Why emotional behaviors matter for the design of decision support systems (DSSs)

Evidence from text-based electronic negotiations

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Focus: Behavioral issues connected to decision support (e.g., Hämäläinen et al., 2013)

Emotions are **important** to consider in **negotiations** and should be when developing negotiation support systems, since these impact negotiation effectiveness (Broekens et al., 2010; Hindriks & Jonker, 2008)

- Research should focus more on how decision or negotiation **support** affects **interactions** between the negotiators (Kersten & Lai, 2007; Turel et al., 2007; Weigand et al., 2003)

- Unfortunately, the impact of DSSs on emotional behavior and specifically emotional dynamics **lacks** empirical **attention** (Bui, 1994; Lim & Benbasat, 1992-93; Pommeranz et al., 2009)

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The **impact** of **decision support** on the **dynamics** of **emotional expressions** in **text-based online negotiations**

Main contributions:

– DSSs impact emotional expressions in and throughout text-based online negotiations (initial evidence)

– Incorporating affective behavior is important when designing DSSs (supplementary evidence to Broekens et al., 2010)
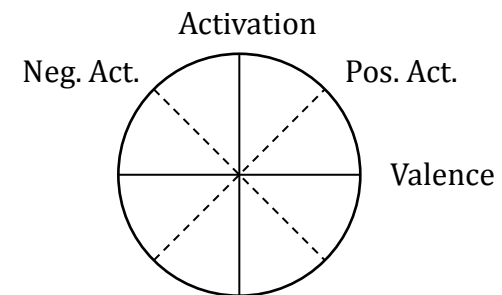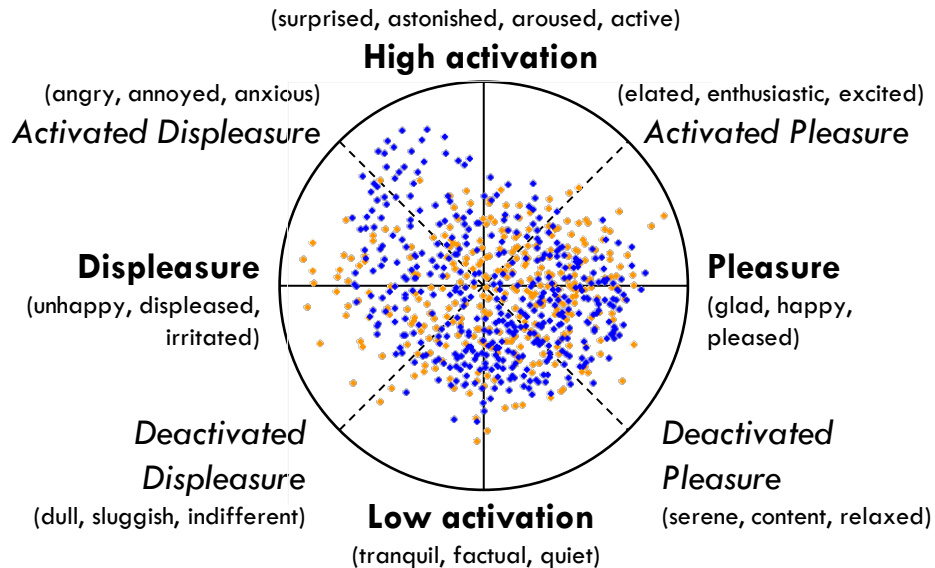
Emotional Expressions
- Theoretical foundation
  - Dimensional perspective of affect (Russell, 1980; Watson & Tellegen, 1985; Yik et al., 1999)
- Methodological foundation
  - Multidimensional scaling based on similarity judgments (e.g. Borg & Groenen, 2005; Lawless et al., 1995)

Temporal dynamics
- Theoretical foundation
  - Phase model theories of negotiations (e.g. Adair & Brett, 2005; Holmes, 1992; Weingart & Olekalns, 2004)
- Methodological foundation
  - Data driven identification of phase split-points (Koeszegi et al., 2011; Vetschera, 2013)

Behavioral dynamics
- Theoretical foundation
  - Multilevel framework: (a) Dyadic, (b) intra-personal, (c) inter-personal level
- Methodological foundation
  - Multilevel modeling: Actor-partner interdependence model (e.g. Kenny et al., 2006)

(surprised, astonished, aroused, active)
High activation

(angry, annoyed, anxious)
Activated Displeasure

(elated, enthusiastic, excited)
Activated Pleasure

Displeasure
(unhappy, displeased, irritated)

Pleasure
(glad, happy, pleased)

Deactivated Displeasure
(dull, sluggish, indifferent)

Deactivated Pleasure
(serene, content, relaxed)

Low activation
(tranquil, factual, quiet)

Activation

Neg. Act.

Pos. Act.

Valence

Theoretical & Methodological Introduction
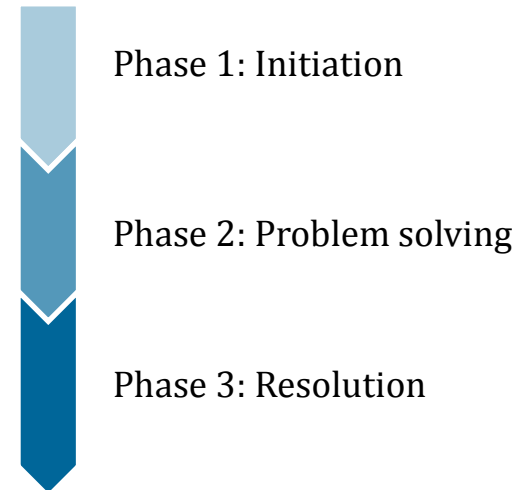
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Phase 1: Initiation

Phase 2: Problem solving

Phase 3: Resolution

Emotional Expressions

- Theoretical foundation
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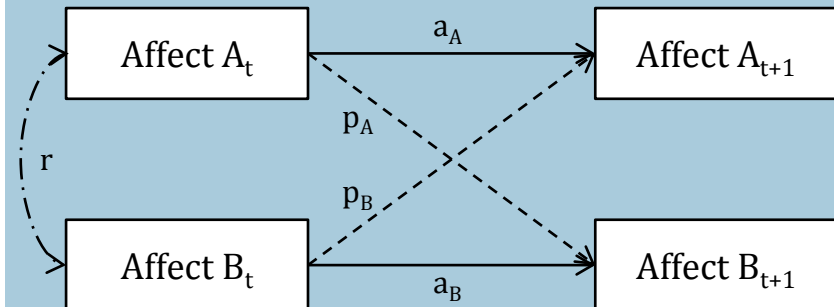
Behavioral dynamics

- Theoretical foundation
  - Multilevel framework: (a) Collective, (b) intra-personal, (c) inter-personal level
- Methodological foundation
  - Mostly multilevel modeling: Actor-partner interdependence model (e.g. Kenny et al., 2006)
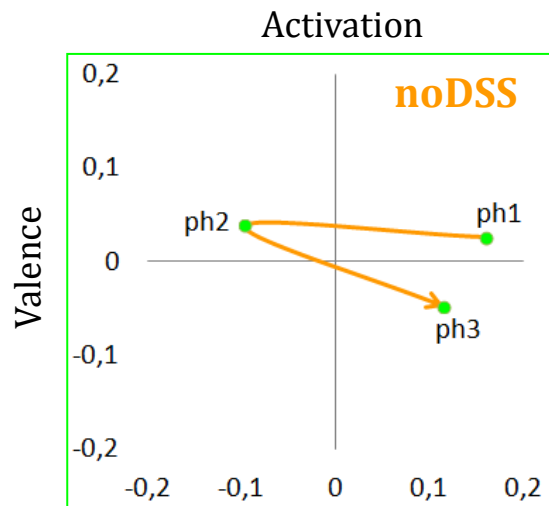
(a) Collective Level

Dyad Level Average Affect (t) → Dyad Level Average Affect (t+1)
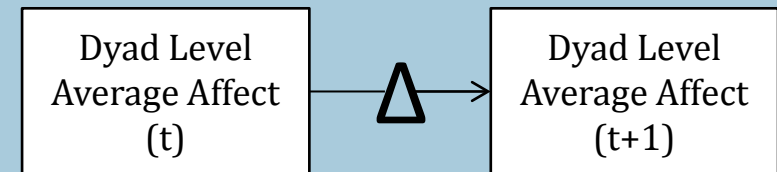
(b+c) Intra- and Inter-Personal Level

Affect A_t —a_A→ Affect A_{t+1}

p_A

r

p_B

Affect B_t —a_B→ Affect B_{t+1}

r … Intra-phase reciprocity of affective expression
p … Inter-personal influence of affective expressions
a … Intra-personal influence of affective expressions

Activation

DSS

Valence

ph3
ph2
ph1

Activation

noDSS

Valence

ph2
ph1
ph3

Table 1. Between phase comparisons: Successful (t-tests)

	Positive Activation	
	DSS	noDSS
Ph1 vs. Ph2	3.105 (.009) ***	3.235 (.015) **
Ph2 vs. Ph3	-3.546 (.006) ***	-1.392 (.198)
Ph1 vs. Ph3	0.019 (.985)	1.342 (.198)

	Negative Activation	
	DSS	noDSS
Ph1 vs. Ph2	-2,374 (.084)*	-3.862 (.003) ***
Ph2 vs. Ph3	0.839 (.411)	3.651 (.003) ***
Ph1 vs. Ph3	-1.667 (.167)	0.342 (.737)

* p < .10; ** p < .05; *** p < .01 | p-values adjusted using false discovery rate (FDR)

Dyad Level Average Affect (t) → △ → Dyad Level Average Affect (t+1)

Activation
(elated, enthusiastic, excited)
Activated Pleasure

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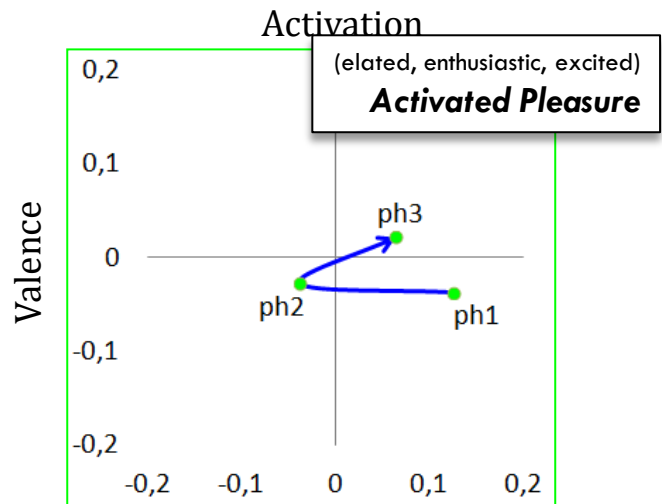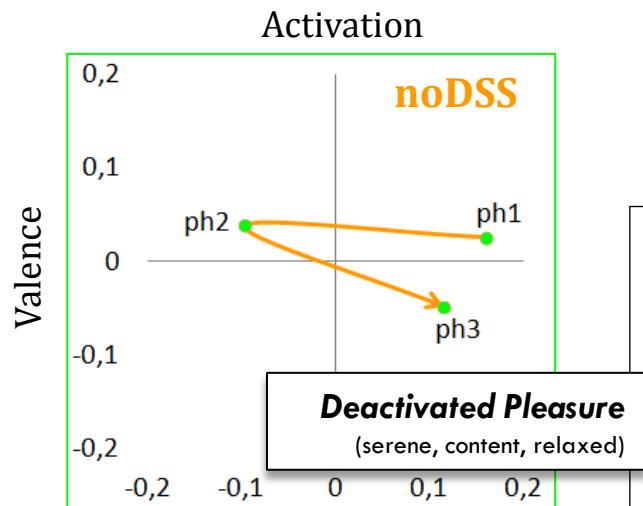|	Positive Activation	
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Activation

noDSS
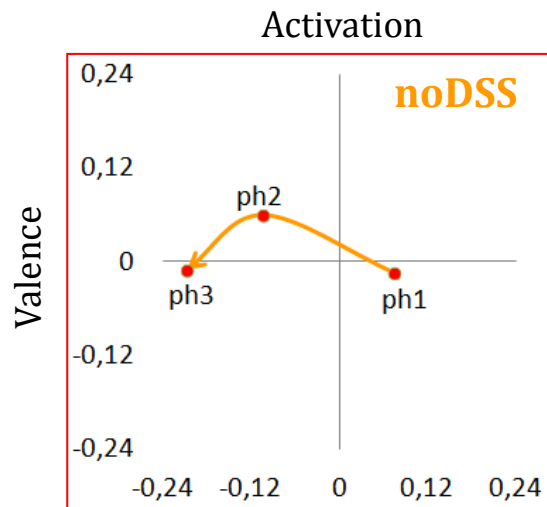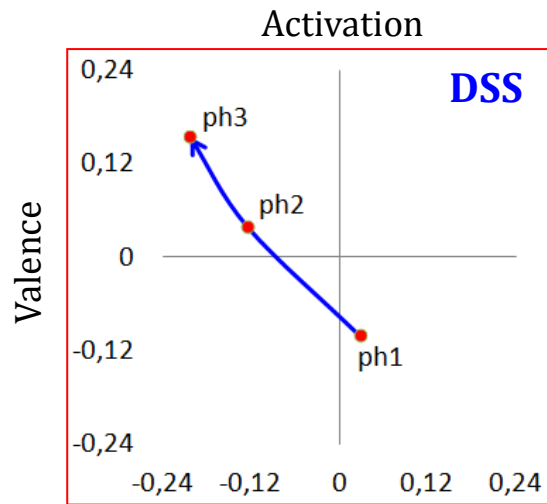
Deactivated Pleasure
(serene, content, relaxed)

In successful negotiations pleasure increases from ph2 to ph3:

– **DSS**: towards activated pleasure (e.g. elated, excited)

– **noDSS**: towards deactivated pleasure (e.g. content, at ease)

Activation — DSS

Activation — noDSS

Table 2. Between phase comparisons: Failed (t-tests)

	Valence	
	DSS	noDSS
Ph1 vs. Ph2	2.854 (.026) **	2.932 (.036) **
Ph2 vs. Ph3	1.118 (.290)	1.844 (.108)
Ph1 vs. Ph3	4.116 (.006) ***	2.866 (.036) **

	Activation	
	DSS	noDSS
Ph1 vs. Ph2	-2,328 (.063)*	-0.834 (.662)
Ph2 vs. Ph3	-1.866 (.092) *	0.816 (.662)
Ph1 vs. Ph3	-4.613 (.003) ***	-0.036 (.972)

* p < .10; ** p < .05; *** p < .01 | p-values adjusted using false discovery rate (FDR)

Dyad Level Average Affect (t)	Δ →	Dyad Level Average Affect (t+1)

(angry, annoyed, anxious)
Activated Displeasure

DSS

Valence

Activation

noDSS

Valence

Displeasure
(unhappy, displeased, irritated)

Table 2. Between phase comparisons: Failed (t-tests)

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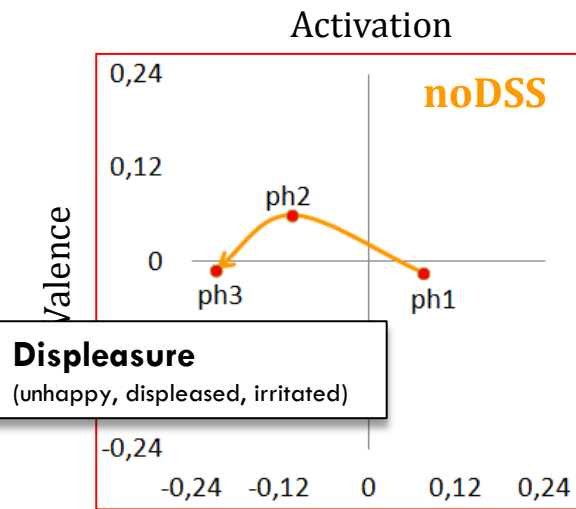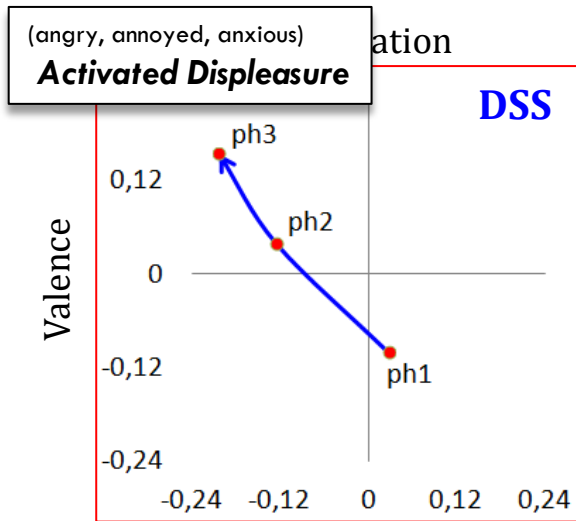|	Activation	
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In failed negotiations displeasure increases over time:
– **DSS**: towards activated displeasure (e.g. angry, anxious)
– **noDSS**: towards displeasure (e.g. displeased, unhappy)

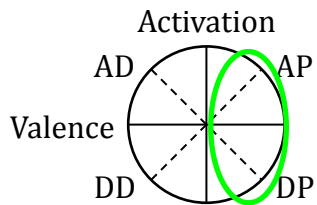Final CI is significantly (t=-2.144) lower (Δ=-0.0903) with DSS

Results: Reciprocation of Affective Behaviors within Phases

Table 3. ICCs (Intraclass Correlation Coefficients)

	Phase 1		Phase 2		Phase 3	
	Valence	**Activation**	**Valence**	**Activation**	**Valence**	**Activation**
Successful (DSS)	.428 **	-.335 *	.367 *	.160	.024	.436 **
Successful (noDSS)	.170	.149	.285	.374 *	.661 ***	.277
Failed (DSS)	.299	-.332	-.263	.169	.344	-.053
Failed (noDSS)	-.163	-.023	.321	.410	-.034	.342
	AP/DD	**AD/DP**	**AP/DD**	**AD/DP**	**AP/DD**	**AD/DP**
Successful (DSS)	.001	.229	.138	.365 *	.578 ***	.083
Successful (noDSS)	.133	.205	.203	.395 *	.546 ***	.466 **
Failed (DSS)	.141	-.059	.218	-.050	.292	-.000
Failed (noDSS)	-.125	-.071	.159	.483 *	-.065	.282

* p < .10; ** p < .05; *** p < .01
AP/DD (Activated Pleasure vs. Deactivated Displeasure); AD/DP (Activated Displeasure vs. Deactivated Pleasure)

Activation

AD — AP
Valence
DD — DP

Phase 3   (noDSS)

Affect N1$_t$

Affect N2$_t$

Results: Reciprocation of Affective Behaviors within Phases

Table 3. ICCs (Intraclass Correlation Coefficients)

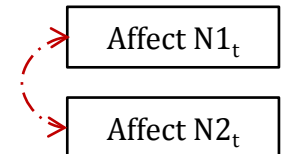|	Phase 1		Phase 2		Phase 3	
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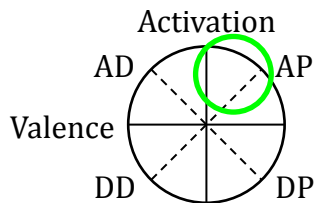

Activation
AD — AP
Valence
DD — DP

Phase 3 (DSS)

Affect N1$_t$

Affect N2$_t$

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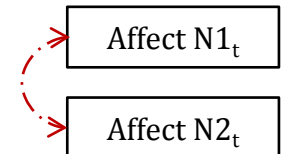|	Phase 1		Phase 2		Phase 3	
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Activation
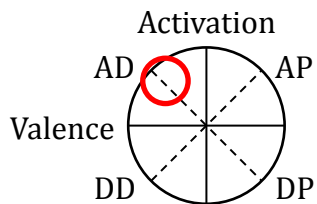AD — AP
Valence
DD — DP

Phase 2 (noDSS)

Affect N1$_t$

Affect N2$_t$

Table 4. APIMs (Actor-Partner Interdependence Models)

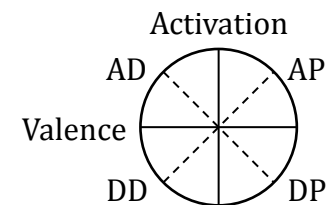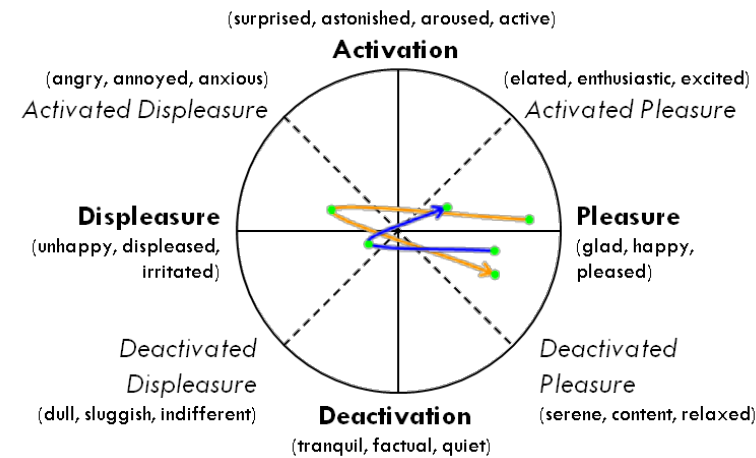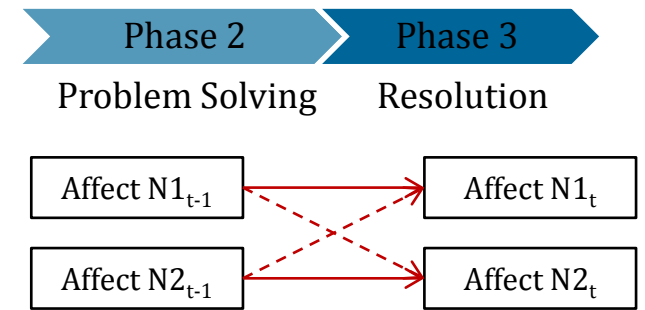|	Valence (phase 3)		Activation (phase 3)	
	Model 1	Model 2	Model 3	Model 4
Predictors (phase 2)	DSS	noDSS	DSS	noDSS
Intercept	0.001	0.301 **	-0.035	0.001
c_CI (actor)	0.164	-0.460	0.062	-0.172
c_CI (partner)	0.045	-0.261	0.204	-0.056
Valence (actor)	0.378 **	-0.004	0.038	0.046
Valence (partner)	-0.025	0.058	0.235	-0.169
Activation (actor)	-0.026	0.070	0.293	0.313
Activation (partner)	-0.150	-0.003	0.252	-0.196
Pseudo R^2	0.188	0.135	0.146	0.118

	AP/DD (phase 3)		AD/DP (phase 3)	
	Model 5	Model 6	Model 7	Model 8
Predictors (phase 2)	DSS	noDSS	DSS	noDSS
Intercept	-0.024	0.213	-0.025	-0.212 *
c_CI (actor)	0.159	-0.448	-0.075	0.205
c_CI (partner)	0.178	-0.225	0.110	0.143
AP/DD (actor)	0.341 **	0.207	-0.011	0.146
AP/DD (partner)	0.160	-0.160	0.329	-0.214
AD/DP (actor)	-0.075	0.167	0.331 *	0.097
AD/DP (partner)	-0.056	-0.046	0.067	0.015
Pseudo R^2	0.316	0.142	0.108	0.107

*** p<.01; ** p<.05; * p<.10

Phase 2 → Phase 3

Problem Solving → Resolution

Affect N1$_{t-1}$ → Affect N1$_t$

Affect N2$_{t-1}$ → Affect N2$_t$

(surprised, astonished, aroused, active)
Activation

(angry, annoyed, anxious)
Activated Displeasure

(elated, enthusiastic, excited)
Activated Pleasure

Displeasure
(unhappy, displeased, irritated)

Pleasure
(glad, happy, pleased)

Deactivated Displeasure
(dull, sluggish, indifferent)

Deactivated Pleasure
(serene, content, relaxed)

Deactivation
(tranquil, factual, quiet)

Activation
AD — AP
Valence
DD — DP

Table 5. APIMs (Actor-Partner Interdependence Models)

	Valence (phase 3)		Activation (phase 3)	
	Model 9	**Model 10**	**Model 11**	**Model 12**
Predictors (phase 2)	DSS	noDSS	DSS	noDSS
Intercept	-0.060	-0.346	0.182	0.035
c_CI (actor)	-0.190	0.580	0.001	0.053
c_CI (partner)	-0.149	0.326	-0.095	-0.076
Valence (actor)	0.480 *	0.616	-0.419	0.614 *
Valence (partner)	-0.032	0.120	0.639 **	0.040
Activation (actor)	0.314 *	-0.266	-0.010	0.013
Activation (partner)	0.355 **	-0.636	0.499 **	0.339
Pseudo R^2	0.362	0.284	0.373	0.213

	AP/DD (phase 3)		AD/DP (phase 3)	
	Model 13	**Model 14**	**Model 15**	**Model 16**
Predictors (phase 2)	DSS	noDSS	DSS	noDSS
Intercept	0.089	-0.211	0.170	0.279
c_CI (actor)	-0.132	0.429	0.137	-0.391
c_CI (partner)	-0.172	0.163	0.041	-0.302
AP/DD (actor)	0.176	0.498	-0.611 *	0.155
AP/DD (partner)	0.739 ***	-0.048	0.393	0.467
AD/DP (actor)	0.124	-0.734 *	0.296	0.152
AD/DP (partner)	0.107	-0.218	-0.271	0.534
Pseudo R^2	0.479	0.443	0.286	0.092

*** p<.01; ** p<.05; * p<.10

Phase 2 → Phase 3

Problem Solving → Resolution

Affect N1$_{t-1}$ → Affect N1$_t$

Affect N2$_{t-1}$ → Affect N2$_t$

(surprised, astonished, aroused, active)
Activation

(angry, annoyed, anxious)
Activated Displeasure

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Activated Pleasure

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Phase 2 → Phase 3

Problem Solving   Resolution

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Activation

AD   AP

Valence

DD   DP

Conclusio

Emotional dynamics differ with respect to whether a DSS is
provided or not – even for a basic analytical DSS

- **Activation** is a central source of differences
  - Successful negotiations
    - DSS: towards activated pleasure (e.g. elated, excited)
    - noDSS: towards deactivated pleasure (e.g. content, at ease)
  - Failed negotiations
    - DSS: towards activated displeasure (e.g. anxious)
    - noDSS: towards displeasure (e.g. displeased, unhappy)
- **Impact** of decision support on **intra-personal** and **inter-personal**
  effects of emotional behaviors

The impact of **DSSs** (on affective behaviors)

- Information, feedback, or guidance functions (e.g. Bui, 1994; Singh & Ginzberg, 1996)
- Cognitive resources (e.g. Blascovich, 1990; Feldman, 1995; Jain & Solomon, 2000)
- EASI (emotion as social information) model (Van Kleef et al., 2010)
  - Dynamics of affective behaviors: Driven by inferential processes and affective reactions
  - Contingent on: Context (competitive or cooperative) and **epistemic motivation**
  - ➜ Decision support can increase **Epistemic ability**

Implications

Importance of considering all **behavioral** aspects within and throughout the negotiations process

- – Research on DSSs should focus more on the (emotional) behaviors of the people in interaction, since these are to be supported
    - Inter-personal and intra-personal effects over time: Reciprocity, actor effects, partner effects
- – Using more elaborate research frameworks and treating dyadic interaction data appropriately is important to "pry open the black box of the negotiation process" (Weingart & Olekalns, 2004: p.154)

➜ Toward "Affective Negotiation Support Systems" (Broekens et al., 2010)

Thank you for listening

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