

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

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# 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 ...

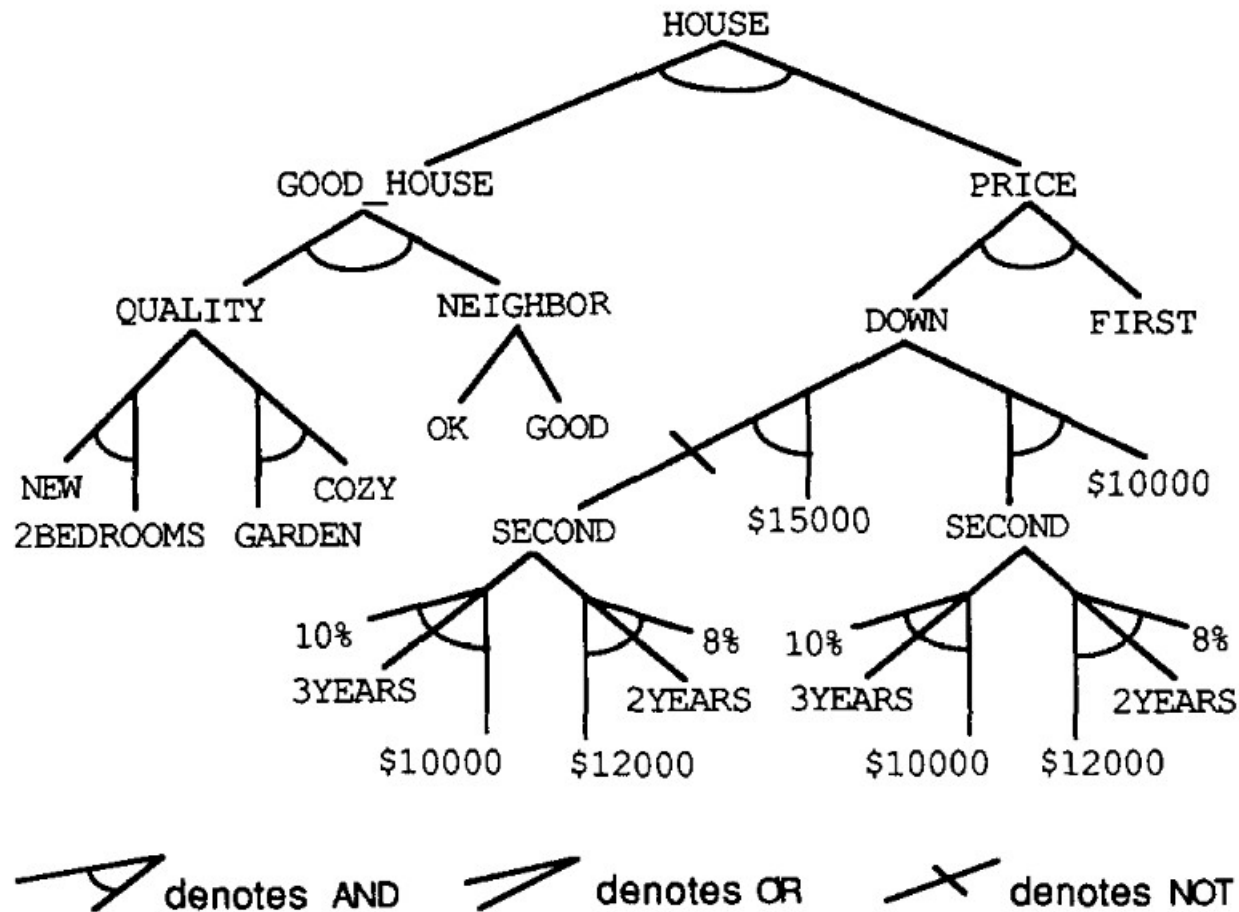
- Rigorous methods
- combined with a concern to accommodate different types of behavior (here, aspiration-based decision making)
- and the wish to bring theory to the end user in an easily accessible form

# 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

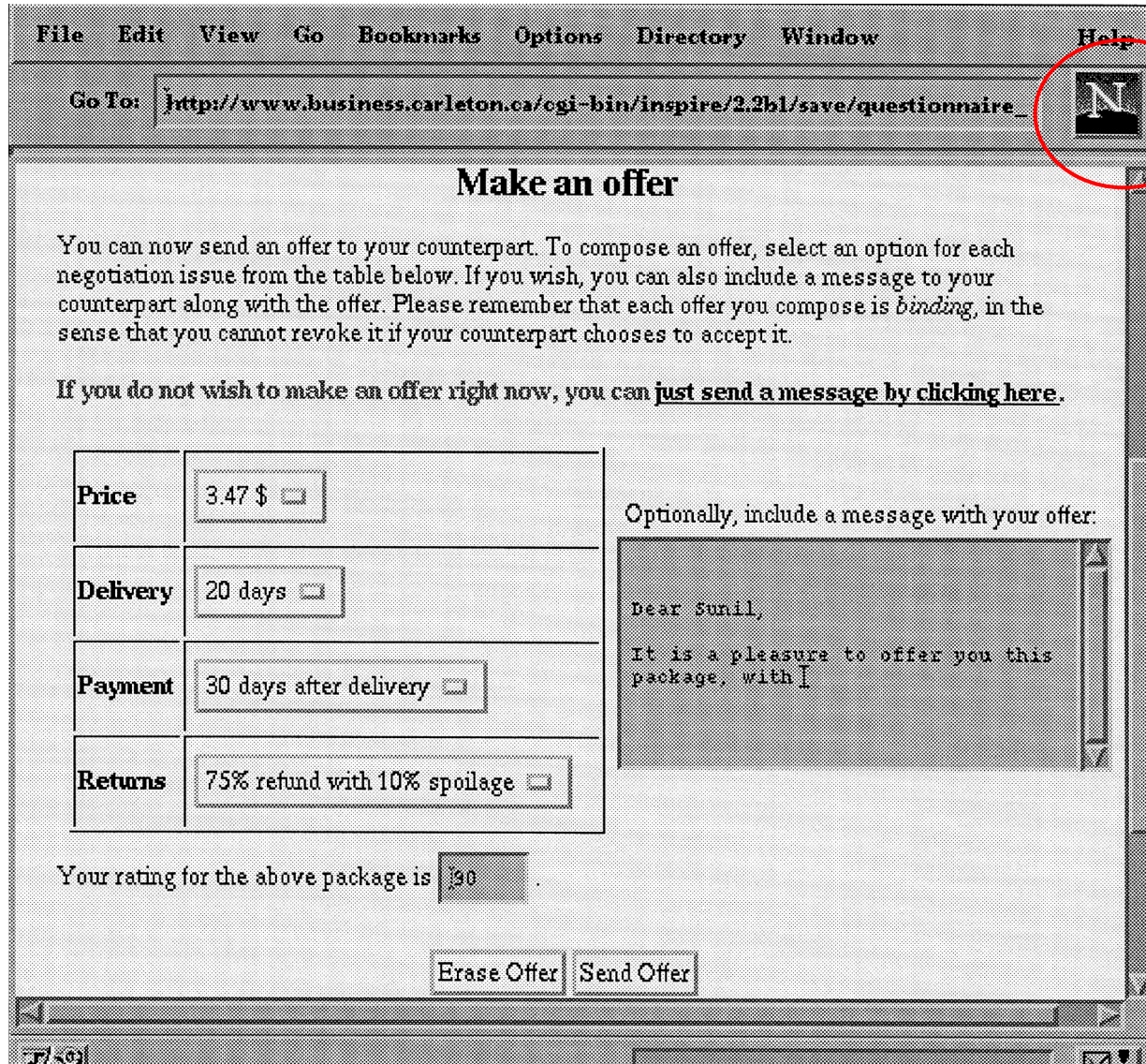
G. Kersten, S. Noronha: WWW-based negotiation support: design, implementation, and use. *Decision Support Systems* 25 (1999) 135-154

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



File Edit View Go Bookmarks Options Directory Window Help

Go To: [http://www.business.carleton.ca/cgi-bin/inspire/2.2b1/save/questionnaire\\_](http://www.business.carleton.ca/cgi-bin/inspire/2.2b1/save/questionnaire_)

## Make an offer

You can now send an offer to your counterpart. To compose an offer, select an option for each negotiation issue from the table below. If you wish, you can also include a message to your counterpart along with the offer. Please remember that each offer you compose is *binding*, in the sense that you cannot revoke it if your counterpart chooses to accept it.

If you do not wish to make an offer right now, you can [just send a message by clicking here.](#)

Price	3.47 \$ <input type="checkbox"/>
Delivery	20 days <input type="checkbox"/>
Payment	30 days after delivery <input type="checkbox"/>
Returns	75% refund with 10% spoilage <input type="checkbox"/>

Optionally, include a message with your offer:

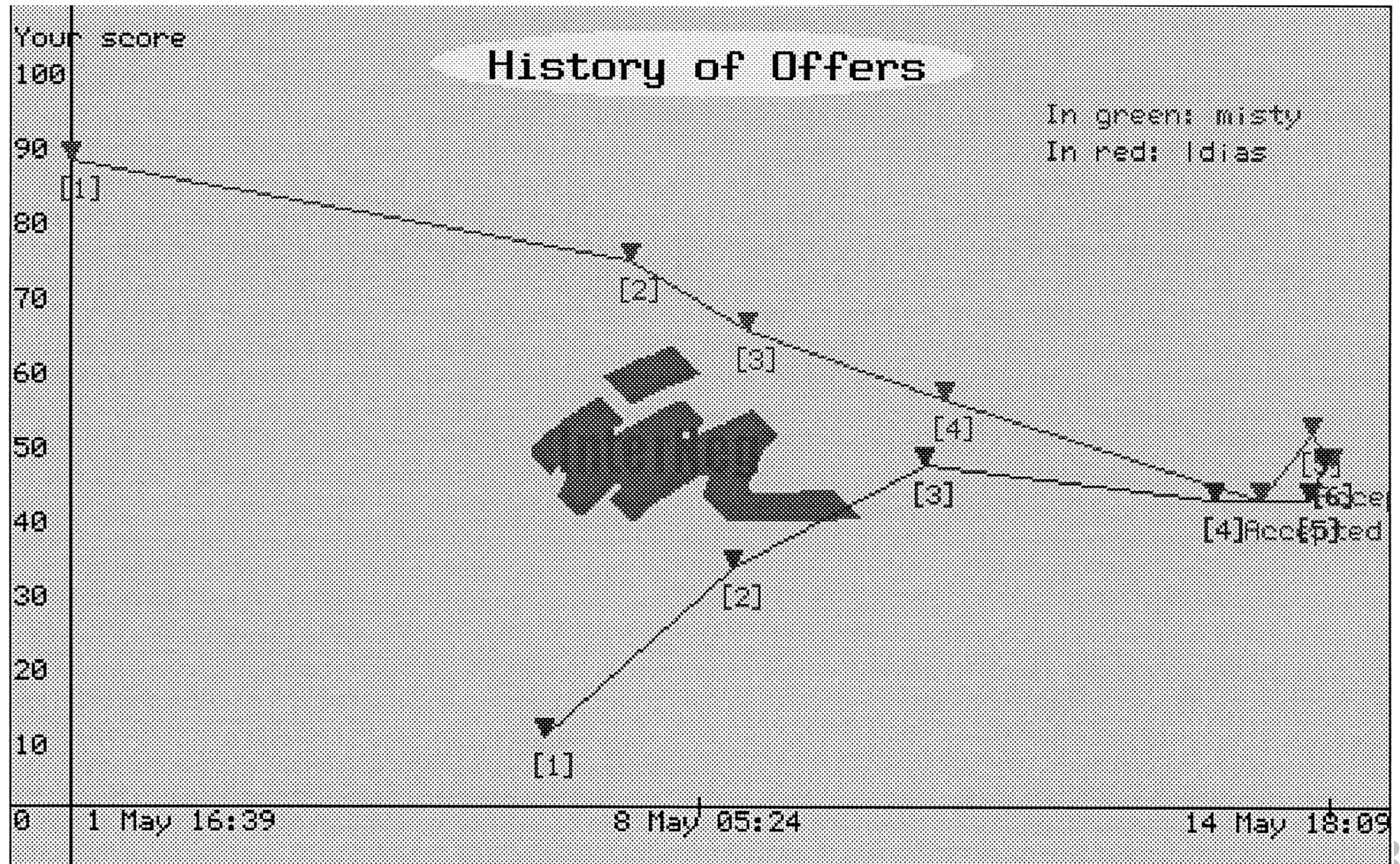
Dear Sunil,  
It is a pleasure to offer you this package, with

Your rating for the above package is .

Remember  
Netscape  
Navigator?



# Inspire: Negotiation Graphs

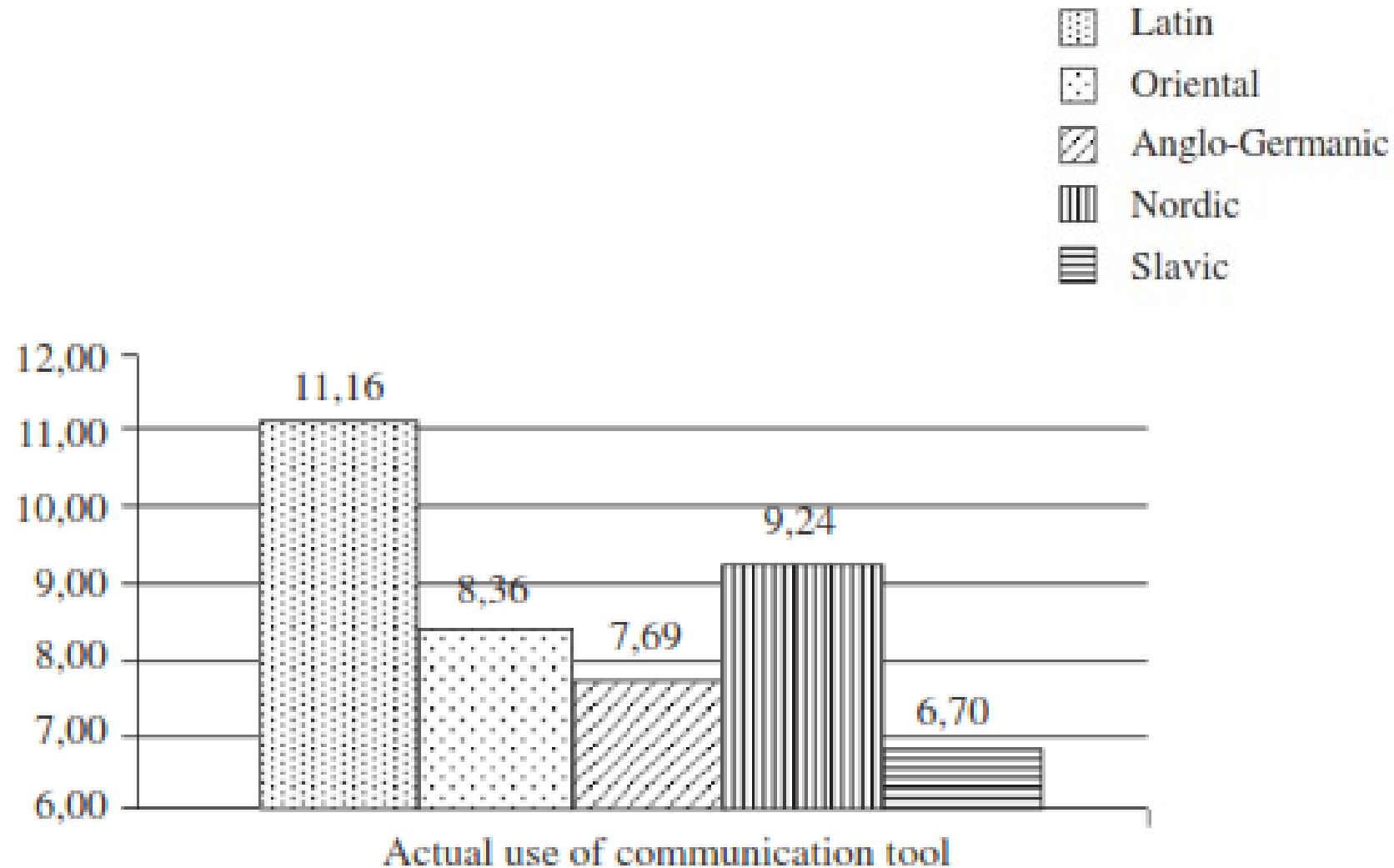




# Inspire: the impact

- 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

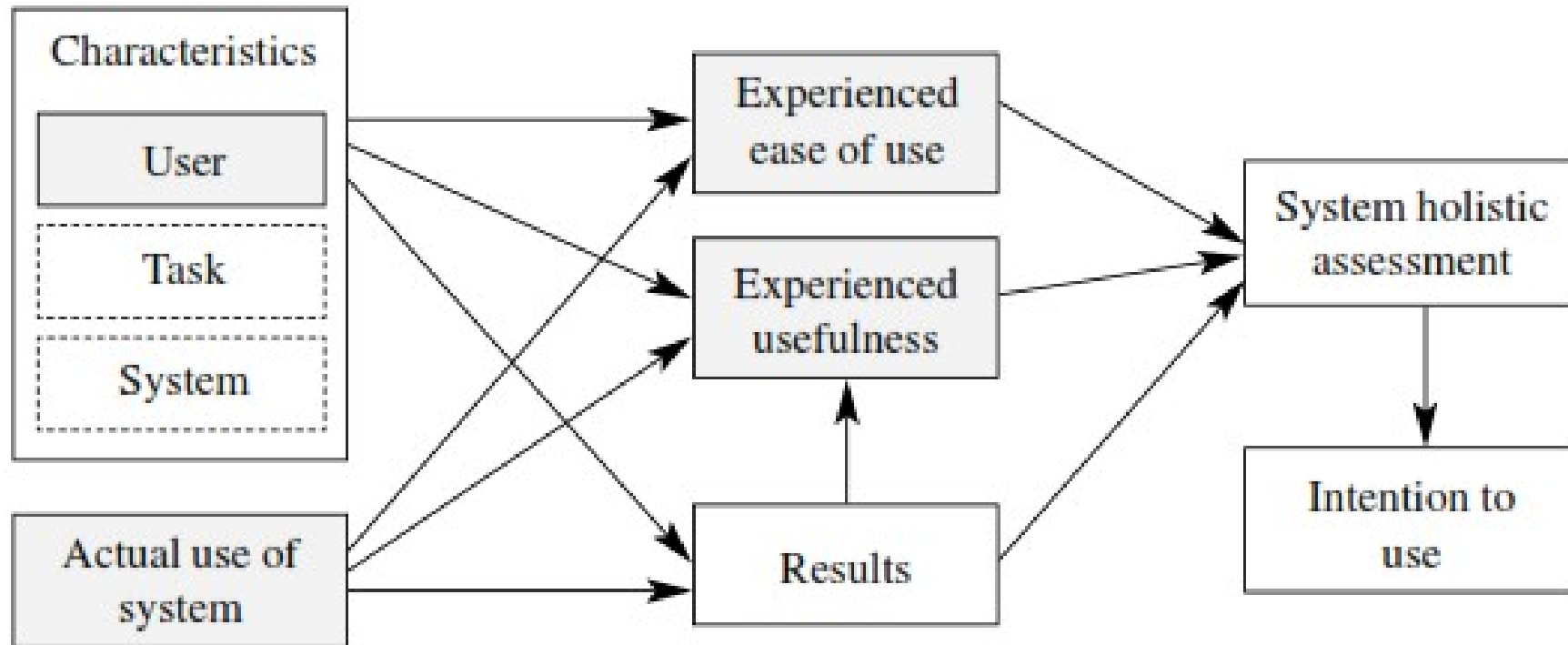


Figure 3. AMIS model to assess Internet-based NSS

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 Comparison

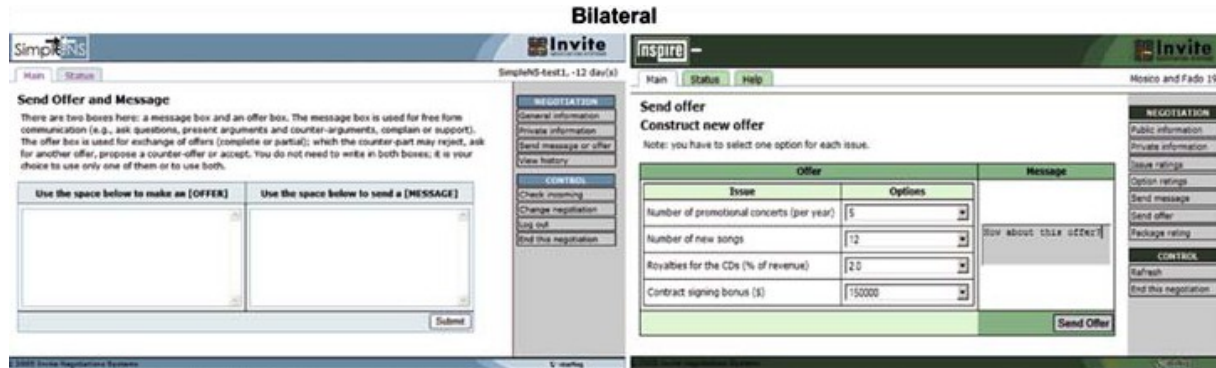
We have prepared the table below for those of you who wish to know more about our systems. If you would like to register for one of the systems, please click on the name.

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
<a href="#">SimpleNS</a>	Bilateral (N)	No	Text messaging	No	IE 6 Firefox 3	800*600 (or above)
<a href="#">Inspire</a>	Bilateral (N)	Preference elicitation Efficiency analysis	Text messaging Structured offer	History graph NegoDance graph	Google Chrome (or newer)	
<a href="#">Imbins</a>	Multi-bilateral (N)	Preference elicitation Efficiency analysis	Text messaging Structured offer	History graph Interactive graph NegoDance graph	Firefox Google Chrome (or newer)	1280*1024 (or above)
Inspire3	Bilateral (N)					
<a href="#">Imaras</a>	Multi-attribute (A)	Revenue (rating) calculator Offer generation	Structured bid	History graph	Firefox Google Chrome (or newer)	1280*1024 (or above)

# Invite: Some prototype systems



**Bilateral**

**SimpleNS** (email-like with offer and message separation)

Send Offer and Message

There are two boxes here: a message box and an offer box. The message box is used for free form communication (e.g., ask questions, present arguments and counter-arguments, complain or support). The offer box is used for exchange of offers (complete or partial) which the counter-part may reject, ask for another offer, propose a counter-offer or accept. You do not need to write in both boxes; it is your choice to use only one of them or to use both.

Use the space below to make an [OFFER]      Use the space below to send a [MESSAGE]

Submit

**Inspire**

Send offer

Construct new offer

Note: you have to select one option for each issue.

Issue	Options
Number of promotional concerts (per year)	5
Number of new songs	12
Royalties for the CDs (% of revenue)	2.0
Contract signing bonus (\$)	150000

Message

How about this offer?

Send Offer

SimpleNS (email-like with offer and message separation)

Inspire (no issue and offer rating)



**Inspire**

Send offer

Construct new offer

Note: you have to select one option for each issue.

Issue	Options
Coverage of out-of-pocket cost	50%
Millennium damage to reputation	Harcar private apology
Millennium damage to reputation	Announcement of 10 10% reliability

Message

Dear Balim,

After careful consideration, we believe the following is the reasonable offer that has nearly both of us.

I will look forward to hearing from you regarding this offer.

Your rating of this offer: 7

Send Offer

**INSS**

Propose New Issue

Negotiation Issue(s)

Currently, the negotiation you are in contains the following required issue(s). Please select one of the issue then click 'View details' to see its details.

Issue Name	Issue Description	Type	Unit
Price	The price of product or service	Quantitative	Unit
Delivery time	The time required for the product to be delivered	Quantitative	day

View details

To propose a new issue, please enter your negotiation.

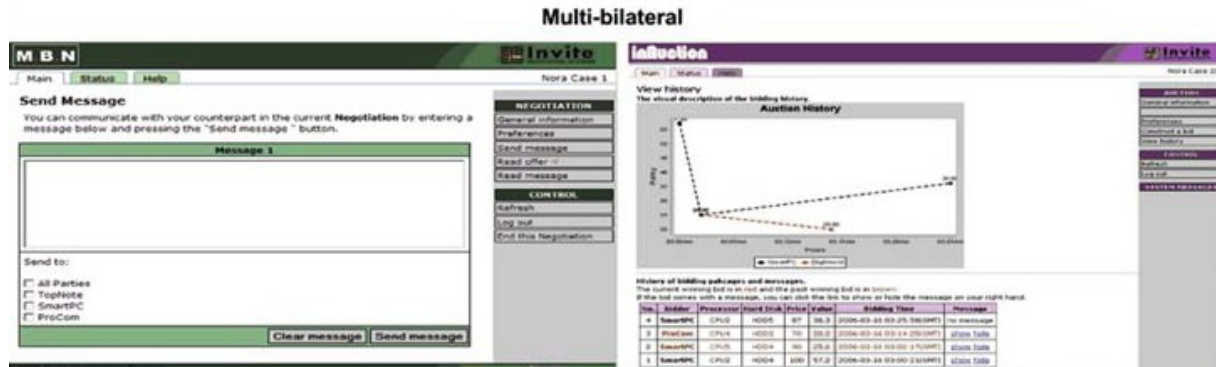
Issue	Enter or Select	Example 1	Example 2	Example 3
Name	Payment	price	grade	color
Description	The time to pay the parts	the price of the product	the quality grade of the product	the color of the product
Type	Qualitative	Quantitative	Qualitative	Categorical
Unit	Unit	Unit	Unit	Unit

Propose new issue

Send to negotiation

Inspire (with issue and offer rating)

INSS (issues and options can be added during negotiation)



**Multi-bilateral**

**MBN**

Send Message

You can communicate with your counterpart in the current Negotiation by entering a message below and pressing the "Send message" button.

Message 1

Send to:

☐ All Parties

☐ TopNote

☐ SmartPC

☐ ProCom

Clear message      Send message

**English auction**

View History

The actual description of the bidding history.

Auction History

History of bidding packages and messages.

The current winning bid is in red and the past winning bid is in green.

If the bid ends with a message, you can click the line to show or hide the message on your right hand.

No.	bidder	Processor	Unit	Unit	Value	Bidding Time	Message
1	Buyer1	CPU1	HD1	BT	50.0	2004-03-24 03:25:56(047)	no message
2	Buyer2	CPU2	HD2	BT	50.0	2004-03-24 03:25:56(047)	no message
3	Buyer3	CPU3	HD3	BT	50.0	2004-03-24 03:25:56(047)	no message
4	Buyer4	CPU4	HD4	BT	50.0	2004-03-24 03:25:56(047)	no message
5	Buyer5	CPU5	HD5	BT	50.0	2004-03-24 03:25:56(047)	no message

Multi-bilateral negotiation

English auction

# 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 negotiations, 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**

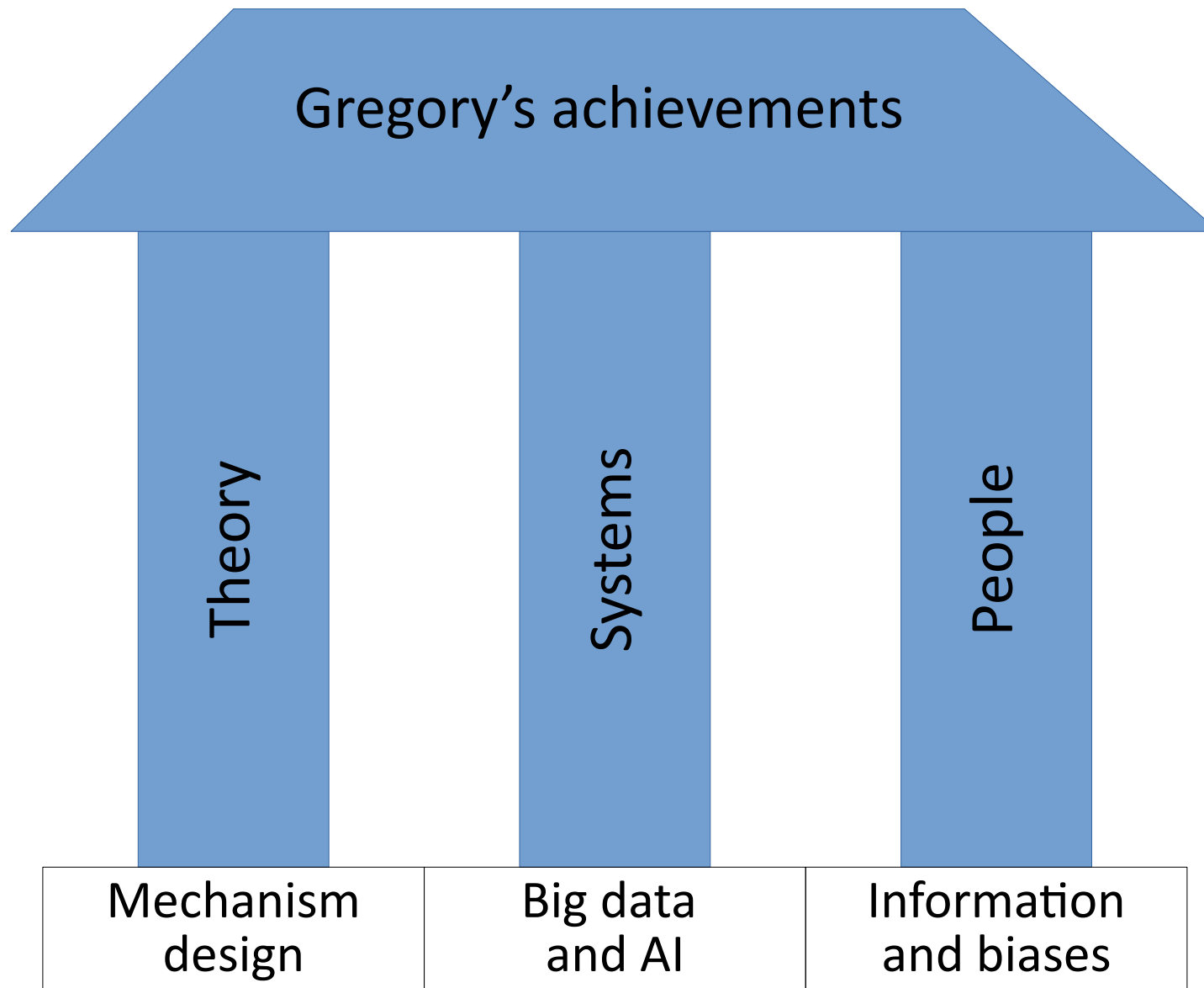
- Information representation in negotiations

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. *IIE Transactions*, 49(3), 304-319.

# What could have followed?







*Thank you, Gregory!*

and thank you for your attention