

# Information technology project management viewpoint: A case study from PTCL

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**Abstract**—The big question of how to successfully complete the project with its constraints always exist with every project. Some set of rules and patterns are needed for project management. Project management strategies provide us set of standards and rules to successfully complete the project and project management viewpoints are one of them. In this paper we have considered most effecting views on information system, and produced a project management viewpoint (PMV) diamond. Dependency relationship among different phases of project management have been explored. Main focus is most common project management viewpoints such as architectural, financial, informational / functional, development, deployment and operational viewpoints. To validate an initial validation of the PMV diamonds on an example scenario of Pakistan telecommunication company limited (PTCL) have been perform.

**Index Terms**—Project Management viewpoint; project governance; fully dependent; partially dependent

## I. INTRODUCTION

Business runs in terms of projects and success of business is being estimated by successful projects. Successful project completion is among the main objectives of the organization to achieve. Time is an important factor involved in success of any project. Evidence shows that a properly managed project has more chances to achieve its goal in desired time than a poorly managed project [1], [2]. Project management can be seen as the process of planning, organizing and managing resources to successfully achieve the specific goals and objectives, usually, under certain constraints for example time, cost or resources [3]. Because a project have defined beginning and end so it need to achieve the defined goals in prescribed time frame. For many years it has been common practice to support project management by project management techniques/plan/life cycles such as Prince 2, Project Management Methodology, Project Management Processes and Project Management Life Cycles [4]–[7]. These project management techniques/plans/life-cycles have long procedures and are time consuming. There are discussions about the concerns of the stakeholders about time and cost constraints involved in project development [8].

During recent decades there has been an increasing trend of developing views for supporting management decision from stakeholder's perspective. In this paper, we present and elab-

orate a framework in which project management knowledge is partitioned into multiple views called "Viewpoints". These viewpoints will mainly revolve around information system (IS) concepts and will explore multiple factor hinder project completion in time.

For project management viewpoints we need to understand IEEE Standard 1471 which brought some welcome standardization of terminology to express view as follows, "A view is a representation of one or more aspects (structural, informational, etc) of a project that illustrates how the project management addresses one or more concerns held by one or more of its stakeholders". Based on IEEE Standard 1471, viewpoint can be defined as follows. "A viewpoint is a collection of patterns, templates, and conventions for constructing one type of view. It defines the stakeholders whose concerns are reflected in the viewpoint and the guidelines, principles, and template models for constructing its views" [9]. Moreover, the concepts introduced by Nick Rozanski and Eoin Woods [10] have been used as well. Hence the project management viewpoints can be considered as framework for capturing reusable project management knowledge [11]. This knowledge can be used to guide the creation of a particular type of information technology project.

Thus the objective of this paper is to design the project management viewpoints, for producing the reusable information. According to Wieringa et al [12], design research is a way to reach a desired output from a given input. They relate this concept to a situation where some change needs to be enacted according to the way we think the world should be. Thus development of a view is for the process of future learning. How a view can be developed and how many aspects involved in the development of a view is discussed in section II. Section III discuss project management viewpoint diamond (PMV diamond) which is an organization of most relevant views. Validation is being carried out on Pakistan Telecommunication Company Limited<sup>1</sup> and discussed in Section IV. Section V closes the discussion with conclusion and future research direction.

<sup>1</sup>www.ptcl.com.pk last accessed May 25, 2016

## II. PROJECT MANAGEMENT VIEWPOINTS

The project management viewpoints are depend on the definition of views, which will produce a comprehensive project guidelines in the form of project management viewpoint diamond (PMV). Moreover reusable knowledge base is also populate based on PMV diamond. Project management is a staged/step by step process [13] and project management institute (PMI), provides a Project Management Lifecycle [7] which is a complete step-by-step methodology for initiating, planning, executing and closing a project. Before passing through any step-by-step process for project management we can develop viewpoints, which will act as a pre-step for successful project management. A number of viewpoint catalogues exist already, but we have found that all of them are for development of software architecture [14]–[16]. The viewpoints we have developed are based on Rozanski and Woods viewpoint [10] and specially designed not only for software related project but also for IT and related projects. This project management viewpoint (PMV) diamond is mainly focused on the information technology projects and consists of six viewpoints, namely architectural/design, financial, functional/informational, development, deployment and operational viewpoints. Each viewpoint is explained:

- **Architectural Viewpoint:** Describes the basic architecture of the project. Architecture or design are sometimes used synonymously in companies. The design viewpoint describes the initial design also it discusses the design choices, tools and techniques and design related concerns of the project.
- **Financial Viewpoint:** Financial concerns of the stakeholder are considered here. Financial analysis team defines the financial constraints of the project. Viewpoints based on strategy making, fund governance, tools for financial analysis are being defined in this category. The outcome of financial viewpoint is assets consultants and investment management.
- **Functional & Informational Viewpoint:** Deals with the functional elements of the projects. For example responsibilities, interface and the information flow. It has significant impact on the final product of the project. If functionality and the information management is done properly then there will be less chances of errors and flaws in the project [17]. This viewpoint can be called as the main viewpoint because it describes the way of handling, transferring, and distributing the information. Also it checks the information flow through some technique or methods. The risk management is also handled in this viewpoint. As project management viewpoint are mainly concerned with the information technology project and these project have ultimate goal of optimal use the information. So this viewpoint can be seen as core of the project management viewpoint diamond.
- **Development Viewpoint:** In this viewpoint we need to think about developmental dependencies, configuration basis management of deliverables, system-wide design

constraints, and system-wide standards to ensure technical integrity. If there is nothing to develop than this viewpoint is void. The importance of this viewpoint depends on the complexity of the system being built. It provides a starting point for the more detailed design to be developed.

- **Deployment Viewpoint:** It describes the environment into which the system will be deployed, considering the constraints of the project for its deployment. Depending on the type of the project sometimes deployment viewpoint is not needed. This viewpoint is especially needed if there is a software development project or IT based project. For such projects it can handle network interconnections, disk storage facilities and technical environment requirements for each element. The mapping of the software elements to the runtime environment that will execute them is also the part of deployment viewpoint.
- **Operational Viewpoint:** The aim of the operational viewpoint is to identify system-wide strategies for addressing the operational concerns of the system. It will tell us how the system will be operated, administrated and will behave when it will be in its production environment.

These viewpoints consider installing, managing and operating the system as a significant task. There exist many views depending on the type of the viewpoint but we will consider most common among them. These views are explained as follows,

- **Roles & Responsibilities:** Which group of people will play the role for those viewpoints also what are their responsibilities? For each viewpoint role performed by the responsible people will be different. Moreover this viewpoint will help us to divide the duties among the staffing of the project.
- **Tools & methodologies:** Selection and management of tool for the viewpoint is being done under this view. For managing the tools there exists many methodologies, but selection of a methodology is based on the project type. Tools and suitable methodologies for each viewpoint will be discussed under this view.
- **Control mechanism:** This view controls both the project team and the project. It is partially based on the roles and responsibility view. If someone is not performing its duty then control mechanism manages it. It also manages the time constraints, economic constraints and other factors.
- **Risk management:** For each viewpoint there are always risk analysis needed, risk analysis save the viewpoint from any unforeseen circumstances.

We have selected six key viewpoints and we have four views effecting on them. By considering each view and viewpoint separately, we have total (Six viewpoint \* Four views) 24 viewpoints. The relationship between the viewpoint and view can be better understood with the help of Project Management Viewpoint (PMV) diamond shown in Figure 1.

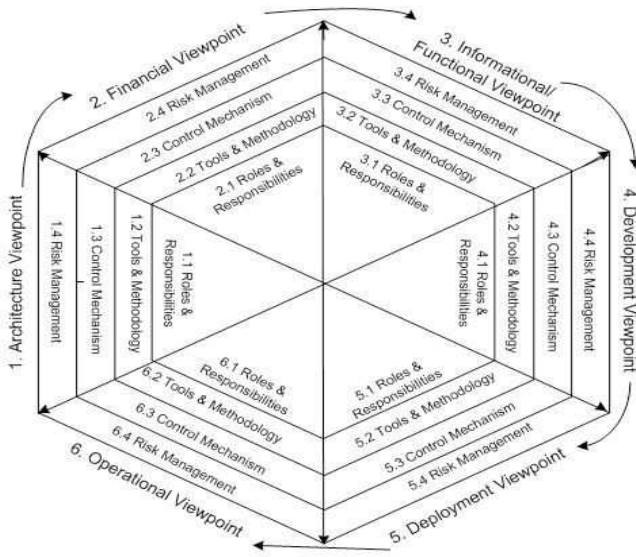


Fig. 1. Project Management Viewpoint Diamond

### III. PROJECT MANAGEMENT VIEWPOINT DIAMOND

Each viewpoint is developed with the help of four views. By writing four views in a viewpoint we come up with a pyramid shape. Joining six viewpoint's pyramids we get a project management viewpoint (PMV) diamond. If the diamond is complete for a particular project then most of the aspects and details of the project will be decided in advance that will help us to complete the project in time. In Figure 1, we can see a PMV diamond consists of six pyramids of viewpoints. Views are affecting factors for development of a viewpoint. In PMV diamond between architectural viewpoint and financial viewpoint, we can see an arrow that is showing that financial viewpoint is dependent on the architectural viewpoint. All viewpoints are partially depend on the preceding viewpoint. The concept of dependency used for PMV diamond is based on perception data dependency [18]. Depending on the scenario there exist partial or full dependency among the viewpoints. Both aspects are shown in Figure 2. Architectural viewpoint is the first viewpoint and the operational viewpoint is the last viewpoint in Figure 1. In the PMV diamond there is no arrow between these two viewpoints. Which indicates that after last viewpoint it is possible to go to the first viewpoint depending on the project type under study. A number with respect to its viewpoint denotes each view, these numbering explains the place of view in the diamond more quickly then their names. If PMV diamond is filled before applying any project management cycle/techniques/methodology then it acts like preliminary knowledge for project success. It is not necessary that PMV diamond should be filled completely because there exists viewpoints/views that cannot be applicable on particular project.

#### A. Scenario 1: Fully Dependent PMV Diamond

In PMV diamond, financial viewpoint appear after the architectural viewpoint and functional/informational viewpoint are after the financial viewpoint. There exist projects in which one viewpoint should be developed before the development of preceding viewpoint So these type of projects develop fully dependent PMV diamond. E.g until the architecture plan of a demanded server is not complete financial department cannot approve the bills.

#### B. Scenario 2: Partially Dependent PMV Diamond

There exist some projects in which each viewpoint is not fully dependent on the preceding one. But the case when we have an IT project, especially a software development project, then we can say it is partially dependent. Architecture, financial, information/functional viewpoint/view can be independent. But deployment viewpoint can never come before the development viewpoint. Moreover the development viewpoint helps to formulate the deployment viewpoint. Consequently such viewpoints are shown in partially dependent PMV diamond. From perspective of view it is possible that there exist some dependency among the views for example as shown in the Figure 2. Colored italic text shows the completed viewpoints/views. Due to partial dependent PMV diamond once architectural viewpoints (From 1.1 till 1.4) is developed completely then the financial viewpoint starts developing and completed till 2.3. Informational/functional viewpoint is also at the level of 3.3. Risk management subviewpoint (4.4) of development viewpoint is dependent on sub-viewpoint 3.4. Thus some views are dependent and some are totally independent.

#### C. Scenario 3: Independent PMV Diamond

In Figure 2 Italic text shows us how randomly views can be decided in case of partially dependent PMV diamond. Roles and responsibilities of all the viewpoints can be decided in parallel. The risk management of financial viewpoint (2.4) can be completed before the risk management of architectural viewpoint (1.4). Dependency among development, deployment and operational viewpoint can be observed in Figure 2. Partial dependent PMV diamond brings us to totally independent PMV diamond depending on the project under consideration.

### IV. VALIDATION OF PVM DIAMOND

For validating the PMV diamond we will consider Pakistan Telecommunication Company Limited (PTCL)<sup>2</sup> as an example. PTCL offers all kind of telecommunications services including Internet, data exchange, land-line phone service, video conferencing and carrier services to companies and individual consumers in Pakistan. PTCL also provides transit connectivity services to other telecom operators including Cellular Mobile Operators (CMOs) "Phone for everyone"<sup>3</sup> is a PTCL project launched to establish a network for land-line phones. The goal of this project was to establish a complete

<sup>2</sup>www.ptcl.com.pk

<sup>3</sup>Name of the project has been altered for confidentiality purpose

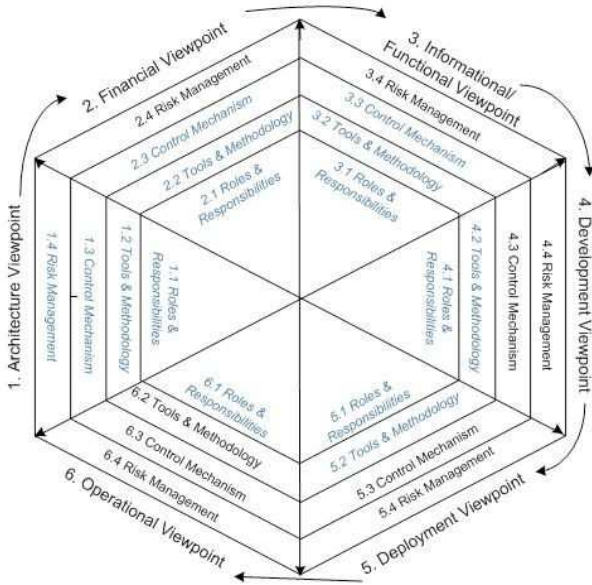


Fig. 2. Partially Dependent PMV Diamond

network and other infrastructure so that request for a new land-line number can be accomplished in a single working day. In order to achieve this goal PTCL have to develop the viewpoint once for one region and then use them for establishment of network and infrastructure all over the country with minor modification..

For validation purpose, we have conducted interviews, and studied the proposal documentation. We have also visited the region Bahawalpur, Pakistan to see practically how the PMV diamond is applicable there. Figure 3 shows the PMV diamond for Bahawalpur region<sup>4</sup>. Views such as roles and responsibilities, tools and technologies, control mechanisms and risk management details about each viewpoint for PTCL project is explained as follows,

- 1) For the PTCL First viewpoint needed is the **architectural viewpoint**. Roles and responsibility view (1.1) include decision like, who will design the architecture, and what are the responsibilities of the architects. Once the architecture is decided for one region then for the other regions it need to be enhance a bit based on the some regional scenario. This enhancement will be handled in view (1.3)<sup>5</sup>. While designing architect one should keep in mind the risk factors for example lack of resources, labour unavailability are among the most effecting risk factors. Hence architect must design some alternatives to deal with such circumstances.
- 2) For **financial viewpoint**, a team of financial experts work under financial analyst. Their responsibility is to maintain budget in such a way that project will be finished with in defined budget. This decision is

<sup>4</sup>Term used by PTCL to defined a division area. Each region lie under one main exchange.

<sup>5</sup>Each number correspond to the views number in Figure 3

made under tools and methodology (2.2) view. Financial Control mechanism (2.3) for financial viewpoint is that project should be controlled under the cost constraints. Any cost management technique can be utilized. Risk factor like exceeding the cost beyond the limit is kept under consideration.

- 3) For PTCL project **information and functional viewpoint** has central importance as it has in software engineering projects. Function and information management team will check for the unavailability of information and malfunctioning of any component in the project. DFD and ERD are the traditional design tools to facilitate data and information flow, for view (3.2) PTCL make use of DFDs and ERDs. As this project lies is practically belong to IT project domain therefore information handling, transferring and managing among the exchanges and between other projects needs to be handled with some information technology model or approach. There can be security aspect lies under the view (3.3, 3.4) but for “Phone for everyone” project it is not applicable, because it goes out of the scope of the project.
- 4) For **development viewpoint**, development team will arrange all the equipment for example telephone sets, cables and other tools needed for the installation. View of control mechanism (4.3) for development viewpoint helps to arrange extra equipment and manpower for this project. Due to accidents or some other reason if we lose our equipment then risk management (4.4) view facilitate us to overcome and provide us extra equipment.
- 5) For **Deployment viewpoint**, deployment team will be responsible for the deployments of basic tools needed for this purpose and required manpower. An important constraint that lies under view of control mechanism (5.3) is cost, time and equipment management. Principal risk lies in this project is that it can affect the functioning of the existing telephones. Hence deployment process should be in parallel with existing phone.
- 6) Last and most important viewpoint is the **operational viewpoint**, which is the evaluation by users. Responsibility of the user is to complain if there exist some problem and PTCL operational team will provide solutions to their complains. Tool and technique (6.2) will remain same as in (5.2). Maintenance of traffic load is another view lies under the operational viewpoint. Authorize use of the telephone and security of the telephone cables from theft and misuse is the view of risk factor (6.4).

We have discussed all the viewpoints with respect to views. Till now no dependency is discussed, dependency among the viewpoints is based on the business rules. In the following sections different business rules and dependencies are being explored.

#### A. Fully dependent PMV diamond for PTCL

Lahore [19] region is a very busy and densely populated region so the business rule PTCL develop is “Tolerance for disturbance in the existing services of PTCL is only 3%”. To

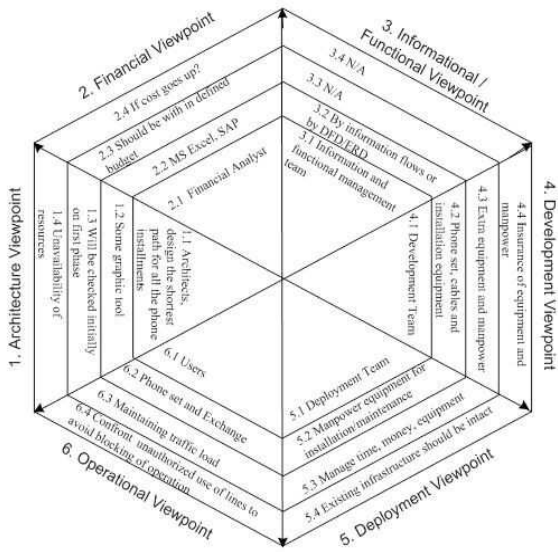


Fig. 3. PMV diamond for PTCL

maintain this business rule one needs to plan and manage all the phases of installation in advance to avoid any inconvenience for the PTCL customers. Similarly, as in case of fully dependent PMV diamond all the viewpoints in the diamond are fully dependent on the preceding one. Most of the details (architectural, financial, information/functional, development, viewpoints) will be developed in advance.

For applying the said business rule to Lahore region fully dependent PMV diamond is best solution. Due to dependence all the viewpoints will be developed one after the other although development process will be slow but the information it provide, will be accurate. The data of the PMV diamond in Figure 3 will remain same for fully dependent PMV diamond only we need to introduce the arrow between the viewpoints to show the dependency.

#### B. Partially dependent PMV diamond for PTCL

For Bahawalpur [19] region business rule is Tolerance for disturbance in the existing services of PTCL is 8%, as there is less population in Bahawalpur and tolerance level is high so we can have flexibility while developing PMV diamond. We can develop viewpoints in parallel but as discussed in section 3.2 there exist some viewpoints which can never be develop in parallel with the preceding one. For example in our PMV diamond financial viewpoint is fully dependent on the architectural viewpoint. Thus for Bahawalpur region one can develop partially dependent PMV diamond. Figure 3 shows a partially dependent PMV diamond.

#### C. Independent PMV diamond for PTCL

Independent PMV diamond is not possible to develop for such a case study because installation of phones is a step by step process we cannot perform step randomly and independently.

Project Management Processes	Project Management Viewpoints
Initiation	Does not exist separately
Planning or Development	Architectural, Financial, Informational/ Functional viewpoints
Production or Execution	Development/ Deployment Viewpoint
Monitoring & Controlling	Operational Viewpoint
Closing	Does not exist separately

TABLE I  
PROJECT MANAGEMENT PROCESS

#### D. Comparison with existing concepts

Discussion about project management started in early 1900 in civil engineering projects by architects. Projects are managed in different ways such as project management life cycle [7] or other approaches and methodologies [5], [6]. Each project management has basic steps of planning, designing and development. Project management viewpoint is an approach influenced from software management viewpoints [9], [10]. Differences among project management viewpoints and project management life cycles/ approaches/ methodologies are as follows,

- PMV is based on the idea of software viewpoints [9], [10], but viewpoints of PMV diamond have all the stages, which is needed by project management. It provides a complete framework for comparison, Table I shows project management process (cf. [6]) with equivalent project management viewpoints
- For simple projects PMV provides a quick, easy and reusable way for project managements as compare to other project management methods.
- For complex project we might need to follow some approach after completing PMV diamond. Because PMV discuss the most general aspects of project. Moreover PMV is especially designed for IT based project,

#### V. CONCLUSIONS AND FUTURE ENHANCEMENTS

The viewpoints are mostly developed for the software development processes and project management viewpoints are avoided. For a successful project management we need viewpoints but viewpoints differs with the type of the project. The proposed PMV diamond has considered most of the viewpoints of an IT project considering only the most relevant viewpoints. The presented approach presents a preliminary base for successful project management especially for IT based projects that helps to pin point all necessary details and save us from missing minute details. We have validated our approach with an example and found that dependence among the viewpoints is based on the business rules affecting the project. While validating we also concluded that not all IT projects are same. Some are different with respect to details but overall most of the IT projects have same viewpoints. In future we need to find out is PMV diamond is equally applicable for project governance or not? Moreover PMV diamond needs to be validated on other experimental domains, which might bring some additional views in PMV diamond.

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