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ABSTRACT

This development research paper explores concepts associated with contribution behaviours. Contribution, in its simplest context occurs in organization settings where employees share knowledge with one another. Usually, this is preceded by a request for help from a colleague however; individuals may decide to contribute in the absence of help requests for example, by preparing a generic instructions document. Contribution can also be considered from the context of influencing decision-making within project teams for example decisions will always need to be made in relation to project schedules and deliverables. Individuals can directly contribute by influencing and participating in such decisions. In reviewing the literature to-date, contribution behaviors are intrinsically linked to concepts embedded in knowledge management, in particular knowledge sharing. Therefore the literature reviewed has explored some primary elements of knowledge management literature including tacit and explicit knowledge. Decision-making process activities (of awareness, searching and matching and formulation and delivery) involved in making contributions are also discussed.

1 INTRODUCTION

One of the primary reasons organisations use project teams is to encourage and facilitate “members with diverse intellectual resources to produce novel associations that give rise to creative solutions” (Ford and Sullivan 2004). At the heart of this lies the theory that the whole is greater than the sum of its parts (Aristotle) so as a group, project teams can make valuable contributions and need to decide “how each individual can best contribute to the team’s goal” (Katzenbach and Smith 2005). Contribution behaviours have been defined by Olivera, Goodman et al. (2008) as “voluntary acts of helping others by providing information.” In their study, they focused on contribution as an act of sharing explicit information or knowledge with co-workers in distributed environments. This development research intends to study contribution in systems development from two broad perspectives; (i) in accordance with Olivera, Goodman et al. (2008), contribution behaviours will be assessed from a knowledge sharing perspective and in addition, (ii) contribution will be assessed as an act of influencing decision-making in systems development environments.

2 MOTIVATION FOR RESEARCH

As discussed in the introduction, this research aims to view contribution in Information Systems Development (ISD) from two perspectives, namely knowledge sharing and decision making within project teams. We will now consider the importance of examining each of these in turn.

From the context of knowledge sharing, Olivera, Goodman et al. (2008) outline how:

- Contribution behaviors can improve organizational effectiveness
- Little work has been done on understanding the contribution act in detail
- Understanding how and why individuals make contributions can help us develop better systems to support and facilitate contribution

As a contribution act relates to individuals’ voluntarily sharing information with one another, contribution behaviors have a direct correlation with knowledge sharing and concepts embedded in knowledge management (section 6). Therefore additional motivations relating to knowledge management are as follows (Olivera, Goodman et al. 2008):

- Although many large organizations have invested heavily in knowledge-sharing technologies, few systems have met their expectations or objectives
- There is a decision-making process involved about whether, what and how to contribute information or knowledge which involves cognitive motivation theories (of awareness, searching and matching, formulation and delivery) to explain why individuals decide to allocate time and effort to the contribution act.

Contribution can also relate to decision-making within project teams. For example, team members “must agree on who will do particular jobs, how schedules will be set and adhered to, what skills need to be developed, how continuing membership in the team is to be earned and how the group will make and modify decisions” (Katzenbach and Smith 2005). Individual members can therefore contribute by influencing such decisions. In organisation settings effective decision-making is crucial where “high quality decisions are expected to lead to more productive actions, quicker problem solving and better organisational performance” (Eierman, Niederman et al. 1995).

3 PROPOSED RESEARCH QUESTION AND OBJECTIVES

The research question is vital for focusing the research and clarifying what it should incorporate (Bryman and Bell 2003). According to Collis and Hussey (2003) the research question is the focal point around which “the research will be designed to investigate and attempt to answer.” This implies that the research question not only guides the study but also determines the appropriate research methodology. The research question proposed for this study is as follows:

“What factors influence Contribution Behaviors in Systems Development Projects?”

In order to allow the research take a clearer focus the specific research question above is narrowed into the following proposed specific research objectives:

- Determine what factors influence knowledge sharing contributions in systems development
- Determine what factors influence decision-making contributions in systems development

4 CONTRIBUTION BEHAVIOURS

In its simplest context, contribution occurs in organization settings where people share information with one another. Usually, this is preceded by a request for help from a colleague however, individuals may decide to contribute in the absence of help requests for example, preparing a generic instructions document which may be useful to all team members (Olivera, Goodman et al. 2008). Olivera, Goodman et al. (2008) describe a basic yet common scenario whereby an employee of a large firm receives an internal e-mail requesting help from an individual whom he/she has never met and for which he/she has no job inter-dependencies with. Responding to such a request is not an immediate priority for this employee, nor is it necessarily a task for which they will receive performance recognition for. Therefore, the motivation and ultimate decision to contribute is in the hands of the employee (Alavi and Leidner 2001) and there is a decision making process involved as to whether to contribute information or not. This decision-making process involves “cognitive motivation theories” of *awareness, searching and matching, formulation and delivery* to “explain why individuals decide to allocate time and effort to the contribution act.” Such key elements are outlined in the following table:

Table 1: Key Elements of Contribution and Summary of Propositions

	Awareness	Searching and Matching	Formulation and Delivery
Cognitive Activity	Develop representation of the request for help	Identify solution that addresses information request	Articulate and communicate the contribution
Role of Motivation	Motivational force generated by characteristics of the sender and their request	Motivational force needed to sustain effort in searching and matching	Motivational force needed to sustain effort in formulation and delivery
Cognitive /Motivational Phenomena	Specificity and concreteness of request increase motivation	Motivational force generated by searching and matching Costs increase as searching and matching moves from internal to external memory systems Specific requests generate higher motivation than general requests	Likelihood of completing the contribution higher for concrete than abstract requests Escalation induced by high investment in searching and matching Perception of effort costs associated with follow-up requests
Facilitating role of technology	Use of media high in social presence increases motivation Use of synchronous media increases motivation	Use of effective search, indexing and retrieval technologies increases motivation	Access to multiple communication channels increases likelihood of contribution Use of authoring tools increases likelihood of contribution

Source: Olivera, Goodman et al. (2008)

While this construct put forward by Olivera, Goodman et al. (2008) deals specifically with contribution from a knowledge-sharing perspective, it is anticipated that this

research can apply this framework to contribution from a decision-making perspective.

4.1 Awareness

Awareness as described by Olivera, Goodman et al. (2008) is “a cognitive activity through which a person recognizes an opportunity to contribute.” Once they recognize an opportunity to contribute (either through a direct request for help or proactively seeking to contribute) the individual must then decide whether or not to act on this opportunity. As table 1 conveys, the decision to do this will be influenced by both motivational forces and the technological facilities available that maximize the degree of social interaction. In the first instance where the individual will potentially respond to a request for help, motivational forces relate to the concepts of ‘exchange relationships’ discussed in section 4.4. In the second instance, where the individual is proactively seeking opportunities to contribute the motivation to fully act on this behavior and make a valuable contribution relates to the individuals’ awareness of ‘social-good’ also discussed in section 4.4.

4.2 Searching and Matching

Searching and Matching is the next stage of cognitive motivation involved in employee contribution acts. It is the stage where the individual determines “whether and how the knowledge domain of the help request matches their own personal knowledge” (Olivera, Goodman et al. 2008). Here the employee uses personal or *individual knowledge* (the combination of explicit and tacit knowledge; section 4.4) to help address the request. It is through searching and matching that the potential for knowledge sharing is initiated where knowledge sharing often “involves identifying matches between personal knowledge and the situations described by those who request help” (Olivera, Goodman et al. 2008). As indicated in table 1, technology that provides efficient searching and indexing capability will assist in the searching and matching process. This is particularly true if the individual is seeking additional explicit knowledge in their quest to address the request for help. As Griffith, Sawyer et al. (2003) explain, “individuals are the most effective media for acquiring and storing tacit knowledge; technology, best for explicit knowledge; while structures and routines are most effective for transferring knowledge.”

4.3 Formulation and Delivery

Formulation and Delivery is the final stage which is described by Olivera, Goodman et al. (2008) as “a cognitive and behavioral activity through which the contribution is articulated and communicated.” The formulation aspect derives exactly what it is that needs to be delivered or communicated while delivery involves the means by which the knowledge is transferred or shared. Delivery can take place through multiple mediators such as “oral communications, e-mail or posting to a discussion forum or corporate database” (Olivera, Goodman et al. 2008). As table 1 conveys, the availability and suitability of technologies to support the individual in formulating and delivering a response, increase the likelihood of the contribution occurring.

4.4 Organisational and Individual Factors affecting Contribution

There are many factors which influence contribution behavior and these have been detailed by numerous researchers including Constant, Kiesler et al. (1994) and Anderson and Williams (1996). The researcher has utilized this research together with other literature indicators (that influence knowledge sharing) to provide a summary of such factors:

Table 2: Organizational and Individual Factors which Influence Contribution Behavior

Factors Influencing Employee Contribution	
Organizational Factors	Individual Factors
Degree of ‘Virtualness’ (Griffith, Sawyer et al. 2003) and technological support (Olivera, Goodman et al. 2008)	Exchange relationships (Constant, Kiesler et al. 1994; Anderson and Williams 1996)
Culture and Values (Fahey and Prusak 1997; O’Dell and Grayson 1998)	Pro-social behavior (Constant, Kiesler et al. 1994)
Reward recognition (O’Dell and Grayson 1998)	‘Social good’ vs. Personal Cost (Constant, Kiesler et al. 1994)
Employee engagement	Willingness to share individual knowledge (Griffith, Sawyer et al. 2003)
Work processes (O’Dell and Grayson 1998)	Organization & Team Commitment

Table 2 categorizes contribution behavior based on two elements, namely, organizational and individual. Organizational factors directly influence individual

factors. For example, the degree to which an employee feels engaged with the organization will influence the level of ‘social-good’ attitudes where the benefits of contribution for the organization are far more outweighed than the social cost (of time or effort) of the individual. In addition, “unless capturing and sharing information are built into the *work processes*, sharing will not happen” (O'Dell and Grayson 1998). In other words, if knowledge sharing is not embedded in an employees role, then contribution is a lot less likely to occur. Some of the factors presented in table 2 will now be discussed.

Exchange Relationships and their impact on ‘pro-social behavior’

The importance of ‘exchange relationships’ in influencing extra-role behavior cannot be overstated where “high-quality exchange relationships are characterized by subordinate contributions to decisions and by the subordinate’s taking over leader responsibilities and tasks” (Anderson and Williams 1996). This statement focuses on supervisor-subordinate relationships however, it has also be found that if there has been a previous positive exchange between coworkers in the past, they are more likely to partake in a positive exchange in the future encouraging ‘pro-social behavior’. If however, a coworker has refused to share information in the past then an exchange, positive or otherwise is unlikely to occur (Constant, Kiesler et al. 1994). As Constant, Kiesler et al. (1994) state “when a coworker has refused a favor in the past, the respondent’s basic, self-centered inclination is not to share information with that person.”

Awareness of ‘social good’

Constant, Kiesler et al. (1994) state how “descriptive studies of behavior in computer networks confirm that employees in some organizations do share knowledge and help others, including organizationally-remote strangers they will never meet in person.” There is a strong realization that in order for an employee to contribute they often must “weigh the social good more than the personal cost” (Constant, Kiesler et al. 1994) and organization leaders “need to consistently and constantly spread the message of sharing and leveraging knowledge for the greater good” (O'Dell and Grayson 1998). In other words, a contribution act may involve a personal sacrifice or cost whereby the decision to respond to a request for help is time consuming and may have no potential for reward recognition at a later stage. As O’Dell and Grayson

(1998) outline, internal transfer of knowledge “is a people-to-people process and usually requires personal generosity or enlightened self-interest.” However, employees may still decide to contribute because they recognize its benefits or social good to the organization as a whole. Research shows that “voluntary help or out-of-role help is positively associated with organizational commitment and with closeness to colleagues” (Constant, Kiesler et al. 1994).

Willingness to Share Individual Knowledge

Naturally, many employees will not always want to share their knowledge with co-workers, as quite often it is this individual knowledge that gives them a competitive edge over their colleagues. *Individual knowledge* is a combination of accumulated tacit and explicit knowledge, which has been built up over a period of time. As Griffith, Sawyer et al. (2003) state, “if the individual allows his or her tacit knowledge to be converted into explicit knowledge, he/she loses the benefit of retaining that knowledge.” Furthermore, a willingness to do this is influenced by exchange relationships (discussed above) where “a certain level of personal intimacy is necessary to establish communication of tacit knowledge” (Griffith, Sawyer et al. 2003).

5 CONTRIBUTION AS AN ACT OF INFLUENCING DECISION-MAKING

Simon, Dantzig et al. (1987) describe how “the work that steers the course of society and its economic and governmental organisations – is largely the work of making decisions and solving problems.” Decision-making has been described as “the performance of a task – the task of making some particular decision” (Bahl and Hunt 1984). In organisation settings encouraging employee contribution in the form of effective decision-making is crucial where “high quality decisions are expected to lead to more productive actions, quicker problem solving and better organisational performance” (Eierman, Niederman et al. 1995).

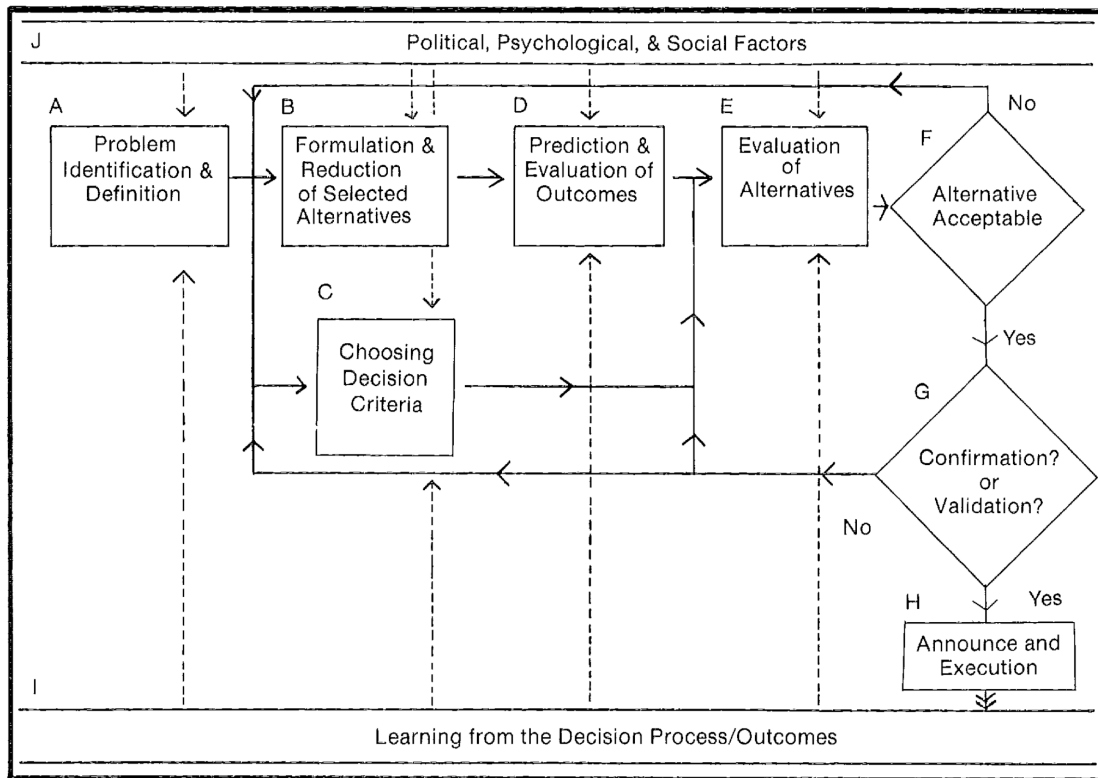
5.1 Decision-Making Process

Decision making is a complex process because decision makers themselves may be subjected to biases, are “limited in their cognitive abilities to process complex information” and often find it difficult to reach a solution that will satisfy different

interests (Eierman, Niederman et al. 1995). As Simon and Dantzig (1987) explain, there are restrictions placed on people such as “the incompleteness and inadequacy of human knowledge,” as well as our inconsistencies of preference and the inherent conflicts among people and groups. As a result of such complexities, technology has been developed to assist the process of decision-making from both an individual and group perspective in the form of Decision Support Systems (DSS) and Group Decision Support Systems (GDSS) respectively. In order to develop such systems effectively it helps to have a “comprehensive descriptive model of decision-making as a process” (Bahl and Hunt 1984). Understanding the decision-making process will also assist in assessing employee contributions in this area.

One of the earliest attempts in literature of modeling a decision-making process was put forward by Bahl and Hunt (1984) and is presented in Figure 1. This general model essentially provides an “event structure” of human choice (Bahl and Hunt 1984). Point A of the model begins with “problem identification and definition” which need to be very clear in order to make an effective decision. Due to resource restrictions (such as time and money), the “selection of alternatives” at point B may be hindered. Points C, D and E are key “decision points” while points F and G relate to some “iterative features of decision making” (Bahl and Hunt 1984). At point H, a decision has been reached and is subsequently executed. This model also accounts for other influences in the decision making process at points I (previous experiences of decision outcomes) and J (political, psychological and social factors) influence the decision making process.

Figure 1: General Model of Decision-Making



Source: Bahl and Hunt (1984)

A detailed literature review is still in progress and as this research continues it is anticipated that a clear understanding and development of the decision-making process construct will help in assessing employee contribution behaviours as an act of influencing decision-making.

5.2 Contribution Behaviours in Information Systems Development (ISD)

This section of the literature review plans to explore existing literature in relation to contribution theory in systems development. Recent literature emphasises a “growing recognition that ISD is a knowledge-intensive process that requires the integration of specialized stakeholder knowledge” (Patnayakuni, Rai et al. 2007) indicating the importance of sharing knowledge. Patnayakuni, Rai et al. (2007) express an ever-growing theme emerging in systems development projects whereby “IS units in similar organizations, with similar skill sets, comparable practices, capability maturity (CMM) levels, and software development tools seem to have markedly different abilities to develop systems.” There are many individual and specific organization reasons for this trend however, “a central challenge is that of integrating specialized knowledge necessary to develop the system that is dispersed across stakeholders with

business and technical domain knowledge” (Patnayakuni, Rai et al. 2007). Therefore creating an environment in ISD that promotes contributions in the form of knowledge sharing is imperative in influencing the successful development of systems.

In addition, agile systems development projects are renowned for their high degree of interaction among team members indicating an intrinsic potential and greater opportunity for employee contribution. Due to this high degree of interaction, agile environments are capable of creating greater amounts of “synergistic knowledge” (Griffith, Sawyer et al. 2003) . Although it may be difficult to determine the degree of contribution within agile environments they may help in recognising the factors which assist in increasing levels of contribution in a systems development context because “agile methods derive much of their agility by relying on the tacit knowledge embodied in the team rather than writing the knowledge down in plans” (Boehm 2002). Therefore, it is anticipated that agile systems development will be reviewed for the purpose of providing a lens of contribution capability within ISD.

6 KNOWLEDGE SHARING

Due to the important emphasis placed on knowledge sharing as a contribution act, it is important to outline some fundamental aspects pertaining to knowledge management and knowledge-sharing. Firstly, there are two types of knowledge namely, tacit and explicit which will now be explained in greater detail:

6.1 Tacit and Explicit Knowledge

Tacit knowledge is not easily definable as it “involves intangible factors embedded in personal beliefs, experiences and values” (Inkpen 1996). Tacit knowledge is therefore difficult to communicate as it is “uncodified and difficult to diffuse” (Choo 1998) and is gained through extended periods of experience. Fahey and Prusak (1997) outlined how “knowledge is a direct outcome of experiences, reflection and dialogue” which ultimately reflects the fundamental concepts of tacit knowledge. There are two dimensions to tacit knowledge, firstly the technical dimension which entails the “hard-to-pin-down skill or craft captured in the term ‘know-how’” and secondly the cognitive dimension which involves “mental models, beliefs and perceptions so ingrained that we take them for granted” (Ichijo and Nonaka 2007). Explicit knowledge on the other hand is the antithesis of tacit knowledge. It is knowledge that

is easily expressed and therefore easily communicated and is “shared in the form of hard data, scientific formulas, codified procedures or universal principles” (Ichijo and Nonaka 2007).

Tacit knowledge is often considered the most valuable type of knowledge to an organization as competitors find it extremely difficult to replicate ideas based on tacit knowledge. However, there is a danger in this interpretation in that “this is tantamount to equating an inability to articulate knowledge with its worth” (Alavi and Leidner 2001) therefore, we should view them as “mutually dependent and reinforcing qualities of knowledge” where tacit knowledge is the foundation needed for developing and interpreting explicit knowledge (Alavi and Leidner 2001). As Fahey and Prusak (1997) state “tacit knowledge is the means by which explicit knowledge is captured, assimilated, created and disseminated.” Finally, Griffith, Sawyer et al. (2003) express a valid point in that the very definite distinctions made between tacit and explicit knowledge are often more of a convenience more than that of a theoretical requirement and we should consider “forms of individual knowing as ranges along a continuum” between tacit and explicit knowledge. This asserts a realistic representation of *individual knowledge* as having various combinations of tacit and explicit.

In order for new knowledge to be created, existing knowledge must be shared where “sharing knowledge in an organization or a network is a trigger and a first step of knowledge creation” (Ichijo and Nonaka 2007). The initial step of knowledge conversion takes place through socialisation where tacit knowledge is shared among individuals before it is expressed in an explicit format through Externalisation. An initial question with regard information sharing is how do you bring people together so that expertise can be shared? The response to this is very often a realization that if organizations are successful in creating an environment for knowledge networks and if they can provide the information technology (IT) to support such networks then it will often emerge (O'Dell and Grayson 1998). Having said this, “the incentives for and barriers to sharing are not really technical” (O'Dell and Grayson 1998) and technology is only one facet of knowledge sharing.

Effective knowledge management systems and networks are imperative for maximizing opportunities for contribution within organizations. However, it is important to remember that while “knowledge management is often facilitated by IT, technology by itself is not knowledge management” (Baltzan and Phillips 2008). There is an increasing danger that organizations hide the concept of knowledge management behind the systems that support it where excessive emphasis on the technology “shifts the focus of knowledge and knowledge work away from individuals – without whom knowledge can be neither generated, transmitted, nor used” (Fahey and Prusak 1997). In fact, some research has gone as far to say that “information technology may destabilize the relationship between organizations and their employees when it comes to the transfer of knowledge” (Griffith, Sawyer et al. 2003). However, creating a technical solution to support the sharing of knowledge and best practices is often the first attempt in developing a knowledge-based firm (O'Dell and Grayson 1998). IT is indeed, the primary mediator for sharing and communicating information and therefore has “an important role in effectuating the knowledge-based view of the firm” (Alavi and Leidner 2001).

IT applications, such as electronic mail, lotus notes or group decision support systems “vastly increase the potential for information sharing in organizations” (Constant, Kiesler et al. 1994). However, despite the fact that many organizations have invested extensively in such “knowledge-sharing technologies, few systems have met their expectations or objectives” (Olivera, Goodman et al. 2008). The reason for this is, as stated previously, that knowledge sharing issues are not technical (O'Dell and Grayson 1998) and a technical enabler to enhance knowledge management is only one step in promoting a knowledge-based firm. Together with *information technology*, other facets include, *culture*, *leadership* and *measurement* (O'Dell and Grayson 1998).

7 CONCLUSION

A detailed literature review of contribution behaviours in systems development is still in progress. This research paper attempts to highlight the primary areas of intended research namely, contribution as an act of sharing knowledge and contribution as an act of influencing decision making within project teams. Continued research will

assess both of these aspects as they relate to information systems development projects.

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