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# ERP and Innovation in Schumpeterian Market Dynamics

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## ABSTRACT

Organizations are under competitive pressure to innovate and at the same time efficiently execute their strategy, and have been implementing enterprise resource planning (ERP) solutions to aid in the achievement of their goals. Sambamurthy, Bharadwaj, and Grover (2003) describe the capability of simultaneous innovation and efficient execution as *agility*, and they propose a model of information technology's role in agility and entrepreneurial action within established organizations. They refer to the market forces that drive the need for agility as *Schumpeterian market dynamics*. We apply a synthesis of two seminal Schumpeterian theories to ERP research. We then relate these lessons to the Sambamurthy et al. framework. We conclude with a view of ERP as an *amplifying* technology that has the potential to amplify either adaptive or creative response, depending largely on firm-specific factors.

## KEYWORDS

ERP, innovation, adaptation, agility, Schumpeter.

## INTRODUCTION

Continuous organizational adaptation, innovation, and efficient execution are imperative for sustained success in today's rapidly changing economic environment. Information technology is thought to generally support process improvement across each of these areas (Sambamurthy, Bharadwaj, and Grover 2003). One particularly visible information technology is enterprise resource planning (ERP), and this paper looks to extend our understanding how ERP might enable or constrain organizational innovation, adaptation, and efficient execution.

In recent years enterprise resource planning systems have become increasingly important, as over two-thirds of organizations are at some level of ERP implementation (Elmes, Strong, and Volkoff, 2004) and implementation can be quite costly, occasionally exceeding \$100 million (Robey, Ross, and Bourdreau, 2002). ERP systems are unique forms of IT in that they are all-encompassing, and by nature aspire to integrate all of the applications and business processes of an enterprise (Davenport, 1998; Bourdreau and Robey, 2005; Robey et al., 2002; Markus, Axeline, Petrie, and Tanis, 2000; Kallinikos, 2004). ERP emerged from both traditional administrative systems that addressed accounting and human resources, and manufacturing systems that traditionally managed a firm's inventory, purchasing, manufacturing planning, etc. (Markus and Tanis 2002). Today leading ERP vendors also look to provide a wide array of other enterprise solutions, including supply chain, customer relationship, and product lifecycle management. Many firms only partially implement ERP, and in varying degrees (Markus, Tanis, and van Fenema, 2000). For the purposes of this paper, we will view ERP in the traditional sense of corporate financial integration and centralized resource planning.

To better understand the potential effects of ERP implementation in existing organizations, we will draw on the work of Sambamurthy, Bharadwaj, and Grover (2003) who have proposed a model of the role of IT in supporting the capability building and entrepreneurial action necessary to gain competitive advantage within firms in "moderate to rapidly changing business environments." They describe such environments as driven by *Schumpeterian market dynamics*, based on the theories of Joseph Schumpeter.

Schumpeter observed that the economics of an industry evolve not only due to what he calls natural and social environmental changes such as wars and revolutions, but also because of "the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates." (Schumpeter, 1975, p. 83) Schumpeter describes a view of industry where creative entrepreneurs take advantage of opportunities as they arise, whereas large, incumbent, often monopolistic, firms are focused on extracting rents in the way which made them successful. He referred to the emergence of entrepreneurial firms at the expense of incumbents as "creative destruction." (Schumpeter, 1975) Schumpeter stated that an existing industry, firm or individual that reacts to the forces of change by

“expansion within its existing practice” is engaged in an *adaptive response* to these dynamics. When they act “outside of the range of existing practice,” they are engaged in *creative response*. (Schumpeter 1947) Existing firms that creatively respond to these market dynamics can be said to take entrepreneurial action (although they are not entrepreneurs in the strict sense).

Stemming directly from Schumpeter’s fundamental observations, two seminal publications by industrial economists address these two responses in different ways. One puts forth an innovative theory of the firm (Lazonick, 1991), and the other names and develops these responses as exploitation and exploration (March, 1991). This paper will attempt to integrate these theories to better understand the relationship of ERP with the innovation potential of existing, successful organizations.

First we will summarize Sambamurthy et al.’s (2003) model on IT’s role in agility and entrepreneurial action of existing firms. Then we will review and synthesize the two Schumpeterian theories, and hypothesize on their implications using ERP research. We then apply these lessons to Sambamurthy et al.’s model and the effects of ERP on the adaptive and creative responses of organizations. We conclude with a view of ERP as an *amplifying* technology that has the potential to amplify either adaptive or creative response depending largely on firm-specific factors.

**INFORMATION TECHNOLOGY AND THE LOGIC OF OPPORTUNITY**

Sambamurthy et al (2003) indicate that successful firms in industries subject to Schumpeterian market dynamics engage in the strategic logic of opportunity, or “relentless innovation and competitive actions”(p.241). Organizational *agility* is critical to the competitive actions that improve firm performance in such environments over time.

They define agility as “the ability to detect opportunities for innovation and seize those competitive market opportunities by assembling requisite assets, knowledge, and relationships with speed and surprise.” (P.245) The agile firm not only responds to moments of opportunity, but also contributes to them through relentless innovation. In the absence of Schumpeterian dynamics, firms apply their dynamic capabilities according to the *logic of leverage* to extract rents based on their competitive advantage. Such advantages are necessarily “short lived,” for the following reasons:

- § Firms continually launch competitive actions to disrupt their rivals’ position and wrest economic rents
- § Firms must undertake a series of actions to continuously recreate competitive advantage
- § Firms with a greater number and variety of new competitive actions will seize greater advantages.

(Sambamurthy, et al., 2003, p. 241)

According to their model, IT investments, if combined with IT capabilities and influenced by the firm’s managerial entrepreneurial alertness, can result in digital options for the firm. Digital options, again combined with entrepreneurial alertness, can then support a firm’s agility. IT capabilities include the quality of the IT infrastructure, human capital and partnerships. Entrepreneurial alertness is management’s ability to perceive and anticipate strategic opportunities and threats in the marketplace. Digital options refer to the unique digitized process and knowledge systems that a firm has in place which can be leveraged as a platform for agility. Sambamurthy et al refer to the relationship between IT, digital options, entrepreneurial alertness, and agility as a “capability-building process.” (see Figure 2)

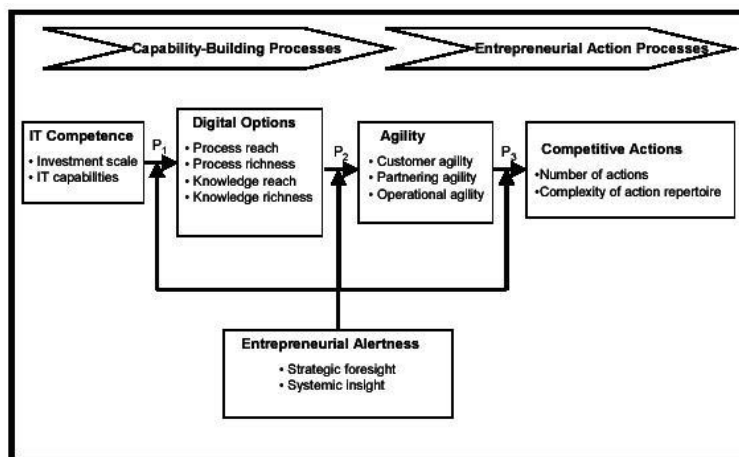
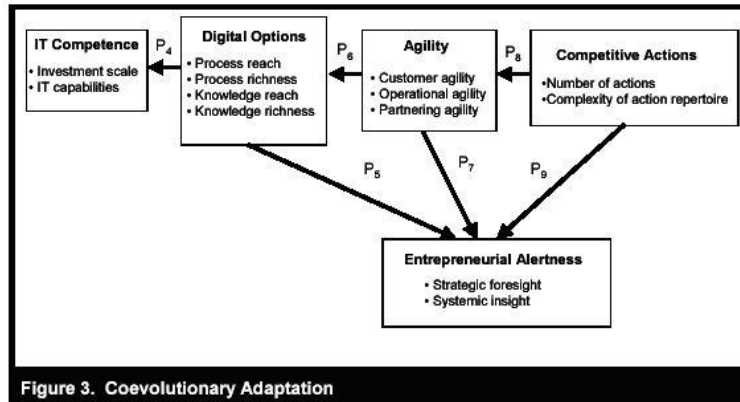


Figure 2. Capability-Building and Entrepreneurial Action

In addition to the positive relationship between IT, digital options, and agility (moderated by the entrepreneurial alertness of management), Sambamurthy et al. indicate that firms benefit from coevolutionary adaptation as well, which is “a virtuous process of feedback and experience through which success with competitive actions revitalizes the three dynamic capabilities of agility, entrepreneurial alertness, and digital options.” (p. 253, see Figure 3)



To illustrate how IT might support agility, Sambamurthy et al. refer to ERP in a number of places. For example, they describe how Ingram-Micro’s ERP implementation acted as a foundation for supply chain connectivity, reducing costs, increasing accuracy, and driving “operational agility.” (p.246)

They also point to Cisco’s adoption of a \$15 million ERP solution, not on the basis of economic justification, but on the basis of “institutionalizing a business model.” They conclude that Cisco’s “process integration around customers, suppliers, partners, and employees,” was made possible largely due to ERP, and resulted in richer process information, or digital options. (p.252) This example is consistent with their assertion that ERP is a salient technology for supporting “digitized process reach” which is thought to support digital options. (p.248)

In another example, Sambamurthy et al. use ERP to describe a scenario where experience with digital options increase the IT capabilities of firms, as ERP systems “often reinforce the cultures, structures, and processes for business championship of IT initiatives and strengthens both internal and external IT/business partnerships.” (p.254)

Based on these examples, Sambamurthy et al (2003) represent an optimistic view of the impact of IT in general, and ERP specifically. They characterize a virtuous cycle where successful entrepreneurial action will support continued agility, which will support digital options, etc. Their key moderating variable is entrepreneurial alertness. This virtuous cycle is not necessarily consistent with Schumpeterian organizational theories, however, as such theories contend that successful entrepreneurial action more often leads to less agility. In order to understand the relationship of digital options and agility to successful entrepreneurial action, we will briefly address two seminal Schumpeterian organizational theories. We will then synthesize their key points and apply them to ERP research to better understand the circumstances by which this virtuous cycle can take place.

## THE THEORY OF INNOVATIVE ORGANIZATIONS

Lazonick (1991) built upon Schumpeter’s notions of adaptive and creative response by indicating that firms can follow either an adaptive or an innovative strategy. If following an adaptive strategy, a firm looks to avoid uncertainty by following proven patterns of productivity, while only enhancing these patterns in scale. On the other hand, firms following an innovative strategy look to confront uncertainty and “develop its productive resources in order to produce a superior product at competitive cost (product innovation), a saleable product at lower cost (process innovation), or both.” (Lazonick, 1991, p.199) Strategic questions associated with innovative organizations center on developing organizational capabilities, whereas adaptive strategies address more classical economic questions such as economies of scale or predatory competitive strategies. An innovative strategy embodies both adaptation and innovation activities.

Lazonick believes that due to the requisite specialization and organizational complexity that enables an innovation, “the very success of the organization in overcoming productive and competitive uncertainty may create the market conditions that encourage it to turn from innovation to adaptation.” (p.206) As the high fixed costs and specific (human and technological)

assets that made an innovation possible also make it difficult for later movers to follow, innovative-turned-adaptive organizations can extract premium rents for a period of time. This rent extracting behavior will lure other innovative competitors into an industry. According to Lazonick, by “sharing the gains of innovation” (p.226) and rewarding employees for successes, an organization can create a pattern of cooperation and reward that requires expansion, and therefore innovative activities, until it becomes part of the organization’s structure. Relationship management, primarily with regard to employees, is the key to a successful innovation strategy.

## EXPLORATION AND EXPLOITATION

March (1991) distinguishes between “the exploration of new possibilities and the exploitation of old certainties,” and indicates that both are “essential for organizations, but they compete for scarce resources.” (p.71) Therefore, he indicates a tradeoff between the two where organizations must determine whether to allocate resources to exploitation, where the returns are more dependable and typically come sooner, versus exploration, where returns are often negative and in the distant future.

March believes that organizational learning is important to the manner in which firms divide their resources. “Each increase in competence at an activity increases the likelihood of rewards for engaging in that activity, thereby further increasing the competence and the likelihood.” (p.73) Success at exploration will lead to exploitation of those experiences, just as success with exploitation will lead to more exploitation. Either way, March agrees with Lazonick that exploitation – which can be considered the result of an adaptive strategy - will generally be self-reinforcing. March indicates that the likelihood of firm exploration increases as (1) turnover and heterogeneous employment patterns will postpone the homogenous socialization patterns that breed self-reinforcing exploitation; (2) the competitive nature of an industry is such that market position has significant effects on returns.

## SYNTHESIS

Both Lazonick and March describe two organizational activities or strategies that loosely reflect Schumpeter’s notion of adaptive and creative response. March’s exploration / exploitation do not map directly to Lazonick’s adaptive / innovative strategies, because exploitation allows for “the refinement and extension of existing competencies”(p.85). Therefore March interprets Schumpeter’s original conceptualization of adaptive response by including what Lazonick would describe as process innovations. Exploration describes the experimentation with competencies that a firm does not possess, which could include either product or process innovations. Lazonick categorizes all such activity under an innovative strategy, interpreting Schumpeter’s adaptive response more strictly to include only what the firm is experienced in doing. Beyond these slight differences, both theories agree that success leads to self-perpetuating cycles of less innovation as firms stick to what they know. Their capabilities, specific assets, risk aversion, learned behavior, etc. all point to greater pursuit along a currently successful trajectory (adaptation / exploitation).

In order to counter this self-reinforcing cycle, March indicates that industry competitive dynamics and heterogeneity of a firm’s human resources will increase the likelihood of exploration activities. Lazonick suggests that the relationships between management and employees, largely founded on a merit-based reward structure, will keep a firm engaged in innovative strategies. Based on these two theories, we put forth the following firm-specific factors that can be used to extend Sambamurthy et al.’s view of agility by offering insight into additional moderating effects beyond the entrepreneurial alertness of managers:

- § **Effects of learning**, experience, and specific assets represent significant forces toward (Schumpeter’s) adaptive response in organizations (March, 1991; Lazonick, 1991)
- § **Industry competitive dynamics** influence a firm’s willingness to allocate resources toward a creative response. (March 1991)
- § **Human resource heterogeneity** is a key driver of potential creative responses. (March, 1991)
- § **Employee rewards**, culture and relationships with management are critical to overcoming forces associated with self-reinforcing adaptive response, and enabling a self-reinforcing cycle of creative response. (Lazonick, 1991)

Following is a brief discussion applying each of these factors to ERP literature, concluding in hypotheses that flow from each point (H3 flows from the final two points together):

### *Effects of Learning*

Enterprise systems such as ERP can be considered to be in a continuous state of development (Fleck 1994). Asymmetry of information between system vendors and specific firms, and the way they learn from each other (technical and local knowledge) as they configure, or innovate, with the system sets the stage for success or failure. If implementation teams focus on “standard” implementations without configuring around the firm’s local knowledge, ERP will likely have a limiting effect on local knowledge creation. Should the structure of an ERP system be aligned with the local requirements through flexible adaptation of the ERP system (Soh, Sia, Boh, and Tang, 2003, Markus 2004), these structures may later represent hard constraints on activity, limiting local flexibility for creative response in unanticipated ways.

H1: ERP implementations, when aligned with local business practices, amplify adaptive response consistent with the trajectory of that business, and place a hard constraint on future creative response in that local context.

### *Industry competitive dynamics*

Highly competitive market dynamics might encourage firms to invest in creative response, but they also drive profits down and force firms to be highly lean and efficient to remain competitive. Investment in ERP can be quite costly – topping \$100 million in many cases (Robey et al. 2002). Thus the amount of capital available for other investments will be greatly limited. As ERP tends to benefit firms in terms of efficiency, it is often thought to limit flexibility (Newell et al. 2003) and therefore the readiness for creative response.

H2: ERP implementations that represent a larger portion of total organizational expenditures will amplify adaptive response.

### *Human resource heterogeneity*

As Sambamurthy et al. indicate, ERP can institutionalize routines and processes. If these processes can be readily adaptable for diverse organizational outcomes, then ERP can be considered a type of digital option, and therefore a potential platform for agility. If, however, these institutional forces constrain an organization from pursuing a viable creative response (Gosain 2004), then ERP can work counter to agility. In the latter case, ERP as the embodiment of strong institutional forces more quickly aid in institutionalization of new, diverse employees, thereby reducing a valuable source of creative response.

### *Employee Rewards*

According to Davenport (1998) “ERP systems can empower users by equipping them with real-time data, but that ERP systems also demand organizational discipline and strict adherence to standardized processes.” If ERP is emancipatory and enables human resource fulfillment by taking certain mental tasks from certain individuals while enabling greater legitimacy for others, then ERP can contribute to a self-reinforcing creative response cycle. On the other hand, if the preoccupation with ERP acts to take attention away from organizational goals, and if the procedural focus of ERP cuts off “procedure development from vital sources of knowledge and practice,” (Kallinikos 2004) employees will be less fulfilled and successful creative response will be less likely.

H3: ERP implementations that focus on human control will amplify adaptive response.

## **DISCUSSION**

Our hypotheses are articulated in a manner that stresses the potential positive effect of ERP on an adaptive response, which would be counter to a firm’s capitalization of agility. This stress on the potential negative impact of an ERP system on a firm’s entrepreneurial action is intended to caution against an overly optimistic view of ERP’s impact on a firm’s continued creative response.

The argument for a negative impact of ERP on agility centers on the structural effects of ERP systems. ERP systems are thought to embody institutional forces and limit the mindfulness of individuals (Gosain, 2004). ERP systems can make it increasingly difficult to work outside of their system, essentially constructing “modes of human involvement,” and cutting off sources of exploration and improvisation from business processes (Kallinikos, 2004). These structural properties of ERP lead some researchers to believe that ERP may lead to efficiency - through routinization, standardization, predictability - at the expense of flexibility of operations (Newell et al., 2003). Such structural and institutional forces might be expected to influence a firm toward an adaptive response rather than a creative one, and potentially limit innovation.

It is important to note, however, that even from a view of ERP as highly a constraining system, it is not thought to entirely stifle human agency (Robey and Boudreau 2005). It can be argued that a great degree of process specification can actually increase the mindfulness of individuals under certain circumstances (Elmes et al 2005). Beyond this, very few firms have comprehensively implemented entire ERP packages globally (Markus, Tanis, van Fenema, 2000), and ERP systems are developed and implemented in a modular, or componentized, fashion, (Spratt 2000) which can be thought to support flexibility for a firm overall (Baldwin & Clark, 2000).

If entrepreneurial alertness of a firm's management is acute and ERP implementation is consistent with a creative response, then the firm's digital options will be favorable along that trajectory. If, however, the ERP implementation proceeds without alert guidance, it will likely limit the organization from pursuing adequate creative response. In light of these issues, we propose three extensions of Sambamurthy et al.'s propositions to include the notion of ERP as both a moderator and amplifier of entrepreneurial alertness:

P1: An ERP system will amplify a firm's adaptive response.

P2: If leveraged in an emancipatory manner, an ERP system can amplify the impact of entrepreneurial alertness on creative response along an established strategic trajectory.

P3: If leveraged in a manner that stresses human control, an ERP system can moderate the impact of entrepreneurial alertness on creative response.

The amplification of adaptive response will occur as ERP represents hard structure that will limit the future organizational action, but will arguably support more efficient operations along an existing trajectory. The amplification on creative response will occur as entrepreneurial alert organizations would be expected to nurture diverse views and emancipatory values in order to benefit from potential innovation.

Finally, as we accept that ERP systems are partially and modularly implemented, we argue that effects of ERP along given trajectories do not necessarily translate to impacts on an organization as a whole. For example, a focus on efficient operations, or adaptive response, for a given division may offer options for creative response due to greater flexibility for the organization as a whole. Adaptive response at one level may support creative response at a higher level.

## CONCLUSION

Sambamurthy et al. (2003) describe an appreciative view of IT's impact on agility, and they repeatedly use ERP as an example to illustrate the enabling value of IT. However, they offer little discussion of whether IT, specifically ERP, may actually limit agility and therefore competitive actions, or innovation. They present entrepreneurial alertness as the key moderating variable, but do not address other potential moderating variables. From two Schumpeterian organizational theories, we introduce other potential moderators, such as the effects of learning, values associated with human control, and relative cost characteristics of an ERP implementation on a firm's agility.

The contribution of this paper to IS literature has been an application of classic Schumpeterian literature to Sambamurthy et al.'s theory on the relationship between IT and agility, using ERP as an example. In doing so, we propose that multiple contingencies must be addressed before reaching any conclusions about the effects of IT, specifically ERP, on firm agility. If a firm can manage to continually leverage ERP in creative manner, then ERP can potentially amplify the creative response in a virtuous cycle, as Sambamurthy et al present. If, however, ERP embodies institutional forces, and firms naturally engage in further adaptive response after successful entrepreneurial action, then ERP can be thought to amplify the adaptive response and potentially limit agility. This has been an initial step toward extending Sambamurthy et al.'s theory to ERP applications.

Refinement of the proposed moderating variables is in order. First, we will further analyze the ERP literature in relation to the four Schumpeterian firm specific factors presented. When these variables are fully theoretically developed, we plan to empirically test their applicability through historical case study research in organizations that have implemented ERP.

## REFERENCES

1. Baldwin, Carliss, and Clark, Kim, (2000) *Design Rules Vol. 1: The Power of Modularity*, MIT Press, Cambridge, Massachusetts.
2. Davenport, Thomas (1998) Putting the Enterprise into the Enterprise System, *Harvard Business Review*, July-August 1998
3. Eisenhardt, Kathleen; Martin, Jeffrey (2000) Dynamic Capabilities: What Are They? *Strategic Management Journal*, 2000, Vol. 21
4. Elmes, Michael, Strong, Diane, and Volkoff, Olga, (2005) Panoptic Empowerment and Reflexive Conformity in Enterprise Systems-Enable Organizations, *Information and Organization*, 15, 1-37.
5. Fleck, James (1994) Learning by Trying: The Implementation of Configurational Technology, *Research Policy* 23, 1994
6. Gosain, Sanjay (2004) Enterprise Information Systems as Objects and Carriers of Institutional Forces: The New Iron Cage? *Journal of the Association for Information Systems*, 5, 4, 151-182.
7. Kallinikos, Jannis (2004) Deconstructing information packages: Organizational and behavioral implications of ERP systems, *Information Technology and People*, 17, 1, 8-30.
8. Lazonick, William (1991) *Business Organization and the Myth of the Market Economy*, Cambridge: Cambridge University Press.
9. March, J. (1991) Exploration and Exploitation in Organizational Learning, *Organization Science*, 2, 1, 71-87.
10. Markus, M. Lynne, (2004) Technochange Management: Using IT to Drive Organizational Change, *Journal of Information Technology*, 19, 1, 4-20.
11. Markus, M. Lynne, Axline, Sheryl, Petrie, David, and Tanis, Cornelius, (2000) Learning from adopters' experiences with ERP: problems encountered and success achieved, *Journal of Information Technology*, 15, 245-265.
12. Markus, M. Lynne, Tanis, Cornelius, and van Fenema, Paul C., (2000) Multisite ERP Implementations, *Communications of the ACM*, 43, 4, 42-46.
13. Markus, M. Lynne and Tanis, Cornelius, (2002) The Enterprise System Experience – From Adoption to Success, in Zmud, Robert W., *Framing the Domains of IT Management*, Pinnaflex Educational Resources, Inc.
14. Newell, S., Huang, J.C., Galliers, R.D., and Pan, S.L. (2003) Implementing enterprise resource planning and knowledge management systems in tandem: fostering efficiency and innovation complementarity, *Information and Organization* 13, 25-52.
15. Pollock, Neil; Cornford, James; (2004) ERP Systems and the University as a Unique Organization, *Information Technology and People*, 17, 1.
16. Robey, Daniel, Ross, Jeanne, and Boudreau, Marie-Claude, (2002) Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change, *Journal of Management Information Systems*, 19, 1, 17-46.
17. Robey, Daniel and Boudreau, Marie-Claude, (2005) Enacting Integrated Information Technology: A Human Agency Perspective, *Organization Science*, 16, 1, 3-18.
18. Sambamurthy, V, Bharadwaj, Anandhi, and Grover, Varun (2003) Shaping Agility Through Digital Options: Reconceptualizing The Role of Information Technology in Contemporary Firms, *MIS Quarterly*, 27.
19. Schumpeter, Joseph A. (1947) The Creative Response in Economic History, *Journal of Economic History*, 1947 p. 149-159; reprinted in Clemence, Richard; (2004) *Joseph A. Schumpeter: Essays on Entrepreneurs, Innovations, Business Cycles and the Evolution of Capitalism*, Transaction Publishers, Seventh Printing 2004, p.221-231.
20. Schumpeter, Joseph A. (1975) *Capitalism, Socialism, and Democracy*, George Allen & Unwin Publishers (originally published in 1942 by Harper & Brothers).
21. Soh, Christina, Sia, Siew Klen, Boh, Wai Fong, and Tang, May, (2003) Misalignments in ERP Implementation: A Dialectic Perspective, *International Journal of Human-Computer Interaction*, 16, 1, 81-100.
22. Sprott, David, (2000) Componentizing the Enterprise Application Packages, *Communications of the ACM*, 43, 4, 63-69.