

CAPTURING BOTTOM-UP INFORMATION TECHNOLOGY USE PROCESSES: A COMPLEX ADAPTIVE SYSTEMS MODEL

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Appendix A

Summary of the Literature

The studies are selected from all articles published in nine premium journals that regularly publish scholarly research on IT use: *MIS Quarterly*, *Information Systems Research*, *Organization Science*, *Management Science*, *Administrative Science Quarterly*, *Decision Sciences*, *Journal of Management Information Systems*, *IEEE Transactions on Engineering Management*, and *Database for Advances in Information Systems*.

Research Perspective	Description	Related Studies
Technology acceptance	This research relies on variance-based models to examine antecedents of initial and continued IT use. The antecedents include individual cognition such as perceived usefulness of a new IT system and organizational factors such as management influence.	Bhattacharjee and Sanford 2006; Cooper and Zmud 1990; Davis 1989; Davis et al 1989; Edmondson et al. 2001; Joshi 1991; Joshi et al. 1999; Kim and Malhotra 2005; Kraut et al. 1998; Leonard-Barton and Deschamps 1988; Limayem et al. 2007; Lucas et al. 1988; Robertson 1989; Sabherwal et al. 2006; Taylor and Todd 1992; Tyre and Hauptman 1992; Venkatesh et al. 2003; Venkatesh and Davis 2000; Venkatesh et al. 2008; Zhu and Kraemer 2005
Task technology fit	This research examines the correspondence between task requirements, individual abilities, and the functionality of an IT system. It highlights the importance of the alignment between the three aspects in inducing positive IT-enabled task performance.	Goodhue 1998; Goodhue and Thompson 1995; Zigurs et al. 1999
Planned change	This research seeks to identify the sequence of activities (often referred to as "phases") in a typical IT use process and to prescribe the stage models as plans for IT use management.	El Sawy 1985; Lassila and Brancheau 1999; Nelson and Cheney 1987; Raho et al. 1987

Research Perspective	Description	Related Studies
System dynamics	These studies employ system dynamics models to examine how the accumulative and marginal effects (i.e., stock and flow) of human cognition, such as learning and commitment to using a new technology, can affect IT use behaviors and organizational performance.	Black et al. 2004; Repenning 2002
Actor-network analysis	This research views IT use as social political processes and employs the actor-network framework to examine how ongoing negotiations among alliance (i.e., actor-networks) with heterogeneous political interests lead to alignment of interests, which eventually enables IT use.	Braa et al. 2004; Sarker et al. 2006; Walsham and Sahay 1999
Social construction of technology	This research assumes that IT use is neither determined by human actors nor technologies, but enacted through interactions between the two without <i>a priori</i> plans. It usually relies on case studies to capture IT use enactment processes.	Avgerou and McGrath 2007; Boudreau and Robey 2005; Davidson and Chismar 2007; Garud and Kumaraswamy 2005; Lapointe and Rivard 2005; Leonardi 2007; Lyytinen and Rose 2003; Majchrzak et al. 2000; Malhotra et al. 2001; Orlikowski 1996, 2000; Robey et al. 2002; Robey and Sahay 1996; Tyre and Orlikowski 1994; Volkoff et al. 2007

Appendix B

Progress of the Literature on IT Use

Critical to the research objective is identifying studies empirically analyzing bottom-up IT use processes. The studies included in the “bottom-up linkage” row were selected according to two criteria. First, they collected quantitative or qualitative data regarding both individual- and collective-level IT use patterns and outcomes. Second, they explicitly analyzed the linkage from the individual-level to the collective-level IT use patterns and outcomes. (Note: The numbering of the potential research areas corresponds to the legend in Figure 1 of the paper.

Research Perspective / Research Area	Technology Acceptance	Task Technology Fit	Planned Change	System Dynamics	Actor- Network Analysis	Social Construction of IT
(1) Individual level IT use	Bhattacherjee and Sanford 2006; Davis 1989; Davis et al. 1989; Joshi 1991; Joshi et al. 1999; Kim and Malhotra 2005; Kraut et al. 1998; Leonard-Barton and Deschamps 1988; Lucas et al. 1988; Sabherwal et al. 2006; Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003	Goodhue 1998; Goodhue and Thompson 1995	Nelson and Cheney 1987	Black et al. 2004; Repenning 2002		
(2) Collective level of IT use	Edmondson et al. 2001; Zhu and Kraemer 2005	Zigurs et al. 1999	El Savy 1985; Lassila and Brancheau 1999; Raho et al. 1987			
(3) Interactions					Braa et al. 2004; Sarker et al. 2006; Walsham and Sahay 1999	Avgerou and McGrath 2007; Boudreau and Robey 2005; Davidson and Chismar 2007; Garud and Kumaraswamy 2005; Lapointe and Rivard 2005; Leonardi 2007; Lytinen and Rose 2003; Majchrzak et al. 2000; Malhotra et al. 2001; Orlikowski 1996, 2000; Robey et al. 2002; Robey and Sahay 1996; Volkoff et al. 2007

Research Perspective Research Area	Technology Acceptance	Task Technology Fit	Planned Change	System Dynamics	Actor- Network Analysis	Social Construction of IT
(4) Dynamic patterns			El Sawy 1985; Lassila and Brancheau 1999; Nelson and henev 1987; Raho et al. 1987	Black et al. 2004; Reppenning 2002	The same as the cell above	The same as the cell above
(5) Top-down linkage	Cooper and Zmud 1990; Kim and Malhotra 2005; Kraut et al. 1998; Leonard-Barton and Deschamps 1988; Sabherwal et al. 2006; Tyre and Hauptman 1992; Venkatesh and Davis 2000; Venkatesh et al. 2003; Zhu and Kraemer 2005		El Sawy 1985; Nelson and Cheney 1987			Avgerou and McGrath 2007; Boudreau and Robey 2005; Davidson and Chismar 2007; Garud and Kumaraswamy 2005; Orlikowski 1996, 2000; Robey and Sahay 1996
(6) Bottom-up linkage						Lapointe and Rivard 2005, 2007; Orlikowski 1996, 2000; Volkoff et al. 2007

Appendix C

Pseudo-Code of a Simulation Session

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Create 53 employees (50 specialists, 2 managers, and 1 director)
Ask each employee {
  Set the 30-tuple, with each dimension takes a value of -1, 0, or 1 with equal probabilities
  Set learning rate  $p_1$  = the learning rate treatment of the current simulation session
  If I am a manager
    [Set learning rate =  $1.25 \times p_1$ ]
  If I am a director
    [Set learning rate =  $1.5 \times p_1$ ]
  If the current workplace rigidity treatment = "rigidity"
    [form a tie with a randomly chosen superior]
  Else
    [form a tie with another randomly chosen employee]
}
Create the ITSS
Ask the ITSS {
  Set the 30-tuple, with each dimension takes a value of 0
  Set the flexibility  $p_2$  = the ITSS flexibility treatment of the current simulation session
}
Create the work requirements
Ask the work requirements {
  Set the 30-tuple, with each dimension takes a value of -1, 0, or 1 with equal probabilities
}
Run one tick of the model clock {
  Ask the ITSS [adapts to the majority practices of employees]
  Ask each employee [learn from the ITSS and learn from each other (the order of these two actions is randomly determined)]
}
Repeat the "Run one tick of the model clock" procedure 12 times
Set assimilation of the ITSS = average (the proportion of identical values between the 30-tuples of the ITSS and the employees)
Set IT-based work performance = average (the proportion of identical values between the 30-tuples of the work requirements and the employees)

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