Chapter 5
Conclusion
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In this chapter, the findings, conclusion and suggestions of the study based on a sample of 96 respondents selected from 96 different software service companies in India.

5.1 Findings

The following are the important findings of the study.

5.1.1 Percentage Analysis- Personal & Organizational Factors

- 69.8% of the respondents selected for the study are male
- 65.6% of the respondents included in the study have highest education as graduate.34.4% of the respondents are post graduate and above.
- 41.7% of the respondents have work domain as project managers who are responsible for quality assurance as well.
- 52.1% of the respondents of the study have overall experience of 6-12 years.
- 47% of the respondents have experience in the current domain ranging from 2-5 years.
- 62.5% of the respondents worked in 2-4 organizations
- 43.8% of the respondents of the study have 3-5 years of association with the current organization.
- 62.5% of the respondents are from organization size of more than 5000.
- 49% of the respondents are from organizations with years of existence between 11-20 years.
- 43.8% of the respondents are from south India
- 59% are working with organizations operating and both software products and software service business domain
- 47.9% of the respondents are working with organizations having mostly local and few international clients
- 51% of the respondent’s organization is operating in banking domain.
- More than 70% of the respondent’s organizations are certified to ISO 9001, ISO 27001 and CMMI level 5.
5.2 Objective 1

5.2.1 To assess and identify the practices followed by different software development organizations in India

5.2.1.1 Quantitative Project Management

- 71.9% of the organizations have project level goals/performance indicators available for all project life cycles/domains/languages.
- Cent percent of the respondent's organizations provide support/guidance for identifying the project parameters to be measured and for the statistical analysis of the data thus obtained.
- 57.3% of the organizations have frequency of rebase line/relook the project level goals/target values periodicity is defined at organizational level.
- 53.1% of the respondent's organizations have frequency of root cause analysis for deviations in project metrics for all instances.
- 59.4% of the respondent's organization has implemented/rolled out tool for data driven project management.
- 64.6% of the respondent's organizations have guidelines available for selecting sub process contributing towards the project goals.
- Cent percent availability of guideline for identification of parameters affecting project health across respondent's organizations.

5.2.1.2 Project Monitoring & Control

- 45.8% of the respondent's organizations have project reviews done with project/senior management/Delivery levels.
- 81.3% of the respondent's organizations have formal system of feedback & control for projects available based on various status reports.
- 81.3% of the respondent's organizations has formal system of feedback & control for projects available based on various status reports
- 82.3% of the respondent's organizations has project communication plan/escalation matrix available in project plan.
- 88.5% of the respondent's organization has tools available for project monitoring & control.
5.2.1.3 Risk Management

- 84.4% of the respondent’s organizations have organizational level guidelines available for Risk Identification.
- 97.9% of the respondent’s organizations has organizational level risk repository available that can be referred by projects for their risk planning.
- 39.6% of the respondent’s organization has formal system of Risk analysis practice other than RPN based.
- Cent percent availability of organizational strategy available for responding to the identified risks and for revisiting the risk.
- 86.5% of the respondent’s organization has practices available that will promote project to report all project level risks (and take it as learning).
- 58.3% of the respondent’s organizations have tools available for risk management.

5.2.1.4. Requirements Management

- 65.6% of the projects from the respondent’s organization have traceability available for all projects.
- 54.2% of the respondent’s organizations have process available for handling requirement changes.
- 71.9% of the respondent’s organizations accurately report effort over run caused by requirement changes (other than schedule deviation) to all relevant stake holders, for all instances of requirement changes.
- 53.1% of the respondent’s organizations have tools available for requirements management.

5.2.1.5 Configuration Management

- 75% of the respondent’s organizations have organization level guideline available for identification of documents and records to be kept under configuration control.
- 100% percent of the respondent’s organization has tools available for configuration management.
- 39.6% of the respondent’s organization has both source code and project documents identified in the configuration system management.
• 75% of the respondent’s organization practices mandatory conduct of impact analysis for all cases of requirement changes.
• 74% of the respondent’s organization has practice configuration management audits based on available organizational procedure and as defined in project plan.
• 100% of the respondent’s organization has defined organizational process available to handle change requests and releases.

5.3 Objective 2

5.3.1 To identify the factors influencing activities such as Configuration Management, Project Monitoring and Control, Risk Management, Requirements Management and Quantitative Project Management in any software project in the software development organizations in India

5.3.1.1 Quantitative Project Management

• The organization’s age (years of existence) and organizations client over view (organization having all local clients, organization having all international clients, organization having few local clients and mostly international clients, organization having mostly local clients and few international clients) have significant influence on availability of project level goals/performance indicator for different projects in quantitative project management.
• The gender, work domain and organizations size have significant influence on implementation of any tool for data driven project management in quantitative project management.
• The gender, association with current organization and organization size have significant influence on availability of guidelines for selecting sub processes contributing to project goals in quantitative project management.

5.3.1.2 Project Monitoring and Control

• Organization’s age (years of existence), and organization’s business domain (software product, software services, both software product and services) have
significant influence on Personal factors and availability of feedback system for projects in project monitoring and control.

- The business domain of the organization has significant influence on implementation of tool for project monitoring and control.

5.3.1.3 Risk Management

- The number of organizations worked with, organization’s size and the organization’s geographical location has significant influence in availability of organization level guidance for risk management.
- The organization’s geographical location and organization’s business have significant influence on availability of risk repository referred by projects for risk planning in risk management.
- The organization’s geographical location has significant influence on availability of practices that will promote project to report all project level risks in the risk management domain.
- The number of organizations worked and organization’s geographical location have significant influence on implementation of tools for project risk management.

5.3.1.4 Requirements Management

- The gender of the respondent and organization’s size have significant influence on adequacy of project plan in addressing techniques/process used for collection of requirements in requirements management domain.
- The organization’s client over view has significant influence on availability of formal system for obtaining commitment from the stakeholders for the requirement changes in requirements management domain.
- The organization’s geographical location has significant influence on implementation of any tool for requirements management.

5.3.1.5 Configuration Management

- The gender of the respondent and organization’s business has significant influence on types of artifacts in configuration management.
Based on chi square analysis, the following influencing factors are identified:

- Gender has influence on Quantitative Project Management and Configuration Management
- Organization’s geographic location has influence on Risk Management and Requirements Management
- Organization’s Size has influence on Quantitative Project Management and Requirements Management
- Organization’s Business has influence on Project Monitoring and Control and Configuration Management

5.4 Objective 3

5.4.1 To assess the difference in the opinion of the project managers performing and not performing the various identified activities relating to quality assurance. Only 49% of the respondent’s organizations are with project managers having awareness on the statistical process control techniques and their usages in software project management.

35.4% of the respondent’s organization has statistical process control techniques implemented by project managers.

35.4% of the respondent’s organizations have project reviews practiced calendar wise (weekly/monthly).

45.8% of the respondent’s organizations have project reviews done with project/senior management/delivery levels.

74% of the respondent’s organizations have techniques/process available that can be used for collection of requirements in project plan.

52.1% of the respondent’s organizations has frequency of revisiting various project planning parameters (cost/effort/schedule) based on requirement changes, are available for all changes.

86.5% of the respondent’s organization has formal system available for obtaining commitment from all relevant stakeholders for requirement changes.
5.5 Objective 4

5.5.1 To explore the relationship between various activities relating to quality assurance practices in the software organization.

It is found from correlation analysis that the experience in the current domain has significant correlation with the number of organizations worked \((r = 0.33)\). The number of organizations worked also has significant correlation with organization’s size \((r = 0.476)\); the organizations age has significant correlation with organizations size \((r = 0.260)\), the organizations age in turn has significant correlation with the number of project managers aware of SPC usage in software projects \((r = 0.286)\).

It is concluded that among the variables considered, the organization’s age, the organization’s size, number of organizations worked and the number of project managers aware of SPC usage in the software project are having significant inter-relationship among them when compared to others.

5.6 Objective 5

5.6.1 To offer suggestions in improving performance of the company by strictly adopting the quality assurance practices.

5.6.1.1 To Managers

- Only 45.8% of the respondent’s organizations has project reviews done with project/senior management/Delivery levels. The review with senior managers is very critical to understand the issues in the projects at early stages and to provide necessary additional support. Hence this area has to be strengthened.
- Only 58.3% of the respondent’s organizations has tools available for risk management. The management of risks with out tools is very difficult due to the complex nature of software projects. Hence this needs support from management.
- 65.6% of the projects from the respondent’s organization has with traceability available for all projects. Traceability of requirements is critical for success of projects. Hence this needs support and focus from the management.
• 53.1% of the respondent’s organizations have tools available for requirements management. It is very difficult to manage requirements in complex projects without proper tools. Hence management has to provide adequate support for the same.

5.6.1.2 To QA Team

• 47% of the organizations under study do not perform root cause analysis for metrics deviations. This analysis is important, as this is required to identify early warning and to put the project back to track. This needs to be strengthened.

• Only 54.2% of the respondent’s organizations have process available for handling requirement changes. Requirement change handling is a critical activity and need additional support.

• Only 39.6% of the respondent’s organization has both source code and project documents identified in the configuration system management. This needs improvement and support from the quality assurance team.

5.6.1.3 To Training Team

• The training team needs to focus on increasing the awareness of quality and process across the organization with a special focus on the training effectiveness. This should start from the top management.

• Quality training should also focus on changing the mind set on quality for its participants, as employees join organizations from different cultural back grounds.

• Training teams can use multiple modes of training like class room sessions, interactive platforms like e-learning and video conferencing to ensure coverage of the trainings to larger set of audience.

5.6.1.4 To the Software Industry

• The Industry has to focus more on quality assurance practices and recruit professionals for managing quality assurance activities.

• More focus need to be given for sharing best practices among different organizations through common forums like Nasscom.
The Industry can implement more quality awards with the support of government of India especially for Software Organizations, which will promote organizations to implement quality culture.

5.7 Conclusion

In this study, an attempt is made to study the Quality Assurance Practices in Software Industry in India through the opinion of the sample respondents selected from some of the software organizations in India. It is understood from the study that the respondents are aware of some of the practices, but the awareness has to be strengthened through various programs to be initiated by the top management. If it is also evident from the study that the respondents with their little knowledge on quality assurance are willing to execute the projects. So it is utmost necessary to train not only the top management, but also the project managers and the quality professionals towards the various quality assurance practices suggested by standard quality assurance models. As the number of studies relating to quality assurance practices are limited in India, similar research studies can be conducted with an expanded study domain, to enhance the quality of the product, services and the project management execution system. If all suggestions in this study are incorporated by the stakeholders who are practicing Quality Assurance in their work domain, then the performance of the system will reach its new heights in the coming years. Similar studies can be conducted in all the areas of software project management on much larger samples. These studies may be conducted in separate region/state, because each region or state will differ in the culture/policies/attitude and so on.