A Survey on Effectiveness of Management on Risks of Inadequate Knowledge/Skills of Team & Inadequate Change Management in Software Maintenance Projects

Dr. Gaurav Lodha	N. Saravanan
Head of Dept,	Ph.D. Scholar,
Department of Commerce,	Faculty of Management,
Manipal University	Jodhpur National University,
Jaipur, Rajasthan (India)	Jodhpur, Rajasthan (India)

Abstract: The aim of this paper is analyse two key software maintenance risk factors and identify if the current risk management models are effective in reducing the occurrence of the risks. The two key risk factors used in this analysis are – Inadequate knowledge/skills &inadequate change management. Data are collected from 130 relevant & experienced project managers from the selected IT companies Results reveals that about 60-70% of the respondents indicate that these two risks are critical but only 35% rate the effectiveness of management of these risks as very effective. The success of software project risk management will greatly improve the probability of software project success.

I.   INTRODUCTION

Software maintenance is the modification of a software product after its deployment with the objective of correcting errors, enhancing performance and other attributes or adapting the product to changes in the environment IEEE (1998). However, it may be noted that software.

Maintenance is not just bug fixing but rather involves planning of post-delivery operations, supportability, and logistics even in the development and testing phase. There is a strong relationship between software maintenance and project cost/effort estimation. A good Software maintenance process could significantly reduce the maintenance cost of the Organization as well make it more easily manageable.

II.   LITERATURE REVIEW

Existing literature indicates top 10 software maintenance risk factors that was most common used by researchers when studying the software risk in software maintenance projects of which the two key risks beloware the focus of this study–

- Inadequate Knowledge/Skills of the team members
- Inadequate Change Management

Knowledge/Skills refer to the "level of expertise and experience together with the appropriate application domain knowledge" of the software project team (Aloini, Dulmin, and Mininno 2007). it is necessary to form a skill-balanced project team having both internal and external experts, managerial, inadequate business knowledge (Jalote 2002). skills and knowledge are important to build software project life cycle and estimate software risk factors according to suitable techniques and tools (Addison and Vallabh 2002; Addison 2003; Aritua et al. 2011; Cliff Mitchell 2011; Keil, Tiwana, and Bush 2002; Schmidt et al. 2001; Sumner 2000; Taimour 2005)

Change management is defined as the effort to managing all the change requests of a software project (Hayat et al. 2010). Without proper software change management, enterprises lack a full understanding of how software running in production automates their business processes. This includes management of changes to software in development, changes to software in production, and changes to associated artefacts. Inadequate change management leads to unauthorized risk, unplanned in software project, and insignificant software project delay. Once a change request is received, it should be processed through a complete change management process (Aloini et al. 2007; Keil et al. 2002; Nakatsu and Iacovou 2009; Schmidt et al. 2001; Sumner 2000).

This study evaluates the effectiveness of the existing risk management models in mitigating the two main risk factors identified.

III.   RESEARCH METHODOLOGY

For analysis of effectiveness of risk management in software maintenance projects, this research focuses on two risk factors

- Inadequate Knowledge/Skills of the team members
- Inadequate Change Management

Data are collected from fairly large IT companies. Respondents are in the position of project manager, senior project manager and delivery manager who are involved in managing the delivery of software maintenance projects. This ensures that the respondents and their managers have already built in robust risk management process in their projects

Respondents profile was also obtained to gain understanding on
- Respondents Designation or position within their organisation
- Respondents years of experience in the IT Industry
- Respondents years of experience in managing software maintenance projects

Respondent's current project(s) profile was also obtained to gain understanding on
- Type of maintenance performed
- Type of technical support service
- Average team size
- Type of engagement
- Type of operating model
- Risk management model adopted
- Maturity level of the organization

The questionnaire was posted online, using the Google Forms and responses were collected and stored in Google forms.
Each respondent was required to rate the effectiveness of the software maintenance risk on the 2 risk factors on a 5 point scale.
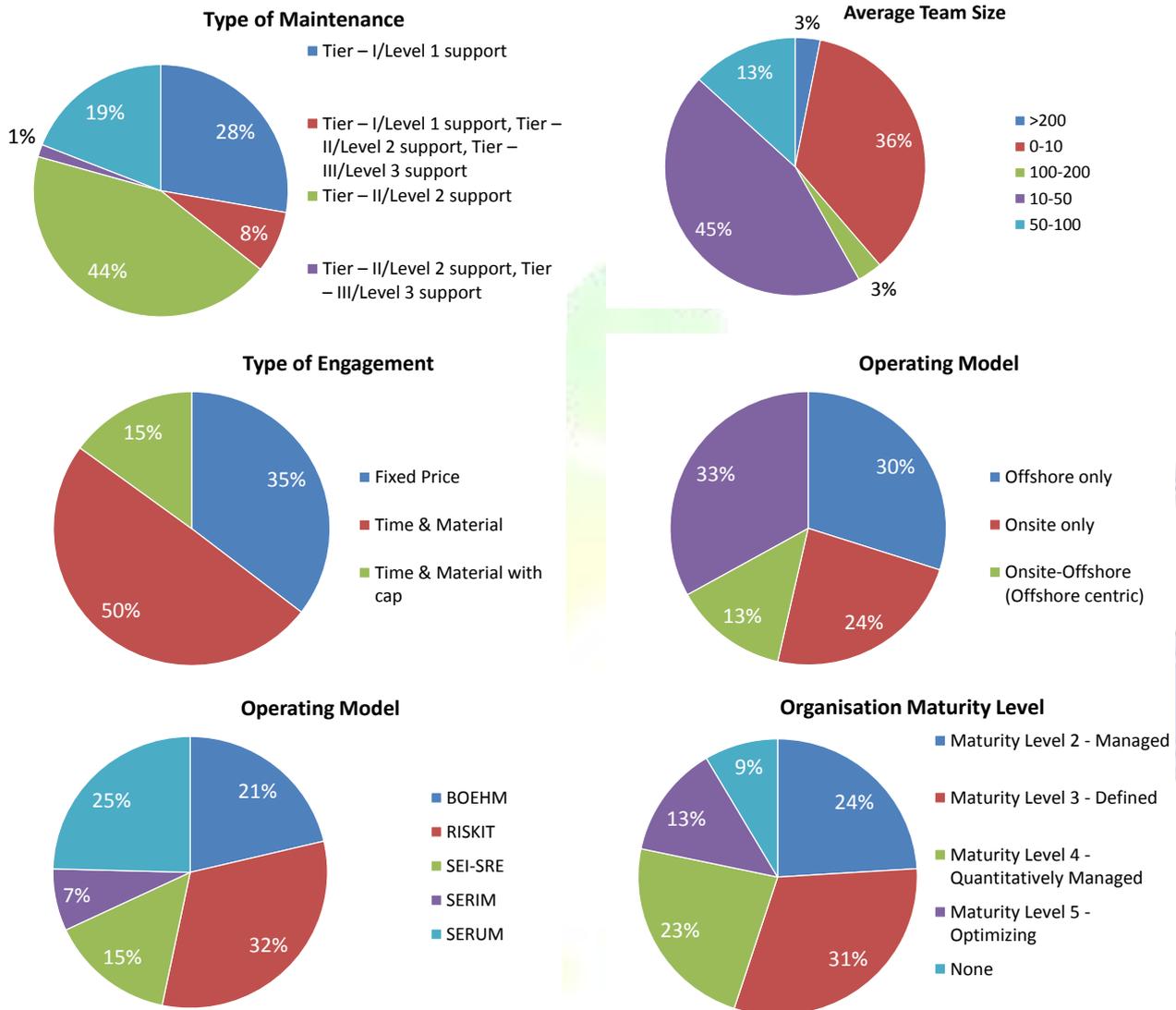
IV.   DATA ANALYSIS

A. Respondent Profile

Designation		Project Manager or Equivalent Sr. Project Manager or Equivalent Delivery Manager or Equivalent Delivery Head or Equivalent	40.3% 30.2% 16.3% 13.2%
Total Yrs of Experience		5-7 Yrs 7-9 Yrs 9-11 Yrs 12 Yrs and above	46.5% 24% 14% 15.5%
Yrs of Experience in Maintenance Projects		5-7 Yrs 7-9 Yrs 9-11 Yrs Above 12 Yrs	56.6% 24% 9.3% 10.1%

B. Project Profile

A detailed view of the profile of the project & team of the respondents were collected.

Type of Maintenance

- Tier – I/Level 1 support
- Tier – I/Level 1 support, Tier – II/Level 2 support, Tier – III/Level 3 support
- Tier – II/Level 2 support
- Tier – II/Level 2 support, Tier – III/Level 3 support

28%, 8%, 44%, 1%, 19%

Average Team Size

- >200
- 0-10
- 100-200
- 10-50
- 50-100

3%, 36%, 3%, 45%, 13%

Type of Engagement

- Fixed Price
- Time & Material
- Time & Material with cap

35%, 50%, 15%

Operating Model

- Offshore only
- Onsite only
- Onsite-Offshore (Offshore centric)

30%, 24%, 13%, 33%

Operating Model

- BOEHM
- RISKIT
- SEI-SRE
- SERIM
- SERUM

21%, 32%, 15%, 7%, 25%

Organisation Maturity Level

- Maturity Level 2 - Managed
- Maturity Level 3 - Defined
- Maturity Level 4 - Quantitatively Managed
- Maturity Level 5 - Optimizing
- None

24%, 31%, 23%, 13%, 9%

C. Response on Criticality & Impact of the two risks

The respondents have responded on the Criticality & Impact of the below two risks on a 5 point scale in their respective projects

- Inadequate Knowledge/Skills of the team members
- Inadequate Change Management

The 5 points scale varies from Insignificant to Severe.

i. Inadequate Knowledge/Skills of the team Members

Insignificant	26.4%
Low	16.3%
Medium	26.4%
High	23.3%
Severe	7.8%

About 57.5% of the respondents feel that this risk has criticality & Impact from Medium to Severe.

ii. Inadequate Change Management

Insignificant	6.2%
Low	23.3%
Medium	42.6%
High	20.2%
Severe	7.8%

About 70.6% of the respondents feel that this risk has criticality & Impact from Medium to Severe.

D. Response on Effectiveness ofRisk Management on the two risks

The respondents have responded on the Effectiveness of riskmanagement of the below two risks on a 5 point scale in their respective projects

- Inadequate Knowledge/Skills of the team members
- Inadequate Change Management

The 5 points scale varies from Completely Ineffective to Highly Effective.

i. Inadequate Knowledge/Skills of the team members
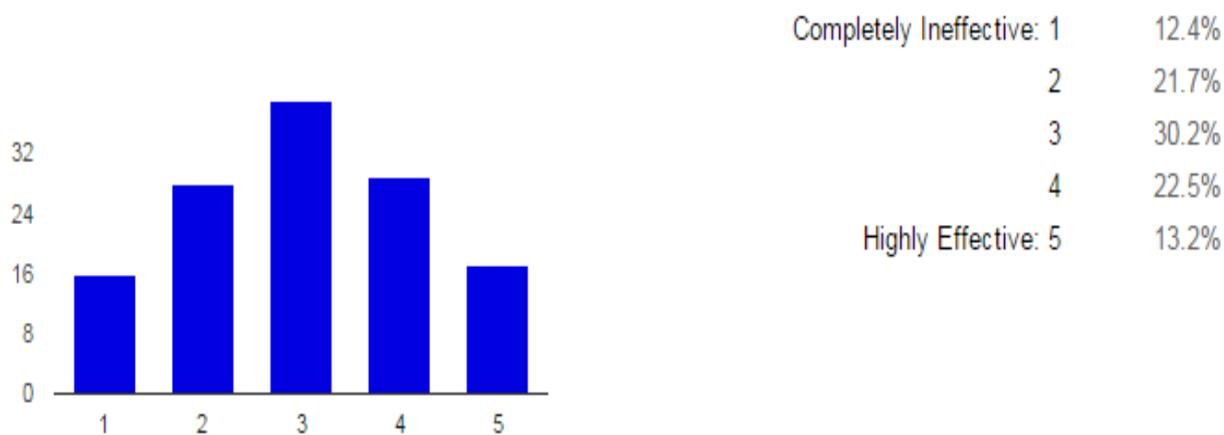
Completely Ineffective: 1	12.4%
2	21.7%
3	30.2%
4	22.5%
Highly Effective: 5	13.2%

Only 35.7% of the respondents have rated the effectiveness of management of this risk at scale 4 & above on effectiveness of managing this risk

ii. Risk - Inadequate Change Management
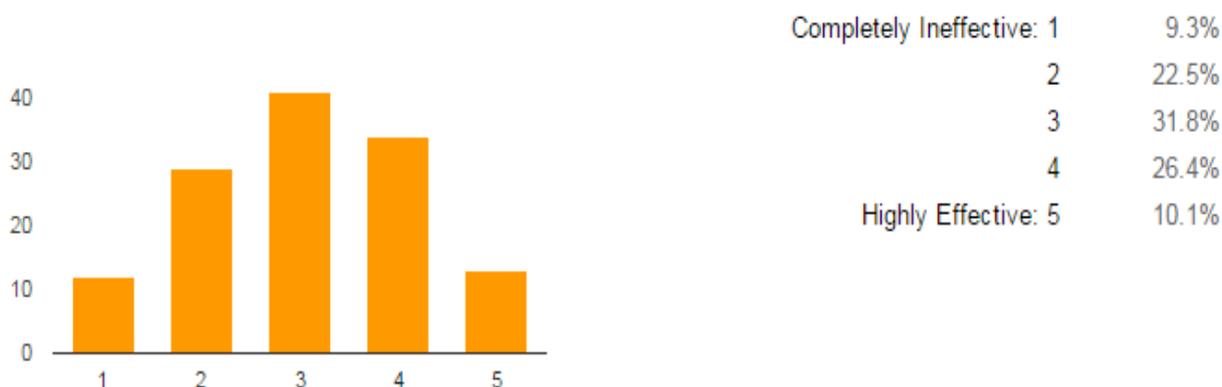
Completely Ineffective: 1	9.3%
2	22.5%
3	31.8%
4	26.4%
Highly Effective: 5	10.1%

Only 36.5% of the respondents have rated the effectiveness of management of this risk at scale 4 & above on effectiveness of managing this risk.

V.   RESULTS AND DISCUSSIONS

The profile of the respondents is a good mixture of managers with experience in different types of projects and delivery models. Below is the summary of the responses towards the two risks.

Risk 1 - Inadequate Knowledge/Skills of the team members	About 58% of the respondents indicated that this risk is critical and has a Medium to Severe impact on their projects.
	When it comes to effectiveness of managing this risk, only 35.7% of the respondents rate the effectiveness of management of this risk through the current risk management models, at scale 4 & above
Risk 2 - Inadequate Change Management	More than 70% of the respondents indicated that this risk is critical and has a Medium to Severe impact on their projects.
	When it comes to effectiveness of managing this risk, only 36.5% of the respondents rate the effectiveness of management of this risk through the current risk management models, at scale 4 & above

VI.   CONCLUSION

Maintenance presents specificities that set it apart from software development. In risk management, this implies that existing methodologies for identification, evaluation and management of risk factors, which were created for development projects, may not be adequate for maintenance projects.

Analyzed results demonstrate that 65% of the respondents feel that two risks - Inadequate Knowledge/Skills of the team members Inadequate Change Management are not very effectively managed within the current risk management models.

VII.   DIRECTIONS FOR FUTURE RESEARCH

The risk management effectiveness proposed in this study needs further validation, through in depth case studies on Industry practices. Similar study need to be done on other key risks that are relevant for software maintenance model. Based on detailed analysis, new risk models or modifications to existing models can be suggested to provide more specific solutions to the software maintenance projects

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