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Enterprise IT Application Systems Agility and Organizational Agility

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ABSTRACT

Enterprise information technology (IT) application systems are conceived and implemented to help organizations to reduce costs and improve efficiency. However, the continuously changing environment, competitive market, and emerging technology require IT application systems to be more agile to accommodate the changes. In this paper, we link the enterprise IT application technical agility (Byrd and Turner, 2000) with organizational agility (Sambamurthy, Bharadwaj and Grover, 2003). We propose that IT application modularity, IT connectivity, and IT compatibility (IT application technical agility) affect customer agility, partnering agility and operational and decision making agility (organizational agility). Measurements for IT application technical agility and organizational agility, an empirical study design as well as data analysis method are discussed. This study extends our knowledge of agile enterprise IT applications and organizational agility. This study will also benefit practitioners by identifying how technical enterprise IT agility affects organizational agility.

Keywords

Agility, Enterprise IT Application Systems, Organizational Agility

INTRODUCTION

Information technology (IT) within organizations faces the dual challenge of “speed and flexibility” and “low cost and efficiency” (Allen and Boynton, 1991). The global future forum expert survey (Unisys, 2004) shows that in next several years, organizational adaptability and flexibility will be more important to business success than operational performance and efficiency. However, almost half companies claim that inflexible IT constrains the business model’s chances (IBM, 2004).

IT management traditionally focuses on improving productivity and efficiency. Efficiency is still important, but it is no longer enough (Unisys, 2004). The mindset of building only efficient IT applications must be adjusted to the new paradigm of building agile enterprise IT application systems, when appropriate. Sambamurthy et al. (2003) raise the question of what is the degree of IT-enabled agility in an organization. Hence, more attention should be called upon in the IT agility area.

Henderson and Venkatraman (1993) propose a strategic alignment model where they argue that external and internal components should align (strategy fit) and that business and IT should integrate (functional integration). Motivated by their alignment model, we link IT applications’ agility to organization agility. Based on the measurement of the flexibility of IT infrastructure by Byrd and Turner (2000), we operationalize Enterprise IT application agility and investigate whether enterprise IT application agility contributes to organization agility.

To summarize, we raise the research question:

Does overall enterprise IT application systems agility contribute to the overall organization agility?

The paper is organized as follows. First, we introduce the theoretical background. Then we propose our theoretical model. Next, we describe empirical study design for this paper. Finally, we discuss the relevance of this research for both researchers and practitioners.

Theoretical Background

In this section, we will review the relevant literature on agility. We build our theoretical framework primarily based on three noteworthy papers: the first is the “strategic alignment model” developed by Henderson and Venkatraman (1993). The second paper is the dimensions of agility from Sambamurthy et al. (2003) and the third paper is the measurement of the flexibility of an IT infrastructure by Byrd and Turner (2000). We also look at other relevant literature to substantiate our arguments.

Fingar (2000) suggests the software paradigm of component-based frameworks promises to provide companies with the speed and agility they need to compete in e-commerce. Desired Software model should be agile, easy to be added, modified, replaced, reconfigured, bundled, unbundled, and rebundled. Further Cummins (2004) states that service-oriented architecture (SOA) and enterprise service bus (ESB) will help organizations achieve agility through providing flexible integration infrastructure capability. SOA and ESB leverage underlying loosely coupled Web services and standard XML technology.

Rather than concern the detailed, surface technology, be it component-based software frameworks or Web services and XML, here we feel more interested in the underlying fundamental constructs of Enterprise IT Application Systems Agility and Organizational Agility.

Definition of Agility

Goldman, Nagel and Preiss (1995) state that agility means the capability of operating profitably in a competitive environment of continuous and unpredictable change. According to Ramasesh, Kulkarni and Jayakumar (2001), agility is the capability of a manufacturing system to provide an effective response to unanticipated changes. An agile system should be effective, which means that the response is both cost and time efficient (Ramasesh et al., 2001). Sambamurthy et al. (2003) describe agility as the ability to detect and seize market opportunities with speed and surprise.

Strategic Alignment Model

Henderson and Venkatraman (1993) propose the “strategic alignment model”. Their research had two building blocks: strategic fit and functional integration. Strategic fit requires a strategy to address both external and internal domains. Function integration identifies two types of matches between business and IT domains: strategic integration at a high level between business and IT strategy, and operation integration at a low level between business process and IT architectures. Organizational infrastructure and process could drive information systems (IS) architectures and applications. David, McCarthy and Sommer (2003) show that enterprise resource planning (ERP) systems are inflexible and impose constraints on organizations. Organizations that implement ERP packages sometimes have to adapt their business processes to meet the software specifications, rather than the other way around.

The Dimensions of Organizational Agility

Sambamurthy et al. (2003) argue that agility includes three interrelated capabilities: customer agility, partnering agility, and operational agility. From business perspective, an organization needs these three types of agilities to survive and thrive in the fast changing market. Customer agility is the ability to co-opt customers to facilitate innovation, generate innovative ideas and involve them in product design, feedback and testing (Nambisan, 2002). IT application systems can help build and enhance virtual customer communities to develop customer agility (Sambamurthy et al., 2003).

Partnering agility is the ability to facilitate alliances, partnerships and joint ventures for inter-firm collaboration. Assets, knowledge, and competencies of suppliers, distributors, contract manufacturers and logistics providers are engaged in partnering agility building (Venkatraman and Henderson, 1998). Broader range IT networks help companies gain superior responsiveness and performance in unstable environment (Zaheer, 1997). Enterprise IT applications such as portals, supply chain management, and visibility technologies help achieve partnering agility.

Operational agility helps firms to create new processes and redesign existing processes in a timely manner to take advantage of market condition. Enterprise IT application systems can drive the modularization of business process and allow for reconstructing them (Malone, Crowston and Pentland, 1999). Operational agility can enable firms to reduce information asymmetries and lead to faster and better informed decisions (Amit and Zott, 2001). In an organization, decision making can happen at the strategic, planning, and operational level. Operational agility not only assists operational level decision making, but it also contributes more to the planning and strategic level decision making.

The Dimensions of Enterprise IT Application Systems Technical Agility

Byrd and Turner (2000) define the IT infrastructure flexibility construct and develop a reliable, valid measurement instrument. According to Byrd and Turner (2000), the concept of IT infrastructure flexibility is: “the ability to easily and readily diffuse or support a wide variety of hardware, software, communications technologies, data, core applications, skills and competencies, commitment, and values within the technical physical base and the human component of the existing IT infrastructure”. They believe that IT infrastructure has two components: a technical IT infrastructure and a human IT infrastructure. Here we only focus on technical flexibility which has four dimensions:

1. IT connectivity: “the ability of any technical component to attach to any of the other components inside and outside the organizational environment”.
2. Application functionality: “the ability to add, modify, and remove the modules of software applications with little or no widespread effect on the applications collectively”
3. IT compatibility: “the ability to share any type of information across any technology components”
4. Data transparency: “the free retrieval and flow of data between authorized personal in an organization or between organizations regardless of location”

Byrd and Turner (2000) confirm that they are second-order factors behind the above dimensions. IT connectivity and IT compatibility belong to one factor, called “integration”, while application functionality and data transparency form another factor called “modularity”. Therefore the technical IT infrastructure flexibility can be represented with the two factors “integration” and “modularity”. This conceptualization is consistent with Duncan (1995), who demonstrated that the technical IT infrastructure flexibility can be classified into connectivity, compatibility and modularity.

Theoretical Model

Since our research interests are on enterprise IT application systems rather than overall macro IT infrastructure, we only consider technical perspective in the context of specific Enterprise IT applications. The technical agility dimensions are:

1. IT connectivity
2. Application functionality
3. IT compatibility
4. Data transparency

We consider three dimensions of organization agility. They are:

1. Customer agility
2. Partnering agility
3. Operational and decision making agility

Based on Henderson and Venkatraman (1993) strategic alignment model, we conjecture Enterprise IT Application Systems agility lead to Organizational Agility. We argue that IT application technical agility (IT connectivity, Application functionality, IT compatibility, Data transparency) will make IT applications agile. Therefore, the agile IT applications will facilitate the specific organization agility for which the IT applications are created for. We have the following models to test the links from each dimension of technical agility to each dimension of organizational agility. For example, we hypothesize that IT application functionality will enrich customer relationship, because with this technical agility, CRM applications are relatively easy to be modified and updated to satisfy market and customers’ demand. Another example is that IT connectivity and IT compatibility may enable IT applications from different organizations to communicate and cooperate, thus facilitate partnering agility.

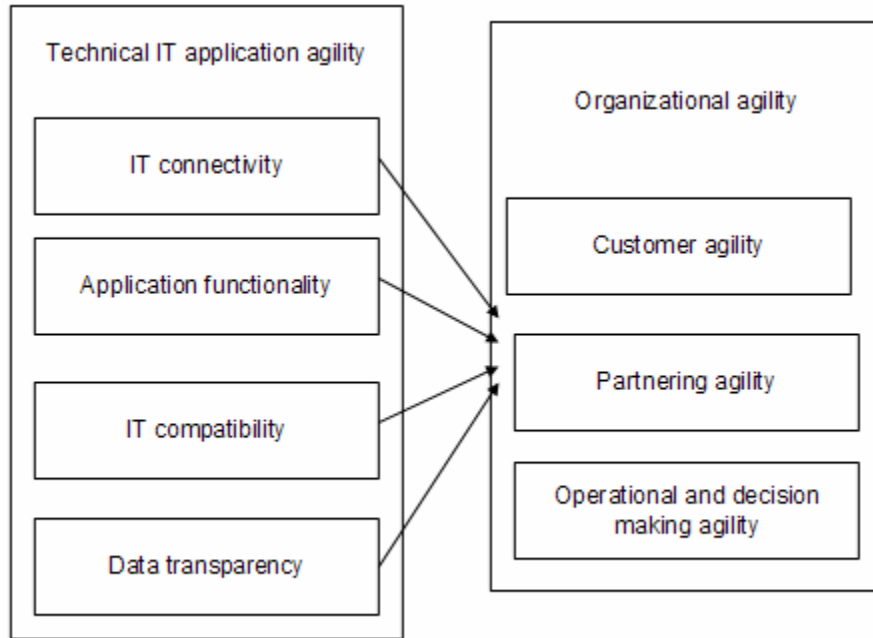


Figure 1. Technical IT Application Agility – Organization Agility Model

Methodology

To test our model, we need to measure Enterprise IT application systems’ technical agility, and organizational agility. We follow Moore and Benbasat (1991) procedure for instrument development. The process includes three stages: item creation, scale development, and instrument testing. First from literature review, we generate a pool of items for technical agility and organizational agility. The objective of this step is to make sure content validity. These measures will come from existing information systems, strategic management, and production and operation management literature. A sampling of items can be seen in the Appendix. Our next step will be to perform scale development. The purposes of this stage are to ensure construct validity, convergent validity, discriminant validity and identify ambiguous items. We adopt card sorting procedures from Moore and Benbasat (1991). A set of cards, with one item on each card, are shuffled into random order and presented to each judge. Each judge is asked to sort cards into categories and assign a label to the category. Inter-rater reliability is measured with Cohen’s Kappa (Cohen, 1960). After this, we will conduct instrument testing. For this stage, we have identified 10 local companies and will use the convenient sample for pilot test. The aim of the pilot test is to make an initial reliability assessment of the scales. We will be using the popular Cronbach’s ALPHA (Cronbach, 1970) to measure reliability. After all above process and iterative refinements, we will get a reliable and valid instrument. Finally, we will conduct a large sample field survey of Fortune 1000 companies to test for proposed relationships. We will follow up the mail survey with a second letter and phone calls to maximize the response rate.

The reason why a field survey is appropriate is that we need to use the real world data to validate and enhance the arguments for our theoretical model. Moreover, a field survey has the advantage of generalizability. From business managers to users, we will collect organizational agility data. From IT managers, we will collect enterprise IT application technical agility data. Based on our model, we plan to adopt structural equation modeling to analyze the data that we collect. A confirmatory factor analysis will be conducted to evaluate the measurement model. Then a path analysis is performed to test the structure model.

Conclusion

Organizations to date are facing tough challenges from global competition, which requires businesses to be both flexible and responsive. Traditional enterprise IT application systems emphasize efficiency; however, to survive and grow, the efficiency of IT is not enough. Some IT applications should be agile. Based on literature review, we propose a framework to link the Enterprise IT application systems technical agility with organizational agility. Potential measurements and a strategy for an empirical test are discussed.

This study extends our knowledge on the issue of agile enterprise IT applications and organization agility. Practitioners will benefit from this study by knowing which technical IT agility affects organizational agility. Moreover, it provides guidelines to practitioner for matching agile IT applications to organizational agility.

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Appendix

Questionnaire for the Enterprise IT Application Systems Agility and Organizational Agility Survey

The following items are measured on Likert scale from 1 to 7. With 1 being Strongly Disagree and 7 being Strongly Agree.

IT connectivity adopted from Byrd and Turner (2000)

1. Compared to rivals within our industry, our organization has the foremost in available IT systems and connections
2. Flexible electronic links exist between our organization and external entities
3. Our organization utilizes open systems network mechanisms to boost connectivity
4. All remote, branch, and mobile offices are connected to the central office

Functionality of applications adopted from Byrd and Turner (2000)

1. The applications used in our organization are designed to be reusable
2. Reusable software modules are widely used in new systems development
3. Our organization uses enterprise-wide application software
4. Legacy systems within our organization restrict the development of new applications

IT compatibility adopted from Byrd and Turner (2000)

1. Information is shared seamlessly across our organization, regardless of the location
2. Software applications can be easily transported and used across multiple platforms
3. Our organization offers a wide variety of types of information to end users
4. Our user interfaces provide transparent access to all platforms and applications

Data transparency adopted from Byrd and Turner (2000)

1. A common view of our organization's customer is available to everyone in the organization
2. Data captured in one part of our organization are immediately available to everyone in the organization
3. Our IT organization handles variances in corporate data formats and standards
4. Mobile users have ready access to the same data used at desktop

Customer agility adopted from Sambamurthy et al. (2003)

1. Our organization has the ability to co-opt customers in exploration and exploitation of innovation opportunities.
2. Our organization can leverage customers as sources of innovation ideas.
3. Our customers are co-creators of innovations.
4. Our customers are users testing ideas, and they help other customers learn about the idea.

Partnering agility adopted from Sambamurthy et al. (2003)

1. Our organization has the ability to leverage assets, knowledge, and competencies of suppliers in the exploration and exploitation of innovation opportunities.
2. Our organization has the ability to leverage assets, knowledge, and competencies of distributors in the exploration and exploitation of innovation opportunities.
3. Our organization has the ability to leverage assets, knowledge, and competencies of contract manufacturers in the exploration and exploitation of innovation opportunities.
4. Our organization has the ability to leverage assets, knowledge, and competencies of logistics providers in the exploration and exploitation of innovation opportunities.

Operational and decision making agility adopted from Sambamurthy et al. (2003)

1. Our organization has the ability to accomplish speed in the exploration and exploitation of innovation opportunities.
2. Our organization has the ability to accomplish accuracy in the exploration and exploitation of innovation opportunities.
3. Our organization has the ability to accomplish cost economy in the exploration and exploitation of innovation opportunities.