

Quality Control and Risk mitigation: A Comparison of Project Management Methodologies in Practice

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Abstract— This paper discusses the comparison of diverse project management methodologies being practiced by global organizations as per their nature, size, scope, environment, diversity and the type of projects. An analysis has been made on IT project management focusing quality and risk issues and management. The basic theme is how different companies manage their projects by comparing quality and risk, and to what extent they use similar methodologies. A further add is the use of traditional methods and heuristics that is supported at governance and policy level.

Keywords: *Project Management, PMBOK, PRINCE2, SCRUM*

I. INTRODUCTION

The paper covers the aspects of IT-Project Management and highlights the quality and risk management issues within three companies having global prospective. The basic theme is to have an analysis of how these three companies are managing the project risk and quality, to what extent they are similar and how their project management methodologies differ from each other. Diverse project management methodologies (i.e. Project Management Body of Knowledge [1], PRINCE2 [2], SCRUM [3]) and quality standards (i.e. ISO9000 [4]), CMM-I [5] are thoroughly discussed in analyzing the scope of these mentioned companies. First company (Company A) is a UK based company and operates in around 36 countries employing 39,000 people, providing services in diverse areas, such as business consulting, systems integration, Information Technology and business process outsourcing. The second (Company B) is a US based company, working since past 15 years and possessing good market reputation. The company has its customers in 48 countries. It is one of the leading providers of the next-generation mobile messaging and wireless internet infrastructure, its applications and solutions. The third (Company C) is a Pakistan based company and is an application service provider. This company specializes in developing financial application services. It is working since past 12 years with their major clients from USA and UK.

The Company has developed Global Development Centers (GDC) in order to provide the best quality services to their clients. The company has a major development center in Pakistan consisting of nearly 150 employees and has made efforts to take maximum benefit of its temporal distance and time differences, in order to provide quality service to its clients worldwide.

Though all of these companies have diverse businesses, nature of work, size of its employee base, but all of them provide IT services globally and have clients in those parts of the world that are very particular with quality of the project and risks associated with it. A proper working methodology and process management is required for each project to be executed in these countries, which is explained further in the later parts of this paper. Each project management approach is unique and beneficial in its own way but one model doesn't fit all environments and projects.

II. LITERATURE REVIEW

A. Project Management

Project Management means managing a project's scope, time, cost, resources, employees, risk, quality, et cetera [6]. There are diverse methods of managing a project depending on the nature, size, scope and duration of the project. This topic gained awareness and was considered as a major project process in the late 1950's [7]. Organizations developed processes and methods for carrying out a products production by following a sequence of activities, in order to deliver the product in time, in the same cost, maintain the quality and achieve the defined objectives. Du et al [8], Schmidt et al [9] and BCS [10] stress that whenever projects fail to accomplish their preferred objectives. It is mostly because of a bad project management.

Along with different sizes of projects there are diverse natures of projects and for which different methodologies are suitable to implement. For example, a Software Development project where time to reach the market is short and competitive, requirements are changing rapidly [11], their methodologies like SCRUM [3], XP (Extreme Programming) [12], RAD (Rapid Application Development)

[12], et cetera will work out better. Whereas companies which have projects that last for a long-term (i.e. 5-8 years) controlled methodologies like PRINCE2 (PROjects IN Controlled Environment) [2], PMBOK (Project Management Body of Knowledge) [1] will work better as the projects need to be controlled, monitored in terms of project requirements as well as what-if few senior employees leave the company while the project is in its mid-state. In order to manage all these issues, controlled methodologies are used.

B. SCRUM

Scrum is an agile software development methodology, used by companies in projects where there is more end-user involvement and requirements keep on evolving till the project completes [13]. In software development, the main concern is to manage the communication, co-ordination and to control the teams which can be a major risk to project failure or delay [14]. Baskerville et al [15] further suggests that agile methods add benefit to companies in developing software in a shorter time. In today's radical changing environment where the ratio of competition is soaring, software development companies need agile methodologies to reach and meet the market demands [11]. Requirements are usually ambiguous in agile development and keep changing therefore a customer is involved through-out the development process and prototypes are built for reducing the confusions. Cao & Ramesh [11] suggest that agile methods work best when adapted by a vertical organization as it believes in informal and frequent communication and a team based environment. Fitzgerald et al [16] emphasizes that agile methods have a huge impact on the quality of the product as the methodology helps in delivering the project in-time as well as reduces the rate of bugs in the software.

Scrum works in iterations and the iteration is known as a sprint which lasts for 30 consecutive days [3]. There are three roles in the methodology which are: the team, the product owner and the scrum master [3].

The beauty of Scrum is that it believes in self-managing and self-organizing teams and there are certain procedures to monitor and control the project even when requirements are uncertain [3]. Few companies maintain a burn-down chart in order to know the time remaining across the sprints [3]. The time to complete each sprint is fixed whereas in case of any complexity generated in the project, the functionality or quality might be trimmed but the sprint is expected to end on the agreed date [3].

C. Project Management Body of Knowledge (PMBOK)

PMBOK is initiated by and belongs to the Project Management Institute (PMI) [1]. It is a methodology which ensures a controlled mechanism of delivering a project bound with time, scope, budget, quality, et cetera [8]. PMBOK highlights the entire characteristics of Project Management which are: the project lifecycle, the knowledge areas and the project management process groups [1]. The PMBOK approach as mentioned before is based on lifecycles. The number of lifecycles in a project may depend on the size and nature of the project [1]. The five process groups namely initiation, planning, execute, monitor and control, close ensure the controlled and organized development and delivery of the project [1]. The project

stakeholders are people who are involved throughout the product development and have a huge impact on the project success. The way companies adopt PMBOK also affects its effectiveness as they have different corporate cultures and structure [1].

Companies that implement PMBOK, their projects are tightly bound with the knowledge areas (i.e. integration, scope, time, cost, quality, human resource, communication, risk and procurement management) and if these phases are planned, organized, controlled and monitored properly, the project achieves success [1].

D. PRINCE2

PRINCE2 is a structured approach extensively deployed for managing projects. Bentley [2] highlights that PRINCE2 is broadly used by organizations as it is a flexible approach and fits to diverse projects. Each project built using PRINCE2 methodology leaves a learning experience for the other projects which helps organizations understand the problems, outcomes, opportunities much better. He further states the key concept of implementing this method: First, every single project should justify the business case. PRINCE2 projects are in stages and at each stage the project is reviewed and analyzed and if the project does not fulfill the business case, the project is closed and secondly, the project should build the entire aspects of the product (i.e. management, technical and quality). Bentley emphasizes that PRINCE2 is based on processes, components and techniques.

PRINCE2 comprises of diverse stages (such as: start, control, organize, stage boundary, close, and planning alternative) through which a project passes under a controlled environment from its start till the end [2]. As discussed before, PRINCE2 [2] is based on components namely: business case, organization, plans, controls, management of risk, quality in a project environment, configuration management and change control. These components are deployed through diverse stages in the project.

The effectiveness and impact of a technique varies on how better the company has understood the methodology, the project and in what way it is planned to be developed. Bradley highlights the four basic roles in PRINCE2 which are: Project Board, Project Manager, Stage Manager and Team Leaders. PRINCE2 being a fit-to-all kind of projects is highly capable and involves end-users throughout the project development so that the end-user requirements are highly met [2]. Logs are maintained to ensure the highest quality to be delivered. Being a structured and controlled approach, it gives a possible in-sight of the project outcomes and helps the project be accomplished in its defined time and cost. Such a methodology keeps everything organized, controlled and adds value to the company. Methods, approaches and techniques have changed through different eras and the requirements, technology and business need have been one of the driving forces for it [11].

E. Quality Standard Models

Quality has proved to result into a long-term profitable entity [24]. Therefore majority of the organizations have implemented different quality standards complimenting their nature of business. There are diverse quality standard models

such as, TQM (Total Quality Management), ISO (International Standards Organization) [4], CMM (Capability Maturity Model), CMM-I (Capability Maturity Model Integration) [5], EFQM (European Foundation Quality Management), et cetera. In this paper in depth focus is given as CMMI and ISO9000.

CMMI is a better version of CMM comprising features to analyze and effectively manage a company [5]. Companies were having problems with deploying CMM at different levels of their organization and the models were not integrated, CMMI overcomes this short coming at it is incorporates the entire organizational processes so that they could be managed better. Alike CMM, CMMI comprises of five maturity levels (i.e. initial, managed, defined, quantitatively managed and optimized) through which it analyzes and evaluates the maturity of an organization. It is highlighted that each CMMI comprises of different process areas (i.e. engineering, project management, process management and support) and companies can evaluate these process areas to ensure whether they are meeting their business goals. In this way they can analyze, assess and make further improvements. It is suggested that CMMI benefits large companies because it requires huge documentation and procedures to follow.

ISO is a quality standard and helps organizations in enhancing and continuously improving their business processes to give them a competitive advantage [4] [30]. The main motive behind this standard implemented by organizations is to provide better services and quality products to their client. ISO 9000 is explicitly a Quality Management and Quality Assurance Standard which specifies its standards procedure, control and documentation in order to assist organizations to implement it effectively and identify the gaps and mistakes in themselves. A quality system like ISO ensures end-user approval, consistency, project stability, return on investment, et cetera. One of the major reasons of adapting these standards is to assure the company's efficiency and effectiveness to the customers. The customers believe that companies adapting such standards will successfully deliver the project within the agreed time, cost and without any quality compromise.

III. RESEARCH OBJECTIVE

This paper analyzes the project methodology, nature and size of the company, scope of projects of three companies based in Pakistan and UAE in terms of quality standards, risk organizing, monitoring and controlling methods.

A range of pilot and structured questionnaire was and based on the real input from concerned technical expertise, detailed analysis will be presented within the framework of project management.

IV. METHODOLOGY

Qualitative and quantitative methods are used due to number of reasons. The qualitative research was based on interviews that helped in knowing the various aspects of the company's nature of work and way of operating. Besides this the interviews helped in interacting and knowing about the

employees (i.e. project manager, technical architect, and developers, designers, etc), their experience, suggestions, and judgment. The interviews aided in clearing ambiguity in few of the questions of the questionnaires. The quantitative research was done through questionnaires. In fact questionnaires were a mixture of both open and close-ended structured questionnaires. The quantitative research facilitated in analyzing the information, as mentioned before the questionnaire sent out was structured and each question was linked to another one to identify the key aspects.

The qualitative research thorough open and closed ended interviews, was carried out through technical architects/project managers of these IT companies. The contacts chosen had vast experience in working with the company on IT projects as well as were responsible for key decision making in the organization.

The qualitative and quantitative research form the basis for primary research where as the secondary research is based on literature and real-world sources.

Detailed Discussion on findings of Structured Questionnaire

Considering the feedback of the company A through Structured Questionnaires, it was found that Cortex is a combination of all the best practices and highlights the fact that company A implements a mixture of standards. Cortex is an in-house developed model and the processes are modified based on time constraints and for further improvement. Cortex fits to all types of their projects and is not commercial available. Company A controls, manages and organizes the quality reviews, assurance and controls it is alike PMBOK approach and the project manager is held accountable of answering the project board about the status of the project which is more a PRINCE2 flavor [1].

Considering the feedback of company B it is identified that company completely implements PMBOK for all of its projects and time-to reach market modifies the methodology at times however the company doesn't have any quality standard like company A and it seems that company B compromises with the quality when time is an issue but this is no threat as in commercial markets this happens [1]. The way the stakeholders influence the project is like a PRINCE2 approach but the way the project lifecycles work and are controlled is much alike PMBOK [1].

Coming towards company C, it follows scrum due to changing market and end-user requirements [11]. In fact, there is no hard and fast rule to stick with scrum project teams at times change the methodology. In order to meet the delivery date, quality compromises are sometimes there and requirements are met according to the priorities. The company has its own way for project meetings and discussions comprising of scrum roles to be performed by diverse employees as discussed before.

Similarities between Companies (i.e. A, B & C)

The commonality and similarities identified between the companies are: tailored project management approaches, deployment of re-usable components, integration, provide upgrades, constantly improving and learning from the past experiences, share collective ownership, all are based in a

different country other than owners, method of communication with clients and stakeholders, methods of controlling the risks of a controlled methodology.

Dissimilarities between Companies (i.e. A, B & C):

The dissimilarities identified between the companies are: implementation of different project methodologies, they all develop diverse type of projects, differ in quality standard approaches and method of implementation, stakeholder-involvement in the projects, the way of teams working on project(s), frequency of upgrades, coding standards, project time spent on each phase, influence of stakeholders, the way and regularity of project meetings.

Company A holds a more structured, organized and controlled environment. Company B is slightly flexible, whereas the third company is significantly flexible and more based on self-organizing teams.

Company A is CMM Level-3 and ISO9000 certified whereas company B considers that quality standards don't justify the cost benefit analysis and believe in their quality assurance teams whereas company C has its own small quality assurance department.

Company A implements roles such as: project board, project manager, etc. who check and assure the project at each stage, and this is how roles work in PRINCE2 [2]. The point to make here is the company implements PRINCE2 roles.

From the above discussion it is evident that company A, B and C do not use the same project management approach for quality and risk management. Each of the companies reacts different for quality and risk issues in the project. Company A implements and strongly emphasizes on a structured approach to ensure a stable and quality oriented process to deliver a quality oriented projects. Cortex comprises of key process areas and incorporates features of PMBOK [1] and PRINCE2 [2]. Company B uses standard templates for dealing with the quality control but with time constraint it negotiates with quality. Company C monitors and organizes according to each sprint but also compromises with quality during time pressures.

V. ANALYSIS

The analysis is based on the both qualitative and quantitative information of the response of the questionnaires.

Table 1. highlights that company A spends more time in the end phases, whereas company B shows figures on percentages with implementation phase carrying the highest percentage but according to a telephonic interview with the project manager, the 33% (Implementation) represents time spent on both Implementation and Testing. This is because the projects require 10% customization to meet the business need and the remaining 90% functionality is always there in the re-usable components. Company C spends time according to minutes/hours per day/week along all phases. These values are according to the sprint but if we analyze the time spent on implementation, it will be nearly 1 hour fourteen minutes per day which doesn't really show a good figure of time spent on the project.

TABLE 1

	Planning				Analysis				Design				Implementation				Testing				Deployment			
	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I
Daily									X								X	X			X	X		
Weekly	X																							
Twice a week					X	X			X					X										
Every two weeks	X												X											
Other																								
					4%				9%				16%				33%							
					↑				↑				↑				↑							
					30 Minutes per week				30 Minutes per week				For 3 days				16 hours in 2 weeks				8 hours for 3 days)			

Table No.1 Time spent on small projects by Company A, B & C.

- T (1) = Technical Architect (1) of company A
- T (2) = Technical Architect (2) of company A
- A = Project Manager of company B
- I = Project manager of company C

Table II shows that for complex projects company A increases the time to be spent through-out all phases comparatively to its small projects. A similar change has been identified in case of company B and company C. But while comparing all three companies with each other it is found that company A is more structure and organized. It tries to keep track of its complex projects on regular basis, whereas company B and company C seem to be more flexible. But same as before, it spends more time on implementing the project.

TABLE II

	Planning				Analysis				Design				Implementation				Testing				Deployment			
	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I	T(1)	T(2)	A	I
Daily					X	X							X				X	X			X	X		
Weekly	X	X											X											
Twice a week									X	X														
Every two weeks																								
Other				10%			20%				25%					45%								
				↑			↑				↑					↑					↑			
				4 Hours per day (for 4 weeks)			4 Hours per day (for 4 weeks)				2 Hours per day (For 8 weeks)					8 Hours per day (for 8 weeks)					8 Hours per day (for 2 weeks)			

Table No.2 Time spent on small projects by Company A, B & C

- T (1) = Technical Architect (1) of company A
- T (2) = Technical Architect (2) of company A
- A = Project Manager of company B
- I = Project manager of company C

Company B has smaller projects compared to company A. The project size is said to be of 3 months duration and 2-3% time is spent on the validation and verification of the project costing 1 Million Dollars. A 3 months project is a small project and if company B adapts any ISO9000 or CMM-I it might face higher costs and time delays due to huge documentation [5]. Implementing a standard which doesn't complement a company is certainly a wrong decision. Company B also justifies the quality concern by stating that they implement standard interfaces which ensure the quality and scalability.

Company C holds a completely different environment, and way of carrying out projects as mentioned in literature

review. Though the project manager states that the company doesn't require quality standards, lack of quality and risk management has been identified within the company [16]. Agile methods like scrum are highly compatible with quality standards like CMM-I [16] and thus it doesn't need the company to change but how the company fits into the model, improves it and makes the best out of it and is therefore recommended for Company C.

Not only different approaches are used but the projects developed by all three companies are of different nature, type, scope and size.

VI. CONCLUSION

After analyzing the project methodologies, nature and size of the companies, scope of projects and various other aspects of these three global IT companies, it is identified that all three companies deploy diverse project management approaches for and have tailored standards, as per requirement. They owe different quality standards, risk management, monitoring, and controlling methods incorporated within their project management approach and the tables clearly indicate the difference between all three companies.

This paper has focused on diverse project management approaches and how they compliment the project quality and risk. One company implements a methodology namely cortex which alike PMBOK and PRINCE2 has methods of planning, assuring and control the project quality as well as management of the risks associated to the project [1] [2]. For companies dealing with multiple projects at a time, with diverse nature and at times same people of the team working on different projects require proper project management else may lead to failures. The major risks associated with any type of projects are cost, time and quality. Bentley [2] considers these factors as the three angles of a triangle where good quality has an impact on time and cost, reduced time can impact of quality and cost again affects the time spent on project and quality. This three tier structure needs proper management and control.

A good ground work has been presented in this area and it is believed that more companies varying in range and dealing with in same countries could provide a platform for

even better analyses of how companies really implement models and how effective they really are.

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