CHAPTER II

II. LITERATURE REVIEW

To study the available literature, the researcher focused on following key areas:

**Software project success criteria** – It focuses on review of literature which defines software project success criteria or discusses software project success criteria used by researchers and practitioners.

**Software Project Failure statistics** – It focuses on review of literature about software project failure statistics.

**Software Project Failure Factors** – It focuses on review of literature related to the key factors/reasons behind software project failure.

**Indian IT Industry** – It focuses on review of literature related to the Indian IT Industry, its current state and challenges faced by it.

For each area a list of key words were identified and relevant combinations of keywords were used as search criteria while searching research databases and internet based sources. E.g. “Software project failure”, “Software project failure factors”, “Software project success”, “Software project success criteria”, “Software project success factors”, etc. The search was carried out only online. Book titles were also searched online; relevant books were referenced in e-book or in the printed format.

In this chapter, literature references relevant to the present research according to the relevant areas are mentioned.
2.1 Software Project Failure Statistics

Most commonly referred software project failure statistics data is from Standish group’s CHAOS reports. (16) The Standish Group collects information on project failures in IT Industry with the objective of making the Industry more successful and to show ways to improve its success rates and increase the value of the IT investments. It publishes a report called CHAOS report. The “2011 Chaos report”, published by the Standish Group IT consultancy found only 37 per cent projects were successful (1) and the remaining were either partially or totally failed.

Ambler (17) (Senior Consulting Partner with Scott Ambler + Associates, a boutique consulting firm specializing in helping organizations to successfully adopt disciplined agile strategies) conducted a survey of IT project success rate and the results were published on http://www.drdobbs.com/. According to the article, 55 percent of agile software projects were considered successful, 35 percent considered challenged, and 10 percent were considered failures. The figures were better than CHAOS report. However, only 55 percent of projects were considered successful indicating high rate of project failure.

McKinsey and the BT Centre for Major Programme Management at the University of Oxford conducted a study of 5400 IT projects and published their findings in an article, ‘Delivering large-scale IT projects on time, on budget, and on value’ (18). After comparing budgets, schedules, and predicted performance benefits with the actual costs and results, the researchers found that the IT projects, in total, had a cost overrun of $66 billion, more than the GDP of Luxembourg. The researchers also found that the longer a project is scheduled to last; it is more likely that it will run over
time and budget, with every additional year spent on the project increasing cost overruns by 15 percent.

IBM conducted a survey of 1,500 change management executives in October 2008. They found that on an average, 41 percent of projects were considered successful in meeting the project objectives within the planned time, budget and quality constraints, compared to the remaining 59 percent which missed at least one objective or failed entirely. (19)

Logica Management Consulting conducted a survey of 380 senior executives in Western Europe in 2008. 37 percent of the respondents reported that they had abandoned a major business change project in the past 3 years. (20)

The United States Government Accountability Office (2008) conducted a survey of federally funded technology projects. OMB (Office of Management and Budget) and federal agencies identified approximately 413 IT projects totaling at least $25.2 billion in expenditures for the fiscal year 2008—as being poorly planned or poorly performing, or both. (21)

In yet another report, ‘Strategies for Project Recovery - A pm solutions research report (2011)’, it was stated that, ‘The statistics regarding project failure are sobering. According to this survey, firms on an average manage $200 million in projects each year. During that time these organizations will realize that $74 million of their projects are at risk of failing.’ (22)

To conclude, significant quantitative data is available on the likelihood of software project failure. The reasons for a software project’s failure are varied but it is the most concerning aspect of the IT Industry globally.
2.2 Defining Software Project Success criteria

Paula Savolainen et al. (2011) did a systematic literature review to understand Software development project success and failure from the supplier's perspective and published a paper about the available literature (9). They studied the software project success criteria from the supplier's point of view. They divided success criteria into project success and project management (PM) success. They found seven articles mentioning success criteria from the supplier's perspective: customer satisfaction, short-term business benefits, and long-term business benefits. This is one of the most important and exhaustive papers on systematic literature review of software project success criteria. The researcher found this paper very useful due to a comprehensive analysis of the available literature on software project success criteria. It also takes into consideration the supplier’s perspective which is very important for the present research.

Agarwal et al. (2006) published a paper ‘Defining success for software projects: An exploratory revelation’ in International Journal of Project Management May 2006 (23). The paper states that there is a difference in perspectives while defining project success criteria amongst different stake holders. They studied software project success criteria amongst stakeholders internal to an organization. They found that the perception is similar among internal stake holders. Meeting scope for functionality and quality were rated high in success criteria. The researcher agrees to the findings as it is expected to have similar project success criteria perception inside a software development organization. The researcher has also experienced that project success criterion doesn’t differ much within internal stake holders. Apart from functionality and quality, other important aspects such as schedule, efforts, costs and meeting business
goals should be considered as a part of project success criteria. If a project is delivered as per functionalities and expected quality norms but has failed to adhere to the schedule or resulted in taking extra efforts then for the software development organization it is not a successful project.

James et al. (2005) focused on Client versus contractor perspectives on project success criteria (24). The aim of this paper was to report the findings of an empirical study that compares the measures of success emphasized as important by the client and contractor organizations and the extent to which differences of emphasis is translated into project management practice. The results show that contractors put more emphasis on minimizing the project cost and duration, whilst the clients put more emphasis on satisfying the needs of other stakeholders. The researcher agrees over the findings. The difference in perspectives makes defining software project success criteria difficult further. Thus a project might be successful from the client perspective but could be a failure from contractor perspective or vice versa.

Procaccino et al. (2005) published a paper, ‘What do software practitioners really think about project success: an exploratory study’ in ‘Journal of Systems and Software’ (25). They conducted a survey to discover some of the components of a project outcome (in terms of personal/professional aspects as well as the project as a whole) that practitioners consider important in defining the project success. They also investigated some of those components that the practitioners perceived were important contributors to success through their impact on the development process. Sixty-six practitioners participated in the study. The participants considered software projects to be successful if they provided them with intrinsic, internally motivating work in developing software systems which met both customer/user needs and were easy to use.
The researcher feels that the study gives a different view for project success, however, it might not be useful in determining if a project was successful from an organization’s or customer’s perspective.

Linberg (1999), in his paper, ‘Software developer perceptions about software project failure: a case study’ (26) provides an in-depth look at software development project failure through the eyes of the software developers. The case study found that there was a large gap between how a team of software developers defined project success and the popular definition of project success. The researcher feels that the study gives a different view for project success, however, it might not be useful in determining if a project was successful from the organization’s or customer’s perspective.

Wateridge (1995), in his paper, ‘IT projects: a basis for success’ in International Journal of Project Management, (27) investigates the key criteria on which the success of IT projects is judged, and the factors that are important in influencing the success or failure of IT projects. The evidence of research shows that project managers concentrate on achieving timescales and budgets. The conclusion is that, for IT projects to be successful in the future, the criteria for success and associated factors that influence success need to be defined clearly, agreed by all parties at the start of the project, and reviewed as the project progresses. The project managers should be concentrating on success criteria relating to users and sponsors and, consequently, the factors to deliver those success criteria. The paper was published in 1995. However, it is still very much relevant today. The researcher agrees with John Wateridge. However, reaching a common understanding on project success criteria amongst stakeholders is
the biggest challenge. Different stakeholders from supplier and Client side are likely to have different project success criteria.

Literature review indicates that researchers as well as software practitioners differ on the definition of software project success criteria. However, majority of them agree that success is rare in software projects. Literature review revealed that that knowledge of definition of software project success from a supplier’s or a vendor’s point of view is limited. The definition of software project success may differ amongst stakeholders of a project.

For the present research, the researcher has accepted the following definition of project success.

A software project is successful if it fulfills the following criteria:

- The project is delivered as per the agreed Schedule, Efforts/Costs, Quality and fulfills explicit and even implicit customer requirements.
- Achievement of Short term as well as Long term business goals of organization.

2.3 Software Project Success/Failure factors

The key objective of review of literature related with Software Project Success/Failure factors was to study and understand the factors identified by researchers and software practitioners. The researcher used these factors as a baseline for identifying software project environmental factors. The study references on factors affecting a software project’s success/failure are mentioned in this section.

Nasir and Sahibuddin (2011) did a comprehensive literature review on Critical success factors (28). They studied forty-three articles from 1990 to 2010 in order to develop a list of critical factors that specifically affected the success of software
projects. Based on the review of articles they identified total twenty six critical success factors related to the software project success as follows - clear requirements and specifications, clear objectives and goals, realistic schedule, effective project management skills/methodologies (project manager), support from top management, user/client involvement, effective communication and feedback, realistic budget, skilled and sufficient staff, frozen requirement, familiarity with technology/development methodology, proper planning, appropriate development processes/methodologies (process), up-to-date progress reporting, effective monitoring and control, adequate resources, good leadership, risk management, complexity, project size, duration, number of organizations involved, effective change and configuration management, supporting tools and good infrastructure, good quality management, clear assignment of roles and responsibilities, good performance by vendors/contractors/consultants and end-user training provision.

Venkatarao Edara (2011) studied factors that impact Software Project Success in Offshore Information Technology (IT) Companies (29). The various factors examined were host country, highest educational degree earned by the software team members, duration of the project, the software development life cycle (SDLC) methodology used, team structure, and the compensation of the team members. Software success was defined as on-time delivery, project completion within the budget and the scope. The results of this study revealed that there was statistically a significant association between software project success and the identified factors except the host country.

In an another article DeMarco (2011), ‘All Late Projects Are the Same’, from the IEEE Sounding board has put forward an interesting point - *fundamental reason for*
late delivery is late start of the project (30). This factor is primarily applicable to the business owners. It was noted that the business owners delay project start due to various reasons which ultimately affect the project schedule and puts pressure on project teams. The argument sounds very simple but highly applicable.

Doherty, Michael (2011) in her paper, ‘Examining Project Manager Insights of Agile and Traditional Success Factors for Information Technology Projects: A Q-Methodology Study’ has listed, a sustained commitment from the upper management to the project and clear, measurable project goals and objectives as critical success factors. (31)

Desiree C. LeBlanc (2008), in his research, studied the relationship between information technology project manager personality type and project success. (32). The findings showed a significant association between an IT project manager's personality type and the project scope. The important factor to note here is the right type of resource allocation as the project manager for the project leads to success.

Emam et al. (2008) did a survey of IT software project failures (33). Emam identified senior management not sufficiently involved, too many requirements and scope changes, lack of necessary management skills, over budget, lack of necessary technical skills, no more need for the system to be developed, over schedule, technology too new; didn’t work as expected, insufficient staff, critical quality problems with software, end users not sufficiently involved as factors responsible for project failure.

Dorsey (2005), in his paper on Harvard Kennedy School website titled, “Top 10 Reasons Why Systems Projects Fail”, (34) identified 3 critical success factors, top management support, a sound methodology, solid technical leadership by someone who
has successfully completed a similar project. The important project failure reasons found were related to software engineering practices, quality of project team, project planning challenges and extensive customization of COTS (Commercial Off the shelf products).

Jones (2005), in his paper ‘Social and Technical Reasons for Software Project Failures’ in CROSSTALK, The Journal of Defense Software Engineering (35) has indentified rejection of accurate estimates and forcing projects to adhere to impossible schedules as the key software project failure reasons.

Charette (2005), in his article on IEEE SPECTRUM, has identified important software project failure factors (36). The software project failure factors are unrealistic or unarticulated project goals, inaccurate estimates of needed resources, badly defined system requirements, poor reporting of the project’s status, unmanaged risks, poor communication among customers, developers, and users, use of immature technology, inability to handle the project’s complexity, sloppy development practices, poor project management, stakeholder politics and commercial pressures.

Cerpa (2008) et al., in their article on Academia.edu (a platform for academics to share research papers) (37) have identified schedule, estimation challenges and lack of awards to staff members as important failure reasons.

KPMG (one of the largest professional services companies in the world) (2005), conducted a Global IT project management survey (38). The key findings of the survey stated that integrated governance, established project management practices and top management commitment are important contributors for a project’s success.

The Standish group (1) in their CHAOS report has identified success factors such as executive support, user Involvement, clear business objectives, emotional
maturity, optimizing scope, agile process, project management expertise, skilled resources, execution, and tools & infrastructure.

IBM Systems Magazine (2012), (39) has identified seven reasons for project failure - poor project planning and direction, insufficient communication, ineffective management, failure to align with constituents and stakeholders, ineffective involvement of executive management, lack of soft skills or the ability to adapt and poor or missing methodology and tools. As per the article, the important areas related to a project’s success are software engineering, project management, executive support and skills/capabilities of human resources. Failure to align with constituents and stakeholders is a very important reason for project failure. Successful alignment with stakeholders such as customers depends upon how much one knows about the customer. Here customer knowledge is one of the most important factors.

Humphrey (2002) published an article, ‘Five reasons why software projects fail’ on ComputerWorld (A leading source of technology news and information for IT influencers worldwide) (40). Humphrey identified unrealistic schedules, inappropriate staffing, changing requirements during development, poor-quality work, believing in magic – COTS (Commercial Off the shelf products) will solve everything as important reasons for software project failure.

Whittaker (1999), in her paper ‘What went wrong? Unsuccessful information technology projects’: states that, the three most common reasons for project failure are poor project planning, a weak business case, and a lack of top management involvement and support (41).

Natovich (2003) talks about vendor related risks in his paper ‘Vendor Related Risks in IT Development: A Chronology of an Outsourced Project Failure’ (42). The
key risks discussed in the paper are (a) Adversarial relationships and loss of trust between the vendor and the client; (b) Vendor management de-escalation of commitment; and (c) Difficulty in breaking the contractual engagement.

Fabriek et al. (2008) presented a paper, ‘Reasons for Success and Failure in Offshore Software Development Projects’ in ECIS (European Conference on Information systems) in 2008 (43). They have stressed the importance of communication in offshore software development projects. Communication is one of the most important factors for project success.

Tarawneh, M et al. (2008) published a paper ‘Software development projects: An investigation into the factors that affect software project success/ failure in Jordanian firms’ in conference Applications of Digital Information and Web Technologies, 2008 ( ICADIWT 2008) (44). The study was for Jordanian firms. The authors stressed on the importance of user involvement and documentation in project success.

Dov Dvira et al. (2003) in their paper, ‘An empirical analysis of the relationship between project planning and project success’ in international journal of project management (45), studied the relationship between project planning efforts and project success. The authors stressed the importance of requirements definition, and development of technical specifications for project success.


Reel (1999) states in his paper ‘Critical success factors in software projects in Software IEEE journal’ (47) five essential factors for managing a successful software
project: start on the right foot, maintain momentum, track progress, make smart decisions and institutionalize post-mortem analyses.

Marasco (2006), in his article ‘Software development productivity and project success rates: Are we attacking the right problem?’ stresses the importance of requirement management and usage of effective tools for project success (48).

Dissanayake (2008), in his blog has listed the following five important qualities of a customer for a successful project. (49). 1) Collaborative, and willing to work with the project team towards the same goals, initially with requirements, and later with deployments and any integrations. 2) Availability of a representative of the end users of the software, and is authorized to speak on behalf of them. 3) Authorized to make decisions that have a significant impact on the project. If the customer is not authorized, there could be delays in proceedings until the necessary approvals are received. 4) Committed, willing to see the project to the end, and willing to put efforts to eliminate inevitable hurdles that the software projects face. 5) Knowledgeable about the organization and the requirements. These points are very useful in understanding things a customer can do. The project team needs to know the customer better and establish strong relationships with the customer. These are very important points related to customer knowledge and customer expectations management.

McManus J (2002), in his paper ‘The influence of stakeholder values on project management’, examines the causes of software project failure, focusing on stakeholder influence and determinants of it (50). McManus has stated that the aspects of stakeholder mismanagement affect project success adversely.

Based on the above references, it was noted that the factors affecting a project’s success or failure primarily fell into software engineering, project management and
project environment categories. The important environmental factors noted were stakeholder involvement, management support, communication, customer expectation management, human resource allocation/development strategies. This review helped to come up with a draft list of factors affecting a software project’s success. The list was used as an important source for software practitioner’s interviews and survey questionnaire.

2.4 Summary

Literature review revealed that majority of the research studies on a software project’s success/failure focuses on software engineering and project management related factors or reasons. A majority of the studies were done within the context of the business implementing software project. Very few studies were done in the context of software project services vendor/supplier companies (IT companies). A lot of efforts have gone into studying relationship between software project success/failure and software engineering. After a thorough literature review it was noticed that in the Indian IT Industry's context environmental factors influencing a software project's success have not been systematically explored.

We, therefore, plan to fill the gap by studying how factors from a software project’s environment are attributing a software project’s success with special reference to the Indian IT Industry.