Behavioral interventions for intra-organizational adoption of e-procurement

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Abstract / Summary
In this paper a conceptual framework is developed to research behavioral interventions for intra-organizational adoption of E-Procurement (EP). First of all, the need for EP adoption research is shown based on adoption theory and managerial practice. Next, a research framework is developed and elaborated using different theoretical perspectives. The elaborated research framework provides the basis for empirical research. Once empirically tested, the framework provides the basis for developing a program of behavioral interventions to effectively increase individual EP adoption in an intra-organizational context.

Key words
E-procurement adoption, technology adoption, behavioral intervention.

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Introduction

That E-Procurement (EP) provides a potential benefit in terms of effectiveness and efficiency of the purchasing organization is by now largely undisputed in literature and practice (e.g. Boer et al., 2002). E-Procurement is defined as the use of Internet technology in the purchasing function. This broad definition encompasses tools for a wide range of purchasing processes, e.g. sourcing, tendering, auctioning, contracting, calling-off orders or evaluation, and purchasing management processes, e.g. purchasing intelligence.

The potential benefits of EP can only be achieved if and when the users and supporting functions adopt the tool. This adoption is not self-evident. People are not keen on altering their current habits and are generally reluctant to change, especially in coercive situations in an intra-organizational setting. Being able to influence individual behavior is one of the core aspects of effectuating managerial strategies. Intervening in the adoption processes of different individuals provides the key towards realizing change and unlocking the value-potential of EP.

This paper aims at designing a conceptual framework to research behavioral interventions to effectively increase intra-organizational adoption. First of all, a literature review is given to show potential research areas in the field of IT adoption, specifically for EP. In addition, it is shown that problems related toward EP adoption are recognized in practice and that a need for prescriptive insight is apparent. In paragraph 3, a research focus is determined that fits within the identified theoretical gaps in literature and answers to a practical need. A research framework is developed in paragraph 4 and elaborated in paragraph 5 using additional theory. This paper ends with a brief discussion on how the elaborated framework is used in ongoing research.

The Need for EP Adoption Research

EP adoption research builds on a rich tradition in the fields of information systems (IS), sociology and psychology. In the past four decades models have been developed for various innovation adoption situations and the spread of adoption across populations (diffusion). One of the major contributions remains the work of Rogers, who defines adoption as "... the decision to make full use of an innovation as the best course of action available" (Rogers, 1995, p.21).

Despite the vast knowledge-base on adoption topics, some research areas remain unexplored. A review of contemporary adoption research has been performed to identify gaps in the current state-of-knowledge. Opportunities for future research have been identified for:

- 'level of analysis'. Organizational level research has mainly concentrated on the characteristics of an organization and the organizational innovativeness or adoption success. On an individual level, a vast theoretical basis exists for adoption. Explanatory insights have been identified on an individual level in the social and psychological disciplines for cognitive and behavioral mechanisms of individual (innovation) adoption. The major concepts in these fields have also been applied towards the domain of technological innovations with TAM (Davis et al. 1989) and UTAT as prime models (Venkatesh et al. 2003). Both individual and organizational level adoption research have been developing more or less independent of each other. Naturally, similar concepts have been applied on both levels, however, attempts to integrate the perspectives are limited. Frambach and Schillewaert (2002) are a notable exception to this.
The complexity of the interplay between individual-level and organizational-level innovation adoption has barely been touched, leaving a research potential for the dynamics of the intra-organizational adoption processes.

- 'adoption object'. Traditional IT adoption research deals with relatively simple innovations and does not show conclusive results for complex technological innovations requiring an implementation effort where adoption must be coordinated and synchronized across many individuals who may be distributed across multiple departments or geographic locations. Fichman (1992) show a lack of research for complex systems with high user interdependencies and a high knowledge burden.

- 'post-adoption decision research'. In a process approach the time-variant nature of the innovation process is recognized. Various authors have identified different stages in the overall adoption process. Kwon and Zmud (1987) developed a widely applied (and celebrated) organizational-level model with the following stages: initiation, adoption, adaptation, acceptance, routinization, and finally infusion. In terms of stages in the overall adoption process a strong bias can be seen for the actual adoption decision. Later stages of the adoption process, i.e. assimilation process or post-adoption-decision phases, are only just being explored and are advocated for future research.

- 'prescriptive research' Research on adoption and diffusion of IT innovations has concentrated on identifying determinant of the rate, pattern and extent of diffusion across a population, the general propensity of an entity to adopt, and the propensity of an entity to adopt and assimilate a particular innovation. Factor studies have yielded explanatory knowledge based on various combinations of independent variables (cf. Fichman, 1999; Jeyarai et al., 2004). Scholars seem to ‘mix and match’ variables and competing models in the search for even higher explanatory power. Prescriptive insights linking individual cognitive adoption models and managerial actions are just currently being derived, e.g. Bhattacharjee (1998). Still, a substantial research potential remains for developing managerial actions based on proven cognitive adoption models.

Recently, several authors have engaged in adoption research with EP as a research object. The prime questions are focused on how contextual factors stimulate or impede organizational level EP adoption decisions and success. For instance, Osmonbekov et al. (2002) study the impact of EP on the buying center structure, in terms of size (number of individual participants), hierarchical level (managerial authority), functional level (degree of specialization) and participation (involvement in procurement stages by members). They conclude that EP is more likely to be adopted with a high size, low hierarchy level, less functional specialization and high participation. Other studies stress the effect of process characteristics and characteristics of the purchasing organization (Subramaniam & Shaw, 2004); aggressive or follower adoption strategy and industry characteristics (Davila et al., 2003). Discriminating characteristics of adopters and non-adopters were further explored by Min and Galle (2003), showing the influence of organizational readiness, user characteristics and IT infrastructure.

Several researchers have developed methods to assess the applicability of certain EP forms or tools. Both conceptual (Hartmann, 2002) and practical (Harink, 2003) methods have been developed. In addition, concepts (Boer 2002), frameworks (Subramaniam & Shaw, 2004) and (consultant) tools have been developed to identify the ex-ante value of EP (e.g. iCARE, ePAT). The tools can be used for assessing the fit of EP and a given purchasing situation on an organizational, process or commodity level, i.e. compiling ‘the business case’. Individual-level adoption issues, however, have hardly been dealt with (e.g. Harink, 2003). Both descriptive and prescriptive intra-organizational adoption research specific for EP has not been found and presents a promising research opportunity.
The need for practical insights

While EP can harness organizational performance through cost savings, reduced purchase prices and time savings, their introduction may be met with skepticism, resistance, or even sabotage on an individual level. Practitioners recognize these problems with individual adoption and have incurred difficulties in managing them. This was one of the major findings of the SIGB Erenstein conference in November 2003 with approx. 50 Dutch purchasing executives and also confirmed in a survey among 44 EP professionals in September 2004.

An exploratory study of factors influencing individual adoption shows that managerial interventions can or should not address all relevant factors, only the ones that are (economically) viable (Reunis et al., 2004). Also, a need for prescriptive insight is more apparent for stimulating adoption than organizing the prerequisites. Organizing the prerequisites for EP adoption can be resource consuming (e.g. data alignment, integration, catalogue development, technical infrastructure), however, the knowledge on how to realize the prerequisites is readily available. Getting people to want to adopt, however, remains difficult. The effectiveness of various interventions remains hard to predict and insight in ways to stimulate adoption is needed. Naturally, efforts to raise individual level adoption should only be conducted when additional adoption is beneficial, i.e. when a value potential is recognized. A practical need is identified for knowledge on how to get people to adopt when two conditions are met: a.) a value potential for additional ‘adoption’ should be apparent and b.) the prerequisites for adoption should be in place. Adhering to these conditions ensures that the stimulation of adoption is both useful and possible. Only manageable factors can be addressed to achieve this adoption.

Research Focus

A research focus is developed on the basis of the identified research opportunities in theory and the practical need for prescriptive insights to influence EP adoption. The interplay between individual-level and organizational-level is addressed by choosing a dyad of individual actors as an intermediate level. Dyadic actor-to-actor behavioral interventions and influence tactics take up a central position in this research. The theoretical foundation can be found in principal agent theory, social network theory and social contagion theory. Actor B is influenced by actor A through a program of interventions. An intervention, both passive and active, is an activity between actor A and B directed toward influencing the behavior of actor B. We are interested in the incidence and the effectiveness of different actor-to-actor behavioral interventions.

Building on Principal Agency Theory, the research is limited towards actor A as a ‘principal’ and actor B as ‘agent’, where actor A wishes to establish or raise the adoption of EP by actor B. Actor A is presented with the choice of a (cost-) effective portfolio of interventions and influence tactics to persuade actor B towards EP adoption. This portfolio benefits from knowledge of the effectiveness of single and compound interventions, depending on the type of actor B and relations of actor A and B. This research project aims at developing this knowledge and providing a method to apply it in choosing an effective portfolio of interventions.

This research provides insight in how to achieve intra-organizational adoption. From the previous discussion of the findings from the EPAM study the focus is thereby restricted to manageable factors, when it is both useful and possible. This concurs with the IT Usage Model (Pijpers, 2001) that suggests that interventions are designed for manageable variables.
influencing individual IT adoption, while taking the moderating effects of unmanageable variables into account. Thus, in a certain context, the unmanageable moderating variables are used to discriminate different groups of individuals and addressed differently. Behavioral interventions can have a varying effectiveness for different types of individuals. This approach is also followed in this research and the manageable variables are limited to the portfolio of behavioral interventions from actor A to B.

This research is limited towards ‘contingent adoption’, or individual adoption following an organizational level adoption decision. A decision for a certain system has been made and a certain degree of technical implementation has been completed. From a theoretical perspective this concurs with secondary adoption (Rogers, 1995) and the two-phased adoption approach put forward by Zaltmann et al. (1973).

Based on the identified gap concerning the applicability of traditional innovation adoption research, the object of EP is limited to complex systems with high user interdependencies and a high knowledge burden. This implies that not all EP systems qualify as a research object. Some EP systems invoke more change than others. In addition, it is postulated that the effectiveness of dyadic interventions differs per EP form, since they are associated with different changes in roles, responsibilities and processes (c.f. Harink, 2003). Simple EP forms, like using sourcing databases, only change the technology to perform a task. Other tools have a broader effect on processes, roles, and individuals. EP systems for collaboration and management support systems are not included in this research. The focus in this study is limited to complex systems supporting transactional purchasing processes on a) a tactical level, i.e. systems that facilitate tendering, RFx and the awarding process and b) an operational level, i.e. systems to support calling of orders within a contract.

Research framework

The discussion of the research focus leads to the practical question of how one individual, i.e. ‘principal’, can influence or persuade another individual towards EP adoption in a certain organizational setting with behavioral interventions. This is paraphrased in the following prime question to be answered in this research project: How can intra-organizational adoption effectively be stimulated?

The dyad of actors is taken as a starting point to develop a research framework. A combination of the concepts in the core research question and the previous discussion result in a guiding framework for this research. In a certain intra-organizational context, an intervention from Actor A influences the adoption of Actor B of EP, moderated by the characteristics of the actor dyad (the relation between actor A and B) and the characteristics of actor B. Figure 1 shows the graphical representation of the research framework.

The framework provides the outline for research questions focused on the relation between the different elements: what is the effectiveness of single Actor A interventions on the Actor B adoption? And how is the effectiveness of single Actor A interventions moderated by the Dyad A · B and Actor B characteristics? Besides insights in the effectiveness of single interventions, the effect of combined parallel and sequential interventions is explored. Actor-to-actor behavioral interventions are not necessarily fully independent; certain parallel combinations could leverage the overall effectiveness. Also time-variant effects of the interventions can exist. A chronological fashion of interventions could leverage the overall effectiveness. This leads to an additional research questions: what is the effectiveness of combined Actor A interventions on the adoption by Actor B?

Cascade effects of actor-to-actor interventions can also exist, i.e. a specific actor can influence the dissemination between other actors. This question conceptually links the dyads of actors in
a network and is therefore a higher level of analysis than employed this research. Cascade effects will be explored, but not explicitly included in this research.

**Figure 1: Research Framework**

The aim is the development of new theoretical insight with a meaningful application in a practical context by professionals. The prime type of output for this research is a method, building on proven theory. This method comprises prescriptive insight into when to apply certain interventions to increase individual-level EP adoption. The method builds on the IT Usage Model (Pijpers, 2001) where the moderating variables are used to discriminate different groups of individuals and develop a program of interventions specific for each group. The research framework is taken as starting point to identify the different interventions and the different moderating variables.

In the next paragraph the concepts in the research framework are elaborated.

**Elaboration of the Concepts in the Research Framework**

Theory is used to specify the concepts, keeping usability in mind. This means that the variables should be recognizable and measurable in practice, while retaining satisfactory scientific reliability and validity. Each of the concepts in the research framework are specified in research variables, starting with the dependant variables of ‘Actor B Adoption’, moving towards the independent variables of ‘Actor A Interventions’, the moderating variables ‘Actor Dyad A-B’ and ‘Actor B characteristics.’

**Actor B Adoption**

The body of literature dealing with IT innovation adoption and usage appears to be a mature research area. The compound research effort has yielded a variety of widely applied models and distinct streams of approaches. Authors have developed preferences for different end-variables and measures, e.g. based on cognition, adoption behavior, stages in the adoption process or the adoption Outcome. For this research a combined end-measure is used based on ‘cognition’ and on ‘adoption behavior.’

The combination of cognition and adoption behavior is frequently used in adoption research and has some advantages for using the theory for developing a portfolio of interventions. The link between cognition and adoption behavior is firmly grounded in cognitive psychological research and applied widely in IT adoption, e.g. as ‘behavioral
intention’ and ‘behavior’ (TAM). The first advantage of including cognitive variables together with behavioral variables is the increased understanding of the internal mechanisms that should be addressed. Behavioral interventions can be more effective when focused on the relevant cognitive variables. An understanding of the way in which attitudes and behavioral intentions are formed can guide the content of an intervention or influence tactic. Secondly, a change in the cognitive mechanism preceding adoption behavior shows the endurance of the behavioral change. For a more enduring effect commitment should be sought for instead of just compliance (cf. Yukl & Fable, 1992). Thirdly, the cognitive processes also lie at the basis of both positive and negative ‘contagious’ behavior, respectively advocacy and subversive forms of resistance. The stimulation of advocacy and the mitigation of resistance can be realized by addressing the attitude formation processes.

The large majority of research only includes people in the ‘adopter’ population that can actually use the system themselves. This approach limits the research to potential users and excludes adoption by enabling or facilitating roles. The overall adoption and/or successful application of IT systems with a high interdependence often rely on other roles than users. This also applies for EP. A tactical purchaser who is fully convinced of using an auctioning system relies on the support of commodity specific business-owners and possibly other functional expertise. The same system requires different usage patterns. In this study both direct and indirect users as potential adopters are recognized. In addition, adopters can be first time users or (acceptance) and continued users (infusion). The operationalization of the behavioral end-variable should therefore cover multiple behavioral outputs. A continuum from positive to negative outcome behavior is used. A behavioral intervention is successful when the behavioral end-variable makes a positive shift. The mitigation of non-adoption or resistance is thereby also recognized as an effective influence tactic.

The choice of the cognitive mechanism that is influenced by actor A is based on the work of Venkatesh et al. (2003). They integrated eight dominant models in contemporary adoption research towards a Unified Model of Acceptance and Usage of Technology (UTAUT) that substantially outperforms every individual model in terms of explanatory power (adjusted R² of 70 percent). The UTAUT uses four core determinants of intention and usage, and four moderators of key relationships (gender, age, experience, voluntariness). The UTAUT is a definitive model that synthesizes what is known and provides a foundation to guide future research in this area. It provides the key drivers of acceptance of targeted populations: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). In this research, the key variables in the UTAUT are targeted by the behavioral interventions from actor A. The effect of an intervention is the difference in the four core determinants UTAUT and BI of the receiving party, actor B. A graphical representation is shown in Figure 2.
**Figure 2: Behavioral Interventions on Cognition and Behavior**

### Actor A Intervention

A behavioral intervention is an activity between actor A and B directed at influencing the behavior of actor B. To specify behavioral interventions a combination is used of an inductive approach, classifying interventions based on empirical findings, and a deductive approach, based on general theories. An inductive approach is used to classify 'intervention types'. Based on exploratory interviews with experts and representatives of large Dutch purchasing organizations, eight categories of actor-to-actor interventions were identified: perceived advantage, communication, demonstration, enforcement, training, involvement, risk reduction, and reward. They are identified on a basis of occurrence and effectiveness in practice specific for EP adoption. The direction and intensity of interaction are used as a discriminatory factors. The intensity of interaction can vary from a one-time unidirectional act, e.g. an e-mail, to a multiple bilateral activity, e.g. training or communication. A full discussion of the exploratory research leading to the eight interventions is given in Reunis et al (2005). This portfolio of actor-to-actor interventions is used in this research as main intervention types.

To further refine the interventions types discriminatory factors for the effect of interventions on the adoption are used. The following factors are identified based on different theoretical perspectives:

- **'Influence Tactics'**: Influence tactics are persuasive techniques or strategies people actively and passively apply to influence each other. It is suggested that one intervention includes on or more influence tactics to a varying extent. Each influence tactic affects the cognition and consequently adoption behavior. Power theories have been used extensively in relation to the choice and application of certain influence tactics or measures. On the basis of resources availability and dependency, perceived power can be asserted towards reaching a desired change. Research shows that the type of influences can be discriminated on the basis of a ‘hard-to-soft’ dimension (Yulk & Falbe, 1992). They define eight influence tactics: coalition, consultation, exchange, inspirational appeals, legitimating, personal appeals, pressure, and rational persuasion. One intervention employs each of these influence tactics to a certain extent and is therefore described as a ‘score’ on all eight influence tactics.

- **'Argument Quality'**: Another way to classify interventions is to assess the overall argument logic. The persuasiveness of an argument across different individuals depends on their cognitive processing. The Elaboration Likelihood Model (ELM) from Petty and Cacioppo (1986) states that there are two basic routes to process information and evaluate appropriate behavior. A central route requires a high need for input for
cognition or ‘elaboration’. The peripheral route requires minimal elaboration and relies on ‘cues’ for a basis for reaction. The result of interventions depends on the way that they effectively target the elaboration continuum from ‘central’ to ‘peripheral’.

- ‘Medium Quality’. The medium used to convey a persuasive message or argument can have a varying capacity for resolving ambiguity and facilitating common understanding (Daft & Engel, 1986). Obviously, ‘face-to-face’ communication is ‘richer’ than ‘computer mediated communication’. The Media Richness Theory (MRT) suggests that an (cost-)effective choice of the medium depends on the persuasive objective and the communication dyad. A broader definition of the richness is used, including the degree of instrumentality and/or supportive resources, to cover the overall medium quality.

A single behavioral intervention is hereby defined as a four-dimensional concept, and is specified as: a.) one type of intervention, based on the direction and level of interaction; b.) a coherent set of influence tactics directed from actor A to actor B; c.) an overall argument quality; d.) an overall medium quality.

**Actor Dyad A - B**

The concept of ‘actor dyad’ deals with different types of actors or individuals, where a specific dyad of two actors mediates the effectiveness of behavioral interventions between them. A dyad can be viewed as: a.) a relationship b.) type of individuals, where both sender and receiver adhere to the same typology, c.) type of individuals, where both sender and receiver adhere to the different typologies. Here we use a classification on a relationship level. To identify discriminatory factors on a relationship level they should have a different effect for the dissemination of adoption. The ‘receptiveness of the dyad’ for influence is key, i.e. how much the dyad facilitates behavioral interventions to influence adoption. The following factors are identified based on different theoretical perspectives:

- ‘Hierarchical distance’: the degree actor B’s hierarchical power over actor A.
- ‘Perceived credibility’: the degree to which actor B believes actor A.
- ‘Affective distance’: the degree to which actor B likes actor A.
- ‘Cognitive distance’: the degree to which actor B understands actor A. A better understanding facilitates the transfer of persuasive messages. The degree of understanding is likely to be higher in a match of professional disciplines.
- ‘Cultural distance’: the degree to which actor A and B share a value system. A similar reference and value system based on a shared (national) culture is likely to facilitate influences.
- ‘Relationship strength’. When people have previously engaged in a professional relationship and/or need to continue or enhance this relationship, this is likely to moderate the effect of influences had some form of interaction. When they need each other they are more inclined to accept each others influences. Also, reciprocity or exchange of favors can contribute to a future reliance on each other.

**Actor B Characteristics**

A cluster of individuals can have similar characteristics and therefore similar adoption behavior or receptiveness towards behavioral interventions. Identifying clusters of individuals should be based on discriminatory factors for the initial attitude (predisposition) and the receptiveness towards behavioral interventions in general. Discriminatory factors are based on
‘predisposition’ as well as the ‘influence-ability’. The influence-ability is based on moderating variables in the cognitive mechanism identified by Venkatesh et al. (2003): Gender, Age, Experience, and Voluntariness of Use. The following factors are identified for predisposition from the perspective of actor B:

- ‘Purchasing Role’. The relation of individuals towards the purchasing function and purchasing decision making process influences their view EP. In classic purchasing theory different roles are identified in the buying center, e.g. Webster & Wind, (1972) introduce the roles of user, gatekeeper, influencer, decider and buyer in the buying center. These roles have different levels of involvement in purchasing. Feeling about a ‘purchasing project’ can differ greatly between ‘business’- and purchasing oriented functions. In addition the disposition for general EP initiatives can vary according to the degree in which the impact of EP on a person job. In turn, this depends on to the role in purchasing processes. For this study we include various purchasing roles, all in the intra-organizational part of the buying center.

- ‘Innovativeness’. This concept has been widely explored on an organizational level by identifying the properties of organizations that innovate over time in a variety of settings. The analogy on individual level also aims at finding determinants for ‘openness/ proneness to innovate’. In classical adoption research, a conceivable amount of attention has been directed towards discriminating adopters from non-adopters. Many of them refer to personality and the ‘Personal Innovativeness’ (Agarwal & Prasad, 1998).

Appendix A shows a graphical representation of the elaborated research framework. How the elaborated framework is used to develop and test hypothesis is described in the next paragraph.

Discussion

This paper shows that there is both a theoretical relevance and practical need for research aimed at identifying behavioral interventions to effectively increase intra-organizational adoption of E-Procurement (EP). A conceptual research framework is developed and positioned within current adoption theory. The research focus is set and the relevant variables are determined. The elaborated research framework is the end product of the first phase of an ongoing research project. Next research steps include the development of hypothesis in the framework and hypothesis testing. A mixed method approach is suggested combining qualitative and quantitative research methods for respectively developing hypothesis and testing them. Hypotheses are developed on the basis of previous empirical studies and the findings from the case studies. Hypotheses are only developed for the variables which were found to be relevant in practice. The elaborated research framework is thereby ‘pruned’ into a testable model. Operationalization of the variables is also done on the basis of previous empirical studies and if necessary revised for the specific situation of EP adoption. After pre-testing a large scale field-survey will be conducted. The tested model is the basis for developing a method to intervene in individual adoption behavior.
Appendix A: Elaborated Research Framework

Actor $A$ Intervention

- Intervention Type
- Influence Tactics
- Argument Quality
- Medium Quality

Dyad Actor $A$, $B$

Dyad Receptability

- Hierarchical Distance
- Perceived Credibility
- Affective Distance
- Cognitive Distance
- Cultural Distance
- Relationship Strength

Actor $B$ Adoption

- Perceived Experience
- Effort Expectancy
- Behavioral Intention
- Social Influence
- Facilitating Conditions

Actor $B$ Characteristics

Actor Disposition

- Purchasing Role
- Innovativeness

Actor Influence-ability

- Gender
- Age
- Experience
References


