CHAPTER V

V. FINDINGS AND RECOMMENDATIONS

Over the period of time the Indian IT Industry has developed strong skills/capabilities in the software engineering and the project management areas. Today almost all top Indian IT companies are ISO and CMMi certified. It is found that in the Indian IT Industry, there is a strong emphasis on the development of core processes in the software engineering, project management, quality and technology management. However, environment in which software projects are developed, maintained and supported has not been given much emphasis and it is found that the environmental factors are affecting a software project’s success in an adverse manner.

In the present research, related environmental factors affecting a software project’s success adversely are identified and are grouped together and the group is referred as a Knowledge Source. Following seven Knowledge Sources are defined as part of the study.

1. **Customer Knowledge (Know Your Customer) – KYC**
2. **Business Acquisition and Relationship Management – BRM**
3. **Personnel and Capabilities Management – PCM**
4. **Skills and Capabilities Development – SCD**
5. **IT Infrastructure Management – ITM**
6. **Multi vendor, geographically distributed project Delivery Management – MDM**
7. **Knowledge Management Practices – KMP**
5.1 Findings from the Hypotheses testing

Hypothesis testing was done using the seven Knowledge Sources - KYC, BRM, PCM, SCD, ITM, MDM and KMP.

5.1.1 Hypothesis I

The Hypothesis I states that ‘There is a correlation amongst the different Knowledge Sources from a software project’s environment’.

The relationship between different Knowledge Sources (studied as part of the present research) was examined using Product Moment Correlation. It was found that there is a significant positive correlation between these Knowledge Sources. It means that the Knowledge Sources are interdependent. Effect of a Knowledge Source on software project success cannot be studied in isolation. Interdependencies with the other Knowledge Sources need to be taken into consideration.

Thus Hypothesis I stated as ‘There is a correlation amongst the different Knowledge Sources from a software project’s environment’ is validated. It means KYC, BRM, PCM, SCD, ITM, MDM and KMP Knowledge Sources are correlated with each other.

5.1.2 Hypothesis II

The Hypothesis II states that ‘Knowledge Sources from a software project’s environment affects the project’s success in an adverse manner leading to partial or total failure of the project’.
Factor analysis was done to test the Hypothesis II. It was found that Knowledge Sources from a project’s environment are affecting its success in an adverse manner leading to partial or total failure of the project.

It was found that all the measured Knowledge Sources are highly associated with Software Project Failure. This concludes that they are contributing to a software project’s failure. Amongst all the Knowledge Sources PCM is contributing to a software project’s failure maximally, followed by BRM, SCD, KYC, ITM, KMP and MDM.

Based on the Hypotheses’ testing results it can be concluded that the Knowledge Sources from a software project’s environment affects its success in an adverse manner leading to its partial or total failure. The Knowledge Sources are correlated or interdependent. Failure of a project due to a Knowledge Source cannot be studied in isolation. Effect of the other related Knowledge Sources needs to be studied as well.

Thus Hypothesis II stated as “Knowledge Sources from a software project’s environment affects the project’s success in an adverse manner leading to partial or total failure of the project.” is validated.

The software project success rate can be improved by taking focused efforts to reduce adverse effects of the identified environmental factors belonging to the Knowledge Sources.
5.2 Findings from the Quantitative Data analysis

5.2.1 Findings about the interrelationships between the Knowledge Sources

To understand the interrelationships between the Knowledge Sources multiple regression analysis was carried out. It was found that the Knowledge Sources are highly interrelated. The observed interrelationships of the Knowledge Sources are shown in the following figure.

Figure 49 Interrelationships of the Knowledge Sources
Based on the regression analysis results and the inputs received from subject matter experts the researcher has proposed a model showing the interrelationships between the Knowledge Sources.

The key findings based on the proposed model are as follows:

- The MDM, KYC, SCD and PCM have a direct relationship with BRM. MDM also has an indirect relationship with BRM through KYC. PCM also has an indirect relationship through SCD. **As MDM and PCM have both direct as well as indirect relationships with BRM, they are most influencing Knowledge Sources on BRM.** ITM has indirect relationships with BRM through KYC. KMP has an indirect relationship with BRM through SCD.

- The KYC, BRM and SCD have a direct relationship with PCM. SCD also has an indirect relationship with PCM through BRM. KYC also has an indirect relationship with PCM through BRM. **As KYC and SCD have both direct as well as indirect relationship with PCM, they are most influencing variables on PCM.** KMP has a relationship with PCM through SCD. MDM has a relationship with PCM through BRM and KYC. ITM has an indirect relationship with PCM through KYC.

5.2.2 Findings related to software project failure experience

The researcher wanted to know whether project failure experiences differed across designations of IT professionals. Groups were formed based on the designations - Architect, Project manager, Delivery manager, Director, VP or above. **It was found that there is a significant difference accounted by the respondents on Project
failure experience. The project managers experienced the least project failure. The key reason noted for this finding was possible limited scope of responsibility of project managers in large projects/programs. The senior management is responsible for delivering large projects/programs and hence the scope of responsibility is much wider as compared to the project managers. Hence, the senior management experiences more project failures.

5.2.3 Findings related to Software Project Failure Indicators

The Software Project Failure Indicators are a set of parameters indicating the project health. A project’s failure can be understood using these Indicators. In this research, Schedule, Efforts, Requirements, Quality, Short Term goals and Long Term goals are used as Software Project Failure Indicators. The researcher wanted to know whether the Software Project Failure Indicators experience differed across designations of IT professionals. Groups were formed based on the designations - Architect, Project manager, Delivery manager, Director, VP or above.

It was found that the Software Project Failure Indicators’ experiences do not differ across the designations of the IT professionals. It means that understanding of project failure symptoms doesn’t differ across the designations of the IT professionals.

It was also found that the mean rank for effort and schedule was very high irrespective of the designation of the respondents. It means that most common Project Failure Indicators are extra efforts and schedule overrun. It clearly highlights that software project teams are taking extra efforts and time than estimated.
5.3 Findings from the Qualitative data analysis

Following figure gives a dashboard view of Knowledge Source wise important findings. The findings are based on the qualitative analysis of the survey response data.

Figure 50 Knowledge source wise important findings

KYC: Sometimes a customer plays dual role of a customer and also as a partner for joint business propositions. It was found that if joint business propositions do not work as expected then it affects the projects delivered to the customer in an adverse manner.

Customer’s geography does influence a project’s success. For example, Customers belonging to Geographies such as North America, Europe have successfully managed outsourcing relationships. They have a strong outsourcing experience and
matured processes to manage the outsourcing. Hence the projects delivered to them are likely to be more successful.

**PCM:** Projects are facing challenges of human resource allocation. It was found that Human resources with matching skills and desired quality are getting allocated to the project right from the required date only on a few occasions.

Domain or business expertise doesn’t always get reflected in project teams leading to challenges while delivering projects. As compared to the domain or business expertise, technical expertise gets better reflected in project teams.

Only 19 percent of respondents have said that third party vetted human resource profile/capability repository was available and used for project team selection.

**SCD:** The project managers often faced challenges while sending the project team members for training during project course. The key reasons for this were non availability of time for training, possible loss of revenue (team members cannot be charged on the project during training), etc.

The quality of training received by the fresh and experienced engineers was not as per the expectations of the IT professionals. With increasing deployment of fresh engineers, focused efforts needs to be taken to improve the quality of fresh engineer training programs.

**BRM:** The growth pressure is forcing the Indian IT Industry to take greater risks to win new business. Due to competition, the Indian IT companies are forced to bid aggressively to win new business.

It was found that often a project’s effort estimates are influenced by the Sales team.
Increasingly, the IT companies are giving commitments to the customers which are hard to fulfill. It is also found that sometimes projects are oversold to the customer. It is noted that the customers have become over demanding in the last three years. It is also noted that Customers feel that over a period of time the expected value by outsourcing to India is likely to diminish.

*KMP:* It was found that lack of company and project level knowledge repository is affecting the project success adversely.

### 5.4 Limitations of the study

The study doesn’t cover small IT companies, Software Product companies or companies which don’t have significant India-centric delivery capabilities.

The influence of factors other than those identified from a software project’s environment on a software project’s success is also important but the present research focuses only on factors from a software project’s environment as defined in the scope.

### 5.5 Scope for further research

Based on the research findings and the limitations the researcher proposes following further research.

Study the interrelationship between factors from a software project’s environment and core software engineering factors.

Study how indentified environmental factors affect a software project’s success with special reference to IT companies outside India.

Study the current status of various outward looking processes from a project’s environment across the large Indian IT companies and the global IT companies.
Comparison of the outward looking processes followed across them. Identification of gaps in the processes and develop/draft processes to address the gaps.

Develop software project success/failure prediction model using environmental as well non environmental factors.

5.6 Recommendations

Within the Indian IT Industry’s context, in the last two decades, the environment in which software projects are developed, maintained and supported has changed extensively. The customer expectations, project scopes and project risks have changed considerably (please refer Annexure B for details). It was noted that, the processes related with core software engineering have changed considerably and have become mature and robust over the period of time. However, the rate of change of environment and rate of change of the processes related with the environment are not in sync. Processes related with the project environment needs to be improved. It is recommended to study the gaps in the existing environmental processes and improve them to address project challenges due to the environmental factors.

It is also recommended that processes/methodologies such as CMM/AGILE etc need to be customized to address the environmental challenges faced by the projects delivered from India. In other words, it is recommended to localize the existing global processes/methodologies to address specific local challenges. E.g. Delivering Agile projects from offshore using fresh engineers.

There is a need to have more outward looking processes E.g. a Specific process to manage the customer expectations spanning across Sales/Delivery/Support. It is recommended to have mini CEOs for an account or a business unit who can have total
freedom and authority while managing their business unit or account. It is recommended to have a group consisting of Sales, Delivery, Technology representatives and support representative to manage every project opportunity. In case of difference of opinions among the group members, final decision can be taken by the mini CEO. This group should jointly commit to the customer. This will ensure that commitment is given by all the internal stake holders of the project. This group should also track the project during its entire life cycle and provide support to the project manager in managing challenges faced by the environmental factors.

It is recommended that the Indian IT companies need to invest in development of 3rd party vetted skills/capabilities repository for their human resources. The project managers can then use such repository to select the suitable candidates and also plan skills/capabilities development program for them.

The effect of the environmental factors should be taken as an input to all project planning and project execution processes. This will help the project managers to take into consideration possible challenges faced by the environmental factors and take proactive actions.

The project review and audit process should include a specific checklist for the environmental factors. This will help the project reviewers to assess the possible risks/challenges due to the environmental factors and recommend corrective actions to the project managers. It is recommended that the organizations should identify possible risks associated with the environmental factors and prepare the recommended risk mitigation strategies for the same. Post project analysis must examine if the project was affected due to the environmental factors. Lessons learned from the project failures due to the environmental factors, should be captured in formal knowledge repositories.
The success or failure of a software project can be possibly predicted by studying the effect of various environmental factors. Software projects with un-addressable or uncontrollable factors are more likely to fail. It is recommended to build a project dashboard indicating the current project status and the environmental factors which are likely to affect its success.