaluate the respective opponent party by both text comments and feedback points (-1, 0, $+1$) after the closing of an auction. Each auction description prominently displays the cumulated feedback score that the seller has collected in prior transactions.

It seems obvious to consider a seller's feedback score as an indicator for her reliability and trustworthiness and one would expect that the final price of an auction and the feedback score of the seller are positively correlated. However, findings of authors, who have investigated the effect of a seller's reputation on the closing price of an auction on eBay, are ambiguous.[1] Whilst some authors claim that the feedback score has a significant positive impact on the sales price, others do not find such a correlation.[2] Moreover, Bajari and Hortaçsu (2004) point out that the feedback score is rather an indicator for a seller's experience than her trustworthiness. Since sellers might learn from experience (e. g. setting up auctions more attractively or choosing parameters such as the auction format more appropriately), interpreting a correlation of the feedback score with the auction revenue as a positive effect of reputation, might be misleading.

In an empirical study using field data from auctions on eBay (http://www.ebay.de), we investigate the impact of (a) the accumulated feedback score, (b) the cost of shipping, (c) the start price, (d) the duration, and (e) the format of an auction on its closing price. With respect to the format, we differentiate between standard auctions and auctions with a so-called buy-it-now price. The data for our research has been collected by a computer robot, which monitors given eBay categories and downloads the details of every new auction as well as its results once the auction has closed. This study is based on a set of 1,274 auctions of Chanel "Coco Mademoiselle Eau de Perfume

[1] An overview of empirical studies on the value of reputation on eBay is given by Resnick et al. (forthcoming) and Bajari and Hortaçsu (2004).

[2] Studies unanimously report, though, that individual negative feedback points burden revenue much stronger than individual positive points increase revenue.

100 ml" conducted between December 20, 2005 and March 09, 2006. Only auctions in which the item was sold are included. All items were labeled "new", "originally wrapped", or "sealed" and are thus considered homogeneous.[3] Note, however, that the surveyed type of eau de perfume has a store price of about 100 euros; on eBay it sells for an average of €27.57 (plus shipping costs which average about €5.61). Since the authenticity of eau de perfume is difficult to verify, the risk of acquiring a forged item might be substantial and therefore the trustworthiness of the seller is crucial.

It turns out that both the duration and the start price are ordinal categories: eBay only allows for auctions that run for 1, 3, 5, 7, or 10 days. We also find that more than 97% of all auctions have a start price of €1.00, 1.99, or 24.99. Most likely, this is also due to the rules of eBay, as €1.00 is the lowest feasible start price and listing fees increase at €2.00 and €25.00. A pre-test on both the impact of the duration and the start price shows, that in neither of the two dimensions, the average revenue per category can be ranked consistently with the order of the independent variable and testing against trend indicates no significant coherence. We conclude that neither the duration nor the start price has a significant impact on the final closing price of an auction.

With respect to the cumulative feedback score f, the shipping costs s, and the auction format t, we do find a significant correlation with the revenues R: revenues rise with the feedback score, decrease with the charges for shipping, and in auctions in which a buy-it-now price is offered ($t = 1$) revenues are significantly higher than in standard auctions ($t = 0$). Moreover, we find that sellers with a higher feedback score tend to charge lower shipping costs and that on average the seller's feedback is higher in auctions with a buy-it-now price than in standard auctions.

In order to shed more light on the impact of the above parameters, we run a multiple linear regression according to the model

$$R = \beta_0 + \beta_f \left(1 - \frac{1}{\ln(f+e)}\right) + \beta_s s + \beta_t t + \epsilon \ . \tag{1}$$

The regression parameter β_0 relates to the value of the item and β_f yields the premium, a seller with a "perfect" feedback score ($f \to \infty$) gains compared to a new seller ($f = 0$).[4] Finally, the parameters β_s and β_t, respectively, give the price deduction for shipping costs and the difference in average revenue between the two auction formats.

Consistent with the results of the pre-test, the regression parameter $\beta_t = 3.63$ shows that auctions with a buy-it-now-offer generate higher revenues than standard auctions (p-value $< 0.1\%$). Moreover, shipping costs clearly decrease revenue: in our data set β_s equals -1.29 and is thus even smaller than -1 as one would expect with rational buyers (p-value $= 6.5\%$). Finally, the regression yields $\beta_f = 1.93$, indicating that a

[3] All descriptions were manually verified in order to avoid labels such as "almost new" in the data set.

[4] Note that the function $1 - \frac{1}{\ln(f+e)}$ monotonically transforms the feedback score from a non-negative integer to a value in $[0, 1)$.

seller with a very high feedback score can realize revenues up to €1.93 higher than a seller with no feedback history.

Interestingly, the premium of a seller with a "perfect" feedback score is lower according to the multiple linear regression ($\beta_f = 1.93$) than the corresponding parameter in the single linear regression ($\hat{\beta}_f = 2.50$). Taking into account that sellers with a higher feedback score charge lower shipping costs and choose a more promising auction format, the result supports the mentioned hypothesis by Bajari and Hortaçsu (2004), that the feedback score also represents the experience of a seller and has not only to do with her trustworthiness.

The above findings raise the question whether the apparent positive impact of a high reputation score is even lower if one considers still more parameters. To investigate this issue, we auctioned 24 perfumes "Jil Sander Sun Eau de Perfume 75ml" in a field experiment on eBay (http://www.ebay.de) using different seller accounts. Twelve accounts were newly set up and had no feedback points (group 'low') whereas the other twelve accounts had feedback scores between 7 and 24 (group 'high'). Besides the sellers' feedback scores, all auctions were setup in the same way (shipping costs, format, start price, duration, ending time, description, design of web site, ...). The auctions were conducted in March/April 2006 and one auction was started per day with group 'high' and group 'low' sellers taking turns. With this setup we controlled for as many auction parameters as possible and pursuing the above argumentation we therefore hypothesize, that in our experiment the impact of feedback is smaller than $\beta_f = 1.93$.

In the field experiment, the perfume on average sold for €18.58 in the group 'high' and for €18.61 in the group 'low'. Thus, a positive impact of feedback points can no longer be found. To test our hypothesis, we transform the revenues R of the group 'high' according to $\tilde{R}(f) = R - \beta_f \left(1 - \frac{1}{\ln(f+e)}\right)$ with $\beta_f = 1.93$ and f denoting the respective seller's feedback score. We then test whether the transformed revenues of the group 'high' are lower than the ones of group 'low'. Applying the adjusted t-test for unequal variances rejects the corresponding null hypothesis at a p-value of 10.9 % (one-sided). Even though not being significant, this also supports our argument that the explanatory power of the feedback score taken as a measure of reputation decreases as more parameters are taken into consideration. Rather, the correlation between a seller's revenues and her feedback score can be attributed to a large part to the fact that highly experienced sellers both have a higher feedback score and design the auction more favorably.

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Facilitating Mobile Groups: Experiences and Requirements

Gerhard Schwabe and Dirk Frohberg

Department for Informatics, University of Zurich
schwabe@ifi.unizh.ch
frohberg@ifi.unizh.ch

1 Introduction

While small groups an informal communities can structure their collaboration on the fly larger teams need facilitation to achieve a tangible outcome. In the last decade, there have been numerous papers establishing this understanding (see Schwabe, 1995) and proposed approaches and frameworks for planning and facilitating collaboration (de Vreede et al., 2002; Beranek et al., 1993; Bostrom et al., 1991, 1993). A smaller number of authors have reported their experiences with facilitating distributed collaboration (Dubs and Hayne, 1992; Niederman et al., 1993; McQuaid et al., 2000; Zhao et al., 2002). They stress both the necessity and difficulties of guiding over distance. Our paper will go one step beyond and report on our concept to facilitate mobile groups. We will first discuss the specialities of collaboration of mobile groups compared with distributed groups. Then we will introduce the case study mExplorer for mobile collaboration. Drawn from the case study we will formulate key challenges of facilitation for mobile groups. The paper will close with the proposition of a framework for mobile facilitation.

2 Distributed Groups

In a common distributed setting of collaboration, the group members are sitting fix in front of a desktop PC at different places, not moving away from it. Collaborative sessions are scheduled and agreed, so all group members participate reliably in the session as demanded. All concentration is focused on the collaborative session. In a well prepared session, all members are well orientated and there is consensus about what to do and how to do it. Roles as moderator, time manager, content manager and so on are fix distributed among participants. Thus all members are acting within a common and shared context. Technology is basically supposed to bridge the gap of distance and to provide an environment, which orientates as much as possible as much as possible.

3 Mobile Groups

Mobile collaboration is further apart from co-located meetings than pure physical distribution. It is not set in one or more meeting rooms but rather situated in a physical environment that may be beyond the control of the facilitator. Mobile collaboration is not purely a cognitive process of data, but integrates physical action and experiences. Mobile groups are for example moderated groups of fresh students exploring the university campus. Mobile groups should not be misunderstood as simply being distributed groups with mobile devices replacing desktop computers. In contrary context, purpose, and dynamics do change for mobile groups. The environment of mobile groups does not provide the rich set of devices and tools meeting participants have become used to from meeting rooms. Instead the environment itself becomes interface. Mobile collaboration is not necessarily scheduled, but could be started spontaneously as all members are reachable anytime and anywhere. Mobile collaborators can not exclusively focus the ongoing collaboration, but need to share their attention with their current environment. They may be distracted by their current environment, but they may also use it as a resource. For instance a person collaborating from the university library might simultaneously be busy searching for a book. And any book in a shelf might give inspiration for the collaboration task. The reliability for permanent participation of mobile members is reduced. People could be cut off the collaboration sessions for technical reasons (e. g. entering a campus building without network coverage). Discontinuity in participation might also result from the nature of multi-focusing, if any other issue gets a higher priority (e. g. a closing office where a student needs to register in order to keep a deadline). If the risk of discontinuous participation is high, there can not be a fixed distribution of roles. That means if the moderator of the ongoing collaboration is cut off, another member needs to take over and replace him. In an extreme case of mobile collaboration, members are frequently leaving and joining the session and thus a lot of effort is needed to provide continuously a shared context.

4 Case Study mExplorer

As part of the Mobilearn project [1] we studied mobile collaboration through the location based game mExplorer. mExplorer familiarizes newcomers with a new environment allowing them to study its geographical setup and the social, organizational and informational rules. mExplorer has been extensively tested in the University environment (Göth et al., 2004; Schwabe et al., 2005; Schwabe and Göth, 2005), but also in the tourism sector (Göth and Lueg, 2006). mExplorer included location based navigation tasks (finding a specific location), knowledge tasks (e.g. how to find a book in the library), and creative tasks (e.g. make campus art more interesting) which groups with 10–20 members have to solve in a mixture of collaboration and competition. The paper reflects on our experiences in facilitating four trials of the mExplorer. These trials

[1] http://www.mobilearn.org

were run from 2004–2006. Two trials are documented in prior publications (Göth et al., 2004; Schwabe et al., 2005; Schwabe and Göth, 2005). Specific data will be provided for our most recent trial (January 2006). The trial consisted of a series of small self-contained tasks (lasting between 10 minutes and 30 minutes). The purpose of the tasks was twofold: 1) The participants should learn about the University campus and enrich it electronically 2) the participants should get acquainted systematically with twelve mobile collaborative tools (such as chatting, navigation history (red line showing the past movements), zoom, even chasing one another and evaluate each functionality's impact on motivation, orientation, learning, group-building, and confidence. There was an individual phase for each of the twelve functionalities containing a short introduction to the functionality, some time to try out the functionality fulfilling a specific assignment (e. g. "solve all tasks as fast as possible", "catch as many other teams as you can", "annotate each point of interest" and so on), and a phase of reflection to fill in a questionnaire.

5 Challenges in Facilitating Mobile Groups

Facilitating is a key success factor of collaboration. Facilitation of mobile groups can build on established frameworks, but the steps have to be augmented for the specific requirements of mobility. The specific nature and dynamics of mobile groups lead to a number of specific challenges for mobile facilitation. Those are:

- **Providing monitoring means:** Having transparency about what is going on in the collaboration activities is key for good facilitation. Thus a facilitator needs powerful monitoring means to be oriented about the groups' activities. MExplorer displays all teams' current locations and their digital activities. Those can be interpreted by the facilitator and lead to aimed supportive action.
- **Facilitating participation:** Participation of group members is discontinuous, which causes irritation, disorientation, complicated coordination and efficiency losses when refreshing the context of joining members. Some facilitation of participation can be provided by awareness functionalities. A system needs to provide awareness about passed, current and future presence and availability of group members. MExplorer provides location information and online status of group members.
- **Facilitating multitasking members:** Multitasking is a typical phenomenon for mobile groups as their current context is manifold. Thus the cognitive load of group members is generally high. With mExplorer, there are always two players sharing one device and thus sharing cognitive load. Performance and confidence of the players is much higher, when they are running in pairs (Schwabe and Göth, 2005).
- **Facilitating permanently alternating roles:** Because of discontinuous participation, roles among group members must be switched, if the process must not be interrupted by absence of a key group member as the moderator. A system needs to be able to handle spontaneous role switches and provide group members with awareness about each other's role. For reduced complexity players in mExplorer

are not supposed to be discontinuous yet, so it is an open issue. But mExplorer supports different roles as player (prey and hunter), facilitator, and audience. The computer system takes participatory over some tasks of a moderator, as it coordinates people with tasks and supports self-moderation providing location awareness about who is where. Thus players can decide explicitly to cooperate and meet other groups or compete and explicitly not meet other groups or compete and hunt other groups for getting points.

- **Facilitating shared and distributed focus:** Collaboration always contains divergent and convergent episodes of activity. Thus the focus of group members needs sometimes to be shared and sometimes to be distributed. Under mobile circumstances it is extremely difficult or ineffective to schedule strictly the begin and end of convergent phases. Furthermore there are no natural means for the facilitator to regain focus of the group, once it got lost. To support the facilitation of mobile collaboration a system can provide means to regain focus and thus synchronise activities. MExplorer allows the facilitator centrally to start and stop sessions on clients. The stop of a session makes players coming back to a designated location. This function is a very radical one. Other available means are sending SMS to all group members or using a notification functionality. It is important to separate strictly media channel of moderation from other communication channels.
- **Facilitating process and evolutionary planning:** An agenda is typically a document to give orientation and steer a process. For mobile groups an agenda must be much richer, more powerful, and much more flexible. It becomes the most sufficient center of focus and attention. A common agenda contains the sequence of activities, associated times and owners. A mobile agenda should additionally contain associated links to tools and documents. It needs furthermore a space for awareness about the current status of work and group members. As a mobile process can hardly be fully planned and determined in advance, a mobile agenda must be very flexible. Discontinuous participation requires low restrictions for edition by various group members. As the process is an issue of consent, there must be room for annotations in order to discuss, rate and vote for single entries. MExplorer does not contain any agenda functionality yet. For this reason the design of mExplorer trusts still very much on physical control within a limited area in a synchronous setting with collocated phases. But mExplorer provides process support in sequencing algorithm for locations, activities and tasks.
- **Facilitating shared and mixed representations:** Due to the limitation of screen size and computational power of mobile devices, representation of communication and material becomes a challenge of structuring them. MExplorer concentrates all relevant activities on one window with only little need to switch to other windows. We found it meaningful to make use of different devices for different purposes, like PDA for orientation and mobile phone for communication. Furthermore the whole physical context must be seen as interface.
- **Mapping of digital and physical world:** Collaboration of mobile groups is not supposed to be barely digital, but takes place in their real environment. The

physical context can be enriched by digital means, if there is a mapping functionality. MExplorer's main screen is based on a map of the physical area.

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Learning Preferences in Negotiations

Rudolf Vetschera

Department of Business Studies, University of Vienna
rudolf.vetschera@univie.ac.at

It is often argued in the negotiation literature that in order to follow an integrative bargaining style and obtain efficient outcomes, negotiators need to develop an understanding of the other parties' goals and preferences (Keeney and Raiffa, 1991; Sebenius, 1992; Kersten, 2001). Yet, so far there is a lack of objective instruments to measure how much information about the partner's preferences can be learned during negotiations. In this paper, we develop such an instrument using an approach from decision analysis, and illustrate the use of this instrument in an empirical study.

Our approach to measure preference information is based on the domain criterion for sensitivity analysis (Eiselt and Laporte, 1992; Schneller and Sphicas, 1983). We assume that preferences can be represented by an additive linear utility function

$$u(X) = \sum w_k x_k \tag{1}$$

where x_k are suitably scaled values of an issue $k = 1, ..., K$ being negotiated and w_k are subjective weights, which represent the preferences of a negotiator towards the issues. Within this framework, uncertainty (and conversely information) about the opponent's preferences corresponds to uncertainty about the weights.

When no information at all is available about preferences, all weight vectors fulfilling the technical conditions

$$\begin{aligned} w_k &\geq 0 \\ \sum w_k &= 1 \end{aligned} \tag{2}$$

are considered to be possible. When it can be observed that a negotiator prefers an alternative X^i over another alternative X^j, a constraint of the form

$$\sum w_k x_k^i \geq \sum w_k x_k^j \tag{3}$$

is created, which reduces the set of possible weight vectors for that negotiator. Constraints (2) and (3) define a polyhedron in $K-1$-dimensional space. The volume of this polyhedron represents the remaining uncertainty about the negotiator's preferences. The smaller this polyhedron becomes, the more has been learned about the preferences of a negotiator.

In the empirical part of our study, we use two forms of constraints (3). When an agreement is reached in a negotiation, it can be assumed that a negotiator prefers all the offers he has made before to the agreement, and prefers the agreement to all offers made before by the opponent (otherwise, one would return to an offer previously on the table). We denote the volume of the resulting polyhedron by V_1. A weaker set of constraints, which is available also in negotiations without agreement, can be obtained from the condition that a negotiator prefers all of her own offers to all offers made by the opponent. The measure obtained from these constraints is denoted by V_2.

To test the validity of V_1 and V_2 to measure the extent that learning of preferences is possible in a negotiation, we analyzed 2,162 negotiations performed using the NSS Inspire (Kersten and Noronha, 1999). The following hypotheses were studied:

- **H1:** There is a positive relationship between the amount of preference information that can be learned during a negotiation as measured by V_1 and V_2, and the subjective impression of negotiators how much they have learned about their opponent's preferences.
- **H2:** There is a positive relationship between reaching an agreement and the amount of preference information that can be learned during a negotiation.
- **H3:** There is a positive relationship between the efficiency of agreements and the amount of preference information that can be learned during a negotiation.

To test hypothesis H1, we performed a correlation analysis between the answers to two questions in the post negotiation questionnaires of Inspire and our measures V_1 and V_2. The two subjective questions referred to whether the opponent was considered to be informative during the negotiations, and whether the negotiators believed to understand the opponent's priorities. Both variables were measured on a five point Likert scale, where 1 indicated the highest and 5 the least amount of learning.

Measure		Opponent Informative	Understood priorities
V_1	ρ	-0.0713	-0.0158
	p	0.0044	0.5261
V_2	ρ	-0.0166	-0.0731
	p	0.5078	0.0034

H1 must clearly be rejected. Only two correlations are significant, and, since smaller values of V_1 and V_2 indicate more learning, in both cases the sign contradicts our expectations. Thus, subjective measures of learning measure different effects than our two domain based measures.

Hypothesis H2 can only be tested for V_2, since here we have to compare negotiations that reached an agreement and negotiations that did not.

		Agreement	No agreement
V_2	Mean	0.6844	0.8506
	SD	0.3282	0.2490

A nonparamteric Wilcoxon test shows that the difference between means is highly significant ($W = 649354, p < 0.0001$). Since the volume of the remaining polyhedron is smaller, more could be learned in negotiations that reached an agreement. In contrast to our measure, there was no significant difference in how informative negotiators were perceived between the two groups of negotiations. In negotiations that reached no agreement, negotiators believed to have developed a better understanding ($M = 3.6839$) than in negotiations with agreement ($M = 3.9139, p = 0.0011$).

		Efficient	Inefficient
V_1	Mean	0.5539	0.5969
	SD	0.3586	0.3611
V_2	Mean	0.6348	0.7012
	SD	0.4511	0.3373

H3 can be tested for both our measures and they both indicate more learning in negotiations that led to an efficient agreement. This difference is significant at $p = 0.0284$ for V_1 and at $p < 0.0001$ for V_2. In contrast, both subjective measures indicated significantly less learning in negotiations that led to an efficient agreement. Thus, our empirical results show that domain-based measures can provide more reliable information about the learning of preferences in negotiations than purely subjective measures.

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Part XVII

Negotiation System Design

The Divergent Information Management System DIMSys

Francisco Antunes[1], João Paulo Costa[2], and Paulo Maççãs[1]

[1] Department of Management and Economics, Beira Interior University, Portugal
francisco.antunes@ubi.pt
macas@ubi.pt
[2] Faculty of Economics, Coimbra University, Portugal
jpaulo@fe.uc.pt

One of the problems of not having a digital organizational memory is that the organization relies a great deal on the workers' memory to retrieve the reasons of past decisions and actions. However, as workers gain increased mobility within the market due to the economy's globalization, as well as more flexible work laws. The possibility of leaving the present organization is directly related to a greater risk of loosing information on organization's processes. Besides that, the geographical distribution of decision agents and managers imposes new challenges to human resources management as managers' knowledge may not be available every time.

This situation becomes an increased hazard to the organization when management documents assume the shape of short reports with directives to organizational action, without explaining the intermediate steps for reaching a decision. In this case, such knowledge is confined to the involved managers' memory, and/or to intermediate documents that are kept in some sort of paper archive. Such situation does not help the creation or development of an integrated solution (computer system) to be digitally accessible across the organization. That system can become vital when defining key business concepts or variables that need to be watched over time (desired return rates, future perspectives on economical factors, expected performances, etc.), reducing (or even eliminating) the need for redundant operations or discussions over the same subjects. By creating an organizational repository, the business keys are available to be directly used into organizational projects, creating a relationship network between main issues and project assumptions or performances. In this way, managers can perceive the relationships among projects using the information network (and attain whether there can be synergies among them). It can also give them the information on the evolution of business factors, as such key issues (variables) can be updated over time.

To accomplish this goal it becomes necessary to explicitly define the key issues to be analyzed within a document and their values. This process is directly associated with the creation of semi-structured documents where explicit data structures are declared in order to be reused/manipulated. This approach goes beyond simple natural language text files that still represent a large percentage of the produced information. The data structures allow their reuse by applying a simpler technological solution, when compared to the ones applied over natural language text files (such as artificial intelligence techniques) in order to produce information extraction and categorization.

Probably the better known solution to provide semi-structured documents is XML (Extensible Markup Language), which organizes a data-structure (using user-defined tags) into a file in order to be reutilized. It can enforce validation features (like the ones implemented by XML document type definition, DTD, or by XML schema) that can enhance the possibility to integrate data structures within an organization or business logic. However, this solution, by itself, does not evidence the evolution of the defined structures over time and therefore is fitter to handle persistence rather than building a relationship network. Also, data tags that identify information structures within the documents are user-defined and so, it can be extremely difficult to recognize them from an organizational repository. The use of XML editors also demands a specialized knowledge on informatics which usually is not a part of the manager's skills, or of the management science teaching itself.

Though there are several approaches to deal with the evolution of documents (as a file) over time using operational transformations and versioning systems, they are unable to describe the individual evolution of a document's content (the key issues and their values that are described within the document's body). Versioning systems do not deal with semi-structured documents. Besides that, such solutions do not aim at knowledge management or organizational memory creation. It seems then, that a solution that could encompass the structuring capabilities of a meta-annotation language (as XML) and the features to manage information evolution over time (of versioning systems) would be of great importance in order to build the digital organizational memory described before.

By allowing the organization to collectively access the organizational memory, divergent information should be expected, not only as a result of operating shared resources, but also as decision agents rebuild, update and relate the information structures (whether synchronous or asynchronously). As such, the system should also go outside the extent of locking mechanisms and replicated databases, as they limit the analysis of the divergent information that is generated within managers' discussions. That situation is mainly due to the fact that locking and replication assume divergence as an abnormal process that should be avoided, or at least that should endure the least amount of time possible, especially when asynchronous work is involved.

In order to circumvent such issues we developed a computer system (the Divergent Information Management System - DIMSys), based on the divergent information model (DIM). This information model embeds data structuring capabilities and an information linking structure, using it to bridge divergent information support features and divergence capabilities to help/improve knowledge creation and retrieval, enhancing documents' expressiveness. The divergent information model combines consistency (or ability to retain meaning within a certain context) and linking capabilities to ensure that shared information artifacts can be represented and manipulated without integrity loss (even though users may attempt to make simultaneous or conflicting operations). This line of work can especially benefit decision agents in retrieving and recognizing the reasons that led users to diverge in their work, helping them to increase the understanding of past decisions. We therefore aim at bringing closer GDSS to knowledge management theory, using the divergent information model.

The referred information model aims at creating a cognitive mold to enable the implementation of an information system to augment information's utility in divergent situations (from both programming and usage perspectives) and also to create a platform where people can share codified, systematic knowledge while cooperating creatively in an organized environment.

As a computer system, DIMSys is intended to overcome the limitations of earlier solutions in order to build a system of integrated information structures, to encompass divergent information existence (its management and solving), as well as to produce semi-structured documents derived from the information structures, without the need for specialized computer skills. The system also makes use of pre-agreed divergence resolution rules to deal with divergent information.

Both issues and values, as defined by the divergent information model, are inserted in the structuring environment under the form of collaboration discussions (as main issues) and organized into topics (sub-issues), which receive the contributions (values) of the working group. As users insert the information, the system transparently manages versions, divergence status, convergence rules, information associations and meta-data (mainly referring to authoring, creation dates and identification for indexing).

All the discussions can be retrieved using the visual map, which expresses the discussion sequence, as well as it status (whether regarding versions or divergence). Such a tool proves to be quite valuable when users are trying to understand past occurrences (providing the "knowledge path" of both issues and values), by visually organizing information so that it makes sense to the user.

So, DIMSys provides a working environment to manage issues that are likely to become divergent over collaboration discussions, using the divergent information model. The system's usage demonstrates the applicability of the information model, as divergence is well managed (as there are no inconsistencies or integrity loss on the information artifacts). Allying versioning capabilities to issues and also establishing their rules for divergence management (convergence) makes the divergence process manageable without the need for locking mechanisms that can hinder collaboration. It also creates a quite understandable way to represent the complexity of the discussion and the followed paths (and also the reasons and methods to do so), in order to achieve the issues' final values.

NegoSys: An Environment for the Management of Knowledge in Negotiation

Melise M. V. Paula[1], Rodrigo P. de Oliveira[1], Rodrigo Severiano[1], and Jano M. de Souza[2]

[1] COPPE/UFRJ - Computer Science Department, Graduate School of Engineering , Federal University of Rio de Janeiro,Brazil and IMG - Granbery Institute of The Methodist Church, Juiz de Fora, Brazil
mel@cos.ufrj.br
rodrigopadula@cos.ufrj.br
rodrigoseveriano@cos.ufrj.br
[2] DCC-IM/UFRJ - Computer Science Department, Mathematics Institute, Federal
jano@cos.ufrj.br

1 NegoSys

In negotiations, personal character defines an inter-dependence between those who take part in it, regarding decision-making. On the other hand, the social aspect represents an inter-dependence amongst these participants, who have to act as a group in order to attain their goals. This antagonism contributes towards the complexity of this process, a fact that makes the creation of efficient computing mechanisms for the support to negotiation more difficult. The goal of this work is to present NegoSys, an electronic negotiation environment that has been undergoing preparation based on two models: a decision model and a negotiation model.

The decision model set in NegoSys was created based on Precritive/Descritive perspective proposed by Raiffa (1982). In NegoSys, the knowledge management is used to prescribe the behaviour of negotiators through the capture and re-use of knowledge acquired during the negotiation. The negotiation model used in NegoSys was based on an adaptation of the 3C Model proposed by Fuks et al. (2002). To negotiate one needs to exchange information (communication). Some activities require the joint operation of the parties (co-operation), apart from an organization of these activities (coordination). The exchanges that take place during communication generate the commitments that are managed by coordination which, in its turn, organizes and orders the tasks that are executed in co-operation.

This way, the architecture employed in NegoSys consists of two layers: the Negotiation layer, named Negotiation Table, and the Knowledge layer, named KMN (Knowledge Management in Negotiation). Apart from the layers we defined the Regulator and Facilitator agents, as well as the Memory of Negotiation, which is the component in the architecture that is responsible for storing all forms of knowledge created.

2 Negotiation Table

At the Negotiation Table the functional components related to the support of the negotiation process, which is bilateral and sequential, are created. In NegoSys, the communication is carried out through the exchanges of synchronous and asynchronous messages that are qualified according to the intention of negotiators. The coordination is done according to the rules defined in the Model of Negotiation. In this model the process starts with the sending of a negotiation proposal. When the proposal is accepted, the activity of preparation is triggered, in which negotiators should carry out some tasks such as BATNA preparation, analysis of interests, and options' investigation. Apart from that, in NegoSys, it is the negotiators that define the attributes that are to be negotiated. Thus, during preparation, from the analysis of their interests, negotiators must set the attributes they intend to negotiate, associating them to their respective reserve values and desirable values. After preparation, the interaction begins between the negotiators who must 'negotiate' which attributes will be considered. Having defined them, negotiators interact in order to negotiate the values for these attributes. Should it be in the interest of negotiators, new attributes can be negotiated.

The negotiation can be finalized at any moment by one of the negotiators; in this event, the process is concluded without an agreement. On the other hand, in the case where all of the attributes set by the negotiators have had their values negotiated, the negotiation ends with an agreement, the contract being formalized as a result. Finally, negotiators must start the Evaluation activity as defined in the model. This evaluation was made in the Evaluation of Negotiation and Strategy Adopted, Agreement Evaluation e Counterpart Evaluation.

In NegoSys, The Regulating Agent is the component of the architecture that is responsible for ensuring that the flow of activities defined in the model is followed by the negotiators. The Facilitating Agent, in its turn, is responsible for the perception defined in the model of negotiation from which the negotiators get to know about the activities carried out in the system.

3 KMN (Knowlede Management in Negotiation)

In KMN, a definition is made for the modules that support knowledge management. To make the identification of knowledge sources easier, from the analysis of negotiation literature, a negotiation glossary was created that defines the competences related to the process. In the Centre of Competences Module, the specialists and documents that can facilitate decision-making during the negotiations are associated to their respective competences. In the Module for Similar Negotiations, negotiators can consult the Memory of Negotiation. For that, some search criteria were defined such as, for example, counterpart identification. The dissemination of knowledge amongst allied negotiators is done from the Communities Module, where Discussion Forums can be created, and which are associated to one of the competences defined in the negotiation glossary.

The practices adopted in negotiations, successful or unsuccessful, represent useful knowledge that can be reused both to stimulate the adoption of successful practices and to avoid the considering of adoption of unsuccessful strategies. In KMN, the Centre for Best and Worst Practices Module was created in which negotiators can share adopted practices. Another form of knowledge considered in NegoSys is related to the context in which the negotiation is being conducted. In some cases, decision-making can be influenced by external data that is supplied by organizations, in the case of, for example, data on the economy. In KMN, the Yellow Pages Module allows negotiators to register this data in association with their supplier, specifying the intervals with which data is supplied, their availability and degree of precision.

Still in KMN, negotiators can consult the Negotiation Workflow which represents the flow of activities carried out during the process. In the Workflow a representation is made for the history of activities executed from the Negotiation Table and a plan for activities that have not yet started. The tasks that have to be executed are associated to each activity, highlighting the state in which they are found at a given moment: in course, not started or finalized. Apart from the tasks defined at the Negotiation Table, which are called standard tasks, negotiators can associate, to each model activity, a non-standard task. As an example, consider the case where a negotiator has consulted a specialist in the Centre of Competences or has analyzed data available in the Yellow Pages module, he/she can share this information from the insertion of a non-standard task, encouraging other negotiators to consult the same knowledge source in other negotiations that take place in a similar context.

The NegoSys has been used by students of the Federal University of Rio de Janeiro and the evaluation of the system has been accomplished based on other works in the literature (Kersten and Noronha, 1998; Köhne et al., 2005). It is important to point that, independently from the context where it is applied, knowledge management depends on the culture of the people involved in the process. Apart from this, for the knowledge to be truly shared, strategies that stimulate knowledge workers must be considered; in this case the negotiators being the knowledge workers, to have them share their experiences. However, as the focus of this work is placed on the technology as a facilitator for knowledge management in negotiation, these aspects are not considered.

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How to Use GeNCA to Develop Your Negotiation Application?

Marie-Hélène Verrons

Laboratoire Leibniz - IMAG – CNRS UMR 5522
38 031 GRENOBLE, FRANCE
verrons@imag.fr

Last year, we showed that GeNCA was the best alternative when you need to develop a negotiation application (Verrons and Mathieu, 2005). This year, we present how to use GeNCA to develop a negotiation application. In this article, we first give an overview of GeNCA and then we take the example of a meeting scheduling application to show the development process with GeNCA.

1 An Overview of GeNCA API

GeNCA (Mathieu and Verrons, 2005) is a generic model and an API for negotiating contracts over resources. It is aimed at facilitating the design and development of negotiation applications and at being used by software agents as well as by human beings. It is built on three levels: a negotiation level, a communication level and a strategic level. As a matter of fact, the way agents communicate doesn't play a role in the way negotiation is made, and different communication ways can be used in a same application executed on different environments.

It is also important to separate the negotiation strategy from the two other levels, to allow a user to choose which negotiation strategy he will use without disturbing the remaining of the application. Moreover, the negotiation strategy is intrinsically linked to the negotiation application.

The negotiation level of GeNCA contains a general negotiation protocol and a management of conflicting negotiations that allows to process them either sequentially or simultaneously. The generic protocol used is an extension of the CNP in order to provide counter-proposals. Parameters to specialise the protocol are set up in a file. Among these parameters, we can cite the number of agreements needed to confirm the contract, answer delay and default answer, number of rounds in the negotiation process, retraction possibility and number of renegotiations allowed. If retraction is possible, renegotiations are made automatically in GeNCA.

The API (written in Java) is composed of several packages according to the levels of the model. The `communication` package is responsible for the exchange of messages between agents. We have defined a client/server architecture for communication between agents. Each agent has to subscribe to the server in order to enter the negotiation application. Then, each message is sent to the server which is responsible for delivering it to the agent concerned. By doing so, we prevent agents from knowing each other and communicating directly in order to avoid coalition formation. The main interface is `Communicator` which defines two methods, one for an agent to send a message to the server and the other for the server to send a message to an agent. The API provides some implementations of the communication level like e-mail communication or communication for the MAS platforms Magique and Madkit.

The `negotiation` package contains the essential classes for negotiating. `Resources` and `Contracts` are defined there. In the API, contracts contains the resources that will be negotiated, the initiator of the negotiation and the answer delay and default answer for the proposal. The `Negotiator` is responsible for the negotiations management and interacts with the `Communicator` for sending messages. Each negotiation is assigned to one `microagent` which interacts with the `Strategies` for decision making, enabling the system to negotiate many contracts simultaneously. It also provides tools for creating strategies such as two preference lists, one over resources and the other over participants. The protocol is also included in this package.

The `strategy` package contains the classes responsible for decision making during negotiations. As there are two roles in the negotiation protocol, two interfaces `InitiatorStrategy` and `ParticipantStrategy` have been designed which define the behaviour of the initiator or participant during the negotiation process. Initiators take decisions such as confirming and cancelling contracts and proposing new ones when the first proposal doesn't fit enough participants. Participants must decide if they accept or reject contract proposals and make counter-proposals. GeNCA provides a default strategy for each case that takes into account the preferences of the user over resources and over participants.

The API provides also a `gui` package. A graphical interface allows the user to create his contracts and answer proposals by himself if he wants to. He can also monitor his negotiations.

This API has been used to achieve several applications like an appointment taking system, an auction system and a negotiation game (Mathieu and Verrons, 2004). The API and examples are available at `http://www.lifl.fr/SMAC/projects/genca`.

2 The Meeting Scheduling Example

We take the example of a negotiation application for appointment taking. Each agent must be able to negotiate rendezvous for the user. Each user defines a diary with time slots free or not and keeps this diary secret. In addition, he gives preferences on slots and on persons with who he prefers to take appointments. Each user can initiate an ask for a rendezvous with one or more participants on one or more time slots.

Contracts in GeNCA involve resources, so the first thing to do is to define the resources that will be negotiated and the persons who will negotiate. For the meeting scheduling example, the resources are time slots and there will be as many agents as persons that may take part to a meeting.

Note: If the negotiation involves more attributes, they must be defined and the `Contract` class must be extended to incorporate them. This has been done for two auction applications.

Then parameters specific to the application must be defined. Retraction and renegotiations are typically numerous in meeting scheduling applications, so retraction is allowed. Renegotiation is done automatically in GeNCA. The whole negotiation management is provided in GeNCA. You can choose to negotiate your contracts always simultaneously or to negotiate those which have conflicts over resources sequentially. In meeting scheduling, we choose the sequential management. You'll also need to plug the `Negotiator` into your agent to give him the negotiation skill.

The way your agents communicate must also be defined. If you need to plug the negotiation ability into an existing application, you'll need to indicate the way agents communicate by implementing the `Communicator` interface. For the meeting scheduling application, we can use the e-mail communication and agents provided with GeNCA.

The main development work is defining the strategies used by the agent to negotiate for the user. As a matter of fact, strategies are specific to the application: you won't negotiate during auctions as you would do during appointment taking. So you have to implement the two interfaces `InitiatorStrategy` and `ParticipantStrategy`. For the meeting scheduling application, the default strategies provided by GeNCA can be used as there is no other parameter added to the contract.

To conclude, GeNCA offers a quick and easy framework for developing a negotiation application. The main work is to define the resources to negotiate, the parameters of the application and the strategies to use. Then you have to define your agents and give them the negotiation and communication abilities.

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Part XVIII

Teams and Organizations

Incentives and Monitoring in Virtual Organisations

Manuela Aparício[1] and Carlos J. Costa[2]

[1] Lusocrédito, Lisboa, Portugal
manuela@lusocredito.com
[2] Department of Information Sciences and Technologies, ISCTE, Lisboa, Portugal
Adetti/ISCTE, Lisboa, Portugal
carlos.costa@iscte.pt

1 Principal Agent Theory

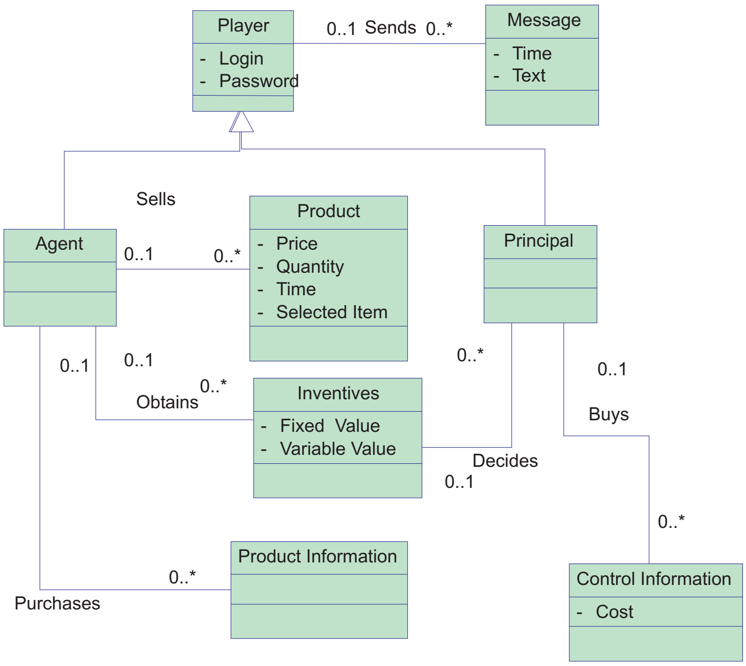
Using game environment is a usual approach either in research (e. g. experimental economics, military studies) either in education (e. g. business management). A simulation framework is being developed to analyse the problem of incentives and monitoring in virtual organisations. The purpose of the framework is to analyse several behavioural variables. Those variables are the results of principal and agent behaviour as consequence of their interaction and answer to modifications in independent variables.

The agency theory describes a relationship in which one part (the principal) delegates work to another (the agent), who performs that work. A major problem raised by the agency theory concerns partial goal conflicts between principal and agent. In order to solve the agency problem, the principal can monitor the agent behaviour or effort, and give incentives depending on the agent results (Eisenhardt, 1989; Jensen, 1983; Ross, 1973).

The importance of agency problem depends on the outcome uncertainty, risk aversion of principal or agent, level of goal conflict between principal and agent, task programmability, outcome measurability, length of agency relationship or information system (Eisenhardt, 1989; Jensen, 1983). Among studies on the impact of IT in organisations, it is important mentioning Gurbaxani and Whang (1991). Lal (1986) also analysed the centralisation and decentralisation of power based on the agency theory. Furthermore, in the context of a virtual organisation (Mowshowitz, 1997) understood as a computer augmented organisational system, monitoring and incentives can be supported by information technologies.

2 System Description

The proposed framework tests agency hypotheses using dyads interacting through computers in a game environment. This system has four actors: agent, principal, client and information supplier.



A simulation framework is being developed to analyse the problem of incentives and monitoring in virtual organisations. The principal may also choose to see agent results (performance): he pays to see agent results and sees the trade performance (result). The agency problem can be mathematically presented in the following form. For the experimental propose we made several assumptions.

$$\begin{aligned} \max: \quad & U_p = P_0 - R_a - M \\ s.t. \quad & R_a - E_i = U_a \\ & C_i = \arg(\max(R_a - E_i)) \end{aligned}$$

Utility level of principal (U_p) is revenue of principal (P_0) less the revenue of agent (R_a) and cost of monitoring (M). Revenue of agent (R_a) and effort performed by agent (E_i) correspond to the utility level of agent (U_a). C_i is the price paid by agent to obtain information. The revenue of the principal depends on a guess (g_i) made by the agent.

This guess depends on a set o value, whose knowledge depends on the effort made by the agent (E_i). This effort is equivalent to the price that he pays ($E_i = C_i$).

$g_i \epsilon \rfloor I(C_i^A), S(C_i^A) \lfloor$

The agent revenue is a decision of the principal. He takes that decision based on the verification of effort (V_e) as well as the verification of result (V_r). Those functions have respectively as independent variables the effort made by the agent and the number of observations of the effort made by the principal (C_i and O_e) and the result of each action of the agent and the number of observations made by the principal (R_i, O_r).

$R_A = F(Ve(C_i^A, O_e^P), Vr(R_i^A, O_r^P))$

The monitoring cost depends on the unitary cost and the number of times of effort and result observation:

$M = p_e O_e^P + p_r O_r^P$

This experimental framework is designed to test some behavioural variables. Those behavioural variables are: (1) Price decision (agent or principal), (2) Agent effort (buying), (3) Incentives based in sales volume, and (4) Incentives based in effort (payment for information). In our framework, we designed a set of independent variables that are related to IT characteristics. Those variables are (1) same place (face to face)/different places, (2) cost of access to market information (principal), (3) cost of communication between agent and principal, and (4) cost of monitoring of agent behaviour and results.

3 Simulation Framework Implementation

The experimental framework is developed with Internet technology. Each dyad is composed of a principal and an agent, interacting with standard Web browsers.

In the decentralised scenario, the principal gives to the agent a code of a product to be sold. The agent will buy information about the correct price to an information supplier. Based in this information (a set of values), the agent has to guess a price and sell the product to the client. The client will buy as much of this product if the guess is not far from the “correct price”. The principal monitors the agent’s effort, a function of the value that the agent pays for the information. Neither the agent nor the principal knows this function.

There is also a centralised scenario, where the principal makes the guess, but the agent gives the information to the principal. The agent chooses the product to be sold from a list of products and he puts a numbers (ex: price). The principal receives the money. In order to set a correct number (price), the agent has to buy information: he pays according to a fitness level, chooses the product and gets the information. Before paying the agent, the principal may choose to monitor behaviour (effort): the principal pays to see agent behaviour (effort) and sees the level of effort performed by the agent.

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Leadership and Virtual Distance in Virtual Teams: A Research Review and Agenda*

Raquel Benbunan-Fich[1], Starr Roxanne Hiltz[2], and Rosalie Ocker[3]

[1] Zicklin School of Business, Baruch College, CUNY
rbfich@baruch.cuny.edu
[2] New Jersey Institute of Technology
hiltz@njit.edu
[3] The Pensylvannia State University
rocker@ist.psu.edu

1 Overview

Virtual teams, especially "global virtual teams" (GVTs) have become increasingly widespread as a mode of operation for both managerial and technical collaboration and decision making. Despite the significance of leadership in Group Decision Support Systems and as a topic in the management literature, and the wealth of empirical studies focused on leadership effectiveness in traditional and computer-supported groups, there is little research examining leadership in virtual teams. This shortage may be the result of a multitude of perspectives to explain virtual team effectiveness and the inability to explore some of them due to the novelty of this research field, and/or the pragmatic complexities of studying leadership in actual virtual teams.

The paper presents a literature review of leadership and virtual teams, especially as they differ in terms of "virtual distance" among members, and identifies potentially fruitful research questions to guide future efforts in this area. First, we present an overview of the concepts of virtual teams and of dimensions of "virtual distance". Then, we examine the different theoretical perspectives on leadership. Next, we review the relevant empirical literature focused on the topic of leadership in virtual teams and the findings of each of these prior studies. We identify important unanswered research questions and present some hypotheses related to the relationship between dimensions of virtual distance, and requirements for effective leadership in virtual teams. Finally, we summarize the results of a pilot study of leadership in partially distributed teams and our plans for future research. This extended abstract summarizes the sections on conceptualization of virtual distance, and research questions about the relationship between virtual distance and effective leadership for virtual teams.

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2 Virtual Teams and Virtual Distance

Virtual teams are generally defined as groups that (1) are identified by their organization(s) and members as a team; (2) are responsible for making and/or implementing decisions important to the organization; (3) use technology-supported communication substantially more than face-to-face communication; and (4) work and live in different geographic locations (Maznevski and Chudoba, 2000). Because they persist over time and typically use substantial asynchronous computer-mediated communication, facilitation must be by leaders within the team, not through outside process facilitation.

Although most prior research has tended to dichotomize work teams as virtual or nonvirtual, and co-located or dispersed, in fact most project teams today involve some mix of face-to-face and virtual interaction, and dispersion or "virtual distance" can be conceived of along several continuums. Most obvious are distance and time dispersion. What is the distance in terms of "crow flies" miles or travel time? This will affect ease of getting together for face to face meetings. What is the temporal distance in terms of time zones? As Kayworth and Leidner (2000) discuss, being separated by many time zones can create major hurdles for virtual teams, because this makes it very difficult to schedule synchronous forms of communication for the group.

In an influential working paper, O'Leary and Cummings (2002) developed conceptual distinctions and measures for configurational dispersion, distance dispersion, and time dispersion. Of particular interest is their definition and measures for configurational disperson. "Geographic configuration" is defined as the arrangement of members across sites. This has two dimensions, site distribution and degree of member isolation. In terms of site distribution, the more sites at which team members work, the more dispersed a team is. The "isolation index" is defined as the percent of team members who are at sites with no other team members. This affects possible subgroup formation to work on some tasks face to face. In their study of 115 multi-site teams, O'Leary and Cummings (2002) found that the greater the dispersion among team members, as measured by distance, time, or configuration, the less frequent the communications within the teams.

Building on prior work conceptualizing and measuring dispersion, Lojeski et al. (2006) developed and validated a construct called Virtual Distance that includes social and cultural distance measures as well as the degree of dispersion related to distance, time, and degree of co-location, and applied it to 115 project teams. Relational distance refers to the difference between team members' organizational affiliations, and cultural distance refers to the extent to which members are from the same national or cultural background. They found that virtual distance influences trust, goal clarity and organizational citizenship and indirectly has an influence on innovativeness and project success. In other words, teams spread over more time zones and geographical locations, and teams with members from different organizations and nations/cultures have more problems and need special attention to leadership or management in order to be effective.

Thus, it can be expected that dispersion or "virtual distance" provides special challenges for team leaders, and may interact with the nature of leadership roles that will be most effective for virtual teams.

3 Virtual Team Leadership: Research Questions

We reviewed seven studies of leadership in virtual teams; Hiltz et al. (1991); Kim et al. (1998); Lurey and Raisinghani (2001); Kayworth and Leidner (2001); Weisband (2002); Yoo and Alavi (2004); Misiolek and Heckman (2005). It is important to point out that in these studies, the teams are fully (rather than partially) dispersed and the leader is part of the group. After reviewing these studies, several research questions arise. First, empirical examinations of leadership either allow leaders to emerge (Yoo and Alavi, 2004; Misiolek and Heckman, 2005), designate leaders (Kayworth and Leidner, 2001; Kim et al., 1998), or allow teams to select a leader at the beginning of the exercise (Hiltz et al., 1991). Clearly, behavioral based analysis of leadership may produce different results depending on the process used to determine a team leader (e. g., emergent, designated, selected by team).

In particular, it is possible that if leaders are assigned or appointed, there is no opportunity to observe distributed leadership behavior. The underlying premise of the studies that assigned leaders to teams is that leadership functions are centralized in one person. However, recent evidence from Misiolek and Heckman (2005) suggests that virtual teams with emergent leaders may exhibit a decentralization of functions across individuals, whereby several team members exercise different leadership functions at different times.

Additionally, regarding the relationship between leadership and team effectiveness, several studies agree that the presence of leaders improves team performance and that leadership behavior involves both social and task-related functions. Although only task-related functions are related to being perceived as a leader in virtual teams (Yoo and Alavi, 2004; Misiolek and Heckman, 2005), social functions and group maintenance are equally important, particularly in virtual teams.

In summary, the following research questions were identified by this literature review:

- What leadership qualities are important to lead a virtual team?
- Can a virtual team be leaderless and still effective?
- Are virtual teams with emergent leaders more effective than teams with elected or designated leaders?
- Which leadership approach is more beneficial (centralized or distributed — designated or emergent)? Is this contingent on the types or degree of virtual distance among team members (time dispersion, distance dispersion, cultural diversity, geographic configuration)?

We suggest that these issues need to be studied in a set of field experiments or studies. Our initial hypothesis is that centralized, designated leadership is more beneficial for smaller and less dispersed and less diverse teams; whereas distributed and emergent leadership will be more beneficial for teams with greater degrees of virtual distance among members. The full paper describes the results of a pilot study of leadership in partially distributed teams and the design of the experiments we plan to conduct to test this hypothesis. In addition, we would also like to conduct field studies of leadership effectiveness in actual organizations working in with partially distributed teams, especially in the area of decision making for emergency response operations.

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Performance Variability and Project Dynamics

Bernardo Huberman and Dennis Wilkinson

HP Labs, 1501 Page Mill Rd., Palo Alto, CA
huberman@hpl.hp.com

1 Introduction and Motivation

One of the main challenges in a large design project or, more generally, any problem solving process, is the coordination of the different tasks comprising that project or process (Galbraith, 1977). Coordination is particularly difficult in situations where the complexity of the project leads to its division into concurrent, interdependent tasks whose results must be dynamically integrated into an overall satisfactory solution. Examples are large-scale software design projects, engineering design projects, and industrial research and development efforts. It has long been recognized that because of the coupled nature of the component tasks such problem solving processes are inherently iterative in their execution. Information from the partial solution to a given task can trigger a chain of revisions as solutions to other, related tasks are modified (van Zandt, 1999).

A number of formal models of cooperative processes have been proposed to predict the number of iterations required for completion, or to suggest optimal concurrency and iteration schemes which minimize the overall time or cost. One notable approach is the work transformation matrix model, which provides a simple mathematical representation to estimate the number of iterations required for a given arrangement of coupled tasks (Smith and Eppinger, 1997; Browning et al., 2002).

Helpful as these models are, they do not account for the frequent situation in which projects enter a vicious cycle of continuing revisions resulting in budget overruns, missed business opportunities and delays which, at times, can make the final solution obsolete. A major factor leading to these undesirable outcomes is the unpredictable fluctuations in the value that a particular unit of work on a single task brings to the overall project. In order to take into account these fluctuations, recent models have focused on individual sources of variability, including asynchronicity and random timing of task updates and information exchange information withholding, exogenous changes volatility of resource allocation, behavioral choice uncertainty of performance evaluation and the complicated landscape of performance maxima and minima.

However, since these models are not stochastic in nature, they do not account for the random and unpredictable nature of project dynamics. This variability is an intrinsic and unavoidable element of any complex cooperative project. Stochastic elements arising from a limited number of sources have been included in several recent modeling efforts, which rely on computer simulation to predict evolution of one or several particular project architectures. In contrast, the goal of this paper is not only to provide a tool for prediction for an arbitrary project with any architecture, but also to make a general study of effects such as project size, interaction strengths, and size of stochastic fluctuations on project evolution.

As we show, the evolution of a set of coupled tasks can vary greatly depending on the structure of the interdependencies, fluctuation strength, and other parameters, so that a general treatment is necessary to study these effects. The simple formulation of our model and the analytical results it provides clearly elucidate the role played by these parameters in a project's evolution, in agreement with previous empirical studies. Furthermore, in conjunction with previous techniques, the model may be used as a predictive tool to determine a range of probable outcomes for various architectures, and to identify those sources of fluctuation which most affect the dynamics.

2 The Model

This paper presents a general study of iterative problem solving processes using a mathematical model which explicitly incorporates the fluctuating nature of task performance and interdependence. The model uses the well-established formalism of the work transformation matrix (WTM) to describe the dynamics of the process. In the WTM model, progress on a given project is described by a state vector which represents how much work is left to be done on each of the component tasks. The work rates and interactions between tasks are encapsulated in the work transformation matrix itself. As the project proceeds, the state vector is updated at each time step according to multiplication by the WTM.

The crucial fluctuating component is included by varying the elements of the WTM at each updating step. Progress towards an overall solution is thereby represented by a stochastic dynamic process. Such a process captures the erratic nature of the evolution of real-world projects and their component tasks. A range of possible outcomes is obtained, including average behavior and likelihood that the evolution deviates significantly from the average. As we show, the mathematical effect of fluctuations and thus the behavior predicted by our model is consistent with previous empirical results and computer simulations on the evolution of cooperative processes.

3 Theoretical Results

We first show that the time to solution increases on average as the number of interactions in the project increase, in agreement with empirical results. Also, we show that as the average strength of the fluctuations increases, the time to completion increases, also in agreement with empirical studies. We demonstrate that a hierarchical or modular project architecture can, on average, alleviate the problem of large convergence time, as previously proposed and in agreement with empirical results and previous studies.

Moreover, because of the temporal variability of the fluctuations, evolution towards solution of any particular instance of a project can differ greatly from the average behavior. As a result, projects which would converge smoothly to solution in the absence of fluctuations can deviate significantly from this path. When the temporal variability is low, convergence to a solution is smooth and the finishing times are distributed close to the average value. But above a given threshold in variability, the distribution of finishing times undergoes a transition to a heavy-tailed log-normal form. This distribution is in agreement with earlier empirical results on cooperative problem solving and implies possible finishing times far greater than the average.

Finally, we show that the effect of fluctuations is more severe in projects which converge slowly to solution. This implies that hierarchical organization not only can decrease the average time to solution, but can also mitigate the possibly unavoidable or uncontrollable effects of fluctuating interactions and work rates.

4 The Model as a Tool for Managers

The model is general and it may thus be applied as a predictive tool to any given project. It is necessary to use numerical inputs relevant to the project which may be obtained as described in the literature. The results of this paper which are directly applicable to a given project, once the numerical inputs have been determined, include: a prediction of the average time to completion of each phase of a project; a range of probable finishing times and the likelihood of significant deviations away from the average value; and a critical value for the strength of the fluctuations, above which fluctuations are very likely to cause significant delays. Furthermore, by varying a project's architecture as a model input, a manager can determine which project architecture is the most advantageous, and identify those interactions and sources of fluctuation which hinder progress the most. Depending on the situation, it may be possible to alter the architecture or implement other strategies to reduce these negative effects.

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Modeling Board Decisions

Hagen Lindstädt and Michael Wolff

Institute of Business Studies and Management, Karlsruhe University
lindstaedt@ibu.uni-karlsruhe.de
wolff@ibu.uni-karlsruhe.de

1 Introduction

In contrast to companies that are run by their owners, business decisions in companies run by management boards are made by groups of individuals with different qualifications and heterogeneous objectives that may differ from those of the owners. The members of the board will assess alternative action differently, depending on individual assessments of the situation and personal goals. From an economic point of view, it is particularly interesting to see how the shareholders assess the quality of the decision made by the board. If, as will be assumed in the following, the shareholders are only interested in the economic position of the company, then it follows that each of them will only be interested in the long-term financial success of the decision that he has delegated to the managers.

The shareholders are faced with either making a decision themselves or delegating it to a group of managers. By delegating to the board the shareholders can hope to reach better decisions, i.e. improving the company's profitability, because of managements' superior knowledge or qualification. On the other hand, each manager pursues his own goals which may differ from those of the shareholders ('personal interests'). The goals of the managers can, however, be at least partly compensated for by an incentive system that offers them a share in the profit made when the owners' goal is achieved. Compensation by means of an appropriate incentive system of course generates reward costs for the owners and so reduces their total gain. The trade-off between the managers' personal interests, their incentives, their qualification, and the board size is central for the model. The following meta decision problem results for the share-holders: They have to find an optimum way of matching incentives, group composition, and rules of group decision with their own goals while taking qualification, conflicting goals and reward costs into consideration.

2 Reference to the Relevant Literature

This problem calls to mind the multiagent approaches of agency theory (Holmström, 1982; Nalebuff and Stiglitz, 1983; Mookherjee, 1984) that deal mainly with the derivation of optimum incentive systems. These approaches generally stem from the assumption that a random, functional dependence exists between a level of activity related to the disutility of the agent's work and a profit-related output. The output depends on the joint level of activity of the agents and on stochastic factors. These random influences cannot be observed by the principal, or at least not without cost, and can result in the type of misbehavior known as moral hazard. These models are based on the idea that the individual agent's activities influence the total output or profit, while the agents are indifferent of the solution itself. In making management decisions, however, it would seem that the level of activity of the managers is less of a critical factor than their qualification and the personal interest they attribute to the alternative courses of action. A manager's decision in favor of an action may be associated with a gain in prestige or other well-founded personal interests such as the broadening of his own field of activity or sphere of influence.

Issues of information pooling by interaction and voting under conflict of interest and strategic behavior have recently gained some interest again. It is often believed that strategic voting behavior has a negative influence on decision quality. For example, Che and Yoo (2001) analyze "negative effects of agent's collusion" in a multiple period model and a different setting. Interestingly enough, we find that in our model strategic voting behavior in the board actually improves decision quality on average. In the presence of heterogeneous information dealing for example with mutual expectations, the difficulties for a dynamic modeling of interaction are enormous. Binder and Pesaran (1998) and Li et al. (2001) provide good and more detailed discussions of this issue. The latter have, however, restricted themselves to the choice between two actions.

The paper presents a model for management decisions that, unlike the agency theory, takes the managers' personal interests in the possible courses of action into account. After the board of managers has been assembled and the go-ahead from the shareholders has been received, an autonomous decision is made without any further intervention. The managers evaluate the actions firstly on the basis of their own information and then on the basis of shared information. In so doing they behave in a rational, utility-maximizing manner. Due to personal interests in the actions, a conflict of aims between shareholders and managers exists, resulting in moral hazard as a consequence of uncertainty as to whether a manager picks an action on the basis of high profit expectation or because of his personal interests. Unlike the disutility of work in the agency theory however, the managers associate personal interests with the actions themselves and not with the disutility of work that would be associated with working and processing information. A level of activity as in the agency theory is thus not necessary. Instead, distribution assumptions about personal interests among the actions are required. To compensate for the conflict of aims due to personal interests, the managers are given an across-the-board share in the actual profit that is realized at a later date from the action chosen by the board. This incentive generates reward costs and, along with personal interests, has an influence on the managers' utilities. Each shareholder's capital is presumably well enough diversified to justify the assumption that he is risk neutral. Therefore, all shareholders can be assumed to have the same linear utility function with respect to the decision's profit.

Most or all of the factors have already been analyzed with more sophistication and analytical depth than possible in a single paper. Our main contribution is the integration of these factors into a single framework, thereby enabling us to look at dependencies, interrelations and trade-offs between the contingency factors.

3 Results

From a shareholder's point of view the quality of the decision made by a group of managers is dependent on numerous factors, the most important of which this paper investigated in detail with regard to their importance and type of influence. The primary influence of these factors on decision quality is determined mainly by three categories: predictive power, conflicting goals and reward costs. Higher predictive power results in better decision quality, while a growing conflict of aims and increasing reward costs taken for themselves have a negative effect. Via one or two of these main determinants, the factors have varying effects on expected decision quality. In the paper, we demonstrate the impact of these trade-offs on decision quality using a simulation tool.

All in all, higher qualification of the managers has a positive effect on mean decision quality due to an increase in predictive power. A greater importance of personal interests leads to a deterioration of decision quality due to a greater conflict of aims. An increase in the size of the board has a positive effect on decision quality due to its greater predictive power, while at the same time increasing the conflict of aims within the group due to the payment of bonus rates being more expensive. Just as for an increase in bonus rate, the resultant effect in this case depends on the concrete problem. A higher bonus rate reduces the net quality of the decision due to the reward costs being more expensive. At the same time it has a positive effect on decision quality due to its primary effect of lessening the conflict of aims from conflicting interests. Strategic behavior reduces the impact of conflict of aims within the board and thus increases mean decision quality if a common reward is paid, and if there is no common goal in the board that negatively correlates with the decision's expected pay-off. We are among other things able to calculate optimal group sizes for different scenarios.

In view of the growing influence of management groups investors would be wise not to just take the qualification and risk aversion of individual managers into account but also, when putting together a board of managers, to take into consideration their personal interests and the group-based factors like strategic behavior that would result from combining the individual characters.

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Leadership Fit on Team Efficacy in Diverse Teams: The Effects of Organizational Culture and Communication Media

Yong-Kwan Lim[1] and John Lim[2]

[1] University of Oklahoma, Price College of Business, 307 W. Brooks, Suite 307E, Norman, Oklahoma 73019-4006
yong-kwan.lim@ou.edu

[2] National University of Singapore, Kent Ridge Singapore 119260, Republic of Singapore
jlim@nus.edu.sg

In today's competitive global economy, firms are capitalizing on the use of diverse teams as they could offer key abilities and contribute toward the resolution of organizational issues (Webber and Donahue, 2001). Due to an increasing representation of women and minorities in organizations and that contemporary organizations are becoming more distributed both geographically and temporally, the workforce is bound to be more diverse with respect to several aspects such as race and functional background (Chatman and Spataro, 2005).

Driven by the increased reliance on diverse teams which form an important facet of organization, a considerable body of research has emerged which attempts to examine the impact of team heterogeneity on group processes and effectiveness (Webber and Donahue, 2001). However, the effects of diversity on group effectiveness are somewhat equivocal as concluded by Williams and O'Reilly (1998) in their extensive review of 40 years of diversity studies. The incorporation of contextual factors could provide a plausible explanation to these mixed findings (Williams and O'Reilly, 1998). Prior research has indicated leadership as a key variable in small group decision-making (Hoyt and Blascovich, 2003), as well as the demographic "fit" between the leader and members of the team as a possible moderating element (Kirkman et al., 2004). However, the literature which examines the interplay among leadership, demographics and diversity is still in its infancy (Jackson et al., 2003). The first objective of this article is to propose the effects of the degree of fit between team leaders' demography and the demographic heterogeneity of the team on team efficacy. The resulting proposed model extends the study of Kirkman et al. (2004) by examining the relationship involving "fit" and collective efficacy. Given the fact that demographic heterogeneity may be conceptualized in terms of overt demographic variables such as gender and race or less visible elements including functional background and organizational tenure (Pelled, 1996; Harrison et al., 2002), this paper focuses on team heterogeneity along several dimensions—gender, race, age, group tenure and functional background—so as to determine the differential impact of various diversity attributes on collective efficacy, an area that is much lacking in prior organizational research (Webber and Donahue, 2001).

Several major theories including similar-attraction paradigm and social identity theory have purported the dysfunctional effects of diversity on group functioning and performance. Given that collective efficacy relates positively to performance and the apparent vital role leaders play in influencing group decision-making and shaping group processes, this paper argues that a better fit between team leaders' demography and the demographic heterogeneity of the team will lead towards higher collective efficacy.

In this paper, we choose to focus on collective (team) efficacy rather than individual efficacy as the latter does not demonstrate clearly the communal beliefs of members as a team to attain a certain level of accomplishment for a given task which requires high degrees of interdependence, coordination and complexity—typical characteristics of a task handled by groups in organizations.

Evidence on the importance of organizational context in influencing diverse team effectiveness can be found in several empirical studies (Chatman and Spataro, 2005). The current work contributes to the growing body of diverse teams research by adopting a multilevel approach in our model and considering the moderating impact of organizational culture. More importantly, this approach will provide a more holistic picture of the effects of diversity on group processes and performance.

Another objective is to discuss the moderating effect of communication media on the relationship between group diversity and group effectiveness. The emergence of computer-mediated communication (CMC) has brought about fundamental changes in the organizational landscape. Given that there is an overall decrease of social contextual cues and a lack of visual appearances in a text-based CMC environment, it may therefore be inappropriate to assume that moderating factors which impact team effectiveness for collocated teams would be applicable to diverse teams completing work assignments in a technology-mediated environment.

We propose how organizational culture and communication media may moderate the mentioned relationship; more importantly, whether or not the factors would help in overcoming the dysfunctional effects of demographic dissimilarity between team leaders and members of a team is of concern.

This article draws upon a variety of disciplines to include perspectives regarding organization, diversity and computer-mediated communication for the formulation of a contingency theoretical model that will be useful in examining the influences of diversity.

In essence, the effectiveness of diverse teams is contingent upon three major constructs: the fit between demographic status of the leader's and the team's demography, organizational culture and communication media. These areas must be acknowledged and considered critically in order for the purported benefits of diverse teams to be realized. The theoretical model presented in this paper opens opportunities for future research, particularly in empirical aspects.

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Meaning Negotiation: Applying Negotiation Models to Reach Semantic Consensus in Multidisciplinary Teams

Jairo Francisco de Souza[1], Melise Paula[1], Jonice Oliveira[1], and Jano Moreira de Souza[1,2]

[1] COPPE/UFRJ - Computer Science Department, Graduate School of Engineering, Federal University of Rio de Janeiro, Brazil
jairobd@cos.ufrj.br
mel@cos.ufrj.br
jonice@cos.ufrj.br

[2] DCC-IM/UFRJ - Computer Science Department, Mathematics Institute, Federal University of Rio de Janeiro, Brazil
jano@cos.ufrj.br

1 Introduction

In our global economic and information readiness, information overload is a fact, not a theory, and there is evidence that most people lack the skills or tools to keep up in the Knowledge Age. Nowadays, all major economic players have decentralized organizational structures, with multiple units acting in parallel and with significant autonomy (Bouzeghoub and et al, 2004). Currently, computational tools and humans have to handle a variety of information sources, with data in several formats, patterns and different quality degrees. Grasping relevant information wherever it may be and exchanging information with all potential partners has become an essential challenge for enterprise survival. The reason that makes semantics so important is that information now has to be sharable and disseminated in a faster way, in a distributed environment, where people or software do not necessarily share a common understanding (Bouzeghoub and et al, 2004).

Another issue which emphasizes the importance of semantic and a common consensus is the on growing of multi-disciplinary teams, present in all domains of activities. While multi-disciplinary teams are common in all kind of environments, it is more problematical to find a common vocabulary, a meaning agreement, which will aim in information and knowledge exchange, besides a common understanding of tasks, activities and works.

Emergent semantic aims to establish semantic interoperability from a consensus, in relation to interpretations that are common in a particular context. Considering the evolving character of information, whose semantics is enriched by interpretation, handling, and use in a particular context, the interoperability is conditioned by the way as the concordance of interpretations on the meaning is established.

Negotiation arises from this context as a process that is appropriate for the construction of consensus. However, as interpretations are not necessarily shared at first, semantic interoperability becomes dependent of the frequency, quality, and efficiency with which such negotiations are conducted in order to achieve agreement. In the negotiations that encompass meanings and interpretations, each participating agent can be regarded as an independent decision-maker that carries its own individual perception and judgment regarding the issues under consideration.

How in negotiation all the parties involved have to contribute for the agreement not to be reached in an unilateral fashion, it can be seen as inter-dependent decision process. Taking into account that each negotiator possesses different knowledge, experiences and focus, the conciliation of objectives or meanings contributes to the complexity of this kind of negotiation. Thus, there is the need for establishing a management of the process of consensus formation, guaranteeing the incremental and evolving aspects of these agreements.

Bearing this assertion in mind, the goal of this work is to present a model of negotiation to obtain the consensus of meanings, that is, semantic consensus, which represents a structured way to deal with the possible conflicts, and with the multiplicity of ideas, making this negotiation a productive process, and a way of creating value for all agents involved by the by the creation of an ontology (which is a common and structure vocabulary). In our approaches to meaning negotiation process, several concepts presented in literature about negotiation are considered and adopted for meaning negotiation context, for example, the BATNA and interest-based approach. In the end of the negotiation, all information which helps to represent the context — as BATNAS, previous domain ontologies, importance and malleability degrees, the attempts at ontology integration and the log of the negotiation table (with the messages IBIS categorization), and the final ontology - are storage for future access.

2 Related Work

There are several works dealing with some related issues, such as information integration, schemas and ontology matchmaking, negotiation in agents' communication and context elicitation. An extended analysis of Emergent Semantic Systems is made in Bouzeghoub and et al (2004) and computational mechanisms can be found in this reference. In Behrens and Kashyap (2001) we found a consensus approach for deriving semantic knowledge on the Web. The significance of information sharing and distribution of cultural knowledge has encouraged some researchers to exploit consensus, measured by inter-subject agreement, as an indicator of knowledge. The method of Consensus Analysis was first presented in several seminal papers (Romney and et al, 1986; Batchelder and K., 1986,?; Batchelder and Romney, 1988). In addition to introducing the formal foundation for Consensus Analysis, the initial papers cited above also provided examples of its application to modeling knowledge of general information among US college students, and the classification of illness concepts among urban Guatemalans. Other more recent applications of Consensus Analysis have focused on measuring cultural diversity within organizations (Caulkins and Hyatt, 1999) and different degrees of expertise in organizations and communities of practice creation (Rodrigues and et al, 2005).

In the literature, the ontologies have been considered for development of Negotiation Support Systems. In (Jertila and Schoop, 2005), the negotiation roles and issues are represented by ontologies. The ontology specifies the background for negotiation partners. Moreover, the contract defined during negotiation is also represented by elements of the ontology. In this work, our objective is to use already-known techniques of negotiation, usually employed in the business scenario, to facilitate the ontology integration process. Therefore, the ontologies represent the issues that will be negotiated. This fact represents one of the aspects that differs our work of the others that have been found in the literature.

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List of Contributors

Susanne Abele
Miami University, Oxford

Fran Ackerman
University of Strathclyde, Glasgow

Carlos E. Acosta
Universidad de Chile

Mark Adkins
Center for the Management of Information, Arizona

David Andersen
State University of New York, Albany

Francisco Antunes
Beira Interior University

Manuela Aparício
Lusocrédito, Lisboa

David Arnott
Monash University, Melbourne

Deepinder S. Bajwa
Western Washington University, Bellingham

Christian Barz
Universität Karlsruhe (TH)

Clare Bayley
University of Manchester

Raquel Benbunan-Fich
Zicklin School of Business

Morad Benyoucef
University of Ottawa

Carsten Block
Universität Karlsruhe (TH)

Klemens Böhm
Universität Karlsruhe (TH)

Pieter Bots
Cemagref, Montpellier Regional Centre
Delft University of Technology

Tatiana Bouzdine-Chameeva
Bordeaux Business School

Robert O. Briggs
University of Alaska Fairbanks
Delft University of Technology

John Bryson
University of Minnesota

Réal Carbonneau
HEC Montréal

Eva H. Chen
Concordia University, Montreal

Xin Chen
Universität Karlsruhe (TH)

Ye Chen
University of Waterloo

Carlos J. Costa
ISCTE, Lisboa

João Paulo Costa
University of Coimbra

Katherine A. Daniell
CEMAGREF UMR G-EAU, Montpellier
ANU, Canberra
ENGREF, France
CSIRO, Melbourne

Karsten Dietz
SAP AG, Karlsruhe

Her-Sen Doong
National Chiayi University

Colin Eden
University of Strathclyde, Glasgow

Karl-Martin Ehrhart
Universität Karlsruhe (TH)

Jamshid Etezadi-Amoli
Concordia University, Montreal

Nick Feltovich
University of Houston

Nils Ferrand
CEMAGREF UMR G-EAU, Montpellier

Michael Filzmoser
University of Vienna

Charles Finn
Empire State College, Albany

Niki Frantzeskaki
Delft University of Technology

Simon French
University of Manchester

Dirk Frohberg
University of Zurich

Henner Gimpel
Universität Karlsruhe (TH)

Andrea Graf
University of Regensburg

Luis A. Guerrero
Universidad de Chile

Magnus Gunnarsson
Göteborg University

Joel H. Helquist
Center for the Management of Information, Arizona

Dirk Heylen
University of Twente, Enschede

Starr Roxanne Hiltz
New Jersey Institute of Technology

Keith W. Hipel
University of Waterloo

Christian Hoppe
Universität Karlsruhe (TH)

Xianhua Huang
Concordia University, Montreal

Bernardo Huberman
HP Labs, Palto Alto

Sandra van der Hulst
Delft University of Technology

Atsushi Iwasaki
Kyushu University

Yücel Karabulut
SAP AG, Karlsruhe

Gregory E. Kersten
Concordia University, Montreal

Claudia Keser
IBM T. J. Watson Research Center
CIRANO, Montreal

D. Marc Kilgour
Wilfrid Laurier University, Waterloo

JinBaek Kim
Concordia University, Montreal

Des Klaas
Curtin University of Technology, Perth

Gary Kleinman
Robert Morris University, Moon Township

Sabine T. Koeszegi
University of Vienna

Frank Köhne
University of Hohenheim

Gwendolyn Kolfschoten
Delft University of Technology

Ludmilla Koshlai
Institute of Cybernetics

John Kruse
Center for the Management of Information, Arizona

Jens Kügler
University of Hohenheim

Conny Kühne
Universität Karlsruhe (TH)

Jonas Kunze
Universität Karlsruhe (TH)

R. Labaki
Bordeaux Business School
University of Montesquieu Bordeaux IV

Carolina M. Laborde
Universität Karlsruhe (TH)

Hsiangchu Lai
Sun Yat-Sen University, Taiwan

Peter Leidner
SAP AG, Karlsruhe

L. Floyd Lewis
Western Washington University, Bellingham

John Lim
National University of Singapore

Yong-Kwan Lim
University of Oklahoma

Huang-Chi Lin
National Chiayi University

Wan-Jung Lin
National Sun Yat-Sen University, Taiwan

Hagen Lindstädt
Universität Karlsruhe (TH)

Stefan Luckner
Universität Karlsruhe (TH)

Simone A. Ludwig
Concordia University, Montreal

Paulo Maçãs
Beira Interior University

Tak Mak
Concordia University, Montreal

Bilyana Martinovsky
Institute for Creative Technologies

Paulo Melo
Coimbra University

Mikhail Mikhalevich
Ukrainian Academy of Foreign Trade

Moritz Mink
Universität Karlsruhe (TH)

Daniel Mittleman
DePaul University CTI

José María Moreno-Jiménez
University of Zaragoza

Amer Obeidi
University of Waterloo

Rosalie Ocker
The Pensylvannia State University

Sobei H. Oda
Kyoto Sangyo University

Jonice Oliveira
Federal University of Rio de Janeiro

Rodrigo P. de Oliveira
Federal University of Rio de Janeiro

Katja Ostertag
University of Hohenheim

Marion Ott
Universität Karlsruhe (TH)

Norbert Palanovics
Nagoya University, Japan

Guiseppe Paleologo
IBM T. J. Watson Research Center
CIRANO, Montreal

V. Pallas
University of Montesquieu Bordeaux IV

Dan Palmon
Rutgers University, Newark

Melise M. V. Paula
Federal University of Rio de Janeiro

Graham Pervan
Curtin University of Technology

Eva-Maria Pesendorfer
University of Vienna

Leah R. Pietron
University of Nebraska at Omaha

Anke Plog
Universität Karlsruhe (TH)

John de Reuck
Taylors College, Perth

George Richardson
State University of New York, Albany

Jesus Rios
Rey Juan Carlos University, Madrid

David Rios-Insua
Rey Juan Carlos University, Madrid

Etiënne A. J. A. Rouwette
Radboud University Nijmegen

Heiko Schepperle
Universität Karlsruhe (TH)

Olive Schmidenberg
Curtin University of Technology, Perth

Björn Schnizler
Universität Karlsruhe (TH)

Mareike Schoop
University of Hohenheim

Gerhard Schwabe
University of Zurich

Stefan Seifert
Universität Karlsruhe (TH)

Rodrigo Severiano
Federal University of Rio de Janeiro

Melvin F. Shakun
New York University

Benedict Sheehy
University of Newcastle

Majid Sheikhmohammady
University of Waterloo

Jairo Francisco de Souza
Federal University of Rio de Janeiro

Jano Moreira de Souza
Federal University of Rio de Janeiro

Katharina J. Srnka
University of Vienna

Dirk Staskiewicz
University of Hohenheim

Kendra Stockmar
Universität Karlsruhe

Ephraim F. Sudit
Rutgers University, Newark

Katia P. Sycara
Carnegie Mellon University

Ruth Ter Bush
DePaul University CTI

Alexis Tsoukiàs
Université Paris Dauphine

Ofir Turel
McMaster University

Murray Turoff
New Jersey Institut of Technology

Alberto Turón
University of Zaragoza

Rustam Vahidov
Concordia University, Montreal

Andreas von Vangerow
University of Hohenheim

Marie-Hélène Verrons
Laboratiore Leibniz, IMAG, Grenoble

Rudolf Vetschera
University of Vienna

Gert-Jan de Vreede
University of Nebraska at Omaha

Danielle E. Warren
Rutgers Business School - Newark & New Brunswick

Ilka Weber
Universität Karlsruhe (TH)

Sebastian Weber
University of Hohenheim

Christof Weinhardt
Universität Karlsruhe (TH)

Dennis Wilkinson
HP Labs, Palto Alto

Michael Wolff
Universität Karlsruhe (TH)

Nan Zhang
University of Manchester

In the tradition of its preceding meetings, the seventh international conference "Group Decision and Negotiation (GDN) 2006" aims at bringing together researchers in the areas of Group Decisions, Negotiations, and Negotiation Support Systems. Participants share a common research focus on complex decision problems, which involve multiple stakeholders with their sometimes very different interests, as well as the different information, mind-sets, and emotions they bring to the bargaining table. The interdisciplinary research does not only seek to improve our understanding of group decision, negotiations, and market processes, but also to support decision makers, negotiators, and market engineers in achieving better outcomes.

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