CHAPTER 3

Literature Review
This section provides a review of literature on ERP systems, ERP for SMEs and critical success factors.

3.1 Overview of ERP systems

Schaper (2002) observes that small and medium-sized enterprises make a major contribution to economic growth and employment in most countries around the world. The collective impact of SMEs is influential as they represent about 95% of all private sector firms in most modern nations and so form a major portion of all economic activity. They account for 35% of exports from Asia and approximately 26% of exports from developed countries including the United States(9). Knight (2000) observed out that in selected countries such as Italy, South Korea and China, SMEs contribute as much as 60% of total national exports. In Belgium they represent 95% of all businesses and employ 40% of the labour force in private companies.

SMEs should be more responsive to the changes in the market and environment. Burns (2001) observes that limited access to finance, a low degree of professionalism, difficulties in hiring qualified manpower, dependency on clients and suppliers and the absence of economies of scale are identified as the weaknesses of SMEs.

Basu Rana et al.(2012) conclude that SMEs face pressures from various corners that include competition from global vendors, new regulatory compliance requirements that would come up every year and providing information to

government agencies, needing to strengthen products and services, at the same
time, physical expansion need to be taken care of. With exposure to global
economies, customers’ preferences are changing drastically and accordingly,
organizations need to enhance their products / services.

It can be seen that SMEs make major contribution for the growth of the
economy in developing countries as well as in developed countries like US and
Italy. SMEs contribute significantly for employment and exports of a country
though they suffer from number of problems. SMEs can turn towards use of
information technology to address some of these problems.

Sandoe et al. (2001) observe that ERP streamlines the processes within an
organization and helps improve its overall efficiency, while providing means to
bolster competitive performance, increase the speed of responsiveness to
customers and strategic initiatives.

Klaus et al. (2000) describe ERP systems as “comprehensive, packaged
software solutions that seek to integrate the complete range of a business’s
processes and functions in order to present a holistic view of the business from a
single information and IT architecture.” O’Leary (2000) describes ERP systems
as “computer-based systems designed to process an organization’s transactions and
facilitate integrated and real-time planning, production, and customer response.”

Davenport (1998) observes that ERP systems constituted the natural
evolution of Material Resource Planning solutions that emerged in the seventies,
integrating not only manufacturing processes, but also linking the wide array of
business functionalities and processes required within any organization.
The most commendable work on literature survey on Enterprise Resource Planning is given by Richard Addo Tenkorang and Petri Helo (2011). They have published an article on “Enterprise resource Planning (ERP): A Review Literature Report” by collecting articles between 2005 and 28 May 2010. A total of 154 articles from 49 journals were reviewed.

Tenkorang and Helo (2011) classified the articles under each category. They critically reviewed the literature concerning the related topics of critical success factors (CSFs) in ERP system implementation, which aimed at identifying and investigating factors that result in more successful ERP system implementation, which generates higher levels of value for organizations. Genoulaz (2005) identified six categories concerning literature review which include: implementation of ERP, optimization of ERP, management through ERP, ERP software, ERP for supply chain management and case studies.

ERP systems emerged to honour the promise to flawlessly integrate the information from an entire enterprise, including processes such as production, customer orders, inventory, purchasing, sales and distribution, human resources, and supply chain (Kang et al, 2008). Since then, ERP systems have been acknowledged as one of the most innovative developments in the information technology era (Al-Mashari, 2003). It was observed that by 1999, over 70 percent of Fortune 1000 companies had either adopted or were in the process of implementing ERP systems (Brazel et al., 2008, Cerullo et al., 2000). Al-Mashari (2003) recognizes that ERP systems are considered as the standard technology for running a business.
Kang et al. (2008) synthesized that these ERP systems display four fundamental characteristics:

- ERP systems can be considered as multinational systems since they reflect national laws and regulations from specific country environments.
- ERP systems comprise reference models that reflect preferred business models in terms of best practices, data employed and organizational structure.
- ERP systems integrate all business processes within an organization, enabling real-time access to the same information.
- ERP systems provide flexibility, allowing organizations to customize the system to fulfill specific scenarios and circumstances.

It can be seen that literature survey mainly concentrates on ERP implementation, ERP optimisation and ERP software among others. ERP software has become one of the advanced technologies to be embraced and perhaps, one of the fastest technologies being adopted by Fortune 1000 companies. ERP systems enable real-time access to the same information, which is crucial for decision making in the organisations.

Rowe (1999) describes ERP implementation as a way to reach management’s dream of unifying and centralising all the information required by the firm in a single enterprise-wide system. ERP provides the common infrastructure, language and repository of information within the organisation that may bring diverse benefits such as consolidation of information technology applications, standardization of procedures, optimization of business processes, and strategic management of business information. Rowe (1999) also states that ERP
provides a significant level of portability and flexibility in adapting to specific requirements of organizations and therefore ensuring efficient alignment in varied business environments.

There has been increasing focus on research in ERP area. Esteves et al. (2001) emphasise that ERP research was a relatively new focus within the IT community. Al-Mashari (2003) confirms the widespread adoption of ERP and proclaimed that “both IT practitioners and researchers are still not able to determine the potential impact of ERP implementation on adopting organizations”. Based on this he concludes that “the need for a new research agenda to address various issues in this context has never been more urgent”.

Stratman and Roth (2002) conducted a survey of North American manufacturing users of ERP systems through a questionnaire. They have identified some factors which are hypothesised to be associated with successful ERP adoption. Some of major factors identified by them are planning, project management skills, ERP training, learning etc.

Umble and Umble (2001), based on their study have explained success factors and failure factors attributable to ERP implementation. Some of the factors responsible for ERP success are definition of business goal, constant communication with end users, education and training management with data, measurement of right things, establishment of aggressive schedules etc. And the failure factors are poor project management, lack of education and training, unrealistic expectations about implementation etc.
There is a need for research to determine the impact of ERP implementation and also the ERP technology. Many researches have been conducted about success and failure of ERP implementation. Some of major factors associated with successful ERP adoption are planning, project management skills, training, etc. There are instances of failure of ERP implementation. And the factors responsible for failure include poor project management, lack of and training, high expectations about implementation etc. ERP implementation is strategic decision.

Nah et al. (2001) identified eleven factors that were critical to ERP implementation success. Those factors are ERP teamwork and composition, Change management program and culture, Top management support, Business plan and vision, Business process reengineering and Minimum customization, Effective communication, Project management, Software development testing, Trouble shooting, Monitoring and evaluation of performance, Project champion, Information technology legacy systems.

Some researchers such as Markus et al. (2000), Gibson et al. (1999), Hunter et al. (2000) and Caldas et al. (2001) affirmed that the adoption of ERP systems has not necessarily turned out to be the right solution for those organizations desiring to improve their business processes and underlying capabilities. Indeed, in many instances, ERP implementation has resulted in dramatic misfortunes for those organizations.

Brazel et al. (2008) have brought up to date current research stream. It is found that the existing streams can be categorized in three groups:

- **Critical Success Factors.** There have been many proposals on critical success
factors. Given the inherent formidable challenge associated with ERP implementations, many studies have aimed at identifying factors that positively affect the success of ERP installations. Within this stream, some relevant studies include Sun et al. (2005), Brown et al. (2007), Kamhawi (2007), Finney et al. (2007), Soja (2006), Nah et al. (2006), Gargeya et al. (2005).

- **ERP announcements and market reactions.** Diverse studies have focused on analyzing the positive impact generated in the market when an organization announces ERP implementation. Studies in this stream have been conducted and they include Hayes et al. (2001), Hunton et al. (2002).

- **ERP implementation and impact on performance.** Other researchers have focused on analyzing the impact of ERP systems on operational performance. Generally, these studies have adopted an accounting-based performance measures perspective (centered primarily on financial ratios). Distinctive studies in this area include Poston et al. (2001), Hitt et al. (2002).

  Mere implementation of ERP does not always guarantee success. In some instances ERP has turned out to be not a right solution to improve processes and its implementation has proved to be a wrong decision. There is a need to investigate whether ERP implementation resulted in financial benefits or non financial benefits. Financial benefits can be measured whereas non financial benefits can be assessed. The ERP software alone cannot be blamed. The current stream of research mainly falls into critical success factors, ERP implementation and impact on performance.
3.2 ERP for SMEs

The SMEs are turning their attention towards ERP software that are expected to fetch benefits. ERP implementation costs include software, hardware and personnel. The software and hardware costs are easily quantifiable but not personnel cost (Davenport, 2000). Dong (2001) proposed a conceptual model exploring the impact of top management on Enterprise Systems (ES) implementation.

Earlier ERP was mostly implemented by large scale industries in view of affordability in terms of cost and requirement. It is not only large scale companies, but also SMEs have the need to go in for ERP software. Koh et al. (2006) concludes that SMEs have the same needs as large enterprises but face different challenges in view of their financial constraints and capabilities. Buonanno et al. (2005) confirm that SMEs either do not have sufficient resources or are not willing to devote a significant portion of their resources to a complex ERP implementation process. Rao (2000) also holds that SMEs are more vulnerable than large companies.

It is seen that SMEs either do not have sufficient resources or are not willing to devote their resources as compared to large scale enterprises. There is a need for more research for ERP for SMEs.

A deeper understanding of the ERP implementation at SMEs is needed to ensure coordination between different departments. Huin (2004) holds that unless differences between SMEs and large enterprises are clearly understood, ERP projects in SMEs will not reach the desired outcomes. Those facts reveal that
the ERP for SMEs definitely demands specific research and analysis other than previous investigations primarily targeting large enterprises. Lussier et al. (2008) notes that understanding small business is an important area of research. The contribution of SMEs is extremely important to the economy and rapid growth. This growth is essential for providing immediate employment opportunities. Ramirez (2005) has summarized main challenges faced by SMEs in Latin America as follows:

• **Lack of training and development of skills.** Companies, especially micro and small ones, often begin as subsistence enterprises without a strong knowledge of basic management techniques.

• **Limited training in development of human resources.** Training constitutes one of the keys to raising productivity. Nevertheless, this need is often neglected by companies, due to budget and time constraints, among other factors.

• **Lack of information systems.** Companies lack the zeal to adopt new Information systems and awareness of the market and marketing issues.

• **Lack of efforts to promote technological innovation.** SMEs are affected by the lack of policies to promote technological innovation and the failure to make technology a high priority.

• **Lack of access to appropriate financing.** Sometimes the companies find difficulties in accessing proper source of finance.

• **High costs of meeting regulatory requirements.** The excessive requirements entrepreneurs must meet when opening and running a business often limit their ability to expand output.
Muscatello et al. (2003) adopted a case study research methodology to analyze implementation activities in order to establish criteria that lead to a successful installation. They indicate that “effective executive management commitment can help a project achieve success” and that the choice of the “executive sponsor” is significant.

Based on a review of the literature, Loh et al. (2004) propose a framework depicting primary factors that may influence the success of ERP implementations in SMEs.

In many countries including Latin American countries SMEs suffer from HR training, appropriate financing and lack of information system. A better information system which is cost effective and suitable for SMEs can be considered by SMEs. It is seen that ERP for SMEs definitely demands specific research other than the studies which focused on large enterprises. It can be noted that understanding of small business is an important area of research.

Rana Basu (2012) found that only eight of twenty five issues are contributing 80% of total contribution. Hence eight issues are regarded as key issues being extracted from review section in context to ERP implementation in SMEs of developing countries like India. The issues for successful implementation of ERP after extracting from Pareto analysis. They identified the most important issues that would actually lead to successful ERP implementation and to prioritize the issues against the benefit criteria by applying TOPSIS (Technique for order preference by similarity to ideal solution) method. Those issues are education & training, support from top management,
properly defined goals & objective, project team competence, project management, change management, proper selection of package and effective communication.

Also the important benefit criteria that appeared frequently in the literature (Shang & Seddon, 2002), have been taken into account for analysis are efficiency in overall business, improved decision making and planning, better utilization of resource, organizational empowerment, improvement in productivity and quality.

Buonanno et al. (2005) contribute with an empirical research analyzing factors affecting ERP adoption and compared SMEs to large scale companies. Their study presents correlation between company size and ERP adoption. A similar comparison between large companies and SMEs is also embraced by Bernroider et al. (2001) but focused specifically in the ERP selection process. They have identified the differences which are related to staffing the group performing the selection process. Basically, large scale organizations engage more manpower in decision making processes than SMEs. SMEs select ERP with less complex models and less expensive methods.

Carrillo (2007) noted that, there are basically four institutions that have conducted the limited research about the challenges of SMEs in Latin America: the International Labor Organization (ILO), the Organization of Economic Co-operation and Development (OECD), the Inter-American Development Bank (IDB) and ECLAC (Economic Commission for Latin America and the Caribbean).
Maldonaldo Miguel (2009) analysed the factors impacting the success of ERP implementations in 49 small and medium enterprises with empirical assessment in Latin American countries. He has analysed the importance of six factors in successful implementation of ERP software. They are change management, ease of use of ERP, ERP project success, ERP business improvement success and ERP user satisfaction. It is found that relationship implying the ease of use of ERP and ERP business improvement has been corroborated. Similarly that relationship implying the ERP user satisfaction and change management has been corroborated. Further the relationship implying ease of use and ERP user satisfaction has been correlated. The relationship implying project implementation success and ERP user satisfaction has been confirmed. The association between project implementation success and business improvement has been correlated.

Zach Ondrej (2012) observed that SME context influences ERP system implementation. Furthermore, the owner-managers significantly influenced almost all issues across the ERP life-cycle, such as ERP system selection, implementation team work and system customization. Even though the CEOs justified the ERP system implementation, their motivation was limited to replacing the old legacy systems. This shows that the lack of strategic perspective in SMEs might limit the ability to acknowledge the potential of ERP implementation.

Large scale firms have manpower and implement complex ERP system. But SMEs have limited manpower which make them to go in for less complex ERP system. In the study of ERP in Latin American countries it is found that
correlation exist between ease of use and business improvement. Similarly correlation exists between ERP user satisfaction and ERP implementation success. There should be strategic perspective in ERP implementation.

3.3 Critical Success Factors of ERP

Business organizations implement ERP software to succeed in their businesses. There are some factors which have to be given importance in selecting and implementing ERP software. Otherwise they will result in failure of the firms in achieving desired results. Critical Success Factors (CSFs) are then defined as those conditions that must be met for the implementation process to succeed (Finney et al., 2007).

While implementing ERP many factors are to be considered. The technical aspect is not the only factor to be considered. Financial, Psychological and other factors are to be considered. ERP is not meant for every business. While implementing the ERP, analysis must consider not only the obvious cost benefit analysis, but non financial factors (Sandoe et al., 2001).

To address both issues, Markus et al. (2000) propose to analyze ERP’s success using a process approach i.e. to assess success at three different stages during the ERP adoption experience or “ERP experience cycle” as they called it. Their contributions are in two focal issues identified: 1) Measurement of Success: Success depends “on the point of view from which you measure it”, since “ERP success” often means different things to different people. For instance, ERP implementers are inclined to define success in terms of timely project completion without running budget overruns while users of ERP
definitely evaluate success in terms of improvements to their business. 2) Timing and Measurement of Success: “Measurement of success depends on when one measures it”. “Different measures of success are appropriate at different points in the ERP experience cycle”.

Loh et al. (2004) have emphasised the critical elements and standardization for SMEs and made substantial contributions in the following directions:

1. **Identification of Critical Elements in ERP Success:** They identified Critical Success Factors, Critical People impacting the success of an ERP system.

2. **Standardization of Critical Success Factors:** They recognized that literature presents different CSFs and acknowledge that in many cases, there are diverse ways of referring to the same factor. In consequence, they propose to filter this repetition and apply a method to derive key unique factors. Their model encompasses 10 CSFs.

3. **Process Theory Approach:** They have included the “Chartering Phase” as a critical one in the “ERP Life Cycle”.

The model proposed by Loh et al. (2004) describes ERP Life Cycle phases which connect CSFs, Critical People and Critical Uncertainties. It is seen that there are two issues, measurement of success and timing of success in evaluating ERP implementation. The critical success factors to be standardized. The analysis of factors should not be only on cost benefit analysis but also non financial factors. Non financial factors contribute for financial performance of SMEs.
Maleki (2010) has identified 14 critical success factors which have critical role in successful implementation of ERP software in SMEs in Karnataka. The most important factor in successful implementation of ERP software is appropriate training. The second most important factor is top management support, the third being project management. The last important factor is project champion.

Aladwani (2001) described an integrated, process oriented approach for facing the complex social problems of workers’ resistance to ERP systems. Huang and Palvia (2001) proposed some factors concerning ERP implementation by making a comparison of advanced and developing nations. The major factors identified by them are economic growth, infrastructure, government regulations, etc. They did not categorize the factors into those that contribute to success and those that contribute to failure.

Vidyaranya B Gargeya and Cydnee Brady (2006) have reviewed 44 companies which implemented ERP software. They adopted a research methodology and given findings. Six factors were identified for success and failure of ERP implementation.

Sun et al. (2005) analysed the critical success factors of ERP implementation in order to propose a structured approach to help SMEs. Grounded on the literature, they consider five critical success factors: management and organization, process, technology, data and people. They emphasize that some CSFs are more important than others.

Research focuses on the identification and deeper understanding of ‘internal’ factors (related to the internal functions of the organization), which can
increase the business value generated by MIS, such as the business process redesign, new human skills, innovations, ‘soft MIS investment’, etc. Finally, (from 2005 until 2010) researchers have started dealing with the effect of ‘external’ factors, which are related to the external environment of the organization, such as generalized competition, strategy, industry concentration, industry dynamism, etc. on MIS business value.

Fontini has also undertaken a critical review of empirical literature on ERP system business values, which investigates the impact of ERP system adoption on various measures of organizational performance.

It can be seen that major researches have been extensive in the field of critical success factors for ERP implementation. Some of the critical success factors include top management support, business plan and vision, business process reengineering, minimum customization and effective communication. In Karnataka Maleki conducted study of ERP in SMEs and identified eleven critical success factors.

She-I Chang et al (2009) in their study on ERP system performance model development based on balanced scorecard approach identified four facets: Financial matters, customer, internal business processes and learning and growth. Financial matters facet includes indicators like gross profit margin, net profit margin, inventory turnover ratio. Customer facet includes indicators like customer satisfaction, Learning and development includes indicators like information accuracy level, information dealing speed. The Balanced Scorecard (BSC) is a performance management and measurement tool; it is a concept for measuring
whether the micro operational activities of a company are aligned with its macro objectives in terms of vision and strategy. Based on Grounded theory, 43 performance assessment indicators were designed for the 25 items of effectiveness but only 21 key performance indicators (KPIs) were confirmed. Using these 21 KPIs in the balanced scorecard, Analytic Hierarchy Process (AHP) and the Fuzzy theory were used to develop the prototype for the effectiveness assessment model of ERP system introduction.

Tenkorang and Helo (2011) have used Harzing’s Publish or Persih Software. Journal articles which belong to this subject mostly provide introductions to ERP definitions and issues of ERP, common ERP misinformation on business and industrial organizational issues, different perspectives of ERP, survey studies on industry experiences, recent trends in ERP and surveys of the ERP literature. The introductory articles provide enlightening guidelines for managers and beginning researchers in the ERP field. The emphasis seems to be on the close relation with Business Process Reengineering (BPR) and a wide range of organizational change issues accompanying ERP implementation. Some articles attempt to clarify the basic meanings surrounding ERP to provide reflections on many years’ of practices.

Tenkorang and Helo (2011) observe that a number of survey studies are reported from the findings of current industry’s experience with ERP. These survey studies can complement the general introductory journal articles supported by the actual data. A number of articles also provide different perspectives on ERP. For example, they are perspectives from managers, users and/or vendors.
Several articles present various types of models for ERP. They range from a conceptual model that explains the ERP system, to the taxonomy of success factors of ERP implementation, to a model of ERP governance and to a user acceptance model. And others try to challenge commonly held views or misconception on ERP by asking questions about the significant values of ERP system and about ERP best business practices. A common observation on the future trends in ERP is its further expansion in scope.

New integration technology such as software modularization, Enterprise Application Integration (EAI), Service-Oriented Architecture (SOA) systems applications, Web 2.0 web services is introduced and their implications discussed. A couple of articles attempt to provide a sense of direction in the ERP research community analyzing the ERP literature.

It seen that Balance Score Card system, Analytic Hierarchy Process (AHP) and the Fuzzy theory are used to identify 21 key performance indicators. New integration technologies like EAI, SOA etc. have emerged. Emergence of new technologies, new business models will help industries.

Tenkorang and Helo (2011) identified the gaps between the industry and the academia and also within the academic research, thus pointing out the potential future trends in terms of further expansion (i.e. ERP II). A few articles provide a similar information, but on a fussy segment. Examples of these fussy segments include the public organizations, the educational organizations, the healthcare organizations, the fashion industry, the manufacturing industry and the service industry. These articles are interesting since common attributes across different
Financial Implications of ERP Software Implementation in Small and Medium Industries in Karnataka segments as well a unique feature of a particular organizational segment can be analyzed. The number of journal articles published on ERP was found to be increasing from 2006. Many of articles started appearing in late 1990s. The highest number was in 2005.

ERP Education and Training is another area lacking much focus. There were a total 115 published articles. Out of this 46 articles were found to be of general in nature and 16 were of case study in nature. 21 articles were on critical success factors. 11 articles were related to change management. There were 43 articles on ERP exploration and uses that formed 20%. Out of this 22 articles were in general in nature. 7 articles were on decision support. 10 were articles were related to specific function in ERP. There were 16 articles related to extension of ERP and 9 articles related to a particular sector. And there 5 articles published on ERP Education and training i.e.2.4%.

It can be seen that major researches have been extensive in the field of critical success factors (CSF) for ERP implementation. These CSFs are the milestones for successful implementation of ERP. The post implementation evaluation of ERP software is to be carried out as it is necessary to upgrade existing ERP software in line with changes in technology, processes. Upgradation may be adoption of latest version of the software or cloud computing etc.

ERP software for small and medium industries is having huge potential and its financial implications can be explored. The benefits of ERP software for improvement in quality, customer satisfaction capacity utilization and information flow can be explored. Significant gap exists between existing SMEs and their
financial benefits after implementation of ERP software. Other than financial benefits, qualitative parameters are also to be evaluated to ascertain whether the improvement in these qualitative parameters has influenced financial benefits of these firms. Hence research on financial implications of ERP software implementation in small and medium industries in Karnataka is taken up.