What Makes or Mars a Knowledge Based Software Process Improvement Initiative? - Prescriptions from the field

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Abstract

Software product quality has always been the most desired thing in the field of software engineering. Software quality is directly related to the software development process. Various models of quality improvement proposed by SEI have been serving as great guides in this direction but recently the whole area of Software Process Improvement has got wide attention of software engineers and researchers alike. Though there are many models proposed in the literature for the implementation of knowledge based SPI, there is dearth of consensus on what makes the SPI effort a success. The present paper explores the critical factors of success as prescribed in literature for the successful implementation of knowledge based SPI.

Introduction

For the continuous improvement of software process, the knowledge and experience of its employees can not be overemphasized in an organisation. Large

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amounts of knowledge in the form of project data, lessons learnt, software artifacts, code libraries etc. could be accumulated for a software organisation but to make this knowledge usable, it needs to be structured, organized, modeled and stored in a generalized and reusable form in an organisational repository, called the 'experience base'. An experience base (EB) may be on paper, in files, in spreadsheets, on the web, or in the brains of the people. Moreover, experiences are related to the environment and the context in which they occurred. Experiences can direct achievement in quality and improvement in software process when reused in their original context.

Based on the ideas presented by Humphrey (Humphrey, 1989), developed at Software Engineering Institute (SEI) of Carnegie Mellon University, Pittsburgh[1], SPI is used as a systematic approach to improve the capabilities of software engineering organisations. The central belief of software process improvement is that the quality of the software product is directly related to the software development process. SPI aims at providing software development organisations with mechanisms for evaluating their existing processes, identifying possibilities for improving as well as implementing and evaluating the impact of improvements (Florac et al., 2000).

Present Paper

The present paper is based on the premise that managing software engineers' knowledge and experience helps improve software development process. The study is explorative in nature and uses exhaustive literature survey as a methodology for identifying the critical success factors for experience based SPI.

Literature Review

A lot of research has been reported about knowledge management (KM) in software engineering e.g. Rus and Lindvall (2002) and Ward and Aurum (2004). An infrastructure to deal with KM in software engineering environments is presented in Natali and Falbo (2002). There are studies which investigate the need for experience bases in software projects (Basili et al., 1992). However, the literature on the use of KM for SPI is limited though pivotal e.g. (Martinez et al., 1995). Presently, there are two approaches to SPI – the model based approach or the

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standardisation approach and the pragmatic approaches or the bottom-up quality improvement approaches. The standardisation school of SPI is based on the premise that developing software in a more well-defined and predictable way results into a higher quality software within cost and time schedules. This approach is focused on certification and comparisons with a process maturity model. The most common standardisation approach in the field of software engineering is the Capability Maturity Model (CMM) developed at the SEI (Humphrey, 1989). CMM is in fact a framework to evaluate or assess the maturity of software engineering organisations. Organisations developing software in planned and documented ways is placed at a higher maturity level than other organisations (Paulk et al., 1995). The model has often been criticised on the grounds of its incompatibility with everyday problems of software engineering companies. The pragmatic approaches to SPI are based on the ideas from the field of Total Quality Management, TQM (Deming, 2000). A fundamental idea in TQM is to learn from the activities one does in an organisation, for which the *plan-do-check-act* cycle has been proposed. The idea is to first *plan* an improvement or change activity, then *do* it, then *check* whether you reached the intended goals, and finally *act*; make changes to work processes in order to do better the next time, based on what you have learned. This kind of feedback-loop is also used in software engineering under the name Quality Improvement Paradigm (QIP), developed at the NASA Software Engineering Laboratory (Basili, 1985). The major focus in QIP is on gathering quantitative data.

The major problem with both these schools of SPI is that they do not specifically value the knowledge and experience of software engineers in improving the software processes in an organisation and do not provide for any system or method to capture, manage and use this accumulated knowledge to avoid repeating the mistakes and to enable the software engineers learn from past experience.

An attempt at establishing an overview of the SPI field is described by Hansen et al. (2004). An empirical investigation of the critical success factors of SPI is given by Sharma et al. (2010).

Knowledge Based SPI: Prescriptions for Success

There has been much research published about critical success factors for SPI adoption. The studies vary with respect to the research approaches used. Goldenson

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and Herbsleb (1995) use survey whereas Ares et al. (2000) use case study method. We also find studies which analyse and interpret previously published research, e.g., Niazi et al. (2003); Rainer and Hall (2001); and Stelzer and Mellis (1998).

Watts Humphrey (1989) and Victor R. Basili (e.g. Basili and Rombach, 1991) have been the pioneers and leaders in the field of software process improvement. Humphrey (1989) declared the following six factors for the success of SPI initiative, pronouncing them as the basic principles of software process improvement: Major changes to the software process must start at the top; ultimately, everyone must be involved; effective change is built on knowledge; change is continuous; software process changes won't stick by themselves; software process improvement requires investment.

Zahran (1998) advised the following ten key factors for the success of the SPI implementation in an organisation: Alignment with the business strategy and goals, Consensus and buy-in from all stakeholders, Management support, Dedicated resources, Sensitivity to the organisational context, Management of change, Prioritization of actions, Support infrastructure, Monitoring the results of SPI, and Learning from the feedback results.

Basili and Caldiera (1995) stress on the reuse of experience and learning, use of the quality improvement paradigm (QIP) for developing core competencies, supporting the QIP process with goal-oriented measurement (GQM) and an organisational infrastructure like Experience Factory for success of SPI effort. Therefore, the critical factors for SPI through experience management, as suggested by them, are: Acquisition of core competencies through (1) a control cycle and (2) a capitalisation cycle, Goal-oriented measurement, and Experience reuse and organisational sharing.

Goldenson and Herbsleb (1995) conducted a quantitative survey of 56 organisations to evaluate various organisational factors that were believed to enable or hinder successful SPI. The factors that were found to be statistically significant in their study are summarised in Table 1. El Emam et al. (1998) made a reanalysis of these factors using multivariate analysis. Based on this reanalysis, they identified focused SPI effort, commitment to SPI, politics, respect, and turnover as the key factors.

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Table 1: CSF and Barriers to SPI as suggested by Goldenson and Herbsleb (1995)

Critical Success Factors to SPI	Barriers to SPI
Senior management monitoring of SPI	Discouragement about SPI prospects
Compensated SPI responsibilities	SPI gets in the way of "real" work
SPI goals well understood	"Turf guarding" inhibits SPI
Technical staff involved in SPI	Existence of organisational politics
SPI people well respected	Assessment recommendations too ambitious
Staff time/resources dedicated to process improvement	Need guidance about how to improve
	Need more mentoring and assistance

Stelzer et al. (1996) identified the following critical factors of success in their study of software process improvement: Definition and documentation of the status quo, Identification of best practices, Identification of business processes, Simplification of routine procedures, Internal audits, Impetus and incentive, Team spirit, Workshop and regular meetings, Definition of a common language, and Customer perception surveys. Furthermore, Stelzer and Mellis (1998) performed an analysis of published experience reports and case studies of 56 software organisations that had implemented an ISO 9000 quality system or that had conducted a CMM-based SPI initiative and as a result of this meta-analysis declared the following set of factors as critical for SPI. In rank order, these factors were: Management commitment and support, Staff involvement, Providing enhanced understanding, Tailoring improvement initiatives, Managing the improvement project, Change agents and opinion leaders, Stabilising changed processes, Encouraging communication and collaboration, Setting relevant and realistic objectives, and Unfreezing the organisation.

Finally, ISO/IEC 15504-7 (1998) asserts cultural and management issues as central for the success of SPI efforts. The ISO 15504 standard emphasises that strong leadership, communication and motivation throughout the organisation are the most important factors for ensuring the success of SPI. It further states that major problems found in software processes often arise from cultural issues and hence these issues must be appropriately addressed at all organisational levels. Consequently, cultural issues should be one of the factors considered in prioritising improvement actions.

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From the exhaustive survey and analyses of the literature related to critical success factors of KM, it was found that several studies have proposed several key factors for successful implementation of knowledge management. For example, Davenport et al. (1998b) have identified eight knowledge management success factors such as technology infrastructure; organisational infrastructure; balance of flexibility, evolution and ease-of-accessibility to knowledge; shared knowledge; knowledge-friendly culture; motivated workers who develop, share and use knowledge; means of knowledge transfer using various information technology infrastructure; and senior management support and commitment.

Ryan and Prybutok (2001) propose five critical success factors for KM such as an open organisational culture; senior management leadership and commitment; employee involvement; teamwork and information systems infrastructure.

Another very comprehensive list of success factors has been presented by Moffett et al. (2003) which suggests the following ten critical factors to successful knowledge management: a friendly organisational culture; senior management leadership and commitment; employee involvement; employee training; trustworthy teamwork; employee empowerment; information systems infrastructure; performance measurement; benchmarking and knowledge structure.

There is a general agreement in literature that a knowledge-friendly culture must be present or nurtured in order to ensure the success of knowledge management implementation. Various studies like Chase (1997); De Long et al. (1996); Greengard (1998); Gupta et al. (2000); Jager (1999); McDermott and O'Dell (2001); Ryan and Prybutok (2001); Skyrme and Amidon (1997); Wah (1999); and Wild et al. (2002) stress the importance of corporate culture for KM implementation. Descriptive studies have identified culture as a major catalyst, or alternatively a major hindrance, to knowledge creation and sharing, e.g., Davenport and Prusak (1998) identify knowledge friendly organisational culture as the most important factor for the success of KM initiatives in organisations. According to them, extensive knowledge transfer could not happen in large global companies without the tools provided by information technology, but the values, norms, and behaviors that make up a company's culture are the principal determinants of how successfully important knowledge is transferred. Allee (1997) also points out that the old practice of hoarding knowledge is often so deeply ingrained in business that changing the culture is a critical factor in the support for knowledge transfer. O'Dell and Grayson (1998) stress that leadership support is required for culture change and also suggest incorporating

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knowledge development and transfer in their professional and career development systems for effective knowledge transfer.

There are many studies which insist that top management commitment and leadership are the most critical factors for a successful knowledge management project, particularly in knowledge creating and culture sharing activities. Kalling (2003) declares that leadership commitment to the knowledge management process is essential. The top management support as a critical success factor for KM has been affirmed by many researchers including Abell and Oxbrow, (1999); Civi (2000); Chard (1997); Davenport et al. (1998b); Dutta (1997); Greengard (1998); Guns and Valikangas (1998); Hansen et al. (1999); Kalling (2003); Moffett et al. (2003); Pemberton et al. (2002); Roberts (1996); Ryan and Prybutok (2001); and Salleh and Goh (2002). Allee (1997) asserts that top management leadership can exert substantive influence on organisational members' KM activities by holding beliefs and values around knowledge. Supporting the same view, Lee and Kim (2001) render various managerial drivers like commitment, policies, and processes to build and maintain organisational knowledge management infrastructures as critical factors of KM success. They stress that an organisation should be able to execute proper managerial actions in a timely fashion as its knowledge management capability evolves.

Pemberton et al. (2002) explain that leadership is responsible for creating the knowledge vision of the organisation, communicating that vision, and building a culture that regards knowledge as a vital company resource. Therefore, poor leadership quality is perceived as a threat to successful implementation of knowledge management. Civi (2000) declares that without the support of top-level managers, the success of KM activities is cumbersome. It has, therefore, been stressed that senior management recognises its importance and buttresses the development of programs and policies to make it real (Greengard, 1998; Gun and Valikangas, 1998). Hansen et al. (1999) put forth that only strong leadership could provide the necessary direction, where an enterprise will need to implement and effectively deploy a knowledge management strategy. To realise the potential of knowledge management, enterprise leadership must provide the proper environment to motivate its workers to enable the creation, organisation and sharing of knowledge (Abell and Oxbrow, 1999).

There is also a wide divergence in the literature about the role of information technology (IT) in the success of KM projects. IT is regarded as a critical enabler

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for knowledge management by Alavi and Leidner (2001) and Davenport and Prusak (1998). They explain that while IT may not guarantee the success of KM as such but it contributes significantly in supporting the KM processes. IT bridges the temporal and spatial distance between members of an organisation, streamlines the knowledge flow and eases collaboration among organisational members. However, Davenport and Prusak (1998) also warn that if you start with technology-centered solutions (for example, a database) and ignore behavioral, cultural, and organisational change, the expected advantages never materialise. According to Basili et al. (1994), the major reason for this failure, is not incorporating the knowledge capturing process into the engineering processes or not supported by the structures of the organisation. According to Ericsson (2001), KM system's ability to store, process and transmit knowledge is not given by technology itself; it is given by the users of the knowledge networks. Hogberg and Edvinsson (1998) also point out that when creating IT-based knowledge networks put the human at the center, since the people who will be using the network must see the value in the system; otherwise they will not use it. In this connection, O'Dell and Grayson (1998) regard the growth and adoption of intranet technologies is a major catalyst for knowledge sharing but they also warn that technology can either support or counteract the sharing of knowledge. Therefore, it is important to first figure out what to share, how often and for what reason, and then choose the technology that makes it possible. Walsham (2001) also states that the right technology can make the connections between employees possible, but it does not make the knowledge sharing happen.

Information Systems infrastructure has also been considered as a key factor for the success of KM. As Bhatt (2001) aptly states that IT can provide an edge in harvesting knowledge and Savary (1999) insists that an effective information systems infrastructure is necessary for the organisation to implement the knowledge management process. Furthermore, according to Davenport et al. (1998b), the two most critical factors for the successful knowledge management project are the establishment of a broad information systems infrastructure based on desktop computing and communications and the utilisation of the network technology infrastructure such as the Internet, Lotus Notes and global communications systems for effective transfer of knowledge. Despres and Chauvel (1999) report that knowledge bases and Intranets are the most popular ways of implementing knowledge management. On the other hand, Kutey and Aurum (2007) posit that technology can no longer be regarded as a universal panacea for KM. They explain

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that rather the expensive IT has led to the cynicism surrounding the introduction of new KM strategies in organisations. Ruggles (1998) mentions that the success factors people, process and technology need to be balanced in a 50/25/25 relation. According to him, people factor needs to be the major focus with 50% of the time and budget of a KM implementation project while process and technology factors only need 25% each in terms of the efforts, cost and other infrastructure. The major reason cited for this overemphasis on people element is that leveraging individuals' existing knowledge in an organisation is the most critical job in managing organisational knowledge.

Incentives and reward system of an organisation also proves to be a critical enabler or the barrier for the KM initiative. Liebowitz (1999) considers the rewards and incentives for knowledge sharing activity as an effective tool for engaging and enhancing employees in KM activities.

Wei et al. (2002) insist that management support, integration with existing technology infrastructure, and an organisational culture that values knowledge creation and sharing are critical success factors for KM system implementation.

Fairchild (2002) states that technology, content, learning, culture and leadership are the key knowledge enablers.

Learning orientation has been advocated as another factor of KM success by Crossan et al. (1999). Liebowitz (1999) expresses that a clear and well-planned strategy is one of the critical factors of KM success. According to him, KM strategy provides the foundation for how an organisation can deploy its capabilities and resources to achieve its KM goals. Literature is abound with several strategies for implementing KM but there seems to be an agreement in the literature that KM strategy has to be linked or integrated with the organisational business strategy.

Many studies have emphasised the importance of communication between diverse people or organisational units inside and outside an organisation for effective knowledge management, e.g., Szulanski (1996); Leonard and Sensiper (1998); and Hansen (1999). These studies emphasise that active communication is important for knowledge creation and transfer. It is important to note here that the written communication between knowledge bearer and the knowledge seeker in some cases may need to be supplemented by oral communication as well to put the knowledge in context (Allee, 1997). Personal contact is often seen as the most important facilitator of knowledge sharing (Sverlinger, 2000). Knowledge is context-specific and dependent on the situation. Hence, according to Nonaka and Takeuchi (1995),

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knowledge is created dynamically in social interaction among people which may take place in both formal and informal face-to-face meetings, over the phone, at internal conferences or during training in educational programs.

There are studies found in literature which strongly recommend positive attitude of members of an organisation towards knowledge sharing as the most important condition for the growth of KM practices in the organisation. Constant et al. (1994) and Bock and Kim (2002) assert that an organisation should shape employees' attitudes for information sharing by establishing an organisational norm such that information sharing is socially desirable.

Many researchers have recognized teamwork as one of the critical factors for successful knowledge management implementation, e.g., Civi (2000); Geraint (1998); Greengard (1998); Mohrman et al. (1995); and Ryan and Prybutok (2001). Quintas et al. (1997) stress that creating and operating an active knowledge management team is vital for ensuring the successful continuance of the KM initiative in an organisation. They further put forward the argument that it is only through a strong team spirit that the KM vision of an organisation can be converted into implementable strategies and can motivate the fellow members to turn their experience and knowledge into organisational knowledge. According to Demarest (1997), effective dialogue within a knowledge management team is essential if knowledge is to be embodied and disseminated. Mohrman et al. (1995) write that teams are the units that actually carry out the work in many knowledge-intensive organisations. They are the ones that must access and apply distributed knowledge effectively. Teamwork is an essential source of the knowledge generation process. Civi (2000) also laid stress on a well-staffed team for the successful implementation of KM. Nelson and Winter (1982) justify the importance of teams in KM because knowledge that individuals possess may be difficult to articulate because it is so deeply embedded in routines and practices that are taken for granted. By creating teams, it allows organisations to apply diverse skills and experiences towards its processes and problem-solving. Furthermore, effective knowledge management systems depend on individuals in the organisation realising how and what they can gain by sharing their knowledge and experiences. The success of knowledge transfer is determined by the interest of the individuals that are supposed to share knowledge. Factors decisive for individuals' interest in transferring knowledge are described by Davenport and Prusak (1998) which they refer to as the "frictions" because they slow or prevent knowledge transfer. These frictions are: Lack of trust; Different

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cultures, frames of reference; Lack of time and meeting places; Not-invented-here-syndrome; and Intolerance for mistakes or need for help.

There are studies linking employee involvement to the success of KM initiatives in organisations. The various studies illustrating the importance of employee involvement for KM include Wilson and Asay (1999), Bhatt (2000), Hall (2001), Binney (2001), Ryan and Prybutok (2001), Hung et al. (2005) and Moffett et al. (2003). Crauise O'Brien (1995) sums up this as the recognition of the importance of employee tacit knowledge is based on the assumption that successful performance improvement may not only depend on how work is organised, and the skill of the worker, but on the willingness of employees to convert tacit knowledge of the work process into continuous process improvement and innovation. Sufficient literature is available which points out that employee involvement is a critical factor in successful KM implementation because since employees must share the nature of knowledge creation and sharing, many knowledge management activities are unthinkable without employee involvement.

There are numerous studies like Carneiro (2001); Greco (1999); Hung et al. (2005); Hwang (2003); Moffett et al. (2003); and Salleh and Goh (2002), stressing on the importance of employee training to KM implementation success. Salleh and Goh (2002) point out the necessity of employees' quality training for an organisation intending to become a truly knowledge-based organisation. Greco (1999) points out that one of the key elements of successful knowledge management is education to help employees recognise what knowledge is valuable. Hwang (2003) also explains that unless people in organisations possess the learning capability to use knowledge creatively, a well-developed KM system cannot be directed at sustaining profitability.

Employee empowerment is another factor found to be critical for the success of KM implementation by many researchers like Anahotu (1998); Bhatt (2002); Martinez (1998); Verespej (1999); and Moffett et al. (2003). Verespej (1999) declares that the real advantages of knowledge management implementation could not be realised without truly empowering the employees.

Many researchers have found a positive relationship between performance measurement and successful KM implementation. Studies include that of Bassi and Van Buren (1999); Beijerse (2000); Bukowitz and Williams (2000); Bukowitz and Petrash (1997); Carneiro (2001); Edvinsson and Malone (1997); Gooijer (2000); and Moffett et al. (2003).

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Alavi and Leidner (2001) also point out that the functionality of a knowledge management system also has a positive effect on knowledge management performance. They explain that the KM system in an organisation should possess diverse and powerful functions to support or perform various knowledge management activities which will lead to more satisfaction among the members of an organisation and which can ultimately lead to KM success in the company.

Davenport and Klahr (1998); Greco (1999); and Hsieh et al. (2002) have identified knowledge structure as one of the critical factors for successful knowledge management implementation. They also claim that rigid regulations, lack of incentives to be creative and lack of commitment in budgeting and funding would be problems for the knowledge management implementation.

There are also studies which enlist various factors that act as barriers or hurdles in implementation of knowledge management initiatives in organisations. Lack of employee time to share their knowledge and corporate culture not rewarding or encouraging the knowledge sharing activities have been reported as major hurdles in KM (Cranfield University, 1998; KPMG, 1998; Brown and Duguid, 1998). Many organisations do not recognize knowledge sharing as an important activity and rather keep their employees overburdened with schedules and workloads. Dworan (1998) points out information overload as another barrier to knowledge management as the sheer volume of available knowledge will discourage the individuals from searching for the knowledge. Pfeffer and Sutton (2000) recognized that organisations have gaps between what they know and what they do and they cite distrusting the source of knowledge, lack of time or opportunity to apply knowledge, or risk aversion as major reasons for this. They also suggest that knowledge access and transfer are only partial steps towards knowledge application and rather effective knowledge application depends more on an ability to turn knowledge into effective action.

Basili et al. (2001a) state that knowledge management is a long-term investment and the benefits out of this cannot be harvested in the short run. Also the benefits out of KM initiative are often intangible and it is hard to assess. Thus the major hindrances in KM implementation are the difficulty of measuring its benefits and justifying the benefits against the investment in terms of ROI.

Table 2 lists the various factors of success and failure found in literature along with their sources.

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Table 2: Summary of Critical Success Factors and Barriers to KM Implementation

S.No.	CSF/ Barrier	References
1	Technology	Alavi and Leidner (2001); Davenport et al. (1998b); Davenport and Prusak (1998); O'Dell and Grayson (1998); Walsham (2001); Ruggles (1998); Fairchild (2002);
2	Resources and organisational infrastructure	Davenport et al. (1998b)
3	Ease-of-accessibility to knowledge	Davenport et al. (1998b)
4	Knowledge-friendly corporate culture	Davenport et al. (1998b); Davenport and Prusak (1998);Ryan and Prybutok (2001); Moffett et al. (2003); Chase (1997); De Long et al. (1996); Greengard (1998); Gupta et al. (2000); Jager (1999); McDermott and Dell (2001); Skyrme and Amidon (1997); Wah (1999
5	Employee Motivation	Davenport et al. (1998b)
6	Means of knowledge transfer	Davenport et al. (1998b)
7	Top management support and commitment/ Leadership	Davenport et al. (1998); Davenport et al. (1998b); Ryan and Prybutok (2001); Moffett et al. (2003); O'Dell and Grayson (1998); Kalling (2003); Abell and Oxbrow (1999); Civi (2000); Chard (1997); Dutta (1997); Greengard (1998); Guns and Valikangas (1998);
8	Employee involvement	Ryan and Prybutok (2001); Moffett et al. (2003); Hogberg and Edvinsson (1998); Ruggles (1998); Wilson and Asay (1999); Bhatt (2000); Hall (2001); Binney (2001); Hung et al. (2005); Crauise O'Brien (1995)
9	Team work	Ryan and Prybutok (2001); Moffett et al. (2003); Civi (2000); Geraint (1998); Greengard (1998); Mohrman et al. (1995); Quintas et al. (1997); Nelson and Winter (1982);
10	Employee training	Carneiro (2001); Greco (1999); Hung et al. (2005); Hwang (2003); Moffett et al. (2003); Salleh and Goh (2002)
11	Employee empowerment	Anahotu (1998); Bhatt (2002); Martinez (1998); Verespej (1999); Moffett et al. (2003)
12	Information Systems infrastructure	Ryan and Prybutok (2001); Moffett et al. (2003); Bhatt (2001); Savary (1999); Bontis et al. (2000); Davenport et al. (1998); Despres and Chauvel (1999); Wei et al. (2002);
13	Performance measurement	Moffett et al. (2003); Bassi and Van Buren (1999); Beijerse (2000); Bukowitz and Williams (2000); Bukowitz and Petrash (1997); Carneiro (2001); Edvinsson and Malone (1997); Gooijer (2000);
14	Benchmarking	Moffett et al. (2003)
15	Knowledge structure	Moffett et al. (2003); Davenport and Klahr (1998); Greco (1999); Hsieh et al. (2002)
16	KM Processes	Lee and Kim (2001); Basili (1994); Ruggles (1998)
17	KM Strategies and policy	Lee and Kim (2001); Abell and Oxbrow, 1999; Liebowitz (1999)
18	Knowledge Networks	Ericsson (2001)

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S.No.	CSF/ Barrier	References
19	Incentives and reward system	Liebowitz (1999); Cranfield Univ. (1998); KPMG (1998); Brown and Duguid (1998)
20	Learning orientation	Fairchild (2002); Crossan et al. (1999)
21	Communication	Szulanski (1996); Leonard and Sensiper (1998); Hansen (1999); Allee (1997); Sverlinger (2000); Nonaka and Takeuchi (1995); Demarest (1997)
22	Positive attitude	Constant et al. (1994); Bock and Kim (2002)
23	Lack of trust	Davenport and Prusak (1998); Pfeffer and Sutton (2000)
24	Lack of time	Davenport and Prusak (1998); Cranfield University (1998); KPMG (1998); Brown and Duguid (1998); Pfeffer and Sutton (2000)
25	Not-invented-here-syndrome	Davenport and Prusak (1998)
26	Functionality of a KMS	Alavi and Leidner (2001)
27	Information overload	Dworan (1998)

Conclusion

After the thorough analysis of the related literature, it is found that there is no single study available which provides a complete and generalized frame for knowledge management by defining critical factors of success and their interrelationships. Many studies are narrowly scoped although they identified some critical success factors. For example, a considerable number of research have yet to initiate the removal of organisational constraints as one of the important factors in ensuring successful knowledge management implementation. In other words, the proposed success factors are fragmented and diversified, depending on the researchers' background and interests. In addition, little attempt has been made to integrate all the success factors proposed by the knowledge management researchers. As such, there is an absence of unifying theories on critical factors that influence knowledge management implementation success. In line with the trend towards examining fully integrated models of knowledge management success factors, a set of variables taken solely from one perspective might explain only a small proportion of how well the success factors contribute to the successful knowledge management implementation in organisations. Therefore, a review of the CSFs literature brings out the fact that the concept has not been applied to any great extent in research on the topic of experience base implementation for SPI. CSFs are often identified

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after the successful completion of certain activities. Hence these factors are near-to real life experiences. Therefore, it is believed that CSFs approach can be very useful in the implementation of experience-bases.

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