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DETERMINANTS OF SaaS ERP SYSTEMS ADOPTION

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Abstract:

ERP systems are now offered on the cloud under Software as a Service (SaaS) model. For small and medium sized enterprises (SMEs), this is considered the best opportunity to take advantage of the capabilities of an Enterprise Resource Planning (ERP) system without the investment and management costs associated with the on-premise model. This study investigates the factors influencing the adoption of SaaS ERP system by SMEs. Using a cross-sectional field study conducted across four major case study organizations and software vendors, this study identifies the determinants for the adoption decision and analyses benefits and challenges. According to study, low total cost of ownership, low initial investment costs, potential willingness of the vendor to participate in co-creation of value for customers, continuous improvement of the product offerings and generic benefits of implementing an integrated ERP system are determinants of SaaS ERP adoption decisions by SMEs. Competitive pressures faced by the enterprise, external factors, concerns on the security and integrity of data have no influence on adoption decision, according to this study. Instead, SaaS ERP vendor's long term reputation, promised shorter deployment time, total cost of ownership, willingness to listen and continuously improve the product, vendor's ability and willingness to support customers throughout the product life cycle are the factors that would attract SMEs towards SaaS ERP systems.

Keywords: SaaS, ERP, SME, Adoption, Innovation

1 INTRODUCTION

The Software as a Service (SaaS) models and the recent cloud computing phenomenon are driving the global IT service industry from both demand and supply sides, even though on-demand software application delivery models are known since 1990s in many forms including application service providing (ASP) and business service providing (BSP). They are now ranked as the top technology and business priority for companies around the world (Gartner 2011). On the supply side, cloud computing and SaaS are becoming key service offerings of many IT firms such as Amazon, Google, Sales force.com that are pioneers and specialize in cloud computing. In addition, traditional IT service firms such as IBM, SAP, Oracle, Microsoft, HP and Fujitsu have also started offering SaaS based solutions.

The world-wide SaaS revenue has exceeded \$12 billion dollars in the year 2011 and is expected to reach \$21 billion by 2015 growing at a rate of 16% (Gartner 2010). More than 50% of organizations worldwide are predicted to use SaaS for strategic business functions (IDC 2009). This is a major transition as SaaS is known to support mostly non-critical business applications (Zainuddin and Gonzalez 2011). These statistics imply that the SaaS market is expanding and SaaS will have more significant impact on individual organizations both large and small.

In a world of business uncertainty and volatility, there is a growing awareness of the need to derive value from the investments made in information technology solutions. With most of the IT budget spent on maintenance and infrastructure and just about 11% spent on developing new applications (Gartner 2009), firms are under increasing pressure to consolidate information technology infrastructure and improve returns on investments already made. This is especially significant for small and medium-sized enterprises (SMEs) who are traditionally resource constrained, and has limited ability to react to environmental uncertainty (Haselmann & Vossen 2011; Stevens et al 2002). Considering the large ERP implementation failures and high cost, SMEs are generally sceptical and found wanting in making a business case that justifies such significant investments in time and money for on-premise models. In general SMEs are expected to significantly benefit from the innovations emerging from SaaS (Haselmann & Vossen 2011). Potential benefits of reduced costs, ease of access to global innovations and scalability are making SaaS based ERP systems, the best option to overcome their traditional IT capability constraints and scepticism about the adoption of ERP systems (Venkatachalam et al. 2011).

Even though deployment of information technologies in general are expected to enhance firm's innovation performance (Hempell & Zwick 2008), potential impact of enterprise systems on process innovation performance was not studied (Engelstatter 2012). Even though there is a lot of interest among practitioners on SaaS ERP systems, empirical research on the adoption and use of SaaS ERP systems is limited (Salleh et al. 2012; Venkatachalam et al. 2012). Recent call for papers for SaaS related studies (e.g. cloud computing and service science) in peer-reviewed IS journals, along with specific suggestions from researchers (Candan et al. 2009; Venkatachalam et al. 2012) show that SaaS is slowly gaining traction among researchers. This research study aims to fill this gap and analyses the benefits and challenges in the adoption and use of SaaS ERP systems in small and medium sized enterprises (SMEs). It will first review the literature on SaaS models in general and SaaS ERP systems in particular. It will then explain a cross-sectional field study methodology employed in this study and presents its findings based on data collected from four medium-sized enterprises. It will then present conclusions and implications.

2 LITERATURE REVIEW

2.1 Software as a Service (SaaS)

Software as a Service (SaaS), also termed as 'software on demand', is increasingly becoming a popular tool for implementing various business applications today. Though a relatively new business model of software delivery, it is fast becoming a serious option for enterprises of all types and sizes.

Software as a Service (SaaS) refers to the delivery of a software to the clients over the Internet that is owned and managed remotely by the service provider. SaaS model is defined as *"an application or service that is deployed from a centralised data centre across a network, providing access and use on a recurring fee basis, where users normally rent the applications/services from a central provider"* (Hoch et al 2001). In this model, a provider delivers an application based on a single set of common code and data definitions, which are consumed in a one-to-many model by all contracted consumers anytime. They use the service on a pay-for-use basis or on a subscription basis (Clark et al. 2006; Xin & Levina 2008) as per the conditions negotiated in the contract and receive in return a service promised in the service level agreement. Employing a one-to-many concept, a standard package of applications such as enterprise resource planning (ERP) system could be provided to as many customers as possible minimizing the customization requirements under this model.

Compared with the 'on-premise' model, SaaS based solutions have shifted the value frontier, and could provide the same level of value at a lower price, or more value at the same price. With the emergence of SaaS, the business rational has shifted from a traditional push based model where vendor designs, markets and sells the product to a pull-based model where solutions are continuously improved through value co-creation (Sarker et al. 2012). In SaaS environment, the customer has freedom to change or exit if the solution and/or service is not satisfactory. SaaS vendors, as an implication of this, are required to provide the promised service and to continuously innovate (Corsello 2009). In addition, they should assure customers on efficient system backups, contingency plans and disaster recovery plans and ensure their delivery through service level agreements. As suggested by Kohli and Grover (2008), this SaaS model is another IT based instrument that is expected to help cocreate business value.

Cost advantages are identified as the strongest driving factor in the adoption of SaaS applications, while security concerns are observed to be the major deterrents (Benlian & Hess 2011). In general, reliability issues, information security, privacy concerns and process dependence are some of the barriers for the SaaS applications (Benlian et al. 2009). Relative advantage, top management support, competitive pressure and trading partner pressure were found to be significant determinants of adopting SaaS model, while complexity of the software application, technology readiness of the firm reportedly had no impact on the adoption decision (Low et al. 2011). Total cost of ownership, speed and ease of deployment, reliability, data security, data safety and disaster recovery, risk mitigation through insulation from the continuous technology upgrades are cited as some of the key benefits of SaaS model (Waters 2005). Similarly, capabilities and reputation of the SaaS vendor strongly and positively affect the adoption intentions of the users (Heart 2009). In case of SaaS ERP systems, however, there are some specific benefits and challenges as discussed below.

2.2 SaaS ERP systems – benefits and challenges

There are different ways ERP systems are deployed in business organizations today. From a full on-premise traditional licensing model to hosted or managed services by a third party and to SaaS on demand model. Driven by a combination of functionality, ease of use, total cost of ownership, speed of implementation and the ability to configure the solutions to individual needs and integrate with existing systems, enterprises big or small select the appropriate deployment model. According to Gartner (2012), organizations are implementing SaaS based solutions as replacements to legacy applications, in 'greenfield' situations and/or as an extension to the existing on-premise ERP systems. For SMEs, it is a 'buy' decision and SaaS ERP model provides them opportunities for the exploration and exploitation of external resources and competencies that are not available within the SME's assets.

Customer satisfaction on the adoption and use of SaaS ERP solutions significantly vary from firm to firm and from report to report. Gartner's study, for example, reported very low level of satisfaction among SaaS users and generally advised caution in moving to SaaS based models (Stamford 2009). Gartner research observes that 90% of SaaS offerings are not 'pay for use' and that it provides more evolutionary approach to functional enhancements (DeSisto 2010). While admitting that SaaS ERPs

are quicker to implement and configure for less complex problems and provide needed functionality on a pay per use basis, Gartner has observed that the capabilities of SaaS ERP offerings to support core end to end business processes are limited and that the total cost of ownership is not guaranteed to be less than on-premise alternative (DeSisto 2010). In fact, according to a Gartner survey of the users and prospects of SaaS solutions in US and UK, 33% of them have reported their solutions not meeting their basic technical requirements (Stamford 2009) and reportedly are not satisfied.

Contrary to above findings, SaaS customer satisfaction is observed to be very strong in requirements such as solution functionality, response time, availability and pricing (McNee 2008). Citing 90% renewal rates as an endorsement to the SaaS based solutions in Europe and US, Kaplan (2009) reports high level of customer satisfaction. On the issue of enterprises moving away from on-premise model to SaaS based ERP model, Aberdeen group (2011) and Salleh (2012) observe reluctance to adopt SaaS based ERP models mainly because of the data security issues, absence of alternative arrangements when there are disruptions to the continuity of service delivery by the SaaS ERP provider.

Leveraging the benefits of IT/IS investments is particularly challenging for SMEs, given their limited technical and human resource capabilities and constrained financial resources (Ada 2009). Many small and medium sized enterprises (SMEs) have reported several concerns about the SaaS model in general and SaaS ERP systems in particular. Some of their most important concerns include security, control, privacy, reliability, and vendor lock-in (Sultan 2011), loss of control of data and services (ENISA 2009). Security, ownership of data, integrity of the provider, ability to move to other SaaS provider and customization are concerns limiting the adoption of SaaS ERP systems (Lenart 2011). For example Karabek et al. (2011) questioned the ability of SaaS ERP vendors to manage all network security from a single point and to offer real-time protection and suggested some data protection guarantees. Other issues such as Internet bandwidth and other supporting IT infrastructure to make the workings of the SaaS ERP easy and efficient are also important. SaaS ERP systems offered on cloud, however, could offer several security benefits with standardized interface and better protection in terms of filtering, patch management, deployment of standard information systems policy, and rapidity of response to security attacks (Moarston et al. 2011). In early stages of SaaS offerings security risks may increase. For example, it may be difficult for the user organization to effectively check the data handling practices of the provider. Multiple tenancy and reuse of hardware resources in a SaaS ERP environment may make it hard to carry out adequate, safe and timely deletion of data a client desires and therefore may introduce an additional risk in terms of security and legal compliance for sensitive data. Thus data security concerns, fear of service disruptions, disaster recovery, Internet bandwidth and supporting IT infrastructure issues are key factors that appear to be dissuading SMEs to adopt SaaS ERP system (Moarston et al. 2011; Karabek et al. 2011 and Lenart 2011).

In case of SMEs, there are not many choices. Many a times, it is either to go for SaaS ERP or nothing. Limited by budget constraints and inability to go through on-site implementations and maintenance, SMEs do not have enough resources to develop, configure/customize and deploy software and supporting infrastructure (Venkatachalam et al. 2012). SaaS vendors are promising a better, faster and cheaper innovation than their on-premise ERP counterparts. Considering these issues, SaaS providers in their value proposition include reduced total cost of ownership, predictable IT expenditure, reduced risks, faster time to benefits realization, outsourced expertise and scalability options (Benlian et al. 2009). Efficiency, complementarities, lock-in and novelty typically support this value proposition. While efficiency dimension is relevant today, the complementarities, lock-in and novelty dimensions are no longer relevant for SMEs. With SMEs having a freedom to move to other solutions in case of dissatisfaction, lock-in options have become obsolete now. The competitive advantage in comparison with other competitors in the industry, also does not matter now as the application provided by the SaaS vendor to all the players is same. This negates the novelty aspect of the technology and the potential competitive advantage argument. Further, SaaS ERP may also decrease their need for technical IT capabilities (DeSisto 2010). So, it is fair to assume that the resources constraints typical to SMEs would not dissuade them in the adoption and effective use of SaaS ERP system. With SaaS

ERP model offering most of the IT costs as variable costs, SMEs should be more willing to adopt and use these systems.

Difficulty and costs of software customization to meet the requirements of SMEs is another issue pointed out in the literature (Low et al. 2011). For SMEs, SaaS model helps overcome the deficiencies arising from provider side customization requirements of Application Service Provider (ASP) model with its multi tenant architecture that allows for customer side customization interfaces (Xin and Levina 2008). Thus configurability of SaaS ERP system helps the customer to adapt the software to fit their individual requirements (Nitu 2009). As mentioned above, configurability gives a flexibility to software enabling multi-tenancy. This is an important characteristic of SaaS ERP model and could be used to determine the SaaS maturity with more mature SaaS solutions having more configurability options (Hudli et al 2009). SaaS ERP vendor offers configurability either by allowing clients to configure the software themselves or by configuring the software on behalf of the clients (Zainuddin & Gonzalez 2011). In SMEs context, configuration is typically carried out by the vendor itself, thereby making the process efficient and cost effective to both parties. Configuration and customization, though a requirement for SMEs, it is relatively less complex and does not dissuade SMEs from adopting SaaS ERP system.

IT capability constraints typically associated with SMEs is a major factor in any IT adoption decision. So, reduced costs, ease of access to global innovations and scalability are expected to make SaaS ERP model one of the best options for SMEs to overcome their IT capability constraints. It is important to understand that SaaS implementation could become less expensive only if it can reduce investments on hardware and resources for patch management, back-up, database administration and system infrastructure upgrades (Saini et al. 2011). For SMEs, that do not have capabilities and resources to setup the initial IT infrastructure, SaaS providers could generally offer prices and SLAs (service level agreements) that are far cheaper than what SMEs themselves can realise with their limited investment levels. More importantly, SaaS ERP implementations require no upfront investment which will allow cash strapped SMEs more flexibility with their use of capital. With much less legacy IT infrastructure in place, unlike larger enterprises, it is relatively easy for SMEs to move to SaaS and try a new functionality or application such as ERP. In terms of change management and user acceptance issues, SMEs are considered relatively easier to deal with given their faster decision making, flexibility and cost imperatives. As pointed out by Carr (2005), smaller organizations will have much less of the 'attitudinal' issues to deal with in moving towards SaaS environments than larger enterprises. Thus, implementation of SaaS ERP system could be less complex and faster in an SME's context thereby saving a lot of indirect implementation and change management costs to SMEs.

Though empirical evidence is not yet available, the potential for the co-creation of value is considered significant in a SaaS environment, where vendor and user could work together and improve the product offering. In general, SMEs need to be innovative, flexible and efficient, in order to survive in competitive market. SMEs, could potentially be more innovative because of their inherent flexibility, faster decision making and willingness to try new approaches and technologies. In general, deployment of information technologies is expected to enhance firm's innovation performance (Brynjolfsson & Saunders 2010). Implementing an ERP system would contribute to automation and improvement of low level transactions and processes, leaving more time and resources for SMEs to focus on complex and critical activities such as product development and customer relationship management. ERP systems enable improved visibility of information and processes about the product life cycle and resource usage in real time, and make it easy for SMEs to identify opportunities for product enhancements and process improvements (Dehning et al. 2007). ERP systems in general improve consistency of process execution and information visibility. Further, through a centralised enterprise wide database, ERP system delivers necessary data in real-time and enables the employees to be more innovative and flexible. (Davenport et al. 2004). It helps them to observe, control and compare the results of process innovations and consistent execution and offer greater insights into further improvements in organizational structure, responsibilities and decision making processes. SaaS based solutions could make employees discover novel and innovative ways of using the technology, facilitate better collaboration amongst employees and make employees more productive

(McAfee 2011). As observed by Tsai (2001), business units are more innovative once they reach a more centralised network position as it enables them to access new knowledge generated by other units faster. Improved contacts and communications with suppliers and customer enabled by an ERP system, could help SMEs generate more innovations, considering the importance of backward and horizontal knowledge linkages for process innovation (Roper et al. 2006). Therefore, it is fair to hypothesise a positive impact of SaaS ERP implementation on innovation performance in SMEs.

Most of the past literature on the adoption and use of SaaS ERP system is based on practitioner reports and anecdotal evidence and there were no significant empirical research studies. In fact, adoption of SaaS ERP system is considered more suitable to SMEs than to large enterprises (Lenart 2011) because of their low total cost of ownership and the ability of ERP system to empower SMEs in managing their processes. Limited evidence that was collected in Europe and practitioners' observations, however, suggest low adoption of SaaS ERP systems and low satisfaction of SaaS ERP customers in general and SMEs in particular. According to limited literature on the topic, doubts about the security, integrity and privacy of data managed by the service provider, inability of the SMEs to provide supporting IT infrastructure services, their fear of service disruptions and limitations of Internet bandwidth are some of the factors that may be dissuading SMEs to adopt SaaS ERP systems. Literature, however, suggests, lower total cost of ownership, pay as you go cost structure, conversion of most of the IT/IS costs into variable costs, competitive pressures, cost effective options to customize and configure the applications, low implementation and change management costs, potential positive impact on innovation performance are some of the key factors in favour of adopting SaaS ERP systems by SMEs.

2.3 Research questions

Though implementation of IT/IS innovations play a complementary role in generating sustained competitive advantage, reasons for adoption, use and the nature of their impact on organizational performance varies from one organization to another. This is contingent upon varying contexts within which these implementations are situated including external competitive factors, firm size, degree of fit, changes these systems enable in organizations and extent and nature of use of these systems after implementation. The emergence and increased adoption of SaaS based ERP solutions have started offering a compelling advantage for companies looking for flexibility, innovation and minimum total cost of ownership. Even though enterprise systems are well entrenched 'on-premise' in most of the enterprises today, and many organizations are considering a move towards next generation SaaS based enterprise systems as reported in the practitioners literature and industry reports, little is known about the drivers, inhibitors and organizational factors influencing the adoption and management decisions. Understanding the drivers for the adoption of these SaaS based ERP systems in small and medium sized enterprises, challenges in their implementation and use, and their impact on performance will help organizations achieve better return on their significant IT investments.

With limited evidence of the adoption and use of SaaS based ERP systems in SMEs, this study will offer insights and empirical evidence into the adoption and use of this IT innovation. Findings of this study would contribute to the limited knowledge in the field and adds to the IT innovation diffusion and implementation literature. The insights from the study will provide practitioners guidance for exploiting the full potential of these IT investments and improve returns. Key research questions this study aims to find answers are:

Why do firms adopt SaaS ERP systems?

How do SMEs deal with the challenges of adopting SaaS ERP systems

How does the adoption and use of SaaS ERP system influence process performance?

3 METHODOLOGY AND APPROACH

SaaS ERP adoption is a relatively new phenomenon. A majority of medium sized and large enterprises still have on-premise ERP systems. Many SMEs have no ERP system or a simpler non-integrated stand-alone systems. Given the nature of questions, nascent stage of the research on the topic, clear understanding and definition of the SaaS ERP models, a cross-sectional field study using multiple case study organizations is considered appropriate. Cross-sectional field study involves limited-depth studies conducted at a nonrandom selection of field sites and lie between in-depth case studies and broad-based surveys. These studies are less structured in their data collection than surveys, and involve shorter, less intensive data collection on site than in-depth case studies (Lillis & Mundy 2005). Such cross-sectional field studies using multiple case study organizations provide an opportunity to explore new and developing areas (Klein & Myers 1999) such as SaaS ERP systems and facilitate understanding of the multiple interpretations of the factors affecting the adoption and use of SaaS ERP systems from different perspectives (Yin 2009). Thus, employing a cross-sectional field study approach draws on a larger number of observations than in one in-depth case study, and deal with more complex "how" and "why" questions better than survey approaches (Eisenhardt 1991; Aherns & Dent 1998). Within a confined domain, cross-sectional field study provides researchers with an effective means of capturing complex phenomenon and uncovering ambiguities and conflicting results. Given the nascent stage of this IT innovation, ambiguities of the benefits and challenges as identified in the literature review section, and the conflicting observations made by practitioners, a cross sectional field study is considered an appropriate methodology for this study. This study focused on the factors and considerations that have influenced organizational decision to adopt SaaS ERP system and its impact on performance.

In this methodology, individual perceptions of senior managers are used to understand, connect and substantiate organizational level phenomenon (Lillis & Mundy 2005). The aim here is not to establish a superficial cause-effect relationships and/or correlations, but to reach a fundamental understanding of the phenomena under investigation. Such cross-sectional field studies using multiple case study organizations provide an opportunity to explore new areas (Klein & Myers 1999) such as adoption of SaaS ERP systems and facilitate understanding of the multiple interpretations of the role of SaaS ERP adoption from different perspectives (Yin 2009). Since the adoption and assimilation of SaaS ERP system takes considerable time and typically involve multiple actors from within and outside the organization, data was collected from enterprises, software vendors and third party consultants as explained in the next section.

Selection of case study organizations is non-random and selected on the basis of location, accessibility and personal contacts, and willingness of organizations and respondents to help with the research process. All the companies studied were engaged in manufacturing and distribution and all had significant presence in their respective industries. Table 1 gives a summary of the characteristics of the organizations and respondents that took part in this study. Given the exploratory nature of research, interviews based on individual perceptions and perspectives of the key individuals in the organization were considered more insightful. Therefore, primary data was collected from two to four key respondents in each of the organizations that are actively involved in the adoption and use of SaaS ERP systems. Accordingly, 14 respondents from 4 different case study organizations in India were interviewed. Each respondent was interviewed for about 60 to 90 minutes. These research interviews were recorded with prior permission and transcribed for further analysis. The data thus collected was coded and analyzed with reference to the themes identified in the literature. The interview questions were on three major aspects. First set of questions deal with the respondents' reasons for the adoption of SaaS ERP solution in their organization and/or in their client organizations and the organizational context. Under this, respondents were asked about the systems the company had before adopting ERP systems, the process they have adopted in evaluating various options, and the reasons for deciding on SaaS ERP system. Second theme relates to the challenges the company faced in the implementation phase. It particularly deals with the challenges (both potential and current) organizations faced and could face in future in using SaaS ERP solutions for managing their processes. The third theme is about the impact. It involves questions on the impact of SaaS ERP solutions on process innovations, improvements and performance and the contribution the client organizations made in the co-creation of

value for the product. The next section presents an analysis and discussion of the findings. A summary of the characteristics of these organizations and respondents is presented in table 1 below.

Background to the organizations studied	Details of the respondents participated in the study
Powerco - A medium-sized Power infrastructure and project management company with more than 300 employees in India; implemented SaaS ERP that is in operation for 3 years; modules include accounts/finance, inventory management, supply chain management and purchasing;	<ul style="list-style-type: none"> • One Chief executive officer • Purchasing manager – member of the SaaS ERP implementation team • One CFO/CAO with experience of working in ERP implementation in the past • Implementation consultant from software vendor
Engco - A medium-sized engineering fabrication company with more than 400 employees in India; implemented SaaS ERP that is in operation for the past 4 years; modules include supply chain management, purchasing, inventory management, accounts/finance and human resource	<ul style="list-style-type: none"> • One Chief Accountant – involved in the implementation of SaaS ERP • General manager – responsible for the operations and SaaS ERP implementation • One manager – responsible for operations • Implementation consultant from software vendor company
Enerco - an energy company that manufactures and installs small scale power plants at various locations in India; employs 300 people; has SaaS ERP for 3 years; implemented all the modules including inventory management, supply chain management, accounts/finance and human resources	<ul style="list-style-type: none"> • General manager • CFO/CAO – active role in the adoption and implementation decision • Implementation consultant from software vendor
Autoco - A medium-sized manufacturing company that makes and/or processes and assembles automobile components; 250 employees in India; implemented SaaS ERP system that is in operation for the past 3 years.	<ul style="list-style-type: none"> • General manager operations • Implementation consultant from software vendor

Table 1 Summary of Organizations and respondents participated in the study

4 ANALYSIS AND DISCUSSION

Data was collected from four case study organizations and a brief description and issues in each of the case study organization are discussed below.

4.1 Engco

Engco had an old accounting system that has no proper interface, and interaction between different departments is found to be difficult. Data in the system is not accurate and not current and reporting is very complex and time consuming. Recognising the company's growth and with the intention of moving onto a next generation information system, the company has considered and evaluated several software vendors as well as the on-premise and SaaS ERP solutions for implementation. Even though they have evaluated product offerings from major vendors such as SAP, Microsoft and Ramco (an Indian based software provider), Engco management has decided on a Ramco SaaS solution called RODE (Ramco on Demand ERP solution).

Engco, though wanted to go for an ERP system, could not venture into it given the high failure rates of on-premise ERP implementations and associated challenges. In this process, they have evaluated several ERP software solutions offered by international and national vendors. Apart from SaaS ERP models, they have also evaluated hosted application of ERP system. With RAMCO being the only product available at that time (in 2007) as a SaaS offering, there was nothing much in that space to compare. The SaaS ERP vendor, was also in a nascent stage and did not have major customers in engineering industry at that time to show case their offering. By becoming a major strategic customer to Ramco, the management at that time believed that they could influence the development of this

product to their advantage. Though it was planned to be just a six month project, it actually took Engco almost three years to fully implement SaaS ERP solution in the company. According to CEO, *"culture of the organization that allowed freedom, flexibility and internal politics"* was the reason for such as long implementation time. It was difficult for experienced functional experts to accept the processes embedded in the SaaS ERP software and work with the system. The senior management deliberately allowed a slow and deliberate process of implementation even though it may not be the best way for the company, just *"to demonstrate that the people are willingly falling in line and feeding the data into the system."*

For Engco, the software vendor had made some improvements to the process and software as promised for specific requests through some customization, while for others some roundabout methods are suggested. When the software vendor is convinced that the customization or changes to the software requested by Engco could also be useful to other customers in future, those improvements were incorporated into the software. On other occasions, the vendor had suggested some simple roundabouts to work with thus offering some workable solutions to Engco, instead of changing the software.

Implementing an ERP system is a bottom-up approach in Engco with frontline employees allowed to take their own time to test the system, use it and work with it. With implementation taking almost three years instead of the six months originally envisaged and promised by the software vendor, the management would have liked the entire implementation process to be different. They believed they could have given increased role for the accounting function and managers in the implementation, and would have sought more support from the SaaS ERP vendor in terms of identifying gaps between proposed processes and existing processes, and highlighting of the changes required upfront before the start of implementation including the changes required for the source documents design, process flow, data entry, connections, master data, controls, organizational structure, roles and reports. He also raised the importance of *"identifying the roles individual employees would play in a post-implementation environment"* and would have liked to *"decide on and arrange relevant training on specific modules, and changed the design of source documents, data entry, transactions and reports well"* before commencing implementation. As noted by the Engco management, they have made several mistakes in the implementation phase including not recognising the significance and enormity of the change management. Engco, had *"used adhoc approaches for the implementation, missed some of the key steps in the implementation, given too much freedom to individual managers in adopting to the new ERP system, and underestimated the importance of planning for post-implementation environment"* resulting in long implementation time and significant consumption of resources than originally budgeted.

Centralised data, ability to access the system and work from anywhere and ability to freeze the process flow' are considered the major benefits identified by the Enggco. In Enggco, SaaS ERP had no noticeable impact on strategic issues or on managerial decision making as the software is transaction-centric and had no analysis capabilities. The existing SaaS ERP system will capture data in the process, stores it in one central location for easy access, which need to be analysed and reworked before presenting it to the management.

4.2 Powerco:

Powerco had discussions with various software vendors including Microsoft, RAMCO, SAP and several other local ERP software vendors before deciding on Ramco SaaS ERP solution. Even though all of the vendors promised to tailor the solution to meet company's needs, the company went with Ramco solutions given the local reputation of the product and tested environment and their established clientele. Majority of business processes an ERP system supports are typical and straight forward designed for a typical manufacturing company. But Powerco is in infrastructure sector, which is significantly different from manufacturing. Powerco is working from contract to contract and each contract is of a different type and differs in scope, there are differences in the pattern of billing and other factors because of the differences in technology employed and the nature of work. The complex nature of billing, particularly, is unique to infrastructure industry. Therefore, Powerco realised at the outset that a standard ERP software solution cannot meet 90% of their infrastructure industry

requirements. Therefore, Powerco initially explored the option of implementing an on-premise ERP solution customized to its unique needs by paying a premium price. They had quickly realised that even a customized solution would not meet their unique billing requirements that may change from contract to contract even after paying a premium price. Therefore, Powerco had decided to go for a SaaS ERP solution, and see how it best meets its requirements. As a strategic step, Powerco had decided at the outset, to follow the processes embedded in the software rather than changing them for majority of its routine transactional processes and then look for workarounds outside the system for its unique requirements in billing.

Powerco, before opting for Ramco's SaaS ERP solution, generally believed that Ramco "in its own interest, will be continuously investing and building their SaaS ERP product incorporating all the developments and changes in technology, business and regulatory requirements. As pointed out by the Chief executive, *"customising a solution to Powerco's unique needs will push the responsibility of updating and modifications on to Powerco itself"*. As noted by CEO, *"we are its first client in infrastructure industry sector.. by taking active role, we will have the opportunity to find solutions to their own problems as well as directly contributing to the overall improvement of the product."*

Security and integrity of data was of no concern to Powerco in a SaaS ERP environment. As pointed out by CFO, they have neither resources nor technical and managerial capability to keep the data safe and up-to-date with the data storage and management technologies. As pointed out by a senior manager, *"we are not data storage and technology experts, and about the viruses and other security issues we don't know who will do what.. and it is a secondary thing to us. Our primary business is infrastructure."* The management, even though can take an insurance and invest in backup hardware, is not capable of regularly doing upgrades, being informed about the developments in technologies, and preventing any outside virus attacks. By simply signing an agreement with the SaaS ERP vendor, management believed it can leave the key responsibility of data backup, security, updates and integrity with the SaaS vendor. As a SaaS vendor is an expert, even if there are some catastrophic incidents and data losses for reasons beyond their control, they still are more capable of recovering and backing up the data securely and deliver continuity of business than Powerco. For SaaS vendor, *"it is their core business, and in its own interest, will take up this challenge and will have sufficient backups, data security and disaster management mechanisms in place,"* noted Powerco CEO.

Powerco did not consider industry trends and/or competition in the market as influencing factor in their decision to adopt ERP in general and SaaS ERP in particular. This is an entirely internal decision for the company. They were open minded and initially identified 10 different product offerings. They had seen several local companies that were prepared to develop and offer a customized software solution to suit Powerco. In the initial screening about 70% of the companies were removed from the short list that the company thought were not having long term focus and had doubts about the viability of the company into the future. This left the field to 3 or 4 vendors who have a significant presence in the industry, good customer reach and satisfied customers in general. They also looked at some of the companies that have initially adopted ERP software and then left it for a new and different ERP. The management collected information from those companies about the reasons for changing over from one ERP solution to another, and constraints and problems they have identified with the ERP they already have. In this process, they have also engaged a technical consultant, who has the experience of implementing ERP systems. The company used this consultant predominantly for understanding process flows, information flows and other technical matters. They, however, did not ask involve that consultant in the adoption decision. Once they had this information, they went to various experienced users in the industry, collected information about their experiences and challenges, evaluated various software solutions and made a final decision to adopt Ramco SaaS ERP. Even though the company originally had just SAP and Microsoft, and on-premise ERP solution in mind, Ramco came into picture much later when they were analysing the technical issues and evaluating various product offerings. After ascertaining the reputation, longstanding history, brand image of Ramco in the market place and performance of its product offerings, Powerco called for Ramco to come onboard and present their solution along with several other major software vendors. Powerco believed Ramco was successful in matching the requirements of the company with their product

offerings and features, convincing Powerco of its strengths in technology, cost effectiveness of their solution to Powerco and availability of continued customer support throughout the product life cycle.

Educating users and understanding and using the capabilities are identified as key challenges in post-implementation environment in Powerco. With time, understanding of the SaaS ERP solution's capabilities, features and functionality has improved and Powerco now is able to use about 70% of it, gradually improving from 50% when it implemented the system 4 years ago. For areas like billing where SaaS ERP solution cannot support because of Powerco's unique requirements and variety, they have managed these processes outside the SaaS ERP solution and are using simple Excel as a solution and manual interfaces with the SaaS ERP for data transfer. Educating users on the information flows, documents and controls in the system was a challenge and took almost six months for the Powerco management to bring its employees up-to-speed after going live with the solution.

With experience and good communication channel with the software vendor, Powerco was able to continually recognise the problems and bugs if any in the system as they encounter and help software vendor in developing solutions. Thus the strategic partnership as its first user in the infrastructure sector has helped Powerco and contributed to improvements in processes and innovative use of integrated information. Implementing SaaS ERP did not yet have noticeable impact on their decision making processes and the management believed it has not reached that stage yet. Significant improvement in the quality and visibility of information across the enterprise already recognised, Powerco believes, its impact on decision making processes should be positive and will be felt soon. With discernible increase in productivity and efficiency improvements, Powerco believes their SaaS ERP system would easily manage expected strong growth in business turnover to \$60 million from the current levels of \$25 million.

4.3 Autoco

Autoco is a medium sized engineering company, and a subsidiary of a large automotive company in India and manufactures and assembles components as per the requirements from the parent company. In addition, this company also manufactures other products on order from other customers. It employs about 250 employees. Earlier, this company has an Unix based information system that will process transactions in batches. With its principals moving onto a large ERP system, this company lost the IT infrastructure support from them and was asked to find a suitable system. So, even though their trading partner had some influence and triggered their search for a suitable ERP system, they did not seem to have placed any pressure on Autoco with regard to SaaS or on-premise model or for a particular ERP vendor. Autoco therefore, after evaluating various options and various vendor offerings, decided to adopt an ERP system that will cater to its information needs for the next 10 years. With the help of IT experts in the principal company, Autoco started collecting necessary information from various ERP vendors and prepared a summary comparing benefits and limitations of each of the ERP vendors' software solutions. As the company was not willing to invest heavily on IT hardware, the company had opted for SaaS ERP. Given that the hardware requires regular updating every two years, the company wanted to implement an ERP system without investing much on the hardware. This important consideration put heavy emphasis on the SaaS ERP system, even though the other two options considered by the company had on-premise ERP solutions. Importantly, the company's unwillingness to employ dedicated IT professionals to maintain and run the on-premise ERP solution, and their reluctance to invest in and regularly update the IT hardware and software have contributed to their decision to go for SaaS ERP. Even though the company had considered an on-premise pre-configured SME ERP solution and a SaaS ERP solution from an international vendor (such as SAP), the management finally went for Ramco, given the significant cost differences and local reputation of Ramco.

Even though the company had some concerns about the data security at the beginning, a management team went to Ramco premises and checked their data centres for security and reliability and satisfied. It is important to note that the company had opted for an SaaS ERP solution as a transition model for the next ten years considering the company's growth and expressed its intention to go for an on-premise ERP solution later. The fact that the SaaS ERP solution they have signed up is not locking them up in any contract, is a huge positive factor in this organization. As pointed out by the chief

executive, the company would like to keep their options open for a possible move to an 'on-premise' ERP solution later on to complement their principal's ERP system in future.

Configurability of the SaaS ERP solution and the opportunity to co-design and improve the processes in the software is another positive factor that made Autoco's adoption successful. The company, at the beginning, sought some changes to the processes embedded in the software and some additional reports and reporting functionality. For example, the company does not need to pay excise duty and VAT as they do not buy the materials. Materials are generally supplied by their principals and customers for processing and invoicing is done for the value added to the materials. This required a change in the process and some changes to the formats and screens. The SaaS ERP vendor had agreed to make those changes and delivered the software to the company. The company in general was satisfied overall with the product as well as with the support provided by the SaaS vendor on a regular basis.

4.4 Enerco

Enerco is a group of operating companies in power infrastructure industry with project sites all over India. With each of their business units relatively small and on project sites, the company wanted to have a readymade software package and did not want a complicated ERP system. A simple on-premise accounting system called 'Tally' that was there for many years was replaced with SaaS ERP system in this company. Enerco has implemented all the major modules, viz, supply chain management, inventory module, finance/accounts and human resources and planning to go on to analytics soon. Total cost of ownership is the main factor for Enerco in deciding on the adoption of SaaS ERP. Further their limited IT capability also played role and the company did not want to have the burden of an on-premise ERP system that requires them to resource for its maintenance, user support, upgrades and management on a continuous basis. Similar to other organizations, was originally concerned about the data security and reliability of ERP software available through Internet and online. The company did due diligence checks by visiting the Ramco data centre and satisfied itself by checking the security infrastructure Ramco had, the way data was managed, and the way it was resourced with technically capable people and technology infrastructure. Competition and external pressures from their major customer and/or trading partner had no significant role in their adoption decision.

Internet bandwidth, a factor that is beyond the control of the Enerco, is considered a challenge. With most of its project sites located in remote areas, accessing SaaS ERP system by the on-the site staff was difficult. Thus, connectivity was a major problem for Enerco than the capability of the SaaS ERP system. Some simple customization in terms of additional screens and searching mechanism was necessary for Powerco and the vendor Ramco readily provided this facility and met company's requirement. Though some bugs were noted as the company was using the software, these bugs were immediately rectified by the Ramco support team, sometimes within a couple of hours and sometimes within a day. Overall, Enerco is satisfied with the services offered by Ramco and did not so far experience any service disruptions. Other than some disruptions of service at remote locations because of the limited bandwidth, Enerco did not face any IT infrastructure related challenges so far.

4.5 Summary of findings

Literature on SaaS models points out security and privacy concerns for many SMEs. But, none of the case study organizations were concerned about the security. In fact, all of them believed that the SaaS ERP vendor is more capable of handling the security of data and privacy concerns than themselves. After visiting the data centre managed by the SaaS ERP vendor, they felt assured with the level of protection and security offered by the vendor. For medium-sized firm, moving to SaaS ERP solution is an interim measure before they move onto a full large scale on-premise ERP model in line with their growth in a few years time, the study noted. For several issues and themes discussed in the literature review section, a comparative summary of the findings from all the four case studies and their relationship with the past literature is presented below.

	Themes/propositions	Engco	Powerco	Enerco	Autoco	Confirms past literature
1	Influence of external competitive pressures on adoption decision	No	No	No	Partial	No
2	Evaluation of both on-premise and SaaS ERP solution	Yes	No	Yes	No	N.A.
3	Reputation, brand image and long standing history of vendor & due diligence in adoption decision	Yes	Yes	Yes	Yes	New
4	Total cost of ownership a factor in their decision	No	Yes	Yes	Yes	Yes
5	SaaS an interim solution before they move to on-premise solution in future	No	No	No	Yes	New
6	Role of legacy IT infrastructure in adoption decision (technology-readiness before adopting SaaS ERP)	No	No	No	No	No
7	Faster implementation time a factor in adoption decision (before adoption)	Yes	Yes	Yes	Yes	Yes
8	Fear of service disruptions and disaster recovery problems	None	None	None	None	No
9	Implementation time is as expected or longer than expected (after adoption)	Very long	Long	Long	Long	New
10	Software and process fit - a criteria in adoption decision	No	No	No	No	Yes
11	Willingness to follow processes in software solution	Yes	Yes	Yes	Yes	New
12	Belief that security, privacy & integrity of data could be managed better by SaaS vendor	Yes	Yes	Yes	Yes	New
13	Increased risk of security perceived initially after implementation	None	None	None	None	No
14	Belief that SaaS ERP would decrease their need for IT capabilities	Yes	Yes	Yes	Yes	Yes
15	Belief that there is freedom to switch to other SaaS vendors as it is pay per use – key factor in adoption decision	No, all firms believed there is still a lot of costly change management required if they decide to move to another SaaS vendor; long term relationship with SaaS vendor considered important by all; but Autoco thought it a plus for a possible move to an on-premise model				New
16	Evidence of opportunities for process improvements and innovation	High	High	Medium	Medium	Yes
17	Belief that co-creation of value is possible resulting in improved product offerings	Yes	Yes	Not much	Yes	Yes
18	SaaS vendor ensuring legal/regulatory compliance of data	Yes	Yes	Yes	Yes	New
19	SaaS ERP helps companies to focus on their core activities (marketing, product development, customer relations etc.)	Yes	Yes	Yes	Yes	Yes
20	Employees discovered novel ways of using technology & processes as they use the system with time	Little	No	No	No	New
21	Improvements in decision making	Not yet	Not yet	Not yet	Not yet	Not yet

Table 2 Comparative summary of the findings

5 CONCLUSIONS

SaaS ERP systems are considered the best option for SMEs to take advantage of the benefits of ERP systems without associated prohibitive costs of IT infrastructure, software, upgrades and maintenance. Empirical research on SaaS models in general and SaaS ERP systems in particular is limited. Filling this research gap, this study analyzed the factors influencing the decision to adopt SaaS ERP systems in SMEs and their impact on performance. Low total cost of ownership, willingness of the SaaS vendor to work with the customer, reputation of the SaaS vendor in the SME community are some of the key determinants of adoption decision. Dispelling the myths surrounding the security issues, the study found security and integrity of data stored at the SaaS vendor, and possible disruption of service failures are not at all issues for SMEs while making an adoption decision. Instead, SMEs are more focused on how well the software 'fits' to their business processes, willingness of the SaaS vendor to listen to and work with them in improving the product offerings and opportunities for co-creating value in terms of process improvements. External competitive pressures and/or trading partners' requirements were not found to be influential factors in their adoption decision. Eventhough SaaS ERP system offers 'pay per use' model without any lock-in contracts, it is not easy to deal with the change management related issues in case of a switch from one vendor to another. Therefore, it appears enterprises do not consider this as an important benefit in their decision and are in general looking forward to a long standing relationship with their SaaS ERP vendor.

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