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Enterprise Systems and Organisational Agility: Conceptualizing the Link

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Abstract

The impact of enterprise systems (ES) on organisational agility (OA) is an under-researched area. Given the trends that most large organisations are moving towards ES and investing heavily on ES infrastructure and the increasing demand for agility, lack of research on ES and OA is a critical oversight. Using insights from the resource based view and dynamic capability theories; this paper argues that organisations can exploit the power of ES to improve their agility in three significant ways – by creating an ES enabled sensing capability and by constantly building ES enabled responding capability. We also argue that the quality of the ES infrastructure which we refer to as ES competence provides the necessary technical and business platform for deploying ES in building and rebuilding sensing and responding capabilities. Our theorising makes an original contribution to IS research by extending current ES research which thus far has focused on ES implementation issues.

Keywords

Enterprise Systems, Information Systems, Organisational Agility, Sensing and Responding Capability

INTRODUCTION

The highly competitive and turbulent business environment is now forcing organisations not only to flexibly adapt to changes when they occur but also proactively predict changes before they impact operations. Organisational agility (OA) refers to organisations' ability to compete and thrive in an unstable business environment. Agility is regarded as a key business factor and an enabler of competitiveness (Ganguly et al. 2009; Mathiassen and Pries-Heje 2006). A McKinsey & Company survey found that nine out of ten executives ranked OA as both critical to business success and growing in importance over time (Sull 2009). A 2009 survey by the Economist Intelligence Unit indicated that 88% of the 249 executives around the world claimed that agility is either extremely important or somewhat important. OA is also a research topic in various disciplines: economics (Ganguly et al. 2009), business strategic management (Soule 2002; Weill et al. 2002), and information systems (Izza et al. 2008; Sambamurthy et al. 2003).

A number of previous researchers have investigated the factors, processes, strategies and structures that contribute to OA. For example, (Zhang and Sharifi 2000) identify agility drivers, providers, strategies and capabilities. (Hermansen and Caron 2003) report on factors that impact a pro-agility organisational culture. (Breu et al. 2002) investigate workforce agility elements. Of all these areas, the role of information system (IS) and information technology (IT) in OA is of particular interest. This is because contemporary organisations function on their IS and cannot survive or grow without IS support (Mathiassen and Pries-Heje 2006; Peppard and Ward 2004). This paper is particularly concerned about one set of information systems, Enterprise Systems (ES), and their relationship to OA. ES refers to an integrated information system that uses both technology and management capabilities of that technology to manage information flow in an organisation (Davenport 1998). ES inherits some of the IS characteristics but has unique features such as standardisation, integration and best practice (Seethamraju and Seethamraju 2009). ES such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM) harness the power of contemporary IT and are pervasively used in most large organisations (Davenport 1998) with an overall ES spending predicted to grow to more than \$7.7 billions by 2010 (VARBusiness 2005).

Despite the pervasiveness of ES and the importance of OA, the relationship between ES and OA remains under-researched and inconclusive. We conducted a twelve year (1998-2009) review of papers published in the top eleven IS journals¹. The findings revealed that although there is some research on IS and OA (Overby et al. 2006;

¹ European Journal of Information Systems, The Association of Information Systems; Information Systems Research, Information Systems Journal, Journal of Information Technology, Decision Support Systems, Management Information System Quarterly, Harvard Business Review, The communication of ACM, the Journal of Management Information System, Information & Management

Sambamurthy et al. 2003; Swafford et al. 2008) there are only five academically published papers on ES and OA (Davis 2005; Gattiker et al. 2005; Ignatiadis and Nandhakumar 2007; MacKinnon et al. 2008; Seethamraju and Seethamraju 2009). Given the trend that most large organisations are investing heavily in ES and the increasing demand for business agility, lack of research on ES and OA is a critical oversight.

The aim of this paper is therefore to review the existing literature on IS and OA in general and ES and OA in particular and propose a conceptual framework that helps to examine the contribution of ES to OA. The main research question the paper addresses is how do organisations exploit ES to become and stay agile?. The rest of the paper is organised in three sections – literature review, conceptual framework and proposition development and conclusion.

PERSPECTIVES ON ORGANISATIONAL AGILITY AND INFORMATION SYSTEMS

The concept of “organisational agility” is rooted in two related concept - “organisational adaptability” and “organisational flexibility” (Sherehiy et al. 2007). Organisational adaptability focuses on how an organisation’s form, structure, and degree of formalisation influence its ability to quickly adapt to its business environment (Sherehiy et al. 2007). Organisational flexibility represents an organisation’s capacity to adjust its internal structures and processes in a predetermined response to changes in the environment (Dove 2001; Yusuf et al. 1999). Adaptability underlies the fit of organisational operations to their environment while flexibility, emphasises the readiness of organisational resources and the ease of resource mobilisation. The “agility” concept encompasses both flexibility and adaptability. An agile organisation is not only “flexible” to cater for predictable changes but also is able to respond and adapt to unpredictable changes quickly and efficiently (Oosterhout et al. 2006). Moreover, agility places a strong emphasis on rapidity because in order to operate in a dynamic environment, speed is an essential quality (Sherehiy et al. 2007). Time has two critical dimensions in OA. Firstly, it refers to the speed in detecting and responding to threats or opportunities. Secondly, it refers to the time that organisations retain competitive advantages before the advantages are imitated by competitors. Agile organisations need to be quick both in detecting opportunities and in taking and implementing actions.

Agility is not a static resource and “does not come in a can” (Dove 2001). It must be developed by organisations when they combine different organisational resources. As information systems are one of the most valuable resources, the role of IS in OA has attracted some research attention researched. The literature on the link between IS and OA promotes three perspectives – the *facilitating, inhibiting and neutral* views.

The facilitating view argues that OA is directly associated with IS. Thus, Desouza (2006) opines that agile organisations and agile information systems are the same thing. IS support for organisational learning and exploration and exploitation is a critical enabler of OA (Lyytinen and Rose 2006). Further, the availability of IS that provide consistent and accurate information and the uptake of new working models have positive association with creating agility (Breu et al 2002). Sambamurthy et al. (2003) argue that IS competencies and the entrepreneurial alertness enable digital options which afford agility.

The inhibiting view maintains that complex IT architecture may hinder organisations from being agile (Newell et al. 2007; Tallon 2008). For example (Newell et al. 2007) argue that IS cannot promote agility because they are built to help enforce control and efficiency, agility on the other hand is spurred by chaos rather than control and efficiency. (Tallon 2008) points out that once an IS is implemented, it will soon become a legacy system as technology keeps developing. Legacy systems might reduce flexibility and innovation, and restrict rather than release the improvisational skills of users as they confront new and unpredictable situations.

The neutral view maintains that, IS can either enable or inhibit OA depending on the existence of agility gaps that are generated by IS and the nature of IS management in place (Oosterhout et al. 2006). OA gap refers to the difference between the level of agility required and achieved. (Overby et al. 2006) point out that, like other organisational resources, IS mismanagement, rather than IS *per se*, is the main reason that negatively influences OA. Without appropriate IS governance, IS will inhibit instead of enable an organisation’s agility. Table 1 summarises and classifies some of the literature on IS and OA in terms of the above three views.

Table 1: Summary of Literature on IS and OA

Reference	Central thesis	Perspectives on OA		
		Facilitate	Inhibit	Neutral

(Breu et al. 2002)	The availability of IS providing consistent and accurate information and the uptake of new working models have positive association with workforce agility	X		
(Desouza 2006)	Agile organisations and agile IS are the same thing	X		
(Fink and Neumann 2007)	IT personnel capabilities including business capability, behaviour capability, and technical capability, support IT infrastructure capability which in turn enables IT dependent OA	X		
(Lyytinen and Rose 2006)	IS functions support organisational learning and exploration and exploitation which enable OA	X		
(Newell et al. 2007)	IS cannot promote agility because they are built to help enforce control and efficiency. Agility is spurred by chaos rather than control and efficiency.		X	
(Oosterhout et al. 2006)	The nature of the agility gap influences the role of IS as either a facilitator or inhibitor of OA			X
(Overby et al. 2006)	IS mismanagement, rather than IS <i>per se</i> , is the main reason that influences OA.	X	X	X
(Sambamurthy et al. 2003)	IS competencies and the entrepreneurial alertness enable digital options which afford agility	X	X	
(Seo and Paz 2008)	IS captures large amounts of data, from multiple sources, in multiple formats and make the data accessible enable sensing capability of organisations	X	X	
(Tallon 2008)	Information legacy systems can be inflexible or unresponsive to change	X	X	
(Weill et al. 2002)	The right balance of investment in high-capability IS infrastructures enables strategic agility. Nonetheless, imbalance investment leads to waste of resources	X	X	

ENTERPRISE SYSTEMS AND ORGANISATIONAL AGILITY

Although research that explicitly investigates the relationship between ES and OA is rare (Table 2), the literature, similar to the general IS and OA literature, tends to be equivocal on the relationship between ES and OA. Some authors claim that ES has a negative impact on agility because of tight integration to make any process change (Newell et al. 2007), and lack of functional fit with business requirement (Ni et al. 2002). Customisation in ES, which results from the lack of fit between organisationally owned business processes with standard processes provided by ES vendors, brings in complexity which may reduce OA (Davis 2005). However, an increase in OA is one of the benefits brought about by ES implementations (Davenport, 1998). As (Gattiker et al. 2005) state, ES contain mechanisms such as built-in flexibility, process integration, data integration, and availability of “add-on” software applications to support agility. The recent introduction of new ES technologies such as Service Oriented Architecture (SOA), business process management (BPM) and web services have altered ES infrastructures, which lead to changes in ES capabilities. Overall the literature thus far has not provided a rigorous framework that shows the mechanisms by which organisations can become and stay agile by exploiting the power of ES. In the next section, we present such a conceptual model.

Table 2: Summary of Literature on Enterprise Systems and OA

Citation	Type of work	Dependent variable	Independent variables	Theory	IS/OA linkage
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(Seethamraju and Seethamraju 2009)	Empirical/ Case study	Business Process Agility	ES integration, best practise, business process orientation standardisation,	ES capabilities	Standardisation and integration have potential to promote agility
(MacKinnon et al. 2008)	Empirical/ Survey	Strategic, operational, human capital, and information, flexibility	Enterprise information system	Strategic management	ES can either support or constrain aspects of strategy management.
(Gattiker et al. 2005)	Empirical/ Case study	Enterprise agility	Built-in flexibility, process and data integration, and consultant knowledge	ES capabilities	The characteristic of ERP supports agility

CONCEPTUAL FRAMEWORK

The central argument of our conceptual framework (Figure 1) is in line with the “facilitating view of IS and OA”. However, we argue that the impact of ES on OA is not direct. Rather, organisations need to transform ES resources to develop an agility-enabling ES capability. To understand the structure of these resources and capabilities, the research draws from the dynamic capability theory (DCT). The DCT is an extension of the resource-based view (RBV) (Teece et al. 1997).

The DCT regards firms’ ability to constantly adapt, renew and reconfigure their capabilities and competences as the major source of performance (Teece et al. 1997). Dynamic capabilities are “the organisational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die” (Eisenhardt and Martin 2000). While RBV emphasises the appropriate selection of resources, DCT emphasises the evolution of resources (Teece et al. 1997), which is signified by two processes: resource-picking and capability-building in the organisation-learning loop. Hence, from the DCT perspective, organisational resources need to be *adaptive, renewable and reconfigurable* to provide sustainable competitive advantage (Teece et al. 1997). Under different conditions of business environment, different types of dynamic capabilities are needed. Therefore, dynamic capabilities have to be adaptive to various business contexts that organisations fall into. Besides, in order to sustain competitive advantage, dynamic capabilities should be renewable and reconfigurable. The DCT provides a relevant theoretical lens to conceptualise the link between ES and OA.

ES can represent valuable and arguably rare resources. They provide the essential platform; can be key sources of organisational capabilities and can potentially, albeit indirectly, contribute to OA (Sambamurthy et al. 2003). However, ES resources are not static or ultimately superior in enabling OA. Instead, ES resources need to be carefully selected, configured and combined with other non-ES organisational resources to generate two critical dynamic capabilities- sensing and responding for OA.

Sensing capability refers to the organisational ability to quickly detect, interpret and capture organisational opportunities (Oosterhout et al. 2006; Seo and Paz 2008). Responding capability represents the organisational ability to quickly mobilise and transform its resources to react to the opportunities that it senses (Gattiker et al. 2005; Oosterhout et al. 2006). The sensing and responding capability are interrelated. If organisations are unable to sense effectively, which means there are opportunities that are disregarded. This will lead to an ineffective response and waste of organisational resources. Therefore, there should be alignment between sensing and responding capabilities to effectively capture business opportunities (Overby et al. 2006). Sensing and responding capabilities are thus types of dynamic capabilities that can be further enhanced through ES (Sambamurthy et al. 2003). The extent to which an organisation uses its valuable ES competencies to enable its sensing and responding capabilities can significantly influence its level of agility. ES competencies and ES enabled sensing and responding capabilities can together help organizations to quickly and efficiently adapt to changes, renew and reconfigure their sensing and responding capabilities and lead them to become and stay agile. Figure one captures the structure of the conceptual framework.

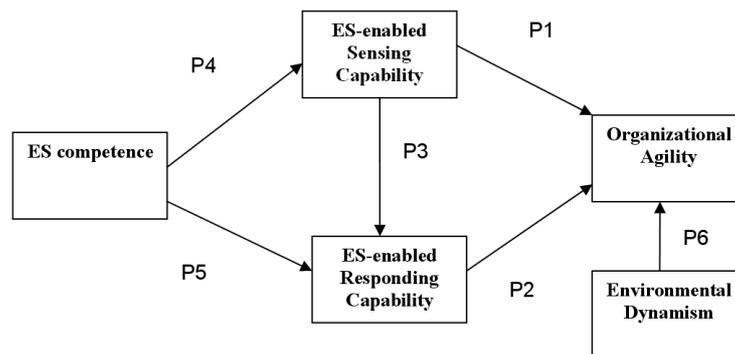


Figure 1: A conceptual framework of how ES can lead to OA

Organisational Agility

The frequency of concepts appearing in various definitions of OA indicate that the monological net of achieving OA comprise of sensing capability, responding capability, speed, and impact of the environment dynamism dimensions. The two concepts, sensing and responding, demonstrate the fundamental process that every organisation performs when changes happen. Thus we define OA as follows:

OA refers to the business performance of an organization that excels in utilising its resources in order to quickly sense changes from its business environment and respond to those changes appropriately.

ES-Enabled Sensing Capability

To conceptually ground our notion of ES-Enabled Sensing Capability (ESESC), we draw from the strategic management literature. In the strategic management literature, sensing capability is closely related to the market orientation and absorption capability (Cohen and Levinthal 1990; Kohli et al. 1993; Overby et al. 2006). Absorptive capacity refers to the ability to acquire, assimilate, transform, and apply knowledge (Cohen and Levinthal 1990). Market orientation refers to a firm's ability to generate and use market intelligence about current and future customer needs (Kohli et al. 1993). Sensing capability focuses on a firms' ability to gather and make sense of externally generated knowledge to manage disruptive changes. Thus sensing capability covers both market orientation and absorptive capability (Overby et al. 2006). Sensing capability not only indicates the ability of an organisation to sense current changes but also to develop market foresight to anticipate changes in the future. Organisations that are able to anticipate changes in their business environment can quickly devise their responding actions in advance of their competitors.

There are various ways of building sensing capability. (Neill et al. 2007) argued that organisations that perform a better capability to *communicate* relevant information among members of the decision making team, *interpret* its environment in a multidimensional way and *analyse* the information simultaneously by incorporating multiple perspectives will have higher sensing capability and eventually become more agile. Furthermore, anticipatory capability, which refers to the ability to predict the way that market is moving can be an essential dimension of sensing capabilities (Day 1994). Overall, the development of sensing capability requires organisations to scan the business environment and capture business insights beyond the usual sources. Such capability can be developed by organisational technologies, processes, values and norms, that together generate knowledge about the future condition (McCardle 2005; Sambamurthy et al. 2003).

Based on the above logic, we postulate that ES, as valuable resources, can be deployed as a source of capability building mechanisms to either directly or indirectly enable sensing capability. We name this construct as *ES-enabled sensing capability* and define it as follows:

ES-enabled sensing capability refers to the ability of an organisation to quickly and efficiently utilise its ES to digitise the process of sensing and develop a strategic market foresight about its business environment.

The sensing process includes capturing, interpreting and prioritizing change signals from business environment. ES functionalities can digitise this sensing process. Enterprise system's global connectivity of activities, data and process makes it easier to integrate information internally across organisations as well as externally with business partners (Gattiker et al. 2005). The integration across the organisation should allow organisations to better sense opportunities and problems such as changes in customer demand. There are three types of ES integration – *vertical, horizontal and technical* (Seethamraju and Seethamraju 2009). Vertical integration refers to integration between different hierarchical levels. While horizontal integration refers to integration between departments or functions within an organisation, technical integration refers to integration between different systems to be compatible to one another. Among the three types of integration, only vertical integration, which enhances the

visibility, accessibility and control and decision support capability, enables top management to comprehend better the critical need for changes.

ES store data centrally and allow the use of powerful data analysis tools such as business intelligence to quickly see hidden trends in data. This allows organisations to make better decisions (Dong and Zhu 2008). Both sensing and responding processes incur cost. Therefore, only significant changes that can create considerable impacts with a moderate level of severity should be treated. Organisations that can quickly classify changes will have more efficient sensing mechanism. When organizations use ES with built-in KPIs and benchmarks, they will be able to quickly filter for potential changes that have significant magnitude. (Coltman 2007) suggests that the customer analytic functionality of CRM can enable organisations to develop proactive rather than reactive market sensing.

As an important development in IT, ES can provide digital options by digitising knowledge and business processes (Sambamurthy et al. 2003). Digitised knowledge reach and richness can significantly impact a firm's sensing capability and through that its agility. Digitised knowledge reach is defined as comprehensiveness and accessibility of codified knowledge in firm's knowledge base and the interconnected networks and systems for enhancing interactions among individuals for knowledge transfer and sharing. Digitised knowledge richness is defined as systems of interactions among organisational members to support sense-making, perspective sharing and development of tacit knowledge (Sambamurthy et al. 2003). While digitised knowledge represents ES-enabled strategy execution ability, the strategy generation for business environment sensing is facilitated by market (business environmental) foresight and organisational learning ability. The above leads to:

Proposition 1: Organisations that utilize enterprise systems (such as ERP, CRM, SCM) in building and renewing their sensing capabilities are more likely to become highly agile.

ES-Enabled Responding Capability

Response capability is an essential and distinguishing feature of an agile organisation (Christopher et al. 2004; Dove 2001). Responsiveness, along with knowledge management and value proposition, are three cornerstones of agility (Dove 2005). While sensing capability generates knowledge of the business environment, responsive capability effectively transforms that knowledge into action (Gattiker et al. 2005; Haeckel 1999). Response capability is thus reflected by the change-enabling capabilities that are embedded in organisational processes (Li et al. 2008). (Christopher et al. 2004) suggest responsiveness to be characterised by a short time-to-market, the ability to scale up (or down) quickly and the rapid incorporation of consumer preferences into the design process. Response acts are the result of a range of operating and strategy capabilities that organisations develop. (Overby et al. 2006) suggest four fundamental strategic capabilities: (1) *production development capabilities* to facilitate a firm's ability to embark on new ventures; (2) *systems development capabilities* to quickly and efficiently implement change to existing systems such as reusable service, SOA; (3) *supply-chain and production capabilities* to adjust existing ventures by shifting production to match a pending change in demand such as high supply chain visibility; and (4) *flexible resource utilisation* to shift resources to areas of need to embark on new ventures or adjust existing ventures. Based on the above understanding of responding capability, we postulate that ES as valuable resources can be deployed as a source of responding capability building mechanisms. We name this construct as ES-enabled responding capability and define it as following:

ES-enabled responding capability refers to an organization's capability to deploy its ES resources and embed them in its strategies and processes to quickly and efficiently respond to changes.

Organisations can exploit their various ES to excel in their responding capabilities. (Ravinchandran and Lertwongsatien 2005) suggest that organisations can employ ES to access markets, reengineer business processes and develop new products/services. ES provide background information that can be used to design competitive response initiatives (Mondragon et al. 2004). ES also provide shared values between different business units (sales, manufacturing, human resource, etc) inside organisations and across their business partners, which enables collaboration in designing or implementing changes (Seethamraju and Seethamraju 2009). Standardisation and integration, which are the fundamental outcome of ES create simplicity and facilitate faster decision making and action, thus, enable response capability (Gattiker et al. 2005).

Organisations that have utilised ES can leverage the digital business ecosystem to enable OA (Tan et al. 2009). Information is shared across the ecosystem regardless of the geographical or time constraints, which can reduce response time. Furthermore, the availability of ES built-in flexibility provided by ES vendors such as web services, and SOA determines OA (Gattiker et al. 2005). Further, organisations can increase their digital process reach and richness, through ES. Digitised process richness refers to the quality of information collected about transactions in the process, transparency of that information to other processes and systems that are linked to it, and the ability to use that information to reengineer the process (Sambamurthy et al. 2003). Digitised process reach refers to the extent to which a firm deploys common, integrated and connected IT-enabled processes. The capability of ES to provide digitised process reach and richness enables organisational response capability as it

facilitates organisations to quickly and easily (re)configure and mobilise organisational resources/capabilities. The extent to which organisations exploit ES to underpin their strategies can result in significant variations in ES-enabled responding capability and in OA. This leads to the following proposition

Proposition 2: Organisations that utilize enterprise systems (such as ERP, CRM, SCM) in building and renewing their responding capabilities are more likely to become highly agile.

Changes identified through the sensing process require an appropriate response. For example, the availability of best practices enables organisations to quickly deploy change execution that are most effective and are synchronised with the industry standard. The sensing capability and responding capability should be aligned to ensure that no changes are ignored or organisational resources are wasted (Overby et al. 2006). Although the variation in sensing and responding capability can create in different types of agility levels, high sensing capabilities can generally lead to high responding capabilities allowing firms to rapidly retool existing products, change production volumes, and customize service offerings. Thus,

Proposition 3: Higher enterprise systems-enabled sensing capability is more likely to lead to higher enterprise system-enabled responding capability.

ES Competence

The creation of ES-enabled sensing and responding capabilities depends on the quality of the ES infrastructure an organisation has put in place. ES are not simply IT solutions but include the dexterous combination of human, and business related competencies (Coltman 2007). The construct of ES competence refers to the quality of the ES infrastructure. Various ES competences are identified (Bharadwaj 2000; Ravinchandran and Lertwongsatien 2005). For the purpose of this research, we focus on the ES competences developed after the adoption and during the continuance of ES uses. Therefore, based on (Maurer 2009) and (Dong and Zhu 2008), we identify three dimensions of ES competences- *ES technical infrastructure competence and ES human and managerial competence.*

ES technical infrastructure competence is defined as the ability of ES technical infrastructure to deliver and support fast design, development and implementation of ES, and the ability to distribute any type of information across organisations. (Sprott 2000) identifies two essential qualities of the ES technical infrastructure: integration, adaptability. Therefore, the technical ES infrastructure competence in this research refers to the integration and adaptability of ES. Integration refers to the establishment of collaborative platform which allow a free-flow of information internally within the organisation and externally with information systems of business partners. The adaptability of ES indicates the extent to which the ES can be easily (re-)configurable or restructured in accordance to new conditions. The ES human and managerial competence refers to the technical and managerial knowledge and skill of using enterprise systems in performing business process (Dong and Zhu 2008). This includes technical, business and behavioural skills (Fink and Neumann 2007). Technical skills refers to IT staff's and end-users ability to configure and maintain and effectively use ES respectively (Stratman and Roth 2002). The business skills refers to the management skills and business process knowledge possessed by individuals working on ES (Maurer 2009; Stratman and Roth 2002). The behavioural skills refer to the interpersonal skills of the people involved in ES such as the ability to work cooperatively in cross-functional teams with personnel from other departments (Maurer 2009). Organisations should not only develop these skills generally but also focus deeply on the ES-specific absorptive capacity (Daghfous 2007). For example, "CRM-specific absorptive capacity allow the firm to acquire, assimilate, analyse and leverage customer-specific knowledge to produce an array of tailored innovative products and services that meet the ever-changing customer needs" (Daghfous 2007): p. 65). Furthermore, since ES are mostly provided by vendors such as SAP and Oracle, the procurement skills which refers to the ability to learn, develop and work with external suppliers for appropriate ES deployment is crucial in managing ES (Maurer 2009). Changing business environment requires changes in business processes and technology that supports the business processes. Hence, organisations need to frequently evaluate the performance of ES; allocate resources for upgrade and maintenance and align ES development with the overall IS and organisational strategies.

ES competences allow organisations to integrate a wider range of systems internally and externally and to capture data from various sources. Furthermore, the ability to distribute any type of data across an organisation enables data to be interpreted from various perspectives. Capturing data from various sources and interpreting them with various perspectives enable organisations to detect and capture changes quickly and respond to them efficiently (Dove, 2005; Maurer, 2009). This leads to the following two propositions

Proposition 4: Organisations that have developed high level of ES competence are more likely to exploit that competence in order to build their ES-enabled sensing capability

Proposition 5: Organisations that have developed high level of ES competence are more likely to exploit that competence in order to build their ES-enabled responding capability

Environmental Dynamism

The proposed framework has one boundary condition - the impact of environmental dynamism factors such as competitiveness and complexity of the environment (Sambamurthy et al. 2003). The dynamism factors can influence the level of agility required in an organization (i.e. organization operating in stable industry with predictable changes will require different level of agility to those who operate in fast changing environment) (Tallon 2008). Therefore we propose that the extent of environmental dynamism serves as a control variable on how ES can be used to achieve agility

Proposition 6: Organisations that operate in fast changing environments where product shelf life is short are more likely to develop high ES competence and high ES-enabled sensing and responding capability than those that operate in a relatively stable environment.

SUMMARY AND IMPLICATIONS

Since the early days of computerisation, there have been dramatic improvements in organisational IS ecosystem as organisations move from in-house-developed systems to contemporary, off-the shelf, enterprise-wide architectures and systems. ES which capture the most advanced development of IT are becoming common fixtures in most organisations. However how ES affect OA has been less researched and the few existing research remains equivocal at best. Working from the perspective that ES can positively contribute to OA, this paper provides a framework to theorise the mechanisms by which organisations can exploit their ES to stay agile.

The paper extends the literature in three significant aspects. First, the research contributes to the current body of knowledge on the post-implementation benefits of ES which is still less researched (Moon 2007). Second, the research identify the missing link between ES capabilities and OA through introducing a framework that is built based on two constructs- ES-enabled sensing capability and ES-enabled responding capability. Thus the paper opens up the black-box of the role of ES in OA in particular and between IS and organizational performance in general. Using the capability hierarchy, the research delineated different levels of ES capability which could support practitioners in managing their ES resources and capabilities more effectively. Third, the current research proposes a framework that can be tested empirically. The Six propositions provide the mechanism to investigate ES related contributions to and variations in OA. We believe that these propositions represent a valuable step towards understanding the connection between ES and OA. We however acknowledge one limitation of the paper and proposed framework. In order to focus more on the ES capabilities, we did not include the self-learning aspects into the framework (Sambamurthy et al. 2003). Self-learning or feedback looping between the capability and outcome can be critical for a sustainable OA.

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