Supporting Negotiations in Many Ways - Gregory Kersten's Scientific Achievements Over Four Decades

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GDN 2021
Virtual conference hosted by Ryerson University
June 6-10, 2021

Overview

- The beginnings: Conceptual models and mathematical programming
- A brief detour into propositional logic
- The Web: Inspire
- A focus on behavior
- Beyond negotiations: Auctions, multilateral negotiations and mechanisms

The beginnings

Gregory E. Kersten is an Assistant Professor at the Carleton University School of Business. From 1973 until 1984 he was an Assistant Professor in the Management Organization and Development Institute in Warsaw. He received his M.A. in Econometrics and Ph.D. in Economic Science-Operations Research from the Central School of Planning and Statistics in Warsaw. He is the author and co-author of more than twenty papers and two text-books, most of them published in Polish. He is also the co-developer of two MIS for short and medium term macroeconomic planning. Dr. Kersten's present research interests are in the area of decision support systems, group decision making and multiobjective mathematical programming.

G. Kersten: NEGO: Group Decision Support System. *Information and Management* 8 (1985), 237-247

NEGO: The basic ideas

- Problem is formulated as a multiobjective programming problem
- Group members specify wants (objective functions in which they are interested) and demands (aspiration levels on these functions)
- System proposes a compromise that fulfills all demands as far as possible
- Group members adjust demands to find a compromise

NEGO: The user interface

NO	OBJECTIVE	WANTS & DEMAND		DM 1	DM 2	DM 3	MEANS
1	WAGES PROD.	MAX	0.0	25.886	7.200	-2.618	10.156
2	BONUSES PROD.	MAX	0.0	10.271	-1.000	-5.455	1.272
3	PROFIT PROD.	MAX	0.0	11.429	8.000	4.364	7.931
4	TOTAL PROFIT		0.0	12.714	18.000	15.273	15.329
5	EXPORT		0.0	13.679	25.500	23.455	20.878
6	WAGES SERV.		0.0	-7.714	12.800	17.891	7.659
7	PROFIT SERV.		0.0	1.286	10.000	10.909	7.398

DO YOU WANT TO SEE ALL PROPOSALS IN GRAPHIC FORM? IF YES WRITE 1, IF NOT WRITE 0.

1 @@@@@

DO YOU WANT TO NEGOTIATE - TO FIND A COMPROMISE DECISION? IF YES, WRITE 1, IF NOT WRITE 0.

1 @@@@@

CHOOSE YOUR OBJECTIVES - WRITE THEIR NUMBERS. AT THE END WRITE 0.

1 @@@@@

3 @@@@@

0 @@@@@

Implemented on an IBM 370/148 mainframe

What we already see here …

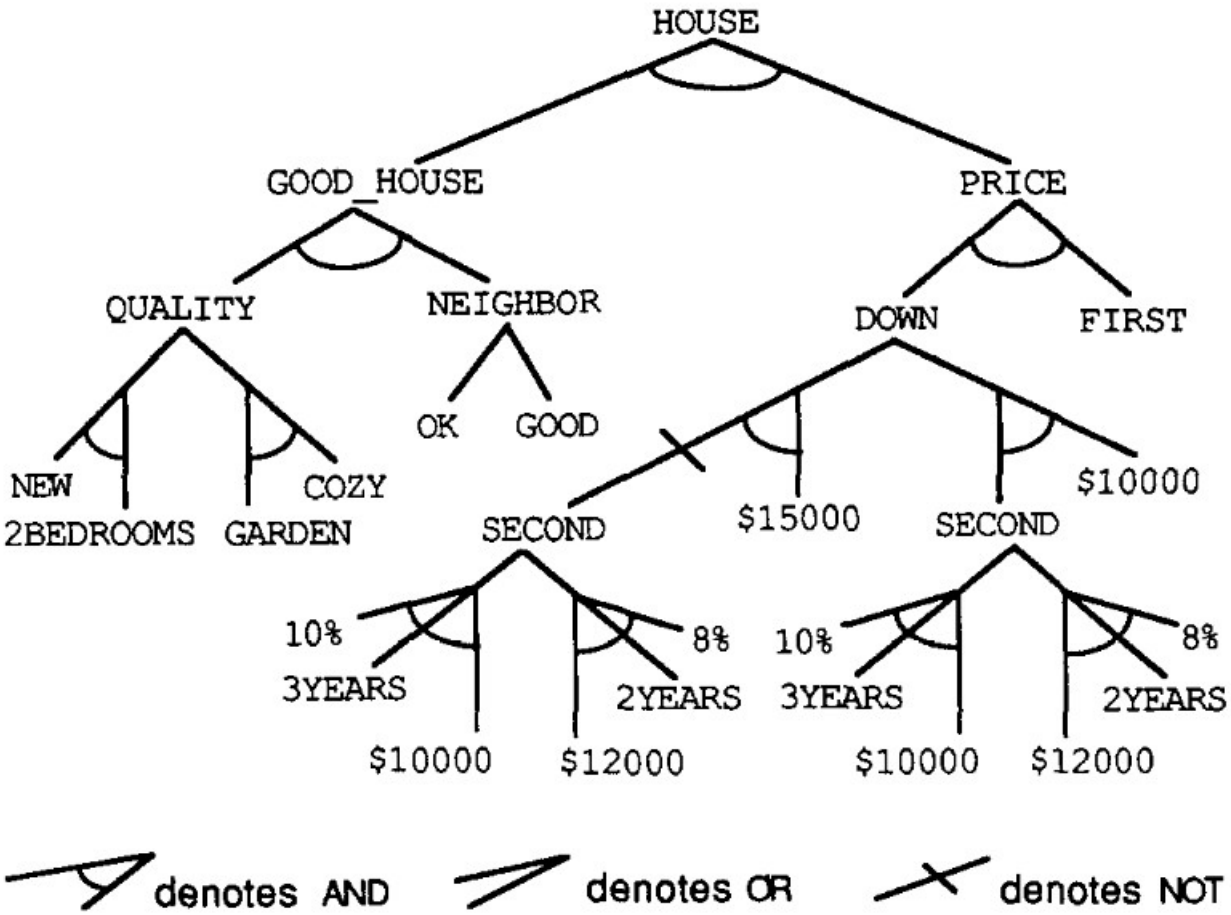
- Rigorous methods
- combined with a concern to accommodate different types of behavior (here, aspiration-based decision making)
- and the wish to bring theory to the end user in an easily accessible form

The next step: NEGOPLAN

G. Kersten: Expert Systems Technology and Strategic Decision Support. *Mathematical and Computer Modelling* 12 (1989) 1321-1333

"NEGOPLAN is a prototype decision support system for negotiation. It uses rule-based formalism for problem representation and modification, and it has been designed for the purpose of support of one party in two-party negotiations."

NEGOPLAN:
Problem representation as tree



NEGOPLAN Highlights

- Problem represented in tree structure
- Allows to identify if positions are compatible
- Response rules for adjusting tree
  - Anticipate opponent's response
  - Provide own response

Again we see …

- A concern for realistic models of negotiator's behavior
- A continuing interest of using the latest technology

The Web: Inspire

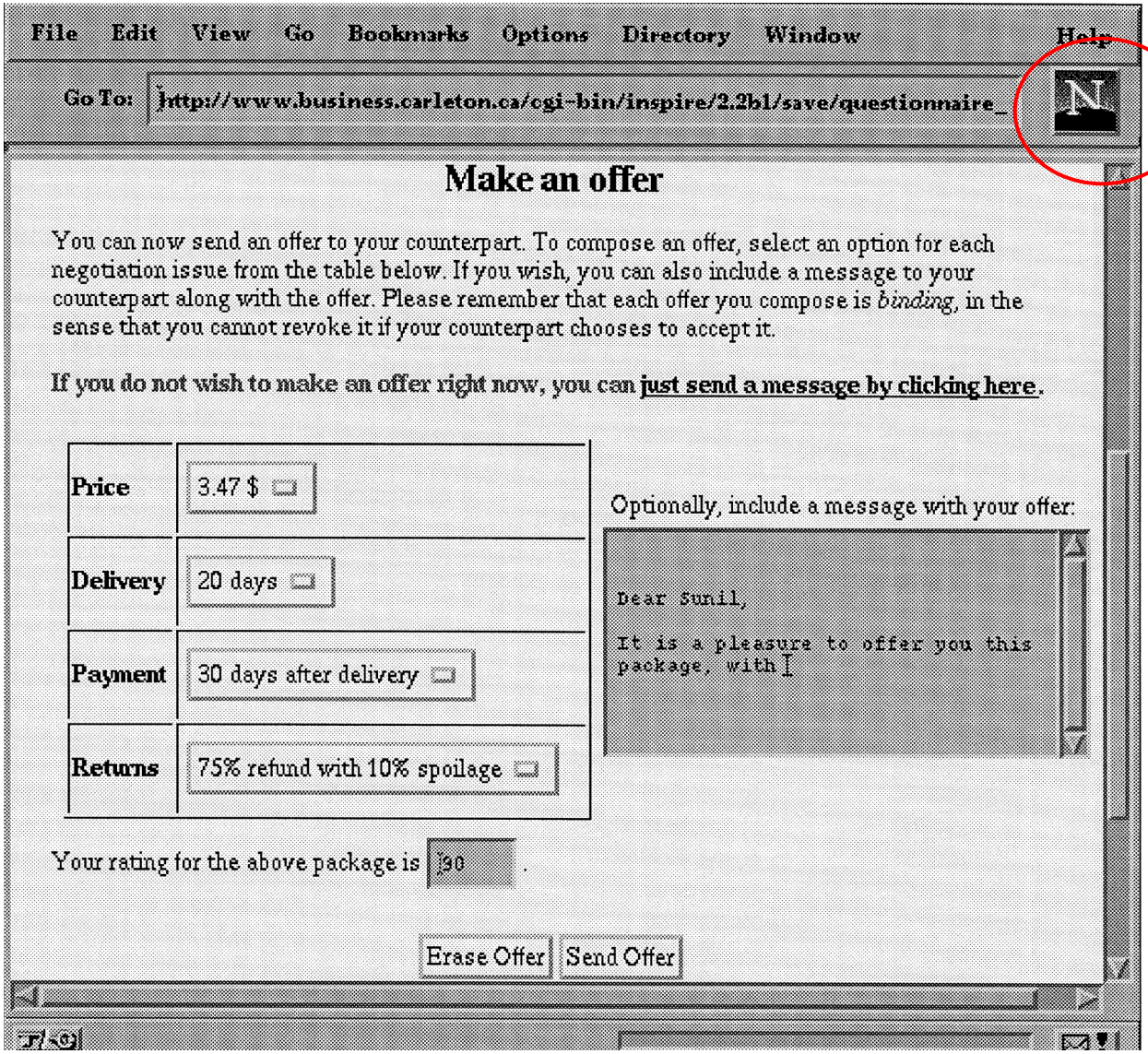
G. Kersten, S. Noronha: WWW-based negotiation support: design, implementation, and use. *Decision Support Systems* 25 (1999) 135-154

Gregory's most cited paper, > 560 citations in Google Scholar

Inspire

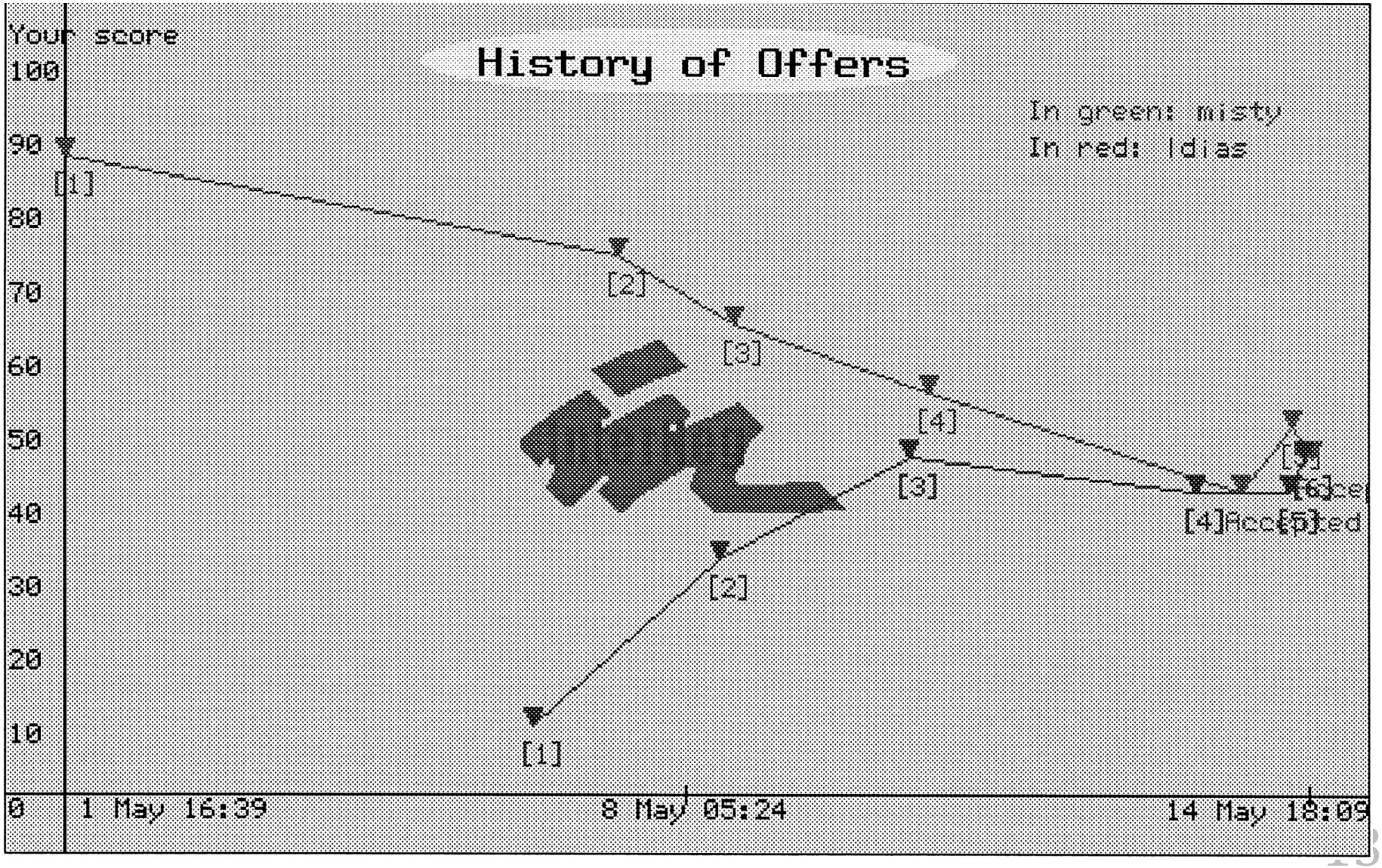
- First Web-Based NSS
- Integrates decision support (by eliciting multi-attribute utilities) with communication support (structured offers and unstructured messages)
- State of the art client-server architecture
- Supports entire process
  - Pre-Negotiation: Preference elicitation
  - Negotiation: Exchange of offers and messages
  - Post-Negotiation: Pareto improvements

The Web: Inspire



Remember Netscape Navigator?

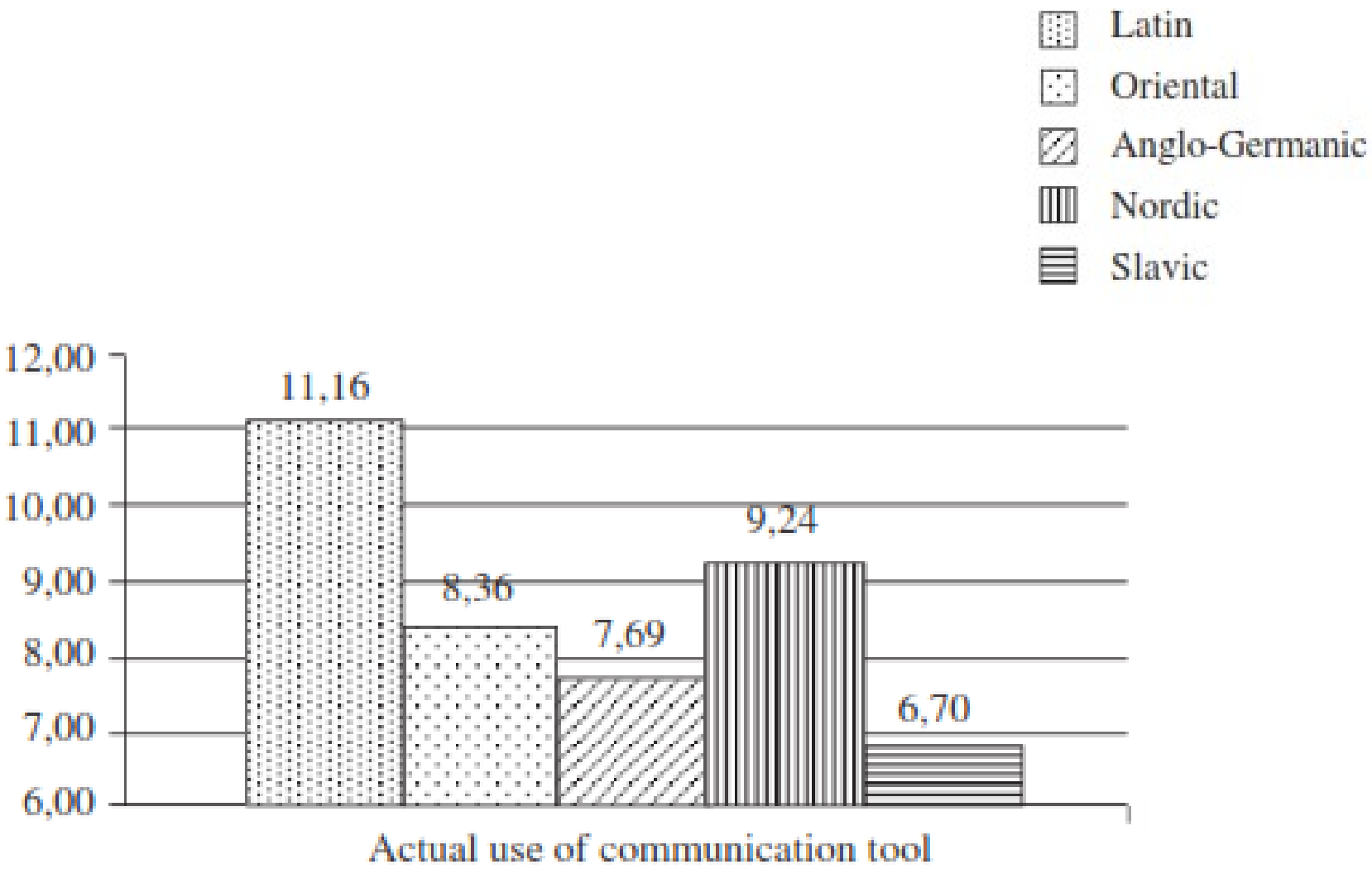
Inspire: Negotiation Graphs



Inspire: the impact

- Used for teaching and research
- Freely available on the web
- Global base of users
- Starting point for empirical research on e-negotiations
- Google scholar search for “Inspire Kersten negotiation”
  ≈ 5,900 hits, topics such as
  - Culture
  - User evaluation of e-negotiation systems
  - Negotiation processes
  - Teaching negotiations
  - Bargaining steps
  - Heuristics
  - Preference models
  - …..

Inspire'd studies: Effect of culture on NSS use



Inspire'd studies: Evaluation of NSS

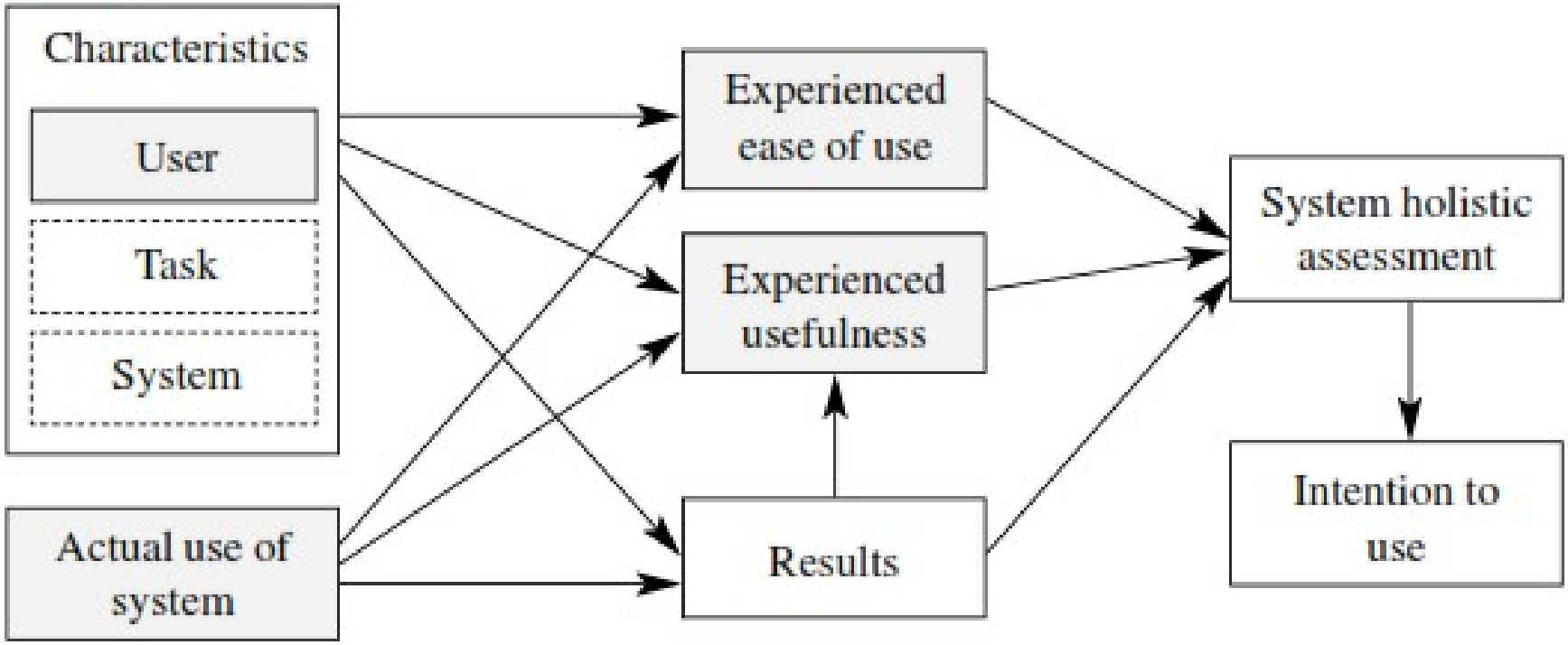


Figure 3. AMIS model to assess Internet-based NSS

S. Koeszegi, R. Vetschera, G. Kersten: National Cultural Differences in the Use and Perception of Internet-based NSS: Does High or Low Context Matter? *International Negotiation* 9 (2004) 79-109

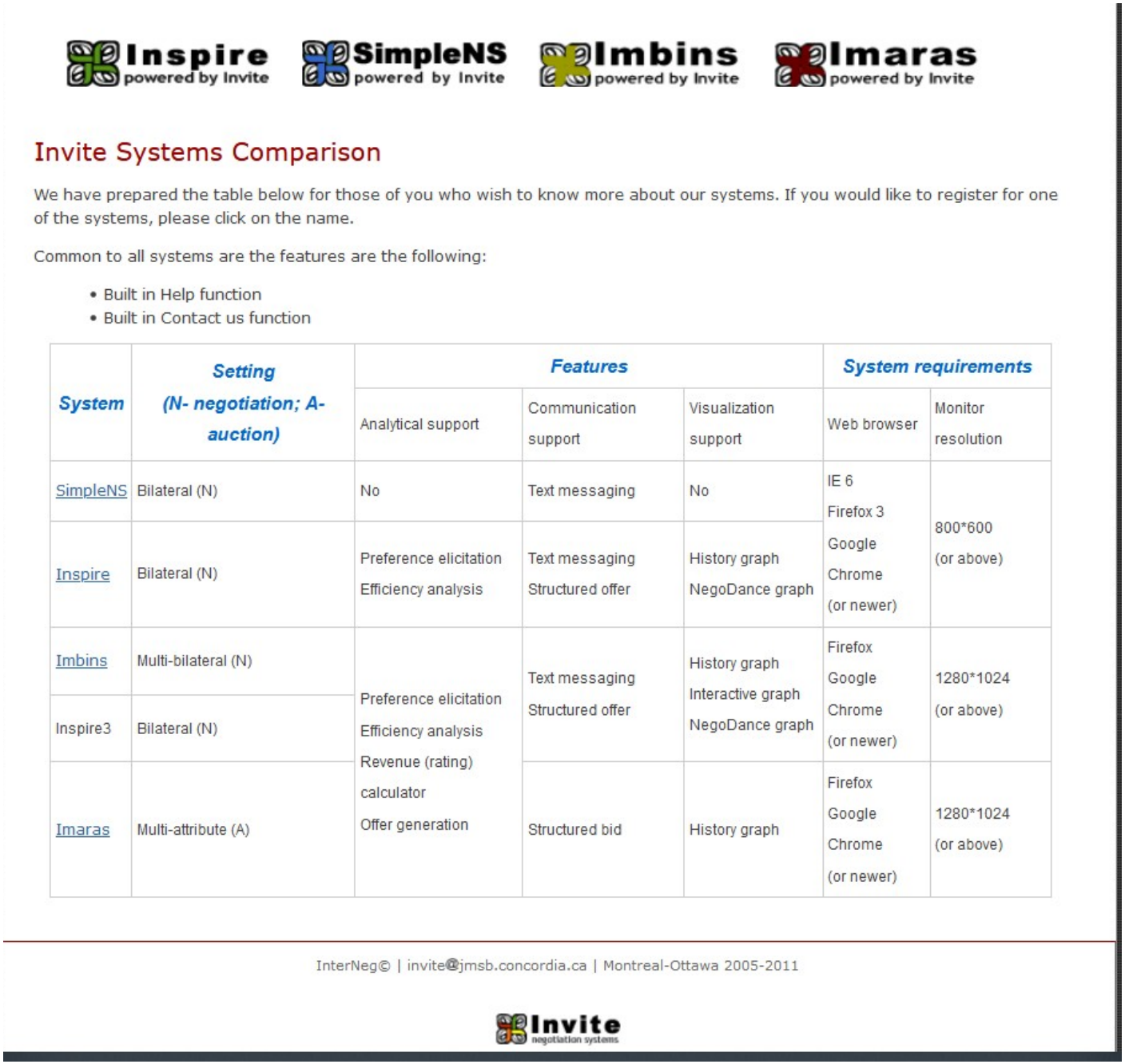
Empirical research triggered by Inspire

- Do negotiators use the system differently?
- How? Are there differences in
  - Communication behavior
  - Offers
  - Concession making ...
- Why?
  - Culture
  - Personal characteristics
- What are the consequences?
  - On outcomes
    - Agreements
    - Satisfaction
  - Attitudes towards the system

Moving on beyond Inspire

- Methodological foundations of negotiation support
  - Classifications of support systems, negotiation protocols and types
  - Montreal taxonomy
    Ströbel, M., & Weinhardt, C. (2003). The Montreal Taxonomy for Electronic Negotiations. *Group Decision and Negotiation*, 12(2), 143-164.
  - GDN Handbook survey
    Kersten, G. E., & Lai, H. (2010). Electronic Negotiations: Foundations, Systems, and Processes. In C. Eden & D. M. Kilgour (Eds.), *Handbook of Group Decision and Negotiation* (pp. 361-392). Dordrecht: Springer.
- Invite platform
  - Allows for consistent implementation of different approaches and systems to support negotiations (and other forms of collaborative decision making such as auctions)
  - Strecker, S., Kersten, G., Kim, J., & Law, K. P. (2005). Electronic Negotiation Systems: The Invite Prototype. Paper presented at the Collaborative business MKWI'06, Passau.
  - Kim, J. B., Kersten, G. E., Law, K. P., & Strecker, S. (2007). E-negotiation System Development: Using Negotiation Protocols to Manage Software Components. *Group Decision and Negotiation*, 16(4), 321-334.

Invite systems



Inspire powered by Invite | SimpleNS powered by Invite | Imbins powered by Invite | Imaras powered by Invite

Invite Systems Comparison

We have prepared the table below for those of you who wish to know more about our systems. If you would like to register for one of the systems, please click on the name.

Common to all systems are the features are the following:

- Built in Help function
- Built in Contact us function

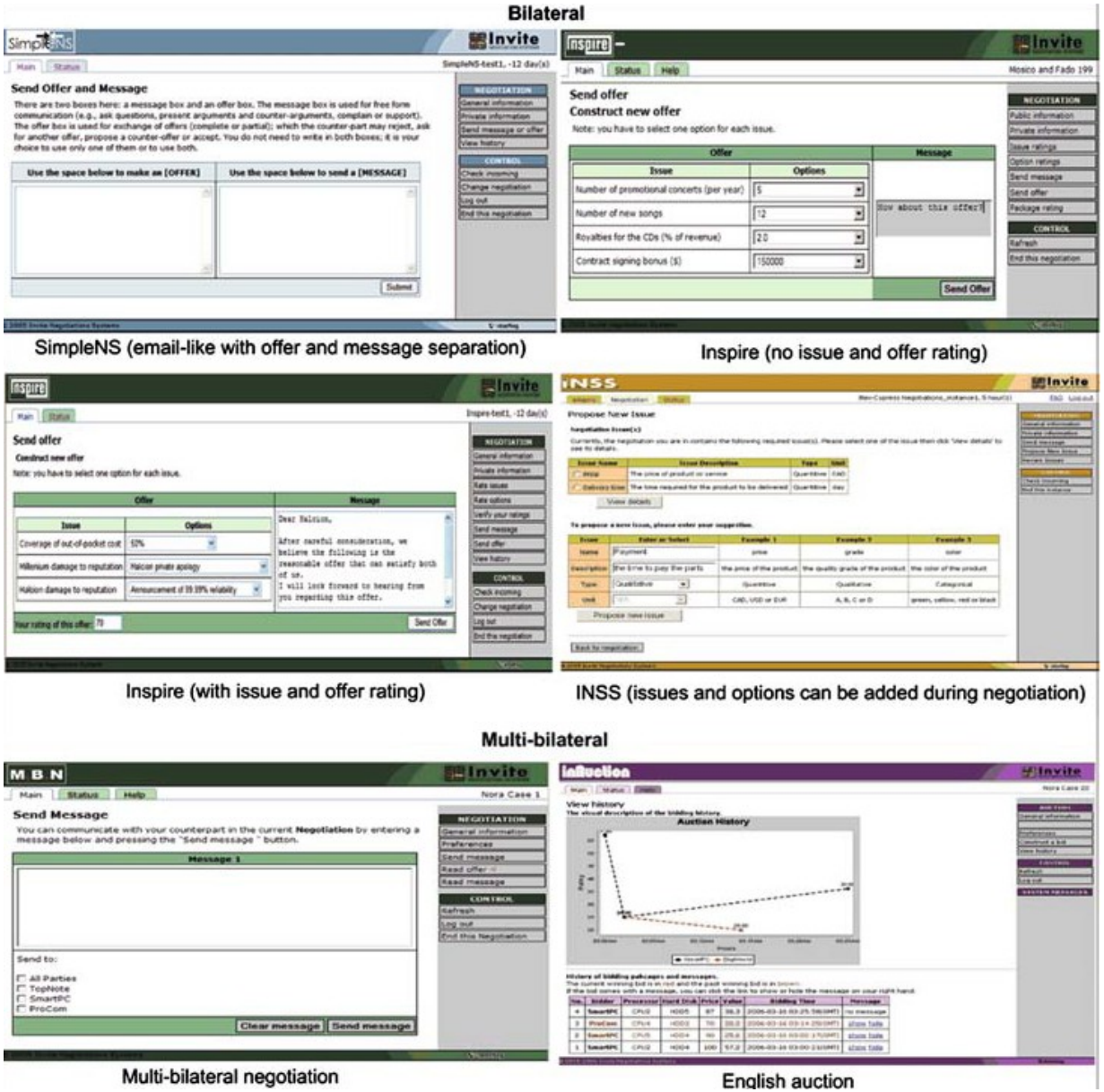
System	Setting (N- negotiation; A-auction)	Features			System requirements	
		Analytical support	Communication support	Visualization support	Web browser	Monitor resolution
SimpleNS	Bilateral (N)	No	Text messaging	No	IE 6 Firefox 3 Google Chrome (or newer)	800*600 (or above)
Inspire	Bilateral (N)	Preference elicitation Efficiency analysis	Text messaging Structured offer	History graph NegoDance graph		
Imbins	Multi-bilateral (N)	Preference elicitation Efficiency analysis Revenue (rating) calculator Offer generation	Text messaging Structured offer	History graph Interactive graph NegoDance graph	Firefox Google Chrome (or newer)	1280*1024 (or above)
Inspire3	Bilateral (N)					
Imaras	Multi-attribute (A)		Structured bid	History graph	Firefox Google Chrome (or newer)	1280*1024 (or above)

InterNeg© | invite@jmsb.concordia.ca | Montreal-Ottawa 2005-2011

Invite negotiation systems

https://invite.concordia.ca/systems_comparison/

Invite: Some prototype systems



Using Invite: Comparison of Auctions and Negotiations

Average objective concession	Auctions	Negotiations
Seller's rating		
Sellers' concession	33.0*	-32
Concession per offer	6.6*	-11.3
Winners' concession	41.9*	11
Concession per winner's offer	6.5	3.9
Buyer's rating		
Sellers' concession	24.5*	-26.5
Concession per offer	4.9*	-9.4
Winners' concession	28.0^	14.6
Concession per winner's offer	4.3	5.2

* Significance compared to negotiations: $p < 0.01$.
^ Significance compared to negotiations: $p < 0.05$.

Kersten, G. E., Vahidov, R., & Gimon, D. (2013). Concession-making in multi-attribute auctions and multi-bilateral negotiations: Theory and experiments. *Electronic Commerce Research and Applications*, 12, 166-180.

Invite experiments triggered research on..

- effects of
  - protocols (bilateral negotiations, multilateral negotaitions, auctions,…)
  - information flow (e.g. revealing other offers in multi-bilateral negotiations)
  - competitive situation
  - …
- on
  - bargaining behavior
  - outcomes

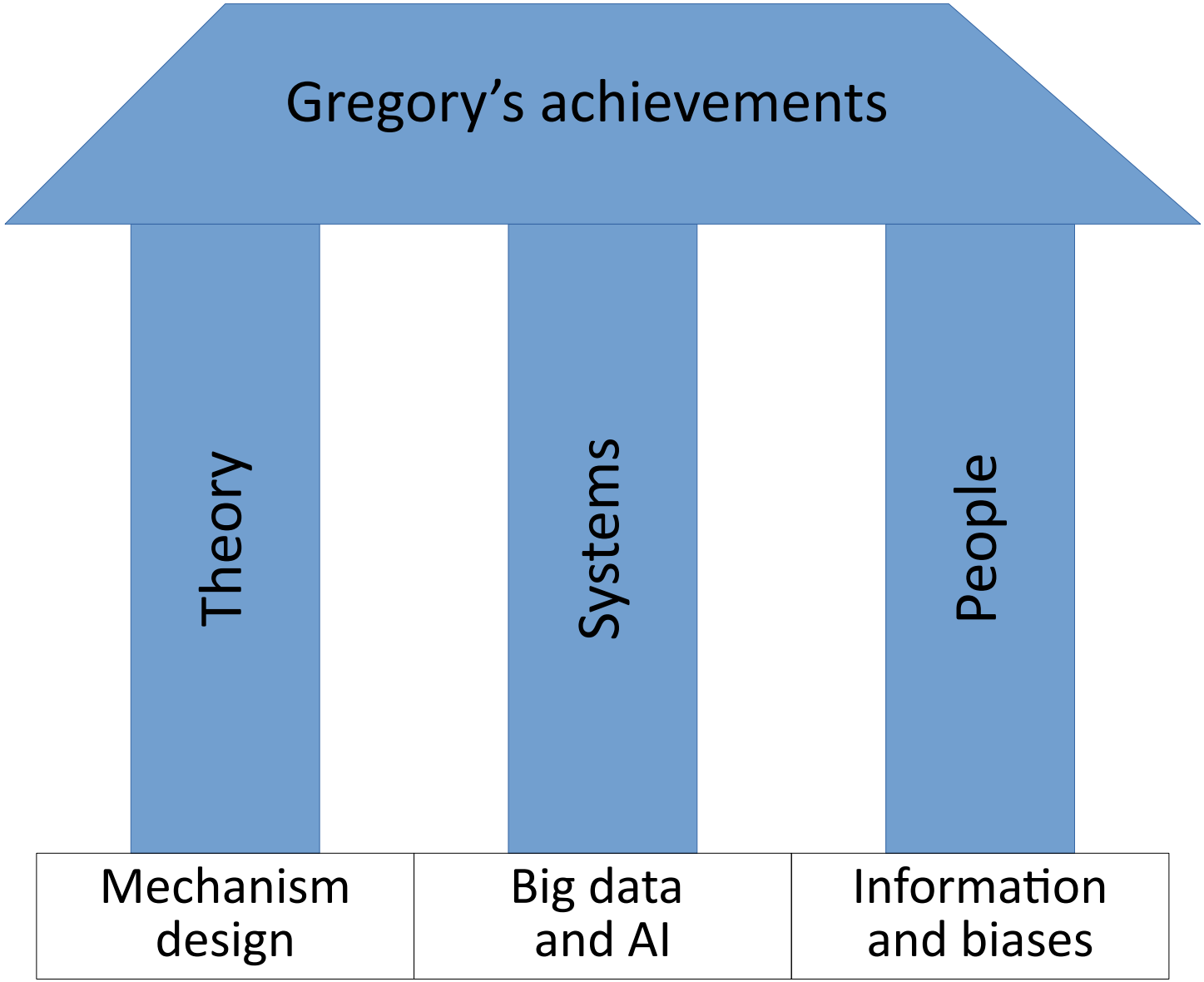
The last published papers

- Acceptance of support tools
  Roszkowska, E., Kersten, G. E., & Wachowicz (2021), T. The impact of negotiators' motivation on the use of decision support tools in preparation for negotiations. International Transactions in Operational Research Published online first in **May 2021**

- Information representation in negotiations
  Wachowicz, T., Kersten, G. E., & Roszkowska, E. (2019). How do I tell you what I want? Agent's interpretation of principal's preferences and its impact on understanding the negotiation process and outcomes. *Operational Research,* 19(4)

- Mechanism design and market efficiency
  Huang, X., Sošić, G., & Kersten, G. (2017). Selling through Priceline? On the impact of name-your-own-price in competitive market. *IISE Transactions*, 49(3), 304-319.

What could have followed?



Thank you, Gregory!

and thank you for your attention