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The Impact of Work System Reconceptualization and Motivation on Information Technology Infusion

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ABSTRACT

The nature of IT Infusion and the relationship between task redesign, herein termed Work System Reconceptualization and IT Infusion has received scant attention from researchers examining post – innovation adoption behaviors. In this paper, these two constructs are conceptually developed and a model describing their relationship, as well as the impact of Individual Motivation upon IT Infusion, of advanced information technologies is presented. In addition, a modification of the six stage model of innovation implementation is presented to include Work System Reconceptualization as a necessary condition to achieve IT Infusion.

INTRODUCTION

IS researchers have extensively studied the behaviors associated with the adoption of an IT and to a lesser extent, post – adoption behaviors which focus on upon the subsequent extent and nature of IT usage. This latter research posits distinct levels of IT usage and suggests that higher levels of usage result in improved levels of organizational performance (Kwon & Zmud, 1987; Cooper & Zmud, 1990, Saga & Zmud, 1994). Only when an IT is used at the highest level, termed *infusion*, is an organization able to maximize its return on IT investment (Saga & Zmud, 1994).

IT infusion is a complex phenomenon and our understanding of it is at an early stage of development. The results obtained by Saga & Zmud (1994) suggest that two constructs bear further investigation. The first is the intervening effect of task redesign, herein termed Work System Reconceptualization (WSR), upon IT infusion. The second is the multi-dimensional nature of IT infusion.

Prior conceptualizations of WSR (e.g., Saga & Zmud, 1994; Cooper & Zmud, 1990) have been developed in the context of organizationally adopted IT applications possessing comparatively little inherent malleability, that is, flexibility to be adapted to a variety of task domains. These conceptualizations have proven difficult to operationalize in an unambiguous manner, and their effects have been understandably difficult to measure, in an advanced information technology context where the IT applications have a significant degree of inherent malleability (see Moore, 2002). This suggests that our understanding of the phenomenon warrants further investigation,

In addition to the above, the extant literature has examined IT infusion almost exclusively at the organizational level of analysis (e.g., Cooper & Zmud, 1990; Zmud &Apple, 1992, King, 1991; Saga & Zmud, 1994). However, while information technologies are often adopted at the organization level, knowledge workers usually determine whether, and to what extent, to utilize an IT in performing their work (Silver, 1991; Silver, 1990). Further, advanced information technologies are inherently malleable which suggests that users can, and will, use the IT at differing levels of sophistication. It follows, therefore, that for advanced information technologies, IT infusion research should focus at the individual level of analysis.

This research contributes to the evolving IT infusion literature in three areas. Prior research (Saga & Zmud, 1994; King, 1991; Kwon & Zmud, 1987; Moore, 2002) has posited WSR as a necessary condition to achieving IT infusion. This research expands our understanding of the nature and dimensions of WSR, its antecedents, and its resulting effect on IT infusion. In addition, it proposes a modification of the six-stage sequential model of IT implementation developed by Cooper and Zmud (1990) to include WSR as a seventh stage. This modification serves to recognize the importance of WSR as an antecedent to IT infusion and to focus research efforts on understanding its nature and role in determining IT infusion outcomes.

Secondly, it expands our understanding of IT infusion and its determinants with respect to advanced information technologies. Thus, it recognizes the need to focus at the individual level of analysis in examining such contexts and the effect of the inherent malleability of such information technologies on IT infusion.

Thirdly, it builds upon existing research regarding the impact of Individual Motivation on IT infusion. Moore (2002) has shown that individual motivation to engage in WSR enactment behaviors is an important determinant of knowledge worker IT infusion behaviors. Further research on the impact of Individual Motivation on IT infusion will enrich our understanding of the dynamics involved in the infusion of an advanced information technology.

A conceptual model is presented that explains the determinants of WSR and the impact of WSR and Individual Motivation on IT Infusion. The relationships depicted in the model will be tested in a subsequent research study, using partial least squares analysis.

THEORETICAL BACKGROUND

Cooper and Zmud (1990) introduced a six-stage sequential model of IT implementation. The first three stages (initiation, adoption and adaptation) culminate in the implementation of an IT through its acquisition/development and installation along with the revision or development of organizational procedures. The latter three stages (acceptance, routinization, and infusion) are post – adoption behaviors that reflect the effect of ongoing interaction between users and the IT. Acceptance reflects the commitment of organizational members to use the IT while routinization reflects the adjustment of organizational governance systems to account for the IT such that the IT is not perceived as new or out of the ordinary. Lastly, infusion occurs as the IT becomes more deeply imbedded within the organization's work systems and is used to its fullest potential.

IT Infusion

IT infusion is defined as the process of embedding an IT application deeply and comprehensively within an individual's or organization's work systems (Cooper & Zmud, 1990; Kwon, 1987; Sullivan, 1985). This definition is somewhat vague for guiding IS research (Saga & Zmud, 1994) and researchers have only begun to explore the dynamics that lead to IT infusion.

Hall & Loucks (1977) developed a schema for conceptualizing levels of use. Through interaction with the technology, the user refines his understanding of both the technology and its application to a given task set. Building on this schema, it is generally accepted that most successful IT applications are enhanced or reconfigured over time reflecting an increased organizational understanding of the IT, as a result of direct experience with the IT and the work system it supports. Later revisions of the IT application are seen to represent higher "levels of use" (Hall & Loucks, 1977; Bayer & Melone, 1989) in which the IT is used in an increasingly sophisticated manner.

Three such levels of infusion have been identified – extended use, integrative use and emergent use (Saga & Zmud, 1994) corresponding to Hall & Loucks (1977) refinement, integration and renewal levels, respectively. Extended use necessitates using more of an IT's features in order to perform a more comprehensive set of work tasks. Integrative use requires using an IT to establish or enhance workflow linkages among a set of work tasks. Emergent use requires using the IT to accomplish tasks that were not feasible or recognized prior to application of the IT to the work system. These dimensions, while conceptually appealing, have proven difficult to operationalize when dealing with advanced information technologies that are highly malleable. This suggests that a reexamination of the dimensions of IT Infusion is warranted.

Alternatively, we can conceptualize the dimensions of lT Infusion by looking at their effect upon a firm's performance. Performance can be viewed as a reflection of the effectiveness with which a firm conducts its operations so as to achieve its objectives (doing the right things) and the efficiency with which those operations are conducted (doing those things right). We can, thus, consider IT Infusion as having two dimensions: effectiveness and efficiency.

Work System Reconceptualization

Prior research has identified task redesign as innovation re-invention (Rogers, 1995), transformation (King, 1991), reconceptualization of work processes (Kwon & Zmud, 1987; Saga & Zmud, 1994) or work process reconceptualization (Moore, 2002). In this paper it is termed *Work System Reconceptualization* (WSR) and is defined as one's cognitive understanding of the reconceptualization of work outcomes and/or the processes by which they are accomplished, so as to fully utilize an IT's capabilities.

The term WSR is preferred in that it more clearly recognizes the possibility of redefining work outcomes, the processes by which those outcomes are accomplished, or both. WSR is viewed as a cognitive state wherein one recognizes the opportunity to change routinized behaviors and, thereby, improve performance. WSR is distinguished from business process reengineering (BPR) in that the former relates to the reconceptualization of work processes and/or outcomes at the individual rather than the organizational level.

The focus of prior studies has been on defining and measuring various levels of IT Infusion, rather than on understanding WSR and its effect upon IT Infusion. Moore (2002) suggested that WSR be viewed as having three levels that reflect the interaction between tasks, processes and outcomes. However, this conceptualization, and the corresponding effect upon the posited dimensions of IT Infusion, extended, integrative, and emergent, has proven difficult to operationalize.

This paper proposes that WSR can be viewed as an individual's understanding of the degree of change necessitated by the enactment of the WSR. Thus, WSR change lies on a continuum from a very minor change to a very major change, and can be categorized as inconsequential, incremental or radical. An inconsequential change results from some minor alteration in the process by which a task is performed. Such a change may not be even recognized as a WSR by the individual is likely to be enacted without further consideration of potential consequences by the individual. An incremental change results from a more substantive modification of the processes by which a task is performed or by the redefinition of some element(s) of a work system's underlying tasks. Radical changes are brought about by the redefinition of a work system's outcomes and the resulting change in processes necessary to accomplish them.

Individual Motivation

IT infusion is, by definition, a change based outcome and it is achieved only when a given WSR is *enacted* by the individual. Hence, to overcome the resistance to change inherent in IT infusion – producing behaviors, an individual must be motivated to enact a given WSR. To be so motivated, the individual must believe that he can enact the WSR and that there are sufficiently valued consequences to be gained there from. Motivation theory seeks to explain the psychological processes and conditions that influence the initiation, direction, persistence, and magnitude of behaviors (Steers & Porter, 1974). Based on the work of Moore (2002), Figure 1 shows that Individual Motivation is determined by the interaction of Consequence Expectancy and Consequence Valuation, Personal Expectancy, Environmental Expectancy and Enactment Cost Expectancy.

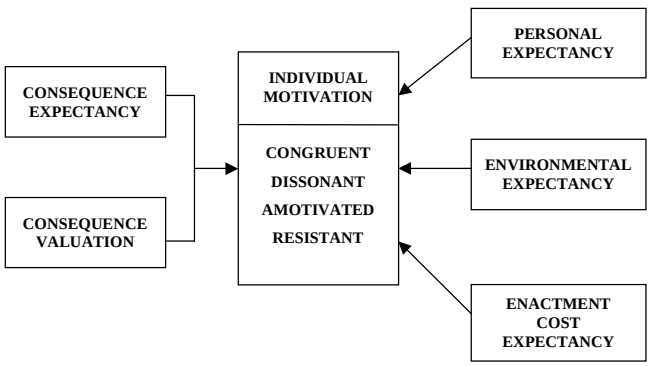
Expectancy is defined as the probability estimate that a behavior, or set of behaviors, will lead to some outcome. *Personal Expectancy* (Cady, Perrewe & Gist, 1997) is an individual's assessment of his capabilities to exhibit the necessary behaviors to produce a given outcome, holding the environment constant. It is similar to, but distinct from, self-efficacy in that the latter includes both personal as well as environmental expectancies (Gist & Mitchell, 1992). An individual's assessment of his ability to enact a given behavior is seen as impacting his motivation to attempt such enactment. This leads to the first hypothesis:

H1. Individual Motivation is directly influenced by Personal Expectancy.

Environmental expectancy is an individual's estimate of the probability that environmental contingencies are conducive to the accomplishment of a given outcome. While there are many potential environmental factors that may influence an individual's motivation to enact a given WSR, three factors are posited here as being germane to the individual in assessing environmental expectancy: managerial support, organizational slack and job characteristics such as autonomy and task interdependence. An individual's assessment of the environmental factors that may influence the enactment of a given behavior is seen as impacting his motivation to attempt such enactment. This leads to the second hypothesis:

H2. Individual Motivation is directly influenced by Environmental Expectancy.

FIGURE 1 – A Model of Individual Motivation



Enactment Cost Expectancy is an individual's assessment of the amount of cognitive effort, time, and/or other resources that will be necessary to enact the WPR, a kind of subjective "return on investment" evaluation. The individual's assessment of the degree of cognitive effort involved and/or the amount of time necessary to enact a given behavior is seen as influencing his motivation to attempt such enactment. This leads to the third hypothesis:

H3. Individual Motivation is directly influenced by Enactment Cost Expectancy.

Consequence Expectancy is the individual's assessment of the probability that a consequence, positive or negative, will result from the quality/quantity of a particular performance outcome. *Consequence Valuation* reflects the individual's assessment of the desirability of those consequences. Outcomes may result in extrinsic consequences, such as monetary rewards or promotions, or intrinsic consequences, such as image or enjoyment. An individual's assessment of the consequences of enacting, or not enacting, a given behavior, and the degree of desirability of those consequences, is seen as directly impacting his motivation to attempt such enactment. This leads to the fourth hypothesis:

H4. Individual Motivation is directly influenced by the interaction of Consequence Expectancy and Consequence Valuation.

Motivational State

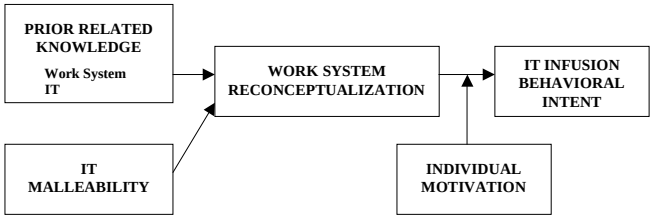
An individual's level of motivation is assessed by his *Motivational State*, which is seen as lying on a continuum ranging from *Congruent* (sufficient valued consequences exist and personal, environmental, and enactment cost expectancies are considered favorable) to *Resistant* (consequences are seen as being unfavorable for the individual regardless of expectancy assessment). An individual is *Dissonant* when personal, environmental and/or enactment cost expectancy is unfavorable. In such instances, the individual sufficiently values the consequences but does not believe they will be obtained because IT infusion will not be achieved due to personal, environmental, or enactment cost constraints. An individual is *Amotivated* when the consequences of WSR are not sufficiently valued by the individual, regardless of expectancy assessment.

CONCEPTUAL MODEL

A conceptual model of the antecedents of WSR and the impact of WSR and Individual Motivation on IT Infusion is presented in Figure 2. An individual's Prior Related Knowledge of the work system and the IT, along with IT Malleability determines the nature of the Work System Reconceptualization. The WSR directly affects IT Infusion Behavioral Intent, with such effect moderated by Individual Motivation. Each of these constructs is discussed below.

The greater the Prior Related Knowledge of the work system and the IT, the more likely it is that an individual will possess what Cohen & Levinthal (1990) term an absorptive capacity, that is, a capacity to recognize the value of new information and apply it to commercial ends. In this context, greater knowledge of the work system and the IT increases the likelihood that the individual will perceive how to alter tasks, processes and/or outcomes with the effect of improving performance. This leads to the fifth hypothesis:

FIGURE 2 – A Conceptual Model of the Determinants of IT Infusion



H5. Prior Related Knowledge of the work system and the IT directly impacts Work System Reconceptualization.

IT Malleability reflects the range of features and capabilities of a given IT across task domains. For example, a transaction processing system is often constructed to perform a given task in a specified manner. As such, its malleability quotient is low. On the other hand, Microsoft Excel is a bundle of technologies that can be applied to a wide ranging set of tasks. Therefore, its malleability quotient is high. The greater the malleability quotient of a given IT, the greater the likelihood for Work System Reconceptualization. This leads to the sixth hypothesis:

H6. Information Technology Malleability directly impacts Work System Reconceptualization.

Because IT Infusion is a change based outcome, Work System Reconceptualization is posited as a necessary antecedent to IT Infusion. It is only through the development of a WSR, and its subsequent enactment, that IT Infusion can take place, and is reflected in the individual's intentions to enact a given WSR. This leads to the seventh hypothesis:

H7. Work System Reconceptualization is a necessary condition for, and directly impacts, IT Infusion Behavioral Intent.

The enactment of a WSR is seen as leading to certain consequences, the valuation of which is internally determined by the individual. The perception of these valued consequences leads the individual to evaluate his personal, environmental, and the enactment cost expectancies regarding the potential for achieving these valued consequences given a successful WSR enactment. The interaction of the consequence expectation and consequence valuation, and personal, environmental, and enactment cost expectancies, produce a given level of Individual Motivation towards enactment of a given WSR. As discussed previously, the more congruent the motivational state, the stronger will be the intention to engage in WSR producing behaviors. This leads to the last hypothesis:

H8. The relationship between Work System Reconceptualization and IT Infusion Behavioral Intent is moderated by Individual Motivation toward WSR Enactment.

CONCLUSION

This paper has presented a discussion of the nature and dimensions of IT Infusion and WSR and has proposed modifying the stage model of implementation to reflect that WSR is a necessary condition for IT Infusion to occur. A model has been presented which describes the antecedents to WSR, the nature and dimensions of WSR and the relationship between WSR and IT Infusion in an advanced information technology context. In addition, the role of Individual Motivation in determining IT Infusion has been presented. As such, this paper has attempted to address issues that have arisen in prior research into post – innovation adoption behaviors and expand our understanding of the antecedents of IT Infusion.

REFERENCES

Cady, S., Perrewe, P., and Gist, M. "Resurrecting Expectancy Theory: New Life for an Important but Prematurely Dismissed Model for Motivational Research," Academy of Management Proceedings, 1997.

Cooper, R., and Zmud, R. "Information Technology Implementation research: A Technological Diffusion Approach," *Management Science*, (36:2), February 1990, pp. 123 –139.

Davenport, T., and Short, J. "The New Industrial Engineering: Information Technology and Business Process Redesign," Sloan Management Review, Summer 1990, pp. 11 – 27.

Gist, M. and Mitchell, T. R. "Self-efficacy: A Theoretical Analysis of its Determinants and Malleability," Academy of Management Review, 17 (2) 1992, pp. 183 – 211.

Hall, G., and Loucks, S. "A Developmental Model for Determining Whether the Treatment is Actually Implemented," *American Educational Research Journal*, (14,3), Summer 1977, pp. 263 – 276.

Hammer, M. "Reengineering Work: don't Automate, Obliterate," *Harvard Business Review*, July 1990, pp. 104 – 112.

King, R. "The Transformation of Organizational Information Systems: Beyond the Implementation Stage," *Proceedings of the American Chinese Management Association*, August 1991.

Kwon, T., and Zmud, R. "Unifying the Fragmented Models of Information Systems Implementation," In *Critical Issues in Information Systems Research*, R. J. Boland and R. A. Hirschheim (eds.), John Wiley and Sons Ltd., 1897, pp. 227 – 251.

Moore, J., "Information Technology Infusion: A Motivation Approach," Dissertation, 2002.

Saga, V., and Zmud, R. "The Nature and Determinants of IT Acceptance, Routinization and Infusion," IFIP, 1994

Silver, M.S., "Decision Support Systems: Directed and Nondirected Change," Information Systems Research, (1:1), 1990, pp. 47-70.

Silver, M.S., "Decisional Guidance for Computer-based Decision Support," MIS Quarterly, (15:1), 1991, pp. 105-122.

Steers, R. M. and Porter, L. W. "The Role of Task-Goal Attributes in Employee Performance, " Psychological Bulletin, 81 (7), pp. 434 – 452.

Sullivan, C. "Systems Planning in the Information Age," *Sloan Management Review*, (26), 1985, pp. 3 – 11.

Zmud, R., and Apple, E. "Measuring Technology Incorporation/ Infusion," Journal of Innovation Management, v9 #2, June, 1992.