

Behavioural Aspects of Software Project Management - In-House Software Development

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Abstract

The study was aimed at looking into the behavioural aspects of software project management in in-house software development centres in India. It was considered to investigate the relationship between sector type and major organisational factor as perceived by the in-house software project head and the collective behavioural perception of in-house software project heads on human resource management, project management practices and supportive skills and environment where in-house development happens. The study was based on survey explorative design by using a structured questionnaire which was pre-tested with 35 in-house software project heads. After making necessary modifications from the collected feedback, questionnaires were sent to nearly 300 in-house software project heads in four different sectors and finally 200 responded. The collected data was analysed using chi-square analysis, correlation and other statistical tools to draw conclusions. The study revealed the collective perception of the in-house software project heads, in the descending order of their perceived interests, towards the factors of human resource management, project management practices, and supportive skills & environment. It was also found out that there is a relationship between sector type and organisational factor as perceived by the in-house software project head. In-house development centre heads need to be concerned with the behavioural aspects of developer community in their organisation, and beginning to consider these variables in their management practices will surely help to turn out successful projects both quantitatively and qualitatively. It is time to prove through further research and experiments that the behavioural aspects of software project management in the in-house development centres in India still need to catch up with the practices to match the global standards as set by major software development companies both in India and abroad.

Keywords: Behavioural Aspects, In-house Development Centre, National Search, Project Management Practices, Software Development, Software Project Management, Supportive Skills and Environment

1. Introduction

Project management is an important part of software development, both for the organisation that depends on third party software development and for those whose software is developed primarily in-house. Most software engineering research emphasises technical matters above behavioural matters. We have evidences that factors related to organisational behaviour⁵⁻¹⁰ have a great impact on software development and developers. For example, culture makes a difference between "just a job" and a soft-

ware development career that someone loves according to Jeff Chelko¹⁶.

Karl Wieggers¹⁷ in his article describes how a small software group gradually adopts a culture to provide a framework of values to make decisions, set priorities, and choose a path to higher performance. An in-house software development centre is a part of a non IT organisation and is involved in the development and maintenance of software for the organisation's use. This paper is a part of an attempt to investigate into the behavioural aspects⁵⁻¹⁰

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of software development with reference to in-house development centres in India.

2. In-house Software Development in India

In the context of contemporary software development practices, particularly against the outsourced model of development, it is pertinent and essential to understand the importance of developing an in-house software development team. Eric K. Clemons¹⁸ states in his recent paper *“If information is critical to the firm’s differentiated image and its ability to innovate, then firms desperately need to retain their in-house development capability. In-house development is even more critical if you wish to retain your firm’s advantage. It’s hard to retain a competitive advantage if your software is written by an outside firm that knows what you are doing well enough to do it for you. If they know it that well then they can teach any or all of your competitors for a fee. One of the nation’s most innovative credit card issuers has policy that their most important software is never written by a vendor. The firm was founded by consultants, and they understand what should and should be entrusted outside the firm.”*

Hamilton Setende¹⁹ in his paper on comparison between in-house development and outsourced ERP narrates *“The company has full ownership of the final product as well as its source code and the knowledge gained while developing it, fits exactly to the business requirements of the company, there is a relationship between the development team and the user base which helps in communication and expectation delivery, it gives you full control over the system and its functionality. Allows you to differentiate from your competitors (as the system is developed for your specific needs), can provide the business with a greater competitive advantage that a bought solution.”*

While we need to understand the importance of developing in-house development centres, it is imperative to know how to manage it effectively and efficiently. The technical and non-technical factors come into play while more often it is likely that non technical aspects do not get their due attention in an in-house development centre.

Non technical organisational factor¹¹⁻¹⁴ such as culture that has influence on behaviour need to be addressed. In the words of Valentine (Val) Casey²⁰, *“Cultures are made up of individuals who are not all the same. That said there are common characteristics that distinguish one culture*

from another. Therefore there are general activities, issues and approaches that need to be recognized. There are also certain activities and types of behaviour which are acceptable in one culture, which are unacceptable in another and this needs to be appreciated.”

Therefore this problem must be addressed both in quantity and quality from the perspective of software project management. It is quite clear any project management should have the following taxonomy of objectives as stated by Bloom¹ namely cognitive domain, affective domain and psychomotor domain. The cognitive domain mainly focuses on knowledge dimension, affective domain on attitude dimension and psychomotor domain emphasises more on skill dimension. As per Bloom’s earlier and improved taxonomy of objectives, cognitive domain incorporates remembering, understanding, applying, analysing, evaluating and creating. Affective domain incorporates receives, response, values, organises and characteristics. Psychomotor domain incorporates imitates, manipulates, reproduces precisely, articulates, and naturalises. Till date most of the empirical studies concentrate more on technical aspects of the issue rather than non-technical aspects like attributes of the in-house software project head, personality proficiency, self analysis, enhancing core competency requests, elimination of non-core competencies, leadership skills, interpersonal relationships, communication excellence, delegation of jobs to others, assessment and evaluation. Feedback mechanism was limited in earlier researches. Absence of non-technical aspects and human element will normally be considered as detrimental to project management. Software development failures of in-house development centres are unlikely to receive the same attention as that of out sourced development organisations with their litigation and escalation of the issues involved. It is highly essential for the in-house software project head to wisely play his role to understand the local dynamics and address these issues as every in-house development centre works for its organisation and the organisational leadership is certainly a force to reckon with in the context of effective software project management.

In the current context, the role of the in-house software project head is rationally classified into three namely developing the individual, building the team, and achieving the task. The role mainly depends on the following important perceived organisational parameters, as stated by Michael C. Harris⁴, namely foundation planning, vertical alignment, horizontal alignment, professional

leadership, value addition, customer focus and control panel. For any type of project, the in-house software project head should lay a foundation planning to have a clear vision, mission, goal and objectives to measure the scale and scope of the project. The in-house software project heads should have the ability to align vertically in the departmental context, organisational context, industrial context, and social context. Failing to align the projects from department, organisation, industry and society often results in chaos. The in-house software project heads should not only be capable to align vertically but also horizontally so that one successful project would lead to completing a few other projects, both long term and short term. Concentrating on vertical and horizontal alignment provides a path way to all other present and potential projects in a meaningful manner. The in-house software project head should also be in a position to develop professional leadership qualities in an incredible fashion so that delivering those competencies results in effective yield. According to compliance theory as proposed by Amitai Etzioni^{2,3,15}, organisations can be classified by the type of power used by the management for directing the behaviour of their staff and the type of involvement exhibited by the staff. In majority of the organisations, types of power and types of involvement are related in three predictable combinations: coercive-alienative, utilitarian-calculative and normative-moral. Organisations with in-house development centres, when attempting to use types of power that are not appropriate for the environment, can reduce organisational effectiveness thereby having an impact on the project management practices as well.

Table 1. Etzioni's Compliance Types

		TYPES OF POWER		
		Coercive	Utilitarian	Normative
TYPES OF INVOLVEMENT	Alienative	1	2	3
	Calculative	4	5	6
	Moral	7	8	9
Cells 1,5,9 – Congruent Compliance Type Cells 2,3,4,6,7,8 – Non-Congruent Compliance Type				

Etzioni stresses that there exists a congruent and non-congruent relationship if proper leadership role has not been assured by the in-house software project head. The model portrayed above clearly indicates that any leader exercises coercive power in an in-house development centre will definitely result in alienative involvement among the staff members. If any leader exercises utilitarian power in an in-house development centre, the followers will tend to follow calculative involvement that results in failure of the project. Similarly any in-house software project head who exercises normative power mechanism can expect moral involvement and symbiotic commitment from their own personnel.

Etzioni demonstrates that the cells numbered 1,5,9 emerge as congruent leadership power-involvement pattern and the remaining cells numbered 2,3,4,6,7 and 8 as non congruent power-involvement pattern. So, any in-house software project head who knows in advance the compliance cellular matrix will surely avoid potential pitfalls & failures. Similarly in-house software project heads should develop and internalise the concept of value leadership which will be a binding agent and glue-gel in many situations. Value may be interpreted in a variety of forms, but in-house software project heads should have a noble concept of benefit to sacrifice patterns to excel. Apart from that, the in-house software project head need to be aware of customer driven aspects of factors related to customer dissatisfaction, attributes oriented to customer satisfaction, perspectives related to customer delight, necessary conditions to customer double delight and sufficient conditions to customer care. The in-house software project heads need to be in a position to understand the panoramic view of all these and also in a position to understand the compliance matrix for the smooth functioning of the organisation. Based on the above organisational parameters, the researcher developed a formal and informal discussion notes after taking inputs from 200 in-house software project heads from four different sectors namely Engineering & Manufacturing, Logistics, Finance and Education.

3. The Methodology

The study was based on survey explorative design by using a structured questionnaire^{24,25} which was pre-tested with 35 in-house software project heads. After making necessary modifications from the collected feed-

back in the pre-test, questionnaires were sent to nearly 300 in-house software project heads in the four different sectors namely Engineering & Manufacturing, Logistics, Finance and Education and finally 200 responses were received at the time of writing this paper. - One of the important components influencing organisational behaviour - the individual perception of each respondent about the factors in three organisational areas namely human resources management, project management practices, and supportive skills & environment was considered and each respondent was asked to mark his score on a four point Likert scale. The respondents were also asked to identify, as they perceived, the most important factor among foundation planning, vertical & horizontal alignment, value oriented professional leadership, customer focus and control panel, affecting their respective sector. The collected data was analysed using chi-square analysis²², correlation and other statistical tools and the same has been presented in the following section.

4. Hypothesis

The Null Hypothesis (H_0) was formulated as “there is no relationship between sector type and major organisational factor as perceived by the in-house software project head.” The Alternative Hypothesis (H_1) was formulated as “there is a relationship between a sector type and major organisational factor as perceived by the in-house software project head.” As mentioned earlier, the four sectors identified were Engineering Manufacturing, Finance, Logistics and Education. The organisational factors are Foundation Planning, VH Alignment, Value Oriented Professional Leadership, Customer Focus, and Control Panel.

5. Results

The calculated value (37.95) is greater than the book value (21.026) and hence the null hypothesis is rejected. Therefore, it is inferred that there is a relationship between sector type and major organisational factor as perceived by the in-house software project heads.

From Table 3 related to human resources management factors, it was inferred that all the respondents strongly agreed to express their perceived interest as follows - 97% of the respondents wanted to have stability and continuity of team, 95.50% to have IT managers with domain expe-

rience, 91.50% to have developers with in-depth domain knowledge, 89.00% to have IT managers with exposure to project management, 87.00% to have trained human resources in project management, 86.50% to have IT managers with technical knowledge, 85% to have multi skilled inter operable developers, 81.50% to have technical training given to the developers, 78.50 to employee experienced developers and 46.00% to have small team of developers (less than 10) plots.

From Table 4 related to project management practices, it was inferred that all the respondents strongly agreed to express their perceived interest as follows - 99.00% of the respondents wanted to have maintainable code, 98.50% to have requirements frozen, 97.00% to have good programming standards, 93.50% to have documentation practices in place, 74.50% to have development quality, 66.00% to do prototyping for understanding requirements, 56.00% for well established software project management practices, 51.50% to have change management for additional requirements, and 35.50% to have testing done by independent team.

From Table 5 related to supportive skills and environmental factors, it was inferred that all the respondents strongly agreed to express their perceived interest as follows - 95% of the respondents wanted to have work-life balance, 92.50% to have IT managers with excellent client relationships, 86% to have flexible developer-client interaction, 81.5% to have IT managers who can get along well with developers, 77.5% want to have top management's commitment and support, 655% want to have frequent interaction with user departments and 31.5% want to have flexi work hours.

6. Discussion

Organisations with in-house development centres when attempting to use types of power that are not appropriate for the environment can reduce organisational effectiveness thereby having an impact on the project management practices as well. The research revealed that the formulated hypothesis was rejected and the alternative hypothesis stating that “there exists a relationship between sector type and organisational factor as perceived by the in-house software head” was found valid. Hence, it is to be concluded that most important organisational factor as perceived by the software heads is varied for different sectors. Being aware of this is a sure strength for

Table 2. Chi square analysis to find out the association between sectors and behavioural perception on major organisational factors

Sectors à Behavioural Perception on Organisational Factors	ASSOCIATION BETWEEN SECTORS AND BEHAVIOURAL PERCEPTION ON MAJOR ORGANISATIONAL FACTORS					OBSERVED VALUES (O)				EXPECTED VALUES (E)				$\Sigma (O - E)^2 / E$				
	Engg & Mfg	Finance	Logistics	Education	Total	Engg & Mfg	Finance	Logistics	Education	Engg & Mfg	Finance	Logistics	Education	Engg & Mfg	Finance	Logistics	Education	Total
Foundation Planning	26	11	8	6	51	26	11	8	6	12.8	12.8	12.8	12.8	13.77	0.24	1.77	3.57	19.35
VH Alignment	5	7	6	14	32	5	7	6	14	8	8	8	8	1.13	0.13	0.50	4.50	6.25
Value Oriented Professional Leadership	4	9	6	8	27	4	9	6	8	6.75	6.75	6.75	6.75	1.12	0.75	0.08	0.23	2.19
Customer Focus	10	10	13	15	48	10	10	13	15	12	12	12	12	0.33	0.33	0.08	0.75	1.50
Control Panel	5	13	17	7	42	5	13	17	7	10.5	10.5	10.5	10.5	2.88	0.60	4.02	1.17	8.67
	50	50	50	50	200	50	50	50	50	50	50	50	50	19.23	2.04	6.46	10.22	37.95

degrees of freedom = (5 - 1) x (4 - 1) = 12
 Level of significance = 0.05
 Book value = 21.026,
 Calculated value = 37.95

the in-house software head to exhibit appropriate behaviour and conduct himself successfully. At the same time, the in-house software heads should take into account the collective perception expressed by them on the factors relating to human resources management, project

management practices and supportive skills and environmental factors. Taking cognizance of it, and moving forward by breaking the behavioural and organisational cultural hurdles and by introducing new practices, the in-house software head can bring about a changed ideal

Table 3. Perception on Human Resources Management

1.0 PERCEPTION ON HUMAN RESOURCES MANAGEMENT		Strongly Agreed
1.1	Need for stability and continuity of Team	97.00%
1.2	Need for IT manager with domain experience	95.50%
1.3	Need for developers with in-depth domain knowledge	91.50%
1.4	Need for IT manager with project management exposure	89.00%
1.5	Need for trained human resources in project management	87.00%
1.6	Need for IT manager with technical knowledge	86.50%
1.7	Need for developers who are multi skilled inter operable people	85.00%
1.8	Need for technical training to team members	81.50%
1.9	Need for employing experienced developers	78.50%
1.10	Need for small development team (less than 10 members)	46.00%

Table 4. Perception towards Project Management Practices

2.0 PERCEPTION TOWARDS PROJECT MANAGEMENT PRACTICES		Strongly Agreed
2.1	Need for Information Security	100.00%
2.2	Need for maintainable code	99.00%
2.3	Need for freezing the requirements	98.50%
2.4	Need for having good programming standards	97.00%
2.5	Need for documentation practices	93.50%
2.6	Need for development quality	74.50%
2.7	Need for prototyping for requirements understanding	66.00%
2.8	Need for well established project management practices	56.00%
2.9	Need for change management for requirements creep	51.50%
2.10	Need for testing by an independent team	35.50%

Table 5. Perception on Supportive Skills & Environment

3.0 PERCEPTION ON SUPPORTIVE SKILLS & ENVIRONMENT		Strongly Agreed
3.1	Need for work-life balance	95.00%
3.2	Need for IT Managers with excellent client relationships	92.50%
3.3	Need for a flexible developer-client interaction	86.00%
3.4	Need for IT Manager to get along well with developers	81.50%
3.5	Need for top management commitment & support	77.50%
3.6	Need for frequent interaction with user departments	65.50%
3.7	Need for flexi work hours	31.50%

work environment. The research also revealed that they wanted in their descending order of perceived interest, the following human resource management factors namely stability and continuity of the team, IT managers with domain experience, developers with in-depth domain knowledge, IT managers with exposure to project management, trained human resources in project management, IT managers with technical knowledge, multi skilled inter operable developers, technical training given to the developers, experienced developers and small team (less than 10) of developers. Their perceived interest towards project management practices, arranged in the descending order, was found to be – concern for information security, maintainable code, freezing of the requirements, good programming standards, documentation practices, development quality, prototyping for understanding the requirements, well established software project management practices, change management for additional requirements, and independent team to do the testing. On supportive skills and environmental factors, again in the descending order of perceived interest, they wanted to have work-life balance, IT managers with excellent client relationships, flexible developer – client interaction, IT managers who can get along well with developers, top management’s commitment and support, frequent interaction with user departments, and flexi work hours.

Table 6. Questionnaire

1.0 PERCEPTION					
1.1	Name of the Respondent				
1.2	Age				
1.3	Qualification				
1.4	Designation				
1.5	Experience in years				
1.6	Name your sector	Enng & Mfg / Finance / Logistics / Education			
1.7	Identify the most important factor you feel your organisation follows (Choose any one. Strike out others)	1. Foundation Planning (or) 2. Vertical & Horizontal Alignment (or) 3. Value Oriented Professional Leadership (or) 4. Customer Focus (or) 5. Control Panel (Control System)			
2.0 PERCEPTION ON HUMAN RESOURCES MANAGEMENT		Strongly Agree	Agree	Disagree	Strongly Disagree
2.1	Need for stability and continuity of Team				
2.2	Need for IT manager with domain experience				
2.3	Need for developers with in-depth domain knowledge				
2.4	Need for IT manager with project management exposure				
2.5	Need for trained human resources in project management				
2.6	Need for IT manager with technical knowledge				
2.7	Need for developers who are multi skilled inter operable people				
2.8	Need for technical training to team members				
2.9	Need for employing experienced developers				
2.10	Need for small development team (less than 10 members)				
3.0 PERCEPTION TOWARDS PROJECT MANAGEMENT PRACTICES		Strongly Agree	Agree	Disagree	Strongly Disagree
3.1	Need for Information Security				
3.2	Need for maintainable code				
3.3	Need for freezing the requirements				
3.4	Need for having good programming standards				
3.5	Need for documentation practices				

3.6	Need for development quality				
3.7	Need for prototyping for requirements understanding				
3.8	Need for well established project management practices				
3.9	Need for change management for requirements creep				
3.10	Need for testing by an independent team				
4.0 PERCEPTION ON SUPPORTIVE SKILLS & ENVIRONMENT		Strongly Agree	Agree	Disagree	Strongly Disagree
4.1	Need for work-life balance				
4.2	Need for IT Managers with excellent client relationships				
4.3	Need for a flexible developer-client interaction				
4.4	Need for IT Manager to get along well with developers				
4.5	Need for top management commitment & support				
4.6	Need for frequent interaction with user departments				
4.7	Need for flexi work hours				

Based on four point Likert Scale

7. Conclusions

Behavioural parameters play a vital role in deciding about the success or failure of projects. In-house software development heads need to focus on the behavioural aspects developer community in their organisation and considering to include these variables in their management practices is a preventive measure from falling into failures resulting out of the unnoticed mental state of people at work. The research proved that there is a relationship between sector type and major organisational factor as perceived by the in-house software project heads. Also collective opinions of all the in-house software project manager respondents on their desired preferences over the areas namely human resource management, project management practices and supportive skills & environment were found out. While this study found out some truth about a few of the behavioural aspects that an in-house software project manager can give attention to for an effective project management, there are a number of other behavioural and organisational factors that need to be further studied particularly in the context of in-house development scenario in India. Major software development organisations in India, on account of influence made by their foreign clients on them and by their own introspection leading to improvement on processes and

practices, have brought in professional software project management practices that include behavioural aspects of software development as well. But in-house development centres in India due to lack of professional software management practices, there is a lot of potential and scope for improvement particularly along the behavioural aspects of software development. It is time to conduct researches to consider such issues so that the Indian in-house development scenario moves forward to match with that of the software development companies in India and abroad.

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