Czech University of Life Sciences Prague

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Diploma Thesis

Trade-off Analysis in ITS Project Management:

Virtual Infrastructure Projects in DHL with a Specific Focus on Time Management

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Trade-off Analysis in ITS Project Management: Virtual Infrastructure Projects in DHL with a specific focus on Time Management

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Objectives of thesis

DHL is a large corporation providing services almost in every country. The corporation's ITS Projects have been brought under the control of the Prague Project Management Office. Both business and company sides are affected by the performance of the Project Management Teams. For that reason, communication and cooperation within virtual teams is a part of every day's work.
The different time zones, shifts, holidays, national holidays, sick days or even different priorities can lead virtual infrastructure teams into failure. To avoid this problem, sometimes Project Managers use common methods of Project Management; sometimes they improvise according to their own experience.
The major objective of this thesis is to analyze the role of the time factor in managing ITS Projects held by DHL IT Services in Prague, and its impact on the business and the company.

Methodology

First of all, the main aspects of the Project Management such as time, cost, scope and quality will be investigated in regards to their relationship.

Secondly, Time Management methods will be investigated in reference to tradeoffs.

After that, variables will be identified from the observations of the finished projects and their final reports.

To do that, different types of projects and different Project Managers will be included in the study in order to provide variety. Personal Interviews and questionnaires will be used to collect secondary and statistical data.

Finally, with a focus on "Release to Production" (RTP) Date, all the findings will be gathered under the Trade-off Analysis to understand what has been given up by the Project Managers during the projects in order to maintain time efficiency.

The proposed extent of the thesis

Approx 60 – 70 pages

Keywords

Project Management, Trade-off analysis, Time management

Recommended information sources

Beise et.al. 2007 ”IT Project Managers’ Perceptions and Use of Virtual Team Technologies” in IEEE Engineering Management Review, vol. 35, no. 4, pp. 26-26

Copertari, Luis F. 2002. ”Time, Cost And Performance Tradeoffs In Project Management”

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Sanchez et al. 2017 “Cost and time project management success factors for information systems development projects”International Journal of Project Management, Volume 35, Issue 8, pp 1608-1626

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Declaration of Honor

I declare that I have worked on my diploma thesis titled "Trade-off Analysis in ITS Project Management: Virtual Infrastructure Projects in DHL with a specific focus on Time Management" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on the 26th March, 2019 ____Omer Caglar Umit____

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Abstract

In spite of almost seventy years of efforts to advance the management of Information Technology (IT) projects, project managers can still face difficulties. Historical data shows that there is no single factor that can be addressed by a project manager to guarantee success or avoid failure under certain constraints. There can be various factors affecting the nature and the performance of the projects. The main aim of this research is to investigate this phenomenon through a case study by using the available data sample extracted from one hundred remotely managed projects, DHL Supply Chain and DHL Express Server Migrations, which were performed for thirty countries' infrastructural development in one and a half years. In order to address and build the case study , and to understand how and why, if any, project overruns or tradeoffs occurred in the schedule performance; the relevant literature, project performance analyses and other empirical studies are examined with a specific focus on schedule and time distribution as well as scope verification from a phase-to-phase perspective. The empirical findings and statistical results of the analysis is expected to be beneficial for future studies on Remote Infrastructure Management (RIM) time performance analysis and process improvement.

Key words: IT Project Management, Remote Infrastructure Management, Project Time-Performance Analysis, Time Management.

Abstrakt

Navzdory téměř sedmdesáti letům snah o řízení projektů informačních technologií (IT), mohou projektoví manažeři stále čelit potížím. Historická data ukazují, že neexistuje žádný faktor, který by mohl projektový manažer řešit, aby za určitých podmínek zaručil úspěch nebo se vyhnul selhání. Povahu a výkonnost projektů mohou ovlivnit různé faktory. Hlavním cílem tohoto výzkumu je prozkoumat tento fenomén prostřednictvím případové studie s využitím dostupného vzorku dat získaných ze stovky vzdáleně řízených projektů DHL Supply Chain a DHL Express Server Migrations, které byly provedeny pro rozvoj infrastruktury ve třiceti zemích v rozmezí jednoho a půl roku. Aby bylo možné adresovat a sestavit případovou studii a pochopit, jak a proč, pokud vůbec, došlo k překročení projektu nebo kompromisům v plnění plánu; zkoumá se příslušná literatura, analýzy výkonnosti projektů a další empirické studie se zvláštním zaměřením na rozložení harmonogramu a času a také ověření rozsahu z hlediska “phase-to-phase” perspektivy. Očekává se, že empirická zjištění a statistické výsledky analýzy budou přínosem pro budoucí studie analýzy vzdálené správy infrastruktury (RIM), časových výkonů a zlepšování procesů.

Klíčová slova: IT projektový management, vzdálená správa infrastruktury (RIM), analýza časových výkonů projektů, time management.

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List of Abbreviations

ANN	Artificial Neural Networks
APAC	Asia Pacific Region
CAB	Change Advisory Board
CPM	Critical path Method
CTTO	Costi Time Trade-offs
DBIA	Design-Build Institute of America
DHL	Dalsey, Hillblom and Lynn (Company name)
DP	Deutsche Post
DPDHL	Deutsche Post DHL
DSC	DHL Supply Chain
ES	Earned Schedule
FTP	File Transfer Protocol
GDPR	General Data Protection Regulation
GWSS	Group Wide Server Standards
HTTP	Hypertext Transfer Protocol
IDM	Infrastructure Delivering Management
IS	Information Systems
ISD	Information System Development
IT	Information Technology

ITS	Information Technology Services
MLEME	Mainland Europe, Middle East & Africa
MRE	Magnitude Relative Error
NASA	National Aeronautics and Space Administration
NPV	Net Present Value
OAT	Operational Acceptance Testing
PeP	Post-e-commerce-Parcel
PERT	Program Evaluation and Review Technique
PIR	Post Implementation Reviews
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMO	Project Management Office
RFC	Request for Change
RIM	Remote Infrastructure Management
RTP	Release the Production
RUP	Rational Unified Process
SBF	Server Build Form
SLA	Service Level Agreements
SM	Support Models

1 Introduction

Since the project based outcomes have become many organizations' common expedience, the effective utilization and management of projects is crucial to stay competitive as of late. During the time, there have been many improvements in technology as well as in understanding project management effectiveness, project success, project managers, leadership styles, project process, organizational structure et cetera. Owing to the fact, new mathematical explanations, new project scheduling methods, costing methods, critical analysis, different leadership methods and increasing empirical studies on the complexity of relationships between human capital and technology are emerging in our everyday life (Newton, 2018).

These rapid changes in the nature of work may constantly impose organizations to adapt new practices, and to develop distinctive management tools as a result of dependency upon the proper use of information as well as technology. As a matter of course, this growing awareness towards technology and the usage of information can lead such sectors to identify Information Technologies (IT) and Information Systems (IS) as a key to success in business (Sanchez, Terlizzi, De Moraes, 2017). Even though the relevant literature highlight the fact that there are different interpretations of success (Hidding and Nicholas, 2017) in project management practices, in this study, success/failure perceived from IT projects are at issue rather than success/failure perceived from IS attributes.

Projects might be seen as just completely instrumental. However, there is a huge social process involved in the delivery of a project such as autonomous human actions based on various human, organizational and institutional interests and the ability to achieve more in a group structure. This broader approach allows researchers and specialists to recognize projects as socially constructed systems. In fact, it also helps flexing the boundaries within which stakeholder and management action is considered lawful. Therefore, it allows for multiple perspectives (Sauer and Reich, 2009).

The role of the technology in complex social networks cannot be underestimated. As an example, In 1960s, according to James E. Webb, the former administrator of National Aeronautics and Space Administration (NASA), rocket technology programs were generating big, expensive and long- term relationships involving organized effort over eighty nations, more than four hundred thousand people, twenty thousand industrial units, and two hundred universities. For that reason, many highly trained professionals were required to work for larger deals such as team goals where uncertainty, high amount of time and efforts are expected to be decreased (Sayles and Chandler, 1971). In Information Technology Services (ITS) Projects of large scale organizations, where human capital and technology elements are interrelated, these given uncertainties and complexities can lead project managers to continuously reformulate their strategic goals to meet their implementation goals (Söderlund, 2012) in order to deliver on time, effort, budget, or scope.

There is a common belief that all these objectives cannot be simultaneously achieved at the same time (Gill, 2008). Because, depending on the implications or the impact, regardless how routinely and easy the decisions are made in the process, there is always a chance that one day those decisions might go beyond the scope affecting a large number of project stakeholders or limiting the project resources involuntarily. It is also possible to have an impact on the assessment of the project's success or failure by encountering one-off decisions (Vahidi and Greenwood, 2010). On the other hand, when accelerating projects, some of the project tasks can be completed faster than planned by either spending less time on them or allocating more resources than planned in the first place. Thus, accelerating a project may increases its cost where minimizing the duration of tasks may decrease their quality and overall project quality (Orm and Jeunet, 2018). The methodologies which are treating time, cost, scope, effort, quality or other project objectives as interdependent dimensions compromised on one another are described as "Trade-offs" in the Project Management literature (Vahidi and Greenwood, 2009).

1.1 Project Management

"The Roman bridges of antiquity were very inefficient structures. By modern standards, they used too much stone, and as a result, far too much to build. Over the years we have learned to build bridges more efficiently, using fewer materials and less labor to perform the same task." (Clancy, 1994-, p.1165). As the author emphasized in his book, large and complex projects in some form have existed for thousands of years, and the aspects of managing complicated activities can be derived particularly from the construction of the wonders of the world. However, efficiency and the accuracy of those managed projects have always been subject to controversial topics among professionals for a century. Because, every business and observer might own unique values and standards regardless the similarities in their project execution.

Depending on different approaches and perspectives, different interpretations of success and failure may arise from the same subject. For example, when Clancy (1994) was mentioning about delivering tasks on time and on budget as a strong condition of efficiency, Bob Lewis was addressing his words as follows; “At the risk of quibbling with Mr. Clancy, some of those Roman bridges are still standing almost two millennia later, while some of our more efficient ones have tumbled into the bay. Adherence to budgets and schedules is our pre-eminent ethic. One suspects Roman held different values.” (Lewis, Bob, 2000, p. 78).

Despite Clark’s opinion, Bob Lewis thought that the key to success in managing large projects is not just being concerned about the time and the budget spent, it is also following the right steps in the right order by maintaining the quality throughout the whole process. As can be seen from the example of Roman bridges, various opinions were expressed by various people for the same events. In that matter, following part investigates most known distinctions between inferences according to their trade-off indications.

In the beginning of 20th Century, project management was already formed into a modern structure owing to improved engineering systems and globalization of management disciplines. At that time, Henry Gantt took the lead, and “Gantt Chart” was developed during the World War I. It was used in scheduling large projects such as the construction of the Hoover Dam, in the 1930s (Brandon, 2006). Eventually, subsequent contributions came as no surprise.

Program Evaluation and Review Technique (PERT) was developed by the Navy of United States of America in 1958. It began as a medium for scheduling the development of weapon systems (UGM-27 POLARIS Missile Program), and the projects were understood to be an acyclic network of activities and consequences. With this algorithm, the project duration is estimated by a network flow plan where each task of the project has an expected value and a variance to estimate the probability of completing either a project or individual activities by any specified time and a given probability (Cottrell, 1999). In the late 1950s, James E. Kelley, Jr. and Booz Allen Hamilton proposed a framework with a parametric linear programming called "Critical Path Method (CPM)" which has the objective of computing the benefits of a project as a function of its duration to solve scheduling and planning problems of large projects such as "UNIVAC I". In this approach, it was believed that an advantageous project schedule that has maximum utility among all applicable schedules of the same project duration can be obtained. Not just the project as a whole, the authors also believed that this methodology can be applied to each project duration steps significantly when the design, procurement or construction functions are concerned in the project (Kelley, 1961). However, if the project is planned in such a way where none of the single paths connect each other throughout the process, then there is no critical path (Goodpasture, 2004).

Dr. Martin Barnes (1988), one of the famous known trade-off theorists in project management, introduced construction project's time, cost and performance boundary by illustrating a triangle to emphasize the importance of managing quality besides time and cost (Vahidi and Greenwood, 2009). Also known as "the Iron Triangle" or "Triple Constraint", suggest that each constraint is connected and moving one point of the triangle will impact the other two points in order of flexibility, from least to most (Dobson, 2004). Barnes (1988), also believed that main control mechanisms of cost and time are equally applicable to control and management of the quality. However, this theory was just a beginning of a new school of thoughts which is still followed and contributed today by many different academicians and project management professionals all around the world. De Wit (1988) suggested that when costs are used as a part of the control mechanism, they measure the progress, which is not the same as success. Because, he underlined a distinction between project success and the success of the project management effort even if they are related.

Sunde and Lichtenberg (1995), argued that James E. Kelley, Jr.'s Critical Path Method (CPM) ignores the stochastic effects which can cause a delay with high probability. Thus, they introduced another trade-off model, Net Present Value Cost Time Trade-offs (NPV CTTO) that suggests crashing selected activities as one unit each time can increase the net benefits each time by decreasing the maximum number of possible crash combinations. Ordinarily ignored stochastic effects were included and formulated in the model this time.

Babu and Suresh (1996), assumed that the quality of a completed project may be affected by crashing the project tasks, and they proposed a framework to study simultaneous trade-offs among time, cost and quality using three linear programming models instead of Critical Path Method (CPM) where cost varies linearly with activity completion time.

Atkinson (1999), stated that accepting the Iron Triangle as base success criteria can result in biased measurement of success in project management. He stated that there can be more than just two best guesses and a phenomenon. Time resource is assumed to be finite which differentiates project management practices from most other types of management. He also pointed out the fact that using the Iron Triangle cannot explain type II error which means something was missed inattentively by the team on the way.

Ke and Liu (2004), established a hybrid intelligent algorithm to solve problems caused by the uncertainty of activity duration times in project scheduling problems which are assumed to be stochastic. Ke and Ma (2014), formulated an approach to the fuzzy random environment where the project completion duration may be affected by many nondeterministic factors, such as the change of weather, the increase of productivity level and the use of extra labor. Mohammadipour and Sadjadi (2016), proposed a multi objective mixed integer linear programming to determine which task should be shortened and how much this reduction should be when shortening the time of a given task increases not just the cost, also risk enhancement and quality alteration.

The field of project management is relatively large including construction, engineering, healthcare, finance, law, and technology (Harrin, 2018). In consequence, there are numerous interpretations of success as well as trade-off decisions that a manager can make. In that respect, following parts investigate solely and exclusively the nature of project management practices which take place in the development of Information Technology Systems (ITS).

1.2 Information Technology & Project Management

IT project management appears to go back to the 1950s, when the Critical Path Method (CPM) was developed and used during the installation of UNIVAC I (Brandon, 2006). In spite of almost seventy years of efforts to advance the management of Information Technology (IT) projects, failure rates may stay high. Aside from the other fields, the changing nature of technology plays a major role in the assessment of success and failure of those IT-enabled projects, since project success and system success are related (Hidding and Nicholas, 2017). At the same time, project managers in IT has been upgrading their managerial skills constantly to remain competitive. Sometimes, these managerial abilities may require being inquisitive, finding the best out of mixed technologies by using the current technologies or acquiring different technologies when it is needed (Nwagbogwu, 2011). It has been found that IT project managers were also receiving challenges from technical complexities, changes in technology, changes in data protection, change involved projects, virtual teaming, instability and interdependence of the environment (Sauer and Reich, 2008).

In 1994, the Standish Group, an IT research advisory firm, conducted a survey for their annual Chaos Report with the sample of 365 IT executives representing 8,380 applications to investigate failure factors in IT project management. It was claimed that large companies (with more than $500 million dollars in revenue, per year) delivered only 9% of their IT projects on planned time and on planned budget. Medium size companies (with $200 million to $500 million dollars in revenue, per year) and small size companies (with $100 million to $200 million dollars in revenue, per year) were able to deliver only 16,2% and 28% of their IT projects successfully. They also pointed out that approximately 175,000 IT application- development projects were held by those big, medium and small scale companies which spent more than $250 billion in each year. In this report, the findings of high failure rates of IT projects were expressed by addressing the Clancy Jr.'s previous quote as follows;

”But there is another difference between software failures and bridge failures, beside 3,000 years of experience. When a bridge falls down, it is investigated and a report is written on the cause of the failure. This is not so in the computer industry where failures are covered up, ignored, and/or rationalized.” (The Standish Group International, Inc., 1994).

In 1997, KPMG, a Dutch professional service company, reported a similar survey on the IT project failures with 1,450 Canadian public and private sector businesses. It was found that more than 60% of the projects were assumed failed by the respondents. Besides, more than 75% of the projects exceeded their time limits with more than 30%; more than 50% of the projects exceeded their budget more than it was planned (Whitetaker, 1999).

When the literature concerning IT projects from 1997 to 2009 was analyzed, it was found that the concept of project success was heavily employed as synonymous to project management success. Because, more than 70% of 26 publications were addressing project success by using traditional methods such as meeting time and budget constraints and requirements (De Bakker, Boonstra, Wortmann, 2010). Later on, the project scope was also introduced as another important factor when estimating success in IT projects especially when the decisions are made upon during the execution of a project due to high number of small and unexpected changes involved in the process. Therefore, when IT project managers are compelled to negotiate time overruns, milestones, and scope problems; the balance needs to be optimized in order to overcome the difficulties and to satisfy end-users (Sanchez, Terlizzi, De Moraes, 2017).

The studies in the literature are not just about finding new management tools and prediction methods for project managers to achieve more significant forecasting results; the number of research focus on the project evaluation methods is also increasing (Ahsan and Gunawan, 2010) Project evaluations, also known as post implementation reviews (PIR), are effective instruments used in organizational learning as well as in analyzing project management performance and its effectiveness (Bernroider, 2011). Because of projects aren’t the same, the evaluations methods might show differences depending on the objectives, time, environment, costs, and conformation of goods and services delivered (Nwagbogwu, 2011).

2 Research Methodology

As emphasized in the previous sections, there are many factors that affect a project's lifecycle. Historical data shows that there is no single component that can be addressed by a project manager to guarantee success or avoid failure. Both in classical and IT project management practices, project managers are facing difficulties. This is an interconnected problem with multiple causes based on the unique nature of each project and their objectives. Based on different approaches, the activities and the behavior of the project managers may show variety in terms of design, execution, monitoring, and evaluation process of the projects. For that reason, the current study aims at using alternative analysis strategies for the case study of one hundred remotely managed IT infrastructure projects in DHL by using the available data and the information from the relevant literature of project management, project performance analyses and from the relevant empirical studies in terms of their references.

The research data was primarily gathered by means of extracting data from one hundred sub-projects of two master projects, DHL Supply Chain and DHL Express server migration projects, performed for thirty different countries' infrastructure development in one and a half years. These projects are performed by a variety of project managers and contractors within the project management office. The primary data resources which are used to gather information are listed down below.

- Request for Change (RFC)
- Project tasks
- Project designs
- Communication materials
- Project activity history
- Project support models, service level agreements
- Post implementation reviews

For the secondary data gathering, personal interviews with relevant managers were conducted to investigate the main aspects of the remote infrastructure services in DHL, project objectives, project milestones and particular reasons for delay in each determined project. The personal interview questions are presented in the Appendix.

2.1 Research Questions

The research questions addressed in this study are:

Q1: What kind of, if any, overruns and underruns exist in the schedule performance of one hundred selected Server Build (RIM) projects, in DHL IT Services, Prague?

Q2: How, and why, if any, those overruns and underruns occurred in the schedule performance of one hundred selected Server Build (RIM) projects, in DHL IT Services, Prague?

2.2 Goals and limitations

As a research goal, the empirical findings and statistical results of the analysis is expected to be beneficial for other research studies on RIM process improvement, and for the future project management teams who are subjected to infrastructural development projects in IT Services.

Due to the company confidentiality and General Data Protection Regulation (GDPR) in European Union law, the descriptive data of the projects, the financial performance of the projects and descriptive/personal data of the project teams are not included in this research. Every project is represented with a special country code instead of a country name. Due to the limited resources, the analysis only include one hundred completed projects with a specific focus on time performance.

2.3 Research Strategy

In the first step of the analysis, the percentage project time overruns and underruns are presented with a country-wise comparison. After that, total amount of time spent on each for phase for each country was counted and visualized. Based on the high numbers of the delayed projects, the investigation followed with determining the dispersion of each country's time overrun data around total time variance mean of the particular project type. Hence, countries with higher values than the average delays are selected and narrowed down to a list. To understand the time-effort tradeoffs between project phases throughout their processes, the actual and weighted-averages of time distribution of each project is compared, the projects which experienced proportional increase in their phase durations were estimated, and demonstrated accordingly. In order to estimate the delayed projects which experienced time overruns in different phases during the process flow, each project was observed with regard to their sequence of events in the process flow and the problematic phases were pointed out by their proportional overruns. After every delayed phase and project in the change was reviewed and personal interviews were conducted with the relevant project managers, the real reasons of each delay are listed based on particular activities and events.

According to the grounds of this research, the following section continues with investigation of the literature which is relevant to the post- project analysis of IT project management performance based on project objectives, lead time and effort.

3 Literature Review

The scope of this chapter consists of the topics which are relevant to the research in order to correctly address and build the case study. In consideration of the nature of project management and information technology systems studies as discussed in the previous chapter, the literature review concentrates on remote IT Infrastructure projects and applicable research models in the field. Further, relevant case studies and performance analyses are reviewed in accordance to their adaptability in the analysis part of the available data in order to demonstrate more significant results as well as to provide context to the reader.

3.1 Remote Infrastructure Management (RIM)

In remote infrastructure management (RIM) services, the project is usually monitored and managed by a service provider whose geographical location is different than the client and the entire physical infrastructure. The build process is usually controlled and monitored through software systems, e-mails, electronic documents and the internet. The service provider can access the client's network and infrastructure servers for build activities by controlling access to physical devices, data, and operating environments. In this way, service providers may save their time, reduce their costs for the client, and they can easily increase their export revenues (Mathew and Das Aundhe, 2011). Many large organizations are participating to the operation and provision of RIM services across geographies with the help of their various globally-functioning business units or global business partners (Mehta, 2017). This rapid growth and the increasing demand for RIM services motived companies to simplify their complex infrastructure systems by investing more in the management of virtual storage related services, physical devices, and enhancing new efficient integration methods (Xavier, 2018).

According to NASDAQ OMX Corporate Solutions' report in 2018, RIM Market growth was around USD 23, 65 Billion in 2017. Their forecast results for 2022 shows that the market can grow up to USD 41, 27 Billion, at a compound annual growth rate of 11, 8% (NASDAQ OMX Corporate Solutions, Inc., 2018). The report also stated that Asia Pacific (APAC) region has a huge potential in this growth because of increasing competition among enterprises to become larger and the increasing demand for virtual database services in the region.

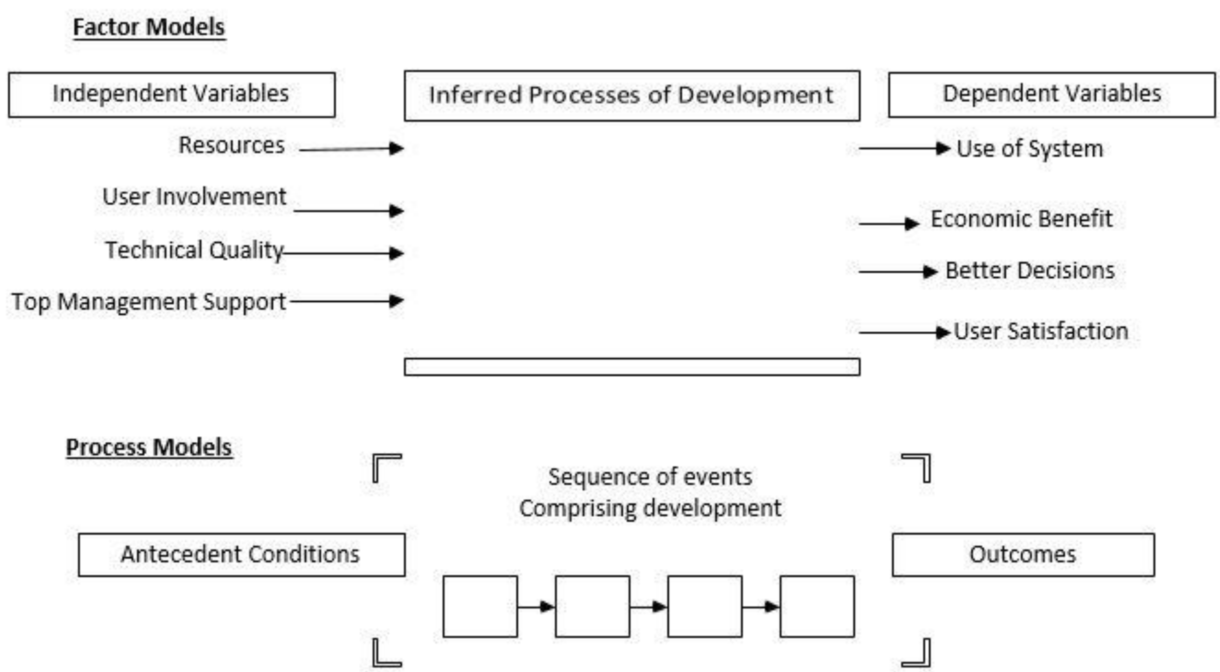
When compared to RIM services, the local IT management can be expensive and time-consuming process which sometimes require the administrators to be physically present during an incident (Avocent Corporation, 2006). Software infrastructure projects might have shorter contracts with less support hours to the client and they can be limited to project- based activities, whereas RIM provides continuous services with longer support hours (Hawk, Zheng, Weijun, 2009). On the other hand, there are also cases that RIM operations might also cause some troubles for the stakeholders. For example, in 2011, Artificial Neural Networks (ANN) investigated the reasons of success and failure of RIM build processes, and they classified some of the advantages and operational issues of RIM projects. Such as people related issues, internet connection issues, unclear responsibility matrices, unclear outsource support, poorly defined roles and tasks, lacking architecture documentation for system and security were addressed in the list of possible issues of RIM services (Ahuja and Sood, 2011).

3.2 Research Models

Traditionally, the knowledge of cause and effects of human behavior was densely embraced by the viewpoint on causalities and the physical causes of organizational activities. In 1982, Mohr explained this association as follows; “Thus, our knowledge of cause and effect comes always from diving into two segments the events specified in the definition when a force is felt by certain parts of body. Some of the events we interpret as the motion associated with the force and some as the identity of the force itself. It is the former events- the set of associated motions- that we categorize in light of the sensation of transfer of momentum to be a physical event. The other events -the feeling of the wind in our faces, the hurt of the blow to the shoulder, the effort of pushing the two magnets together- these are how we know the force is there.” (Mohr, 1996, p.46). Later on, this theory of process and factual causes was adopted by other researchers in the literature of information systems in which they distinguished the research approaches between different performance analyses.

Newman and Robey (1992) did a research on user- analyst relationships, and they suggested that factor and process approach can be used in research models for information systems. Vlasic and Yetton (2004) stated that project management theoretical arguments on research models for information system development projects have been categorized as either factor research models, or process research models (Sun and Zhang, 2006). The main purpose of factor-focused research models is associating the level of goods and services produced with a level of predictor by inferring their causal relationship. Therefore, this type of models do not explain how those outcomes occur, they explain how and why predictors and outcomes are related. On the other side, process-focused research models illustrate the degree of association between predictors and the results. They focus is on sequence of events over time in order to explain how and why particular results are gained (Newman and Robey, 1992). Figure 1. 1 illustrates Newman and Robey's factor and process research models of system development projects. Even though factor and process models consider different types of data, they can be treated as two models that share similar research goals. Therefore they can be also applied simultaneously to the research as Vlasic and Yetton (2004) performed in their work.

Figure 1. 1: Factors and Process Models of System Development



Source: Newman and Robey (1992), p.250-265.

3.3 Post-Project Performance Analyses

Corovic (2006), made a comparative study of performance indicators for project performance analyses. As a sample, the author used the data of one IT project with five consecutive occasions within its schedule. After the estimations, it was found that earned schedule (ES) indicators were more useful if the research focuses principally on the time or on the schedule performance of the projects especially in IT field.

Gunawan and Ahsan (2010) focused on project cost and schedule performance issues, and the main reasons for poor outcome of selected international development projects. They looked at one hundred projects hosted by several Asian banks, and they identified the root causes of project delays and cost underruns. They made a sample size comparison of cost and schedule variations, and then another comparison of overall project performances. They found that the projects delivered the latest experienced cost underrun.

Vlasic and Yetton (2004) investigated the how task variance and task dependence influenced the schedule's level and its variances. They analyzed four different information system development (ISD) projects which were either completed or underway in that time. They examined the projects individually and then compared them to inspect similarities. After, they stated that project overruns were a function of the interactive effect resulted from using both the level of and variances in project performance against schedule.

Chen et al. (2015) analyzed a set of 418 design- build type of projects from the database of the Design- Build Institute of America (DBIA). They identified the rates of cost overruns and cost saving as well as the time performances in terms of time-overrun rate, cost overrun rate, early start rate and early completion rate. To do that, they first categorized the projects according to their characteristics. Further, they calculated the distribution of time overrun rates and they made tests on time performance within characteristics to capture the differences.

As highlighted in this section, there are different types of post- project performance analyses and they may provide different answers to different questions. As a matter of fact, different evaluation methodologies can be mixed and applied when the observer count different characteristics in. To give an example, Moraes and Laurindo (2013) conducted a questionnaire with thirty-seven IT professionals whose work experience on IT projects ranged from 2 to 15 years. They explored the importance of various performance criteria in ex- post evaluations of IT projects especially when each dimension of performance varies with different aspects. Five different ex-post performance evaluation methods from five different authors were included in a factor analysis to determine which author's recommendations was a better fit for the respondents in analyzing project performance. It was found that the methodologies which covered multidimensional characteristics of performance analysis were chosen by the majority.

3.4 Summary

One of the specific aims of this research is to develop an alternative analysis strategy for the case study by using the available data and the information from the relevant literature of project management, project performance analyses and from the relevant empirical studies in terms of their references. The previous chapters in this research reviewed the literature in order to provide a guidance to researcher in assessing which suitable approaches and analytical tools might be used in the practical part of the work, the case study analysis.

The empirical studies on ITS project performance, especially on architect-led design-build type of remote infrastructure projects, exposes the limitations of traditional approaches in current non- traditional IT project management practices. However, existing empirical post-project performance analyses show that there are no specific rules such as assigning only one approach and one analytical methodology at a time. In fact, there can be multiple approaches and various performance analyses employed at the same time.

The following chapter indicates the chosen research methodology and approach specifically for the process performance analyses of one- hundred remote infrastructure projects managed by the project management office in DHL ITS, Prague.

4 Practical Part

4.1 Deutsche Post DHL Group

Before 1970s, the freight shipments were taking a long time to arrive due the long waiting queues and documentation work at the harbor customs of destined locations. In 1969, Adrian Dalsey, Larry Hillblom and Robert Lynn took a step forward, and they founded a company named DHL which stands for the initial letters of their last names. The main business idea was to be able to reduce the amount of time taken by the customs to process those freight shipments, and to gain the customer satisfaction. If they could manage to transport the customs documents by air arriving earlier than the actual shipment, they could save significant amount of time at the end. Under the circumstances, they personally transported cargo documents from San Francisco to Honolulu by planes, and they accomplished to shorten the amount of time spent with processing shipments (Deutsche Post DHL Group, 2018).

The partnership of Deutsche Post and DHL International started back in 1998. When Deutsche Post decided to increase and intensify their majority interest in DHL, they acquired twenty- five percent share of Lufthansa Cargo in 2002. In this way, Deutsche Post increased their majority stake up to seventy-five percent. Very short period after the merge, the remaining two investment funds of DHL and the shares of Japan Airlines were acquired by Deutsche Post AG (operates under the trade name DPDHL Group). As a result, DHL become a completely owned subsidiary of the Group (Deutsche Post DHL Group, 2018).

Today, Deutsche Post DHL Group is one of the largest leading corporations that provide many solutions such as shipping, domestic and international pick-ups, e-commerce, logistics, warehousing, managed transports and other value- added services to over 220 countries and territories across the globe with more than 350,000 employees (DHL Express, 2018). In table 1, this integrated services and costumer focused solutions to manage letters, goods and information are summarized, and grouped as corporate divisions and business units of DPDHL Group.

Table 1. 1: DPDHL Group Corporate divisions, 2018.

	Deutsche Post DHL Group Corporate Center				
	Deutsche Post	**DHL**			
Corporate Divisions	Global Mail- Dialog Marketing	Express	Forwarding - Freight	Supply Chain	Global Business Services
Business Units	DHL Post – e-Commerce – Parcel	DHL Express	DHL Global Forwarding and Freight	DHL Supply Chain	DHL IT Services

Source: In-house Resource A (2018).

- *DHL Post – e-Commerce – Parcel (PeP)* operates the shipment of mail and light-weight merchandise as well as international shipment for their business customers in key European mail market. They offer international dialogue marketing services, consulting and communication solutions for international business clients.
- *DHL Express* unit deals with urgent documents and goods that are transported from door to door with a pre-defined delivery time. They also provide medical services to life sciences and healthcare sector such as thermal packing for temperature- sensitive materials and technical products.
- *DHL Global Forwarding and Freight* provides standardized and multimodal transport or individual solutions for the clients including brokering transport services between them and freight carriers.
- *DHL Supply Chain* focuses on Customer-centric outsourcing services in warehousing, transport and value-added services which include planning, sourcing and producing for logistics partners.

Due to the limitations and the focus of the research, following parts merely concentrate on DHL IT Services, management divisions and the remote infrastructure projects.

4.2 DHL IT Services

DHL IT Services is responsible for building and running different IT and infrastructure solutions for the Deutsche Post DHL Group. The unit also supplies the information and technology needs of their customers and colleagues, and they focus on the protecting DPDHL from harm by providing services such as information security, data protection and privacy, business continuity and recovery from disasters. Today, DPDHL can process approximate number of 20,000,000 shipment information per day, millions of business partner electronic data interchange, more than 200,000 service desk contacts monthly with corporate telecommunications network across more than 220 countries (In-house Resource A, 2018). When the size of the company and the quantities of daily data transaction are considered, an efficient and secured system is required. In this respect, there are different management divisions with different responsibilities working jointly for the same business goals of DHL IT Services. This global management network of DHL IT Services is presented in table 2.

DHL IT Services leverages a multinational workforce of 3,500 professionals, and they are located in different continents according to their provision and business requirements. The main offices and data centers are located in Czechia, Malaysia, Germany, and the U.S.A. In this way, these global data centers enable IT Services to deliver predictable service performance 24 hours a day around the world (In-house Resource A, 2018).

The scope of the analysis is only related to the projects and the project management performances in the department of Server Transfer Center of Competence in DHL IT Services, Prague. For that reason, the following chapters focus on the relevant environment in the research.

Table 2. 1: Management Network in DHL ITS, Global Business Services, 2018.

<table>
<tr><th>Governance</th><th colspan="3">Risk, Compliance, Information Security</th><th colspan="3">ITS Performance Improvement</th></tr>
<tr><td>Relationship & Demand Management</td><td colspan="3">Proposal Management</td><td colspan="3">Shared Services Demand Management</td></tr>
<tr><td rowspan="6">Build & Run</td><td colspan="3">Project Management</td><td colspan="2">Incident & Request Management</td><td>Problem Management</td></tr>
<tr><td>Application Build</td><td colspan="2" rowspan="2">Acceptance & Handover</td><td colspan="2">Service Operation & Support</td><td>Capacity & Effort Management</td></tr>
<tr><td>Infrastructure Build</td><td colspan="2" rowspan="2">Configuration Management</td><td rowspan="2">License Management</td></tr>
<tr><td colspan="3">Change Management</td></tr>
<tr><td colspan="6">Service Level Management</td></tr>
<tr><td colspan="6">IT Service Continuity Management</td></tr>
<tr><td rowspan="2">Enabling
Process</td><td colspan="2">Resourcing & Onboarding</td><td colspan="2">Employee Career Management</td><td colspan="2">Investment Management</td></tr>
<tr><td colspan="2">Order to Cash</td><td colspan="2">Purchase to pay</td><td colspan="2">Supplier Management</td></tr>
</table>

Source: In-house Resource B (2018).

4.3 DHL IT Services, Prague

Just like the other DHL IT centers around the world, DHL IT Services in Prague provides security, high-availability and disaster-resilient environments for the business- critical applications and needs at a quality and price level that is competitive with the market while retaining trademarked information and knowledge within the Group. Their infrastructure is designed for current and future technologies allowing adaptation to new solutions in line with business investment plans. The globally functioning data centers in Prague enable IT Services to deliver services twenty-four hours a day and provides support services hosted according to the agreed service levels. These services also include hosting private cloud servers which allow automated self- provisioning of Windows and Linux virtual machines for Production and Test/Development purposes. According to the company estimations, there were approximately 1,200 IT professionals just working at the Prague offices in the beginning of 2018. The purpose of this study is to analyze the role of the time factor in managing RIM infrastructure Projects completed by DHL IT Services in Prague, and to analyze, if any, trade-offs performed during that period of time. Thus, next section investigates the objectives of RIM infrastructure projects processed by the project managers of Project Management Office (PMO).

4.4 Project Management Office (PMO)

The Project Management Office (PMO) is responsible for the standardization of almost six thousand Business Unit and third party-managed servers for whom choose the support from IT Services. They are responsible for carrying out the principles set by Group Wide Server Standards (GWSS) across DPDHL Group. They process the designs, proposals, and migration activities to transfer business unit- managed servers under the protocols of ITS. Optimization and automation services are provided for the Server Build process to increase scalability as well as in supporting processes such proposal and order creation.
The objectives of the center is taking two different approach to its activities. One of them is Build Factory Approach where exchange-to-exchange build teams are set and escalated to perform the tasks related to the transitions with a certain capacity per week for both RIM and physical locations. The other approach is the Transition, and it concerns the application of ITS principles to prepare the environment to become one of GWSS compliant (In-house Resource A, 2018). The scope of the center includes all regions, countries and divisions that ITS can provide RIM and physical database services. In fact, this transformation resulted in significant number of server footprint reduction in two migrated units, by 30%.

Initiation process starts when IT architects validate the information from the business unit and prepare the drafts of project high level designs with input build and run cost estimates. ITS project managers run and monitor the data collected by the business unit, they process the high level design prepared by the IT architects. And then, proposal manager propose the final financial build and run estimates based on the designs. ITS Project Manager presents the proposed scope of the project together with the approach, principles, timelines, and governance model. Thus, the project is moved forward for build and transition under a Request for Change (RFC). Besides, there are also supporting materials such as Service Level Agreements (SLA) and Support Models (SM) prepared between the project managers and the business to clarify responsibilities, targets, maintenance windows and security requirements. In table 3, the life cycle of the project is given from end-to-end view in order to specify the responsibilities of project management office in accordance with the life cycle of the project.

4.5 Request for Change (RFC)

RFCs are project management instruments used in DHL IT Services for defining project scope, getting the approvals, assigning build and run tasks, testing and monitoring the whole implementation activities from beginning to the closure of the project through its life cycle. The tool can be used in analyzing time performance since it automatically records a traceable activity history that allows project managers to determine whether the project meets predetermined objectives or not. In this way, the company aims at simplifying, managing and improving the process to achieve business objectives by avoiding risks of disruption, high documentation costs and poor implementation (In-house Resource C, 2018).

Furthermore, there are different types of change carried out within service management tools. These types are defined as preauthorized, standard, minor, significant and major change with low, medium and high priority options.

- *Preauthorized/ Standard Change* is usually used by the service owners. The change needs to be non- disruptive, implemented by only one group and it should have low impact and low risk for the IT Services and the Business.
- *Minor Change* is used for non-critical implementations with no outage for the business. In this change, failure does not impact other customers and the change roll- back is easy and quick.

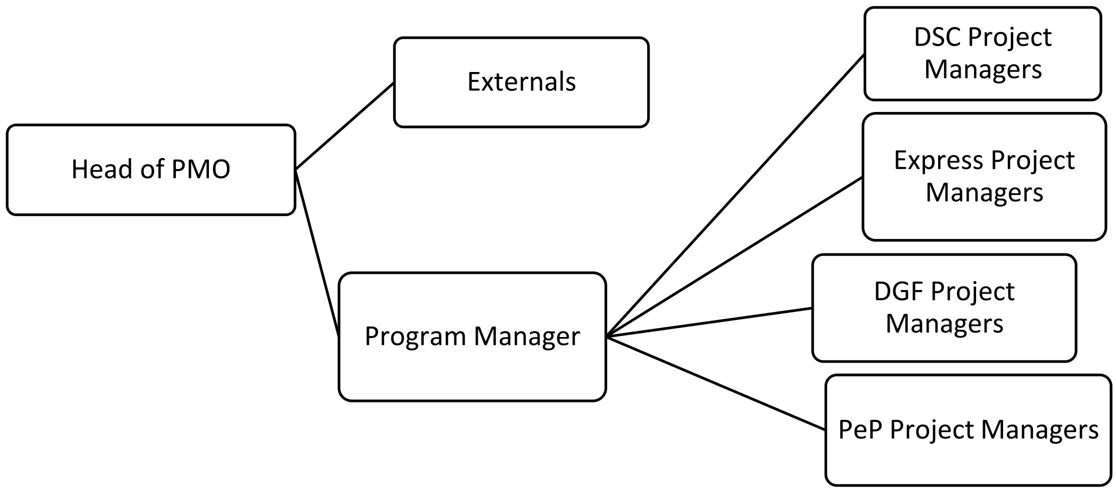
- *Significant Change* represents significant impact, outage or risks that exist for the IT services. The change is performed by co-operation of different departments or business units. It also requires server reboot or application restarts during the implementation.
- *Major Change* poses substantial risks of disrupting vital services and it is a part of the critical part of the business. In addition, it has an impact on high percentage of users across the global organization.

The data selected for the analysis of this research are in the category of significant change. Because, these projects have significant impacts on the infrastructure environment together with component tasks, roles and responsibilities assigned to different teams. The details of these projects and the certain responsibilities are discussed in the following sections of this Chapter.

4.6 Server Migration/ Transition Projects in PMO

In order to achieve GWSS compliance, PMO's main objective is to migrate or transfer DHL Business Unit- managed servers by either taking them under the ITS support with either remote Infrastructure services, or with the help of different physical data centers in DHL IT Services around the world. These business units are DHL Post –e-Commerce – Parcel, DHL Express, DHL Global Forwarding & Freight, and DHL Supply Chain. Every unit has a steering board, project co-Leads, finance and design Support for their projects. Figure 2. 1 represents the department organizational chart for the projects in PMO.

Figure 2. 1: PMO organizational chart, Induction document.



Source: In-house Resource A (2018).

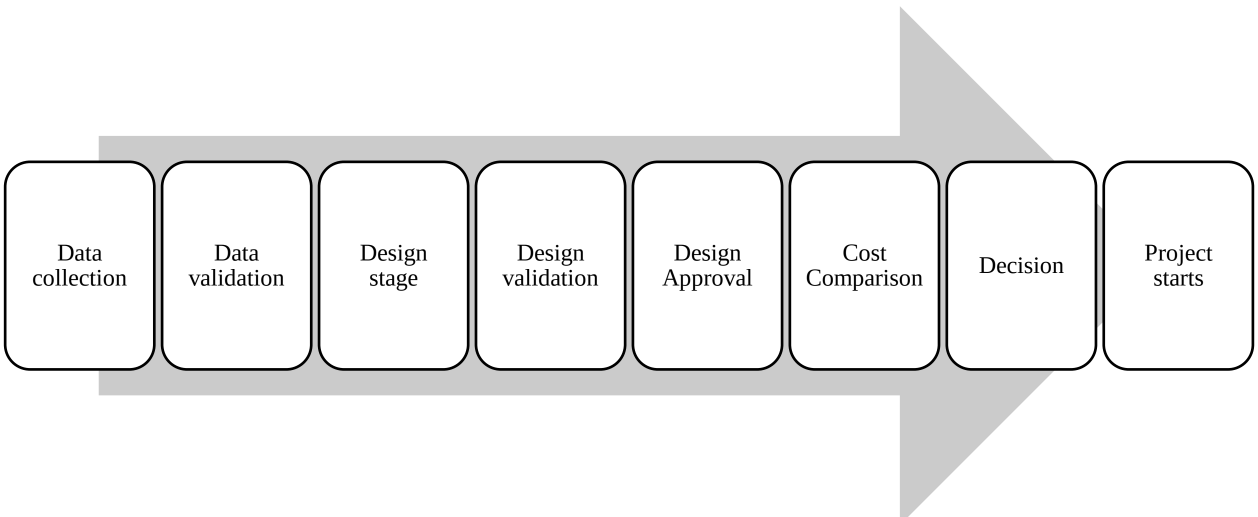
PMO managers deal with three types of projects in building servers regardless of the business units. These types are as follows;

- *Server Build under RIM*
- *Server Build in Cloud*
- *Server Build of Virtual or Physical Machine*

All these Server Build projects are aligned with GWSS, and follow the rules of ITS Infrastructure Standards. However, as emphasized earlier, the projects and the execution methods in PMO may vary depending on the approach and activities. To build a Cloud server, project managers access to the cloud portal via a cloud group and they create the hosting services for the client business unit. Managers also provide support in building the cloud servers, and the servers are ready for application or installation in short period of times. The virtual and physical servers are built in- country, and the aim for these projects is to reduce in-country server footprint by centralizing the data to regional datacenter as well as to provide a better and interconnected infrastructure system within the Group. To avoid the risks of internet breakouts, confidential data loss and other disasters; there are different methodologies followed in building virtual and physical machine servers in countries. As a result, different procedures are followed based on the solution.

Before the execution, all of these types follow the same engagement process as their initiation activities. These steps are illustrated in Figure 3. 1 according to their order.

Figure 3. 1: PMO Project Engagement Process, 2018.



Source: In-house Resource A (2018).

Nevertheless, when the project actually starts, it may go through a different project life cycle in relation to its type. The data collected for this research is limited to only DHL Supply Chain (DSC) and DHL Express projects which are completed and taken under the RIM services with ITS support. Both of the business units follow RIM- build objectives of PMO projects, and they have the same project life cycle in change. For that reason, the next section investigates the Server Build (RIM) project life cycle and its process phases.

4.7 Project Life Cycle of Server Build Projects: End-to-End View

The project life cycle of the change consists of nine steps. Project Management (PM), Infrastructure Delivery Management (IDM), Change Management and Commissioning Management play different roles in each stage. These are defined as draft, registered, risk and impact, approval in principle, build and test, tested, to be approved for implementation, approved for implementation, implemented and review phase.

4.7.1 Draft

When the architectural design of the project is approved, the projects managers and business contacts come to agree on the last decisions. The project management creates a draft of the project as RFC, they make sure every mandatory section is filled in. After that, a Server Build form (SBF) is created to clarify the tasks of IDM according to the demands of the business unit. The scope, the list of build and test tasks, and the summarized version of the architect design should be attached to the RFC in order to register the draft version. If project manager and the team fulfill the requirements, they can register the RFC by declaring the planned start and end dates as well as the planned Release the Production (RTP) date.

In case of any suspension or leading time problems in the following phases of the RFC, the status is set back to draft by the Change Management. Until the issues are solved, the project manager is supposed to keep the RFC as in draft.

4.7.2 Registered

By registering RFC, project manager takes the first step towards the implementation. The necessary checkups in the environment is made by the teams, and the quality of the change is reviewed by the Change Management. The proposed RFC goes through an approval process to evaluate its potential risk and impacts to the environment. When it is approved, the status of the project is changed to Risk and Impact by the Change Management.

4.7.3 Risk and Impact

In this phase, the proposed project goes under an approval process. Change analyst involves various groups and stakeholders in the approval process based on the scope of the change, impact on services and technology used in the project.

4.7.4 Approved in Principle

When all the approvals are provided, the status is changed to Approved in Principle. Assigned Infrastructure delivery manager starts processing build tasks. Commissioning Management involves in the process, and the status changed to Build and Test.

4.7.5 Build and Test

In the Build phase of the cycle, the project manager works with the business unit to ensure the necessary equipment is ordered, and they are connected accordingly. Change analyst evaluates the process based on the scope. After that, Infrastructure delivery manager completes remaining tasks. Operational Acceptance Testing (OAT) is performed, and the results contribute to the decision of the Change Advisory Board (CAB).

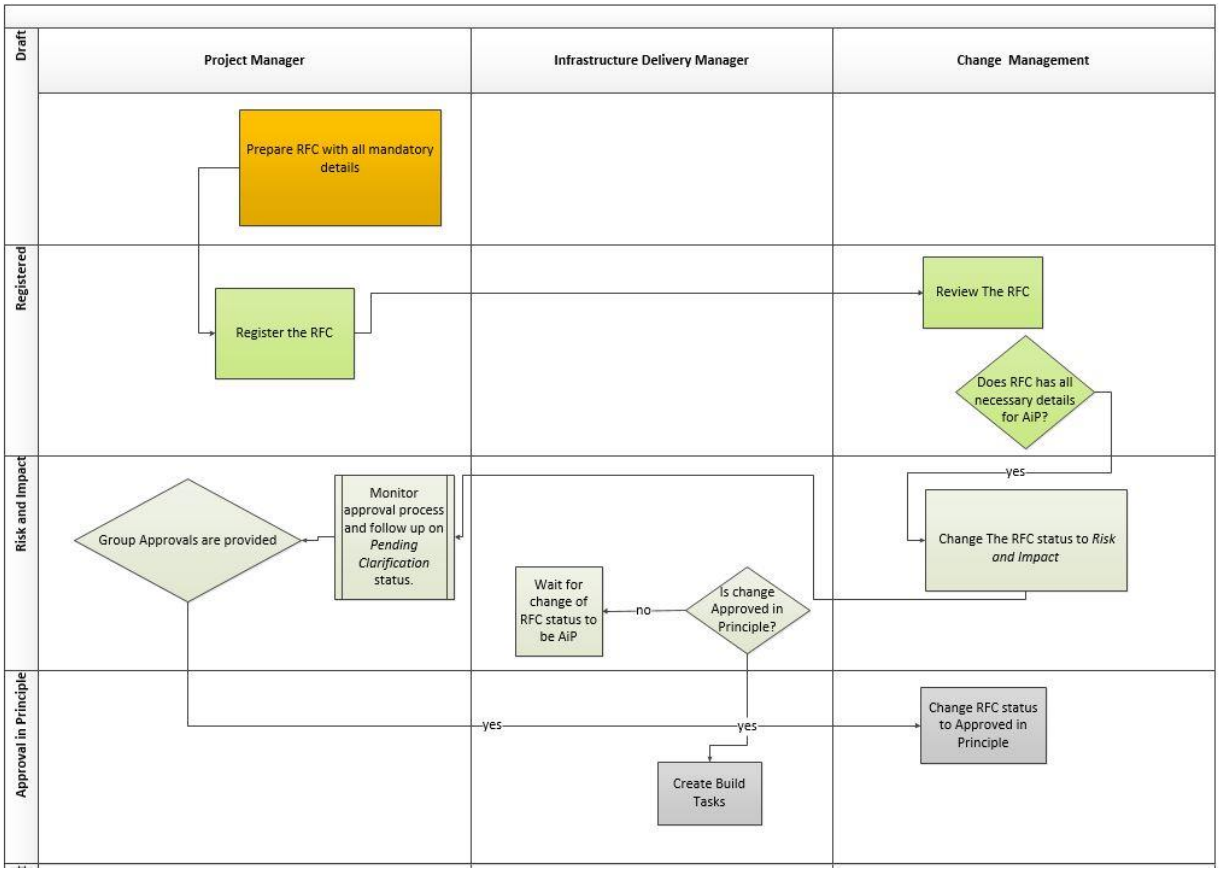
4.7.6 Approved for Implementation

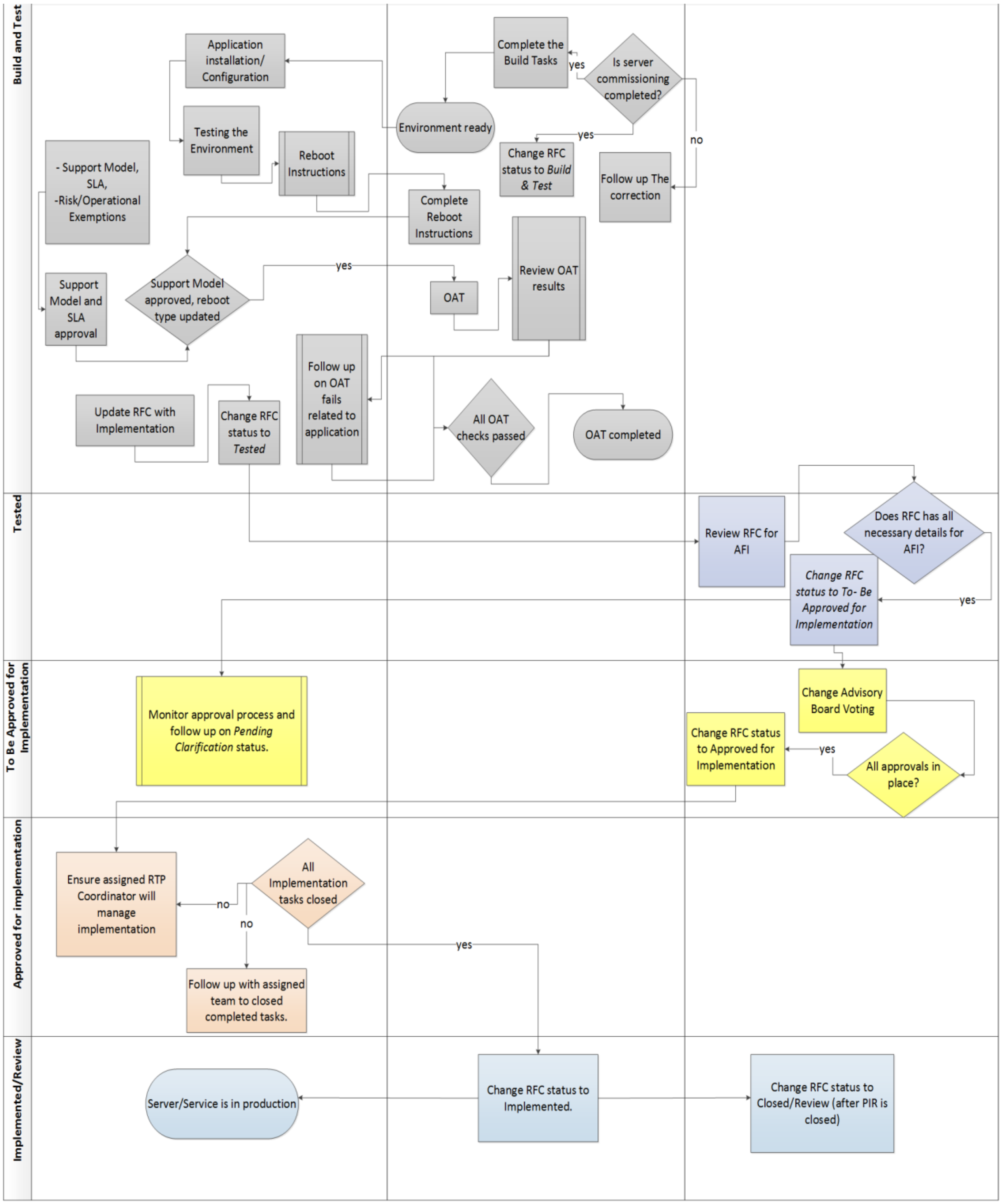
If the CAB approves for implementation, the status is changed to Approved for Implementation. Consequently, the project goes through an implementation phase with the guidance of the project manager to meet the predetermined deadline of Release the Production (RTP) date. All implementation tasks are closed in this phase.

4.7.7 Implemented/ Closed

Implementation is done during approved change window and result of implementation can be tracked within requested implementation task by the implementer. When the system is implemented, the servers are working functionally in production and the Post Implementation Review is completed. If there is no failure or pending conditions, the status is changed as Closed by Change management. Table 3 illustrates the whole Project Life Cycle of Server Build (RIM) projects in PMO from an end-to-end view.

Table 3. 1: Project Life Cycle of Server Build (RIM) projects in PMO.



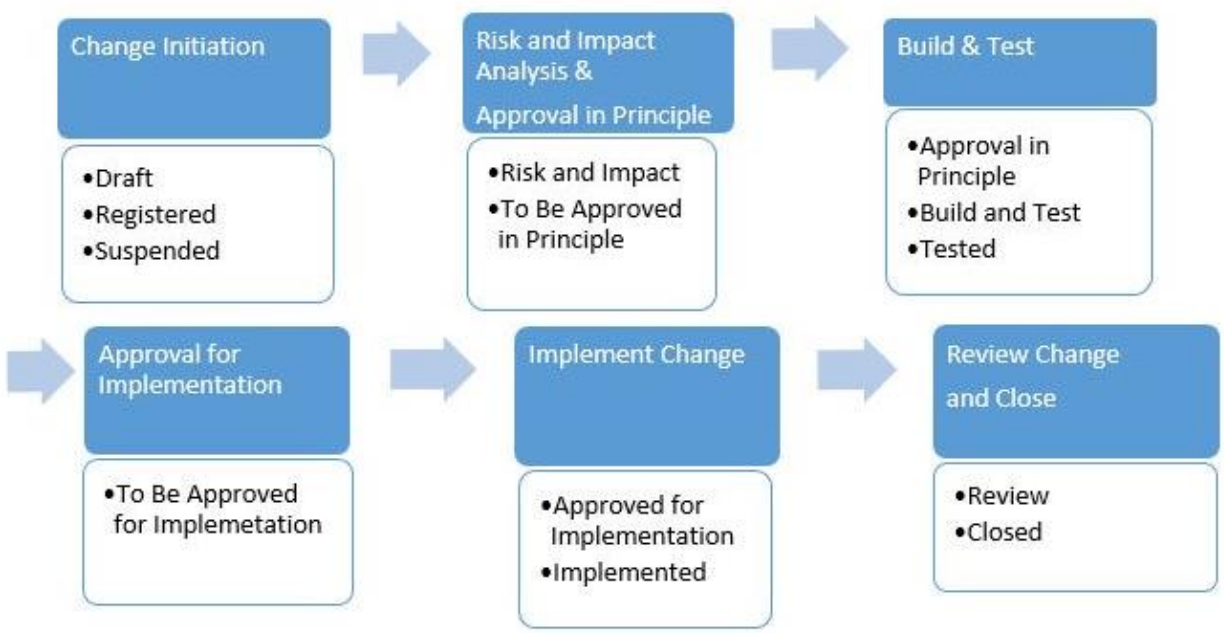


Source: In-house Resource B (2018).

According to the 4th edition of the Project Management Body of Knowledge (PMBOK) Guide (2008), project phases can be finalized in sequence or overlapping, and the function of the phases helps them to be defined as an element of the project life cycle. Thus, the Guide also states that if the phase structure is segmented into logical subsets, it can mitigate the problems in controlling and monitoring of the project. Besides, the phase- ends are regarded as natural points where project managers usually reallocate the effort in motion to move forward, roll-back or totally cancel the project. For that reason, Project Management Institute (PMI) referred to these ends as phase gate and exits, milestones, decision stages or kill points of the project. In PMBOK Guide, the Institute grouped and summarized these processes into five categories as Initiation Phase, Planning Phase, Executing Phase, Monitoring and Controlling Phase, and Closing Phase.

As investigated earlier in this chapter, there are nine stages for the RFC to succeed in fulfilling requirements. In DHL IT Services, these stages are grouped into six phases defined by the change status, and they are presented in blue color, in Figure 4. 1.

Figure 4. 1: Process Flow of the change via RFC (Change Management ITS).



Source: In-house Resource C (2018).

All the mentioned phases of Server Build (RIM) projects depend on a degree of control to be successfully delivered. Thus, PMBOK Guidelines conclude that projects may have similar phase names, and the phase structure may contribute to the work of managers in controlling and monitoring of the project. Consequently, these projects might be initiated in the early stages in order to specify what is allowed and expected for that phase. In the light of the facts, the researcher employs the same approach as PMI to track, review and analyze the progress and performance of the Server Build (RIM) projects with regard to schedule and time distribution as well as scope verification from a phase-to-phase perspective.

4.8 Data

Due to the given conditions earlier in the research scope, unavailable data and limited research resources; this section only concerns project management activities and time performance in managing Server Build (RIM) projects.

4.8.1 Data Selection

The research data was primarily gathered by means of extracting data from one hundred sub-projects of two master projects, DHL Supply Chain and DHL Express Server Migration, performed for thirty different countries' infrastructure development in one and a half years. These projects are performed by a variety of project managers and contractors within the Project Management Office. For the data gathering, interviews were performed to investigate the main aspects of the remote infrastructure services and project objectives. Primary data is collected from the change requests as well as from documentation and the final review reports. All the server migration projects are grouped into five categories according to the qualification as follows;

Project Type 1

Like in all other project types, the team redirects the environment to the nearest central in country hosting locations. The projects performed as migration/ transition activities of only one type of server are grouped under one name the similarities in number of the build tasks and the overall project sizes are taken into consideration in assembling. There are eight projects in sample that fall into this category.

Project Type 2

The projects consist of migration/ transition activities of two servers which are implemented together to the same location site. These servers are required to be implemented together, and all of the sample projects share the same number tasks and the process. There are twenty- five projects in sample that fall into this category.

Project Type 3

Type 3 projects also have only migration/ transition activities of two servers, but they are different type of servers than the ones implemented in Type 2 projects. In addition, these projects have a different duration times and tasks that involve different units in the production. There are fourteen projects in sample that fall into this category.

Project Type 4

This project type delivers migration/ transition activities of three specific servers which are implemented together to the same location site. All the projects selected share the same processes of approvals, build and implementation tasks and requirements. There are thirty- nine projects in sample that fall into this category.

Project Type 5

These projects are performed for migration/ transition activities of four different type of servers which also are implemented together to the same location site. Because of the differences they have in the process, these projects are considered as one, Type 5. There are fourteen projects in sample that fall into this category. In Table 4. 1, five project types are presented with project and country numbers.

Table 4. 1: Project types and number of the servers built by location.

	Unit 1 (Supply Chain Servers)	**Unit 2 (Express Servers)**
Type 1	Country 2 (1), Country 4 (1), Country 1 (3), Country 3 (1)	Country 5 (2)
Type 2	Country 1 (8), Country 6 (3), Country 7 (2), Country 8 (1), Country 9 (2), Country 10 (1), Country 11 (1)	Country 12 (1), Country 13 (2), Country 10 (4)
Type 3	Country 3 (1), Country 14 (4), Country 8 (1), Country 15 (3), Country 4 (1), Country 1 (2)	Country 5 (2)
Type 4	Country 1 (12), Country 9 (3), Country 16 (1), Country 10 (3), Country 18 (2), Country 17 (1), Country 19 (5), Country 5 (2), Country 20 (1)	Country 15 (1), Country 1 (1), Country 24 (1), Country 23 (2), Country 13 (1), Country 21 (1), Country 22 (1), Country 12 (1)
Type 5	Country 2 (1), Country 16 (1), Country 10 (1), Country 18 (1), Country 25 (1), Country 26 (1), Country 5 (1), Country 20 (1)	Country 27 (1), Country 28 (1), Country 29 (1), Country 12 (1), Country 30 (1)

Source: Own research.

4.8.2 Schedule Data

When IT projects involve contextual changes, time can be critical for project managers because it has an impact on the business outcomes (Sauer and Reich, 2009). Thus, it can result in expediting or delaying Release the Production (RTP) date which is estimated in the beginning of the project life cycle. Schedule comprehension techniques and agile methodologies can be applied in controlling the schedule to deliver in short lead times. For that reason, this section focuses on the project life cycle phases and their real time durations.

According to the start and end date of each phase, the duration periods are estimated in number of days. Each project is introduced by their types, countries together with their actual and planned end dates. In this research, the registration of the RFC is considered as the starting phase of the execution, and the previous estimations of the start dates are disregarded in the data selection. Further in this chapter, *U1* stands for Unit 1, and it is used to differentiate DHL Supply Chain migration/ transition projects. *U2* stands for Unit 2, and it is used to differentiate DHL Express migration/ transition projects. Table 5 illustrates each project with country codes and their individual schedule data, in days.

Table 5. 1: Schedule Performance Data of 100 Server Build (RIM) projects.

Project Number	Location	Project Type	Total Duration Time (in days)				Total	
			Registered	Risk and Impact & AIP	Build and Test	Approval for Implementation	Planned Duration	Actual Duration
1	Country 1	Type 1	1	10	42	5	56	58
2	Country 1	Type 1	0	8	22	2	26	32
3	Country 1	Type 1	0	16	47	7	49	70
4	Country 2	Type 1	0	34	10	3	40	47
5	Country 3	Type 1	0	35	12	4	44	51
6	Country 4	Type 1	0	10	33	10	42	53
7	Country 5	Type 1	0	7	16	14	33	37
8	Country 5	Type 1	0	7	16	14	41	37
9	Country 1	Type 2	1	8	31	6	52	46
10	Country 1	Type 2	1	10	24	1	31	36
11	Country 1	Type 2	0	8	9	4	20	21
12	Country 1	Type 2	0	8	23	21	27	52

13	Country 1	Type 2	0	8	19	4	35	31
14	Country 1	Type 2	0	8	13	2	20	23
15	Country 1	Type 2	0	8	23	6	30	37
16	Country 6	Type 2	0	88	15	3	36	106
17	Country 6	Type 2	0	90	10	10	103	110
18	Country 6	Type 2	0	88	8	8	104	104
19	Country 7	Type 2	3	45	6	6	46	60
20	Country 7	Type 2	3	9	15	3	30	30
21	Country 8	Type 2	0	63	18	3	86	84
22	Country 9	Type 2	0	11	38	3	34	52
23	Country 9	Type 2	1	12	29	7	41	49
24	Country 10	Type 2	0	29	33	3	60	65
25	Country 1	Type 2	0	16	52	1	58	69
26	Country 11	Type 2	18	31	104	10	155	163
27	Country 12	Type 2	0	17	28	8	54	53
28	Country 13	Type 2	0	6	49	14	39	69
29	Country 13	Type 2	0	6	54	14	71	74
30	Country 10	Type 2	0	9	41	4	50	54
31	Country 10	Type 2	0	7	43	4	33	54
32	Country 10	Type 2	0	7	34	14	61	55
33	Country 10	Type 2	0	7	52	9	61	68
34	Country 3	Type 3	0	6	113	8	85	127
35	Country 14	Type 3	1	18	67	31	40	117
36	Country 14	Type 3	1	12	44	15	40	72
37	Country 14	Type 3	0	11	7	4	19	22
38	Country 14	Type 3	1	6	42	16	30	65
39	Country 8	Type 3	0	63	27	2	72	92
40	Country 15	Type 3	7	8	15	9	39	39
41	Country 15	Type 3	0	21	18	8	42	47
42	Country 15	Type 3	1	11	21	8	33	41
43	Country 4	Type 3	0	26	65	10	62	101
44	Country 1	Type 3	0	35	44	13	45	92
45	Country 1	Type 3	0	8	41	10	52	59
46	Country 5	Type 3	0	7	10	5	16	22
47	Country 5	Type 3	0	7	15	15	33	37
48	Country 1	Type 4	1	10	44	3	37	58
49	Country 1	Type 4	1	10	52	36	58	99
50	Country 1	Type 4	1	10	19	1	20	31
51	Country 1	Type 4	1	10	15	21	28	47

52	Country 1	Type 4	0	8	16	4	26	28
53	Country 1	Type 4	0	8	21	3	22	32
54	Country 1	Type 4	0	8	20	3	21	31
55	Country 1	Type 4	0	8	13	3	11	24
56	Country 16	Type 4	0	18	21	7	39	46
57	Country 9	Type 4	1	10	139	24	171	174
58	Country 9	Type 4	0	46	29	11	60	86
59	Country 9	Type 4	1	43	56	11	43	111
60	Country 17	Type 4	0	98	67	8	120	173
61	Country 10	Type 4	0	35	61	8	83	104
62	Country 10	Type 4	0	33	24	1	42	58
63	Country 10	Type 4	0	68	10	7	78	85
64	Country 18	Type 4	0	16	107	1	36	124
65	Country 18	Type 4	0	16	71	2	72	89
66	Country 19	Type 4	1	6	11	8	23	26
67	Country 19	Type 4	1	6	30	14	25	51
68	Country 19	Type 4	1	15	36	14	38	66
69	Country 19	Type 4	1	20	51	10	63	82
70	Country 19	Type 4	3	28	53	14	70	98
71	Country 5	Type 4	1	14	36	8	44	59
72	Country 5	Type 4	1	13	50	4	48	68
73	Country 20	Type 4	1	24	126	7	151	158
74	Country 1	Type 4	0	16	47	7	68	70
75	Country 1	Type 4	0	16	75	8	63	99
76	Country 1	Type 4	0	16	89	6	77	111
77	Country 1	Type 4	0	8	78	15	91	101
78	Country 13	Type 4	0	28	22	15	62	65
79	Country 21	Type 4	0	2	98	16	91	116
80	Country 22	Type 4	0	23	60	5	79	88
81	Country 12	Type 4	0	17	55	13	90	85
82	Country 23	Type 4	0	7	18	13	45	38
83	Country 23	Type 4	0	7	17	6	20	30
84	Country 24	Type 4	0	31	36	13	56	80
85	Country 1	Type 4	0	25	11	4	37	40
86	Country 15	Type 4	0	9	23	8	42	40
87	Country 2	Type 5	2	81	9	15	84	107
88	Country 16	Type 5	7	11	21	7	32	46
89	Country 10	Type 5	0	65	42	7	107	114
90	Country 18	Type 5	0	16	66	3	67	85

91	Country 25	Type 5	1	42	64	9	108	116
92	Country 26	Type 5	3	14	44	19	75	80
93	Country 5	Type 5	1	13	34	6	57	54
94	Country 20	Type 5	0	11	52	8	82	71
95	Country 1	Type 5	0	8	55	7	40	70
96	Country 27	Type 5	0	6	13	4	8	23
97	Country 28	Type 5	0	7	91	3	58	101
98	Country 29	Type 5	1	7	19	5	12	32
99	Country 12	Type 5	1	15	56	2	66	74
100	Country 30	Type 5	0	3	28	10	28	41

Source: Own research. (This table represents the time- schedule performance of 100 Server Build (RIM) projects performed by ten project managers and various contractors between April, 2017 and November, 2018. This data is exclusively collected and gathered after all the projects are implemented and closed, in December, 2018).

4.9 Analysis

By using the given time variances of each project, a country-wise comparison is derived from the difference between the estimated time for a project to be completed and the actual amount of time required to perform that project. If the variance is a positive value, it means that the project was completed ahead of the schedule. If it's negative, the project was the behind schedule (Chen et al., 2016). First, the time variances are used to determine each project's schedule overrun and underrun. The projects which concern the same country and same deliverables are presented together with their overall percentages under each country. After that, an evaluation is made in order to inspect whether those large variances are frequent values for each country in each project type, or just occasional events.

Accordingly, to understand the project dynamics from an allocation perspective, the researcher benefited from the approach of Chaudron and Heijstek (2008), the Rational Unified Process (RUP) methodology, where they visualized the effort and time distribution data of similar industrial software development projects through their lifecycles in order to evaluate the striking features or abnormalities. This visualization technique also known as the RUP Hump (Ambler, 2005) which refers to a plot of effort spent over time during a particular phase. In the direction of the analysis, the researcher aims at providing insights from the interaction between the time spent on disciplines such as Phase 1, Phase 2, Phase 3 and Phase 4. The findings are used in the assessment of intensity patterns that describe the nature of the distribution of time. Furthermore, the results might be also useful for project managers to improve project planning practices in terms of assessing optimal time and effort allocations for the mentioned type of projects in this study.

4.9.1 Time Performance Analysis

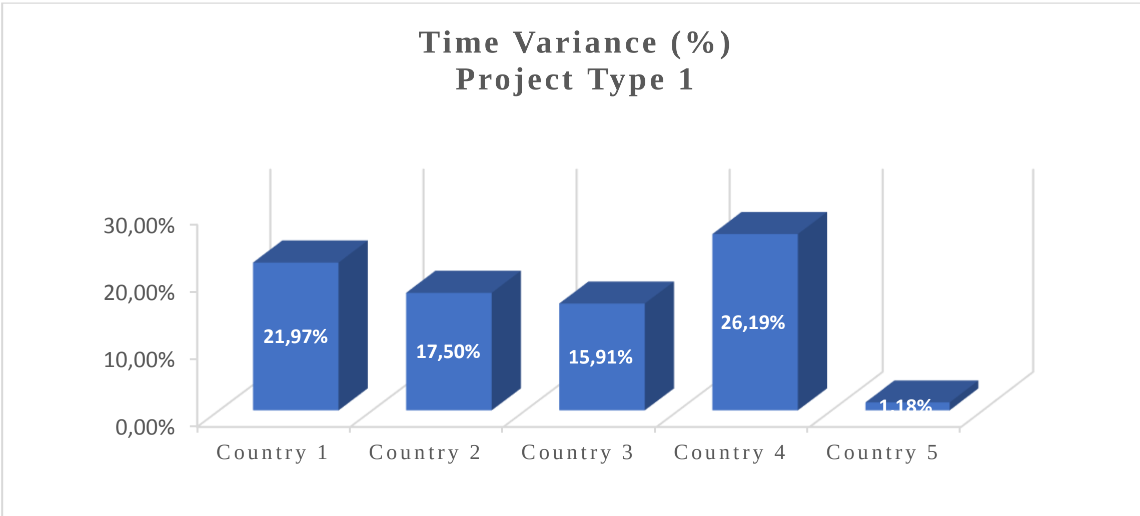
Time Variance, also known as Magnitude Relative Error (Bhatnagar and Ghose, 2012) or the Time Overrun Rates (Chen et al. 2016) estimates the accuracy of the project manager effort in days by measuring the change between the planned and actual project duration. Calculated as follows;

$$\textbf{Time Overrun Rates (\%)} = \frac{\textbf{Actual Duration- Planned Duration}}{\textbf{Planned Duration}}$$

Each project is given with their individual time variance values of estimation in percentage.

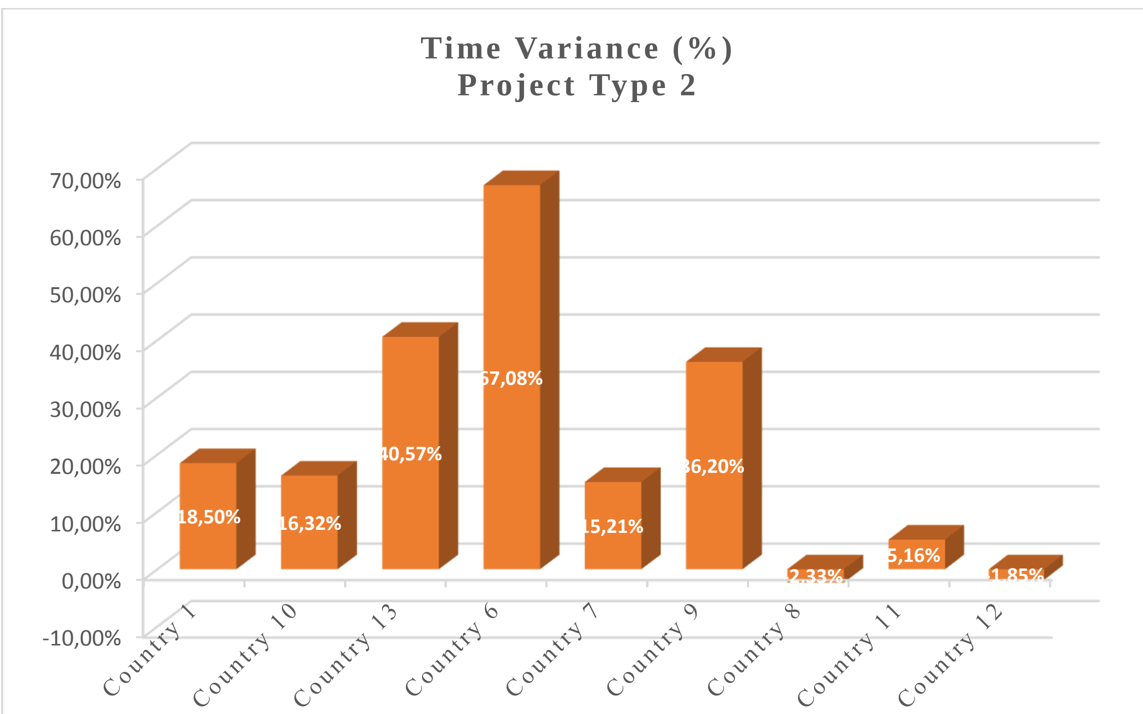
After the applying time variance (%) formula to each project, the percentage project time overruns and underruns are presented with a country-wise comparison. The mean values of multiple projects are used as individual time variance values representing countries.

Figure 5. 1: Country-wise comparison of time variations in Type 1.



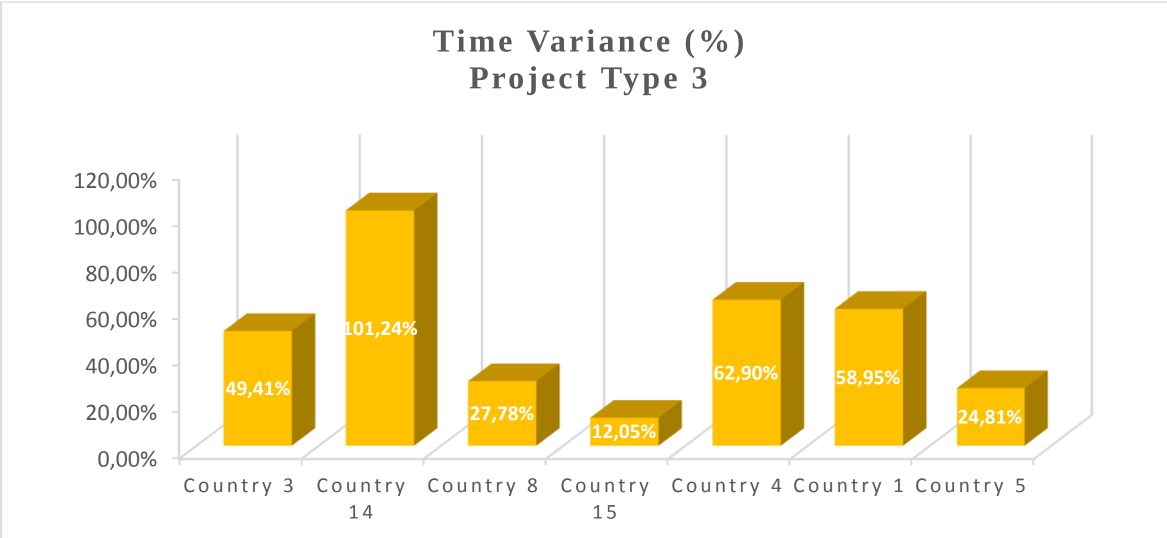
Source: Own research.

Figure 6. 1: Country-wise comparison of time variations in Type 2.



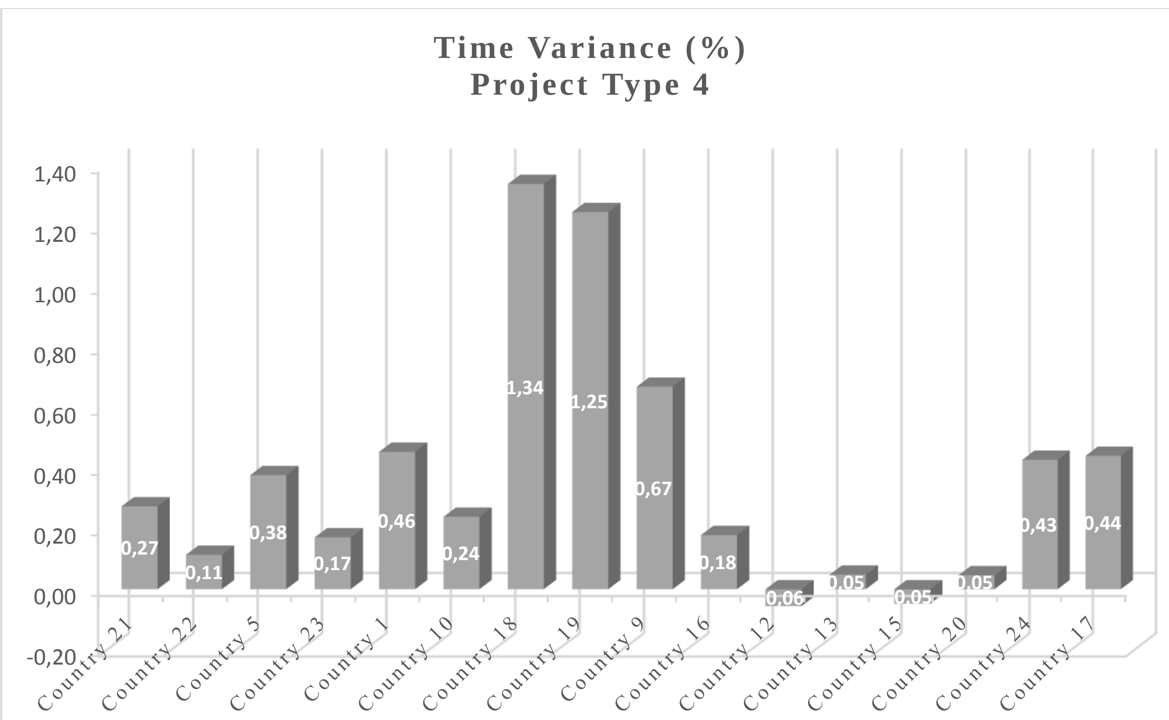
Source: Own research.

Figure 7. 1: Country-wise comparison of time variations in Type 3.



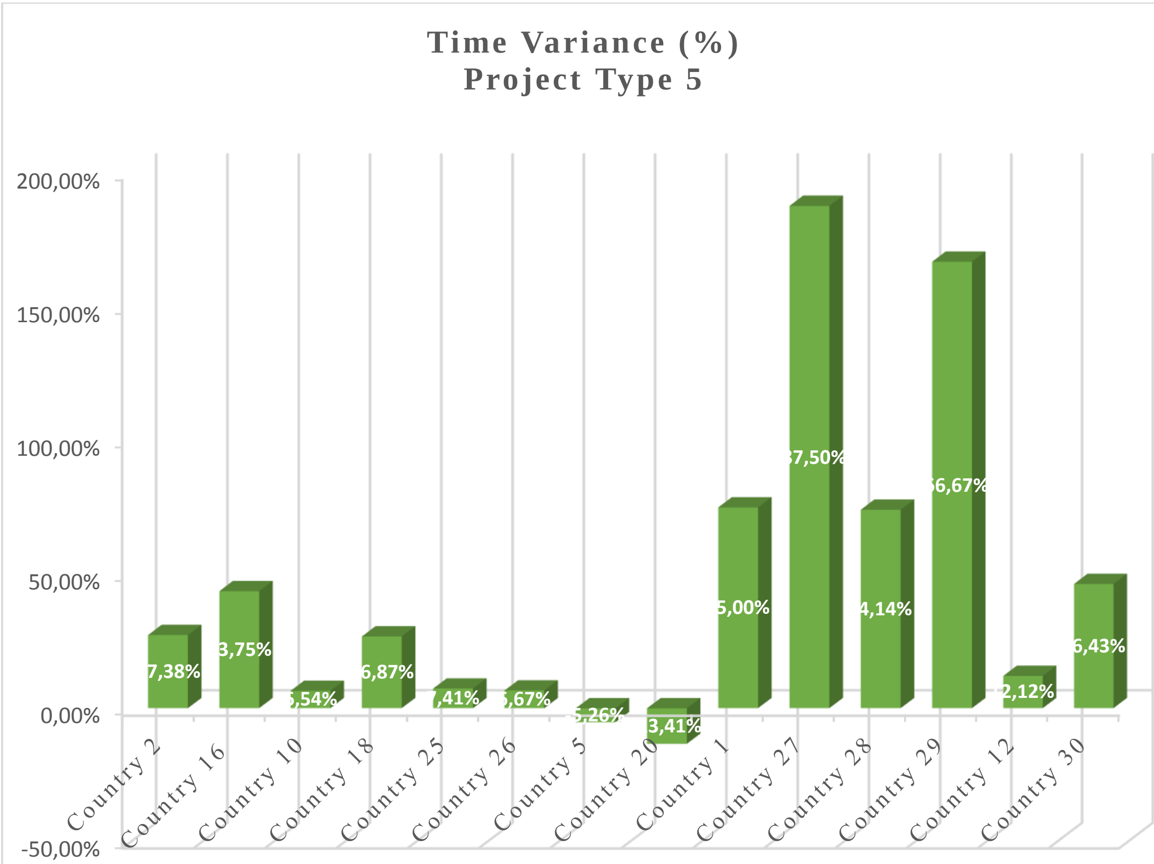
Source: Own research.

Figure 8. 1: Country-wise comparison of time variations in Type 4.



Source: Own research.

Figure 9. 1: Country-wise comparison of time variations in Type 5.



Source: Own research.

4.9.2 Visualizing Effort Time Data

In this section, the analysis is followed by counting and visualizing the amount of total time spent on each for phase for each country. The mean values of multiple projects are taken into account to interpret the results in a country-wise view point.

The life cycle stages are renamed and tagged as follows;

Phase 1: Registration to Risk and Impact Total Duration (X_1)

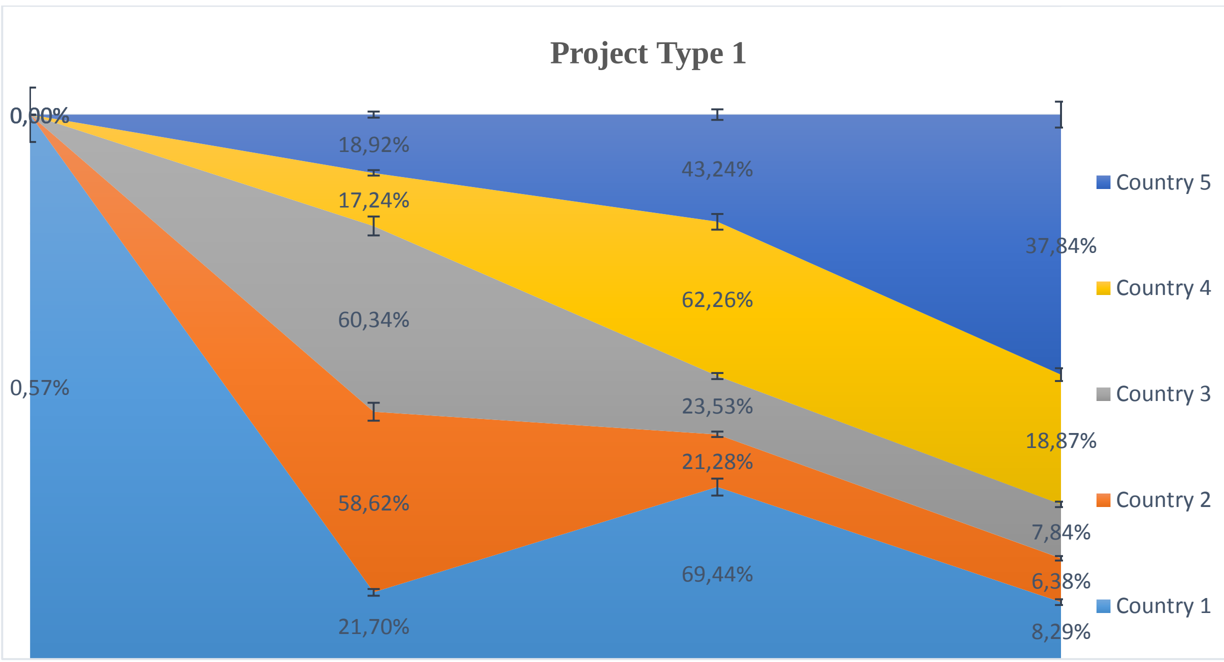
Phase 2: Risk and Impact and AIP Total Duration (X_2)

Phase 3: Build and Test Total Duration (X_3)

Phase 4: Approval for Implementation (X_4)

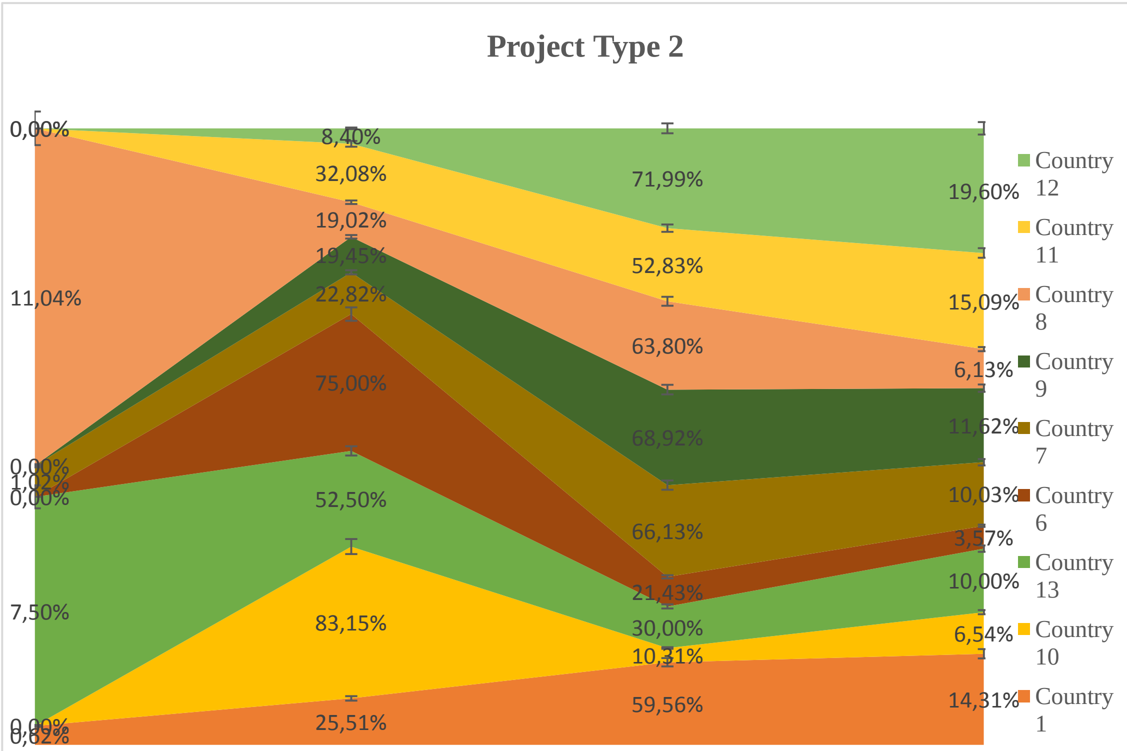
- k = project number
  n = phase number
  y = Total Project Duration
  Z_n = total time spent on nth phase (%)
- $f: x \mapsto f(x)$
  $y = f(X_1, X_2, X_3, X_4)$
  $y_k = X_{1,k} + X_{2,k} + X_{3,k} + X_{4,k}$
  $Z_{n,k} = X_{n,k} / y_k$

Figure 10. 1: Phase-wise comparison of time effort distribution in Type 1.



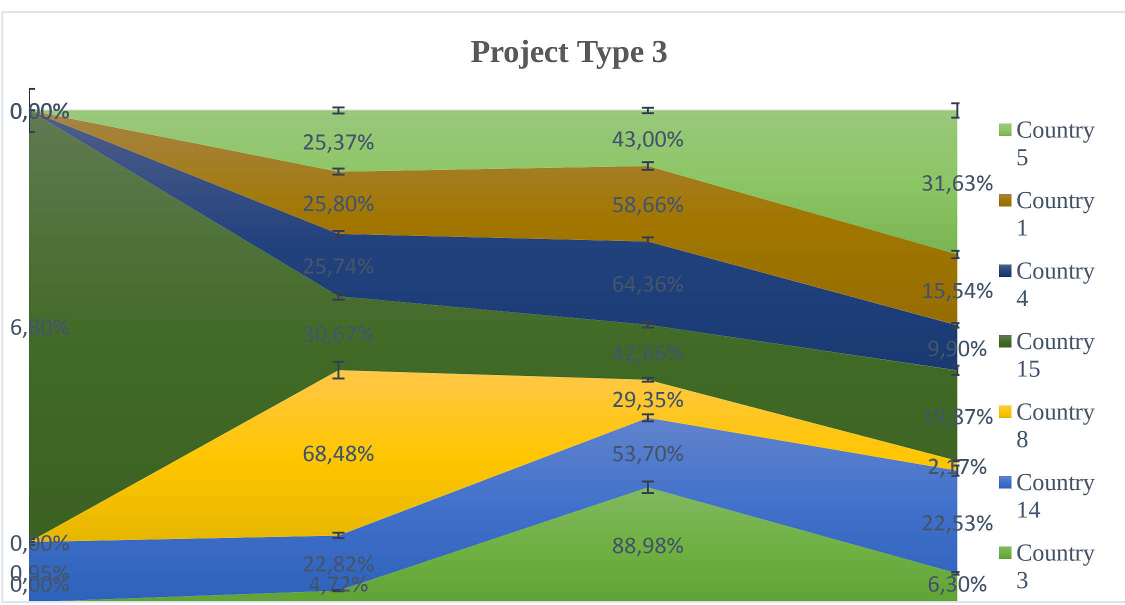
Source: Own research.

Figure 11. 1: Phase-wise comparison of time effort distribution in Type 2.



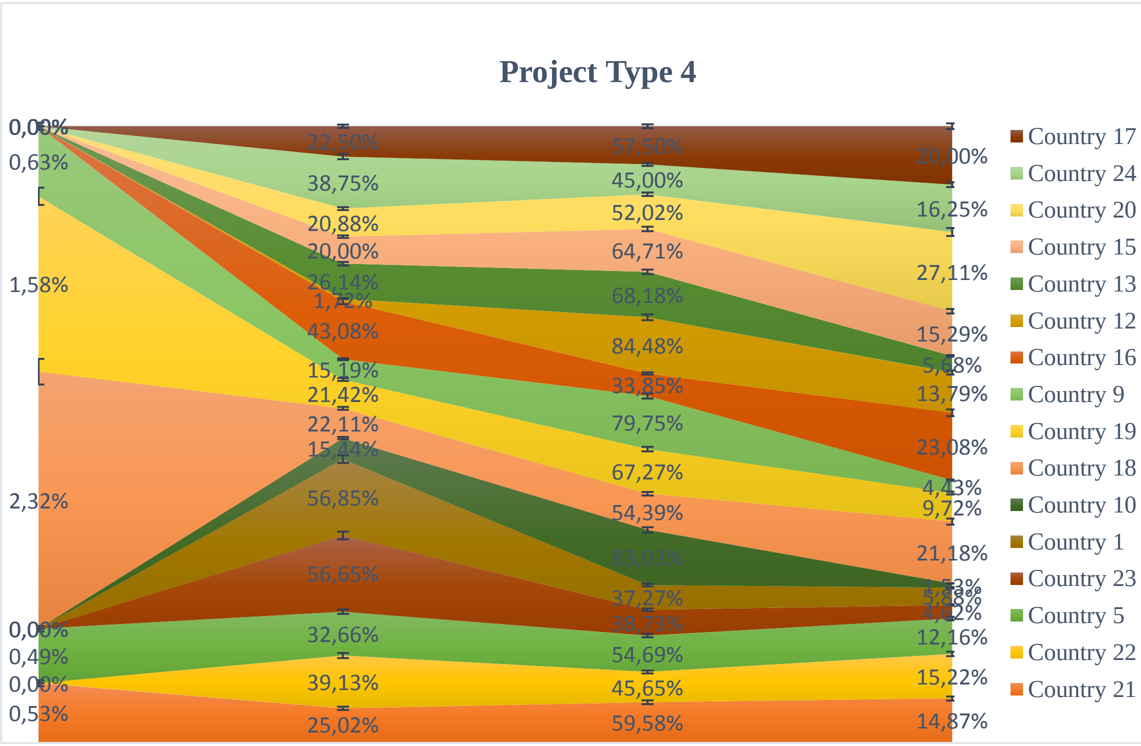
Source: Own research.

Figure 12. 1: Phase-wise comparison of time effort distribution in Type 3.



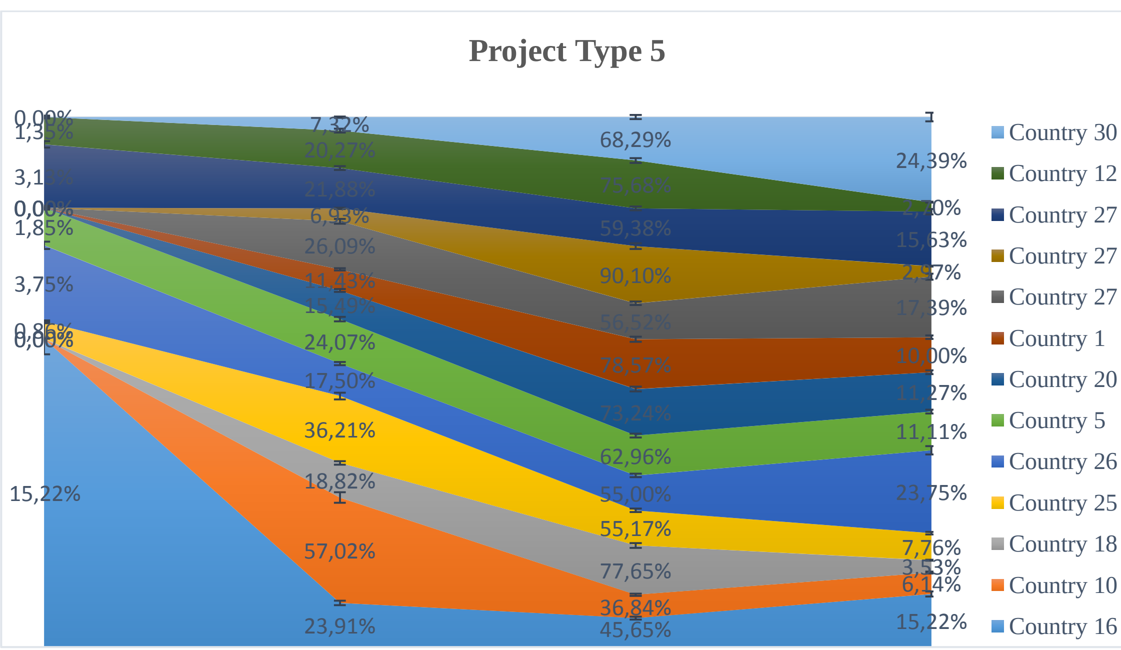
Source: Own research.

Figure 13. 1: Phase-wise comparison of time effort distribution in Type 4.



Source: Own research.

Figure 14. 1: Phase-wise comparison of time effort distribution in Type 5.



Source: Own research.

4.9.3 Budget Performance Analysis

All the Server Build (RIM) projects in the data set are considered as cost neutral projects where the implementations are performed for the Group's own infrastructure development, and all the build costs associated with the projects are covered by the firm. However, every project was granted with a budget for the required infrastructure and services. These budgets were dedicated to all the necessary build actions and covered all external employee costs in the migration or transition activities of DSC. Based on the confidentiality, the available financial data is analyzed and presented only with their percentage values. To do that, thirty countries are grouped into two regions which are Asia-Pacific (APAC), and Mainland Europe, Middle East & Africa (MLEMEA). There are ten countries from APAC region, and twenty countries from MLEMEA region are in the data set, and each region has its own budget for the build actions. Actual and estimated costs of these two regions are compared with regard to obtain cost overrun rates (%) in these two regions of DHL Supply Chain and Express.

4.10 The Results

4.10.1 Budget Performance

$$\textbf{Budget Overrun Rate} = \frac{\textbf{Actual Budget} - \textbf{Planned Budget}}{\textbf{Planned Cost}}$$

Table 6. 1: Budget Overruns.

	MLEMEA	APAC
Total Budget Variance (%)	0.00%	2.34%

Source: Own research

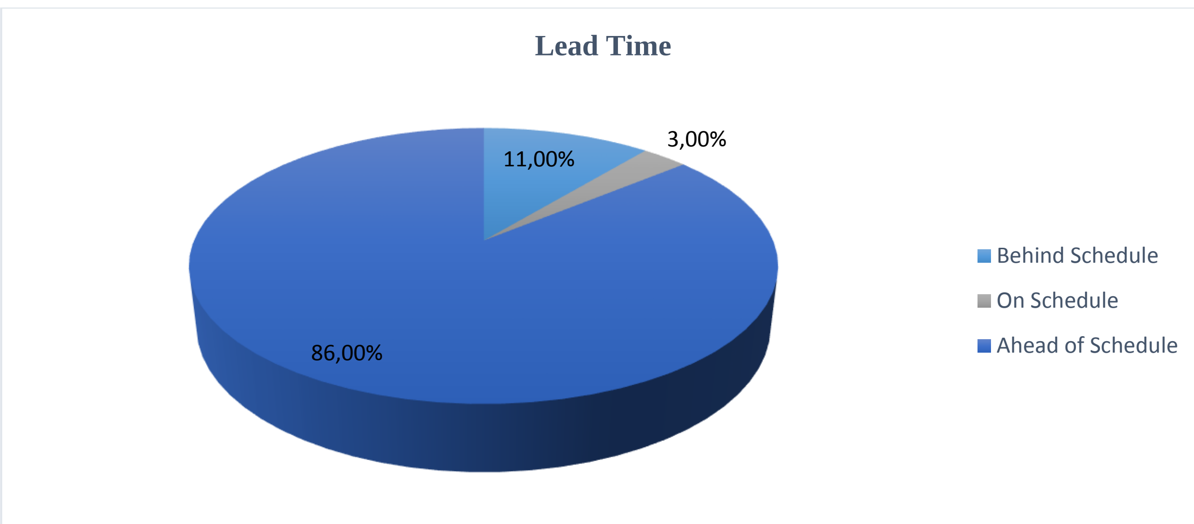
After the calculations, the budget estimated for MLEMEA region is 100% used during the project; the actual and planned costs of all 20 countries are met in the closure. In

APAC region, there was only 2, 34% increase found in the value of estimated cost resulted from the secondary and additional orders of only one country which is not included in this study. For that reason, all the selected projects in the sample are considered successful in terms of meeting the project budget.

4.10.2 Time performance: Actual vs. Planned Project Duration

After obtaining the time variances for each project, overall time performance in one hundred projects are calculated, and shown in Table 5. Positive variance values represent the projects that were ahead of the schedule, negative values represent the projects completed behind the schedule, and the value 0 represent the projects completed on estimated time.

Figure 15. 1: Lead time performance of 100 selected projects (Actual-Planned End Date).



Source: Own research.

According to the high numbers of the delayed projects, investigation followed with determining the dispersion of each country's time overrun data around total time variance mean of the particular project type. Hence, countries with higher values than the average delays are selected for the inspection.

n= project country

k= project type

x_n= Project Total Time Variance

μ_k= Mean of Total Variances of project type k

$p = x_n > \mu_k$

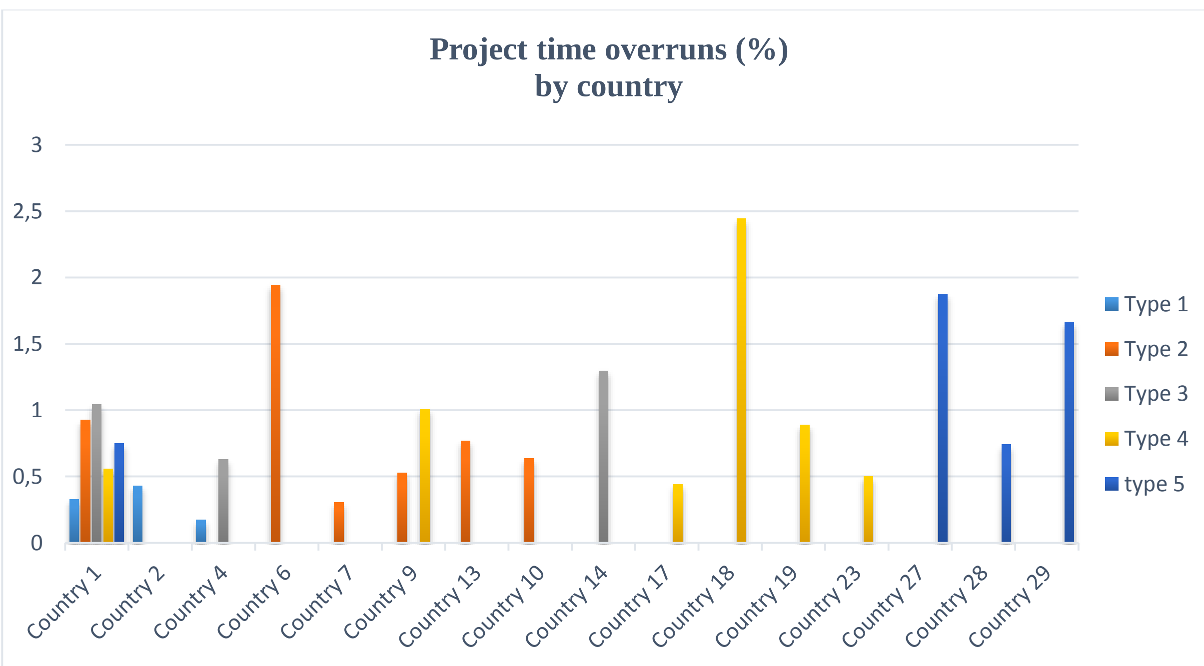
q=Project is selected for investigation

$p \rightarrow q$

After given conditions, the total mean values are calculated as μ_1= 0.16433, μ_2= 0.2463, μ_3= 0.5348, μ_4= 0.4231 and μ_5= 0.4727.

These values narrowed down the list of delayed projects. Thus, the new data shows that two countries from the project type 1, six countries from project type 2, three countries from type 3, six countries from type 4, and four countries from type 5 have bigger time variance values than the average. Figure 16. 1 illustrates the summary of delayed project types together with their location information.

Figure 16. 1: Countries with time overruns in each project type (Actual-Average Durations).

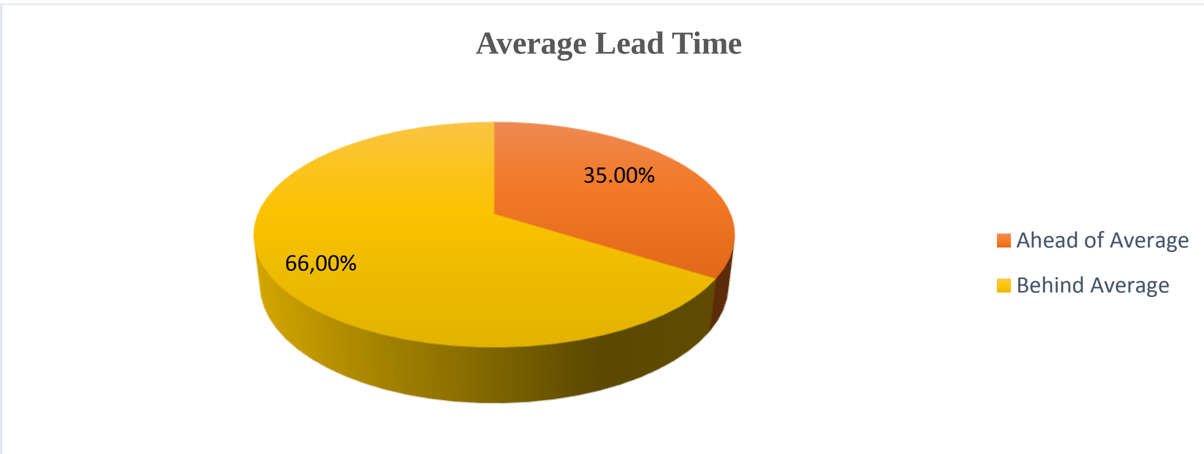


Source: Own research.

Based on the statistical distribution, 35 projects from 16 countries in the data set diverge from the average variation. Which finalize the new results as illustrated in Figure 17. 1.

4.10.3 Time performance: Actual vs. Average Project Duration

Figure 17. 1: Average lead time chart of 100 selected projects (Actual-Average Durations).



Source: Own research.

After the visualization of effort time data, the weighted average of each phase in each project type is estimated with their percentage values. Respectively, the findings are used for the visualization of the total time distribution for each project type. This approach consists of the following steps;

k = Project type

n = Phase number

N_k= Total number of the projects in project type k

y_{total} = Total Project Duration

$Z_{n,k}$= Total time spent on phase n, project type k

$X_{n,k}$= Duration of phase n of project type k, as a percentage

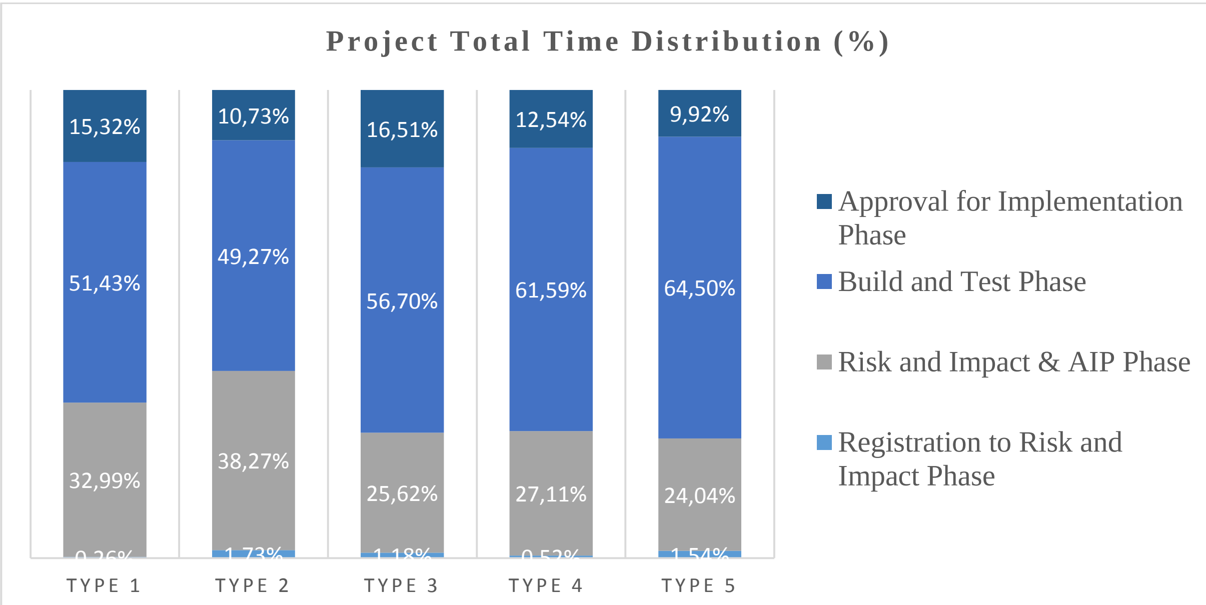
$X_{n,k} = Z_{n,k} / Y_{total}$

$\overline{X}_{n,k}$= Weighted average duration of phase n of project type k

$\overline{X}_{n,k}(\%) = \Sigma (X_{n,k}) / N_k$

Based on the statistical distribution of the data set, the weighted average values ($\bar{x}_{n,k}$) for each phase and each project type are obtained, and summarized briefly in Figure 18. 1.

Figure 18. 1: Project total time distribution by the weighted averages ($\bar{X}n,k$).



Source: Own research.

In the light of the findings that demonstrated both in Figure 16. 1 and Figure 18. 1, time overruns in each country and project type are calculated with particular weighted average durations of each phase and project type. For the qualification, the project phases which took more time than the estimated weighted- average durations are determined as follows.

k= Project type

C= Country number of the selected project type k

$C_{total} = \Sigma (C_{n,k})$

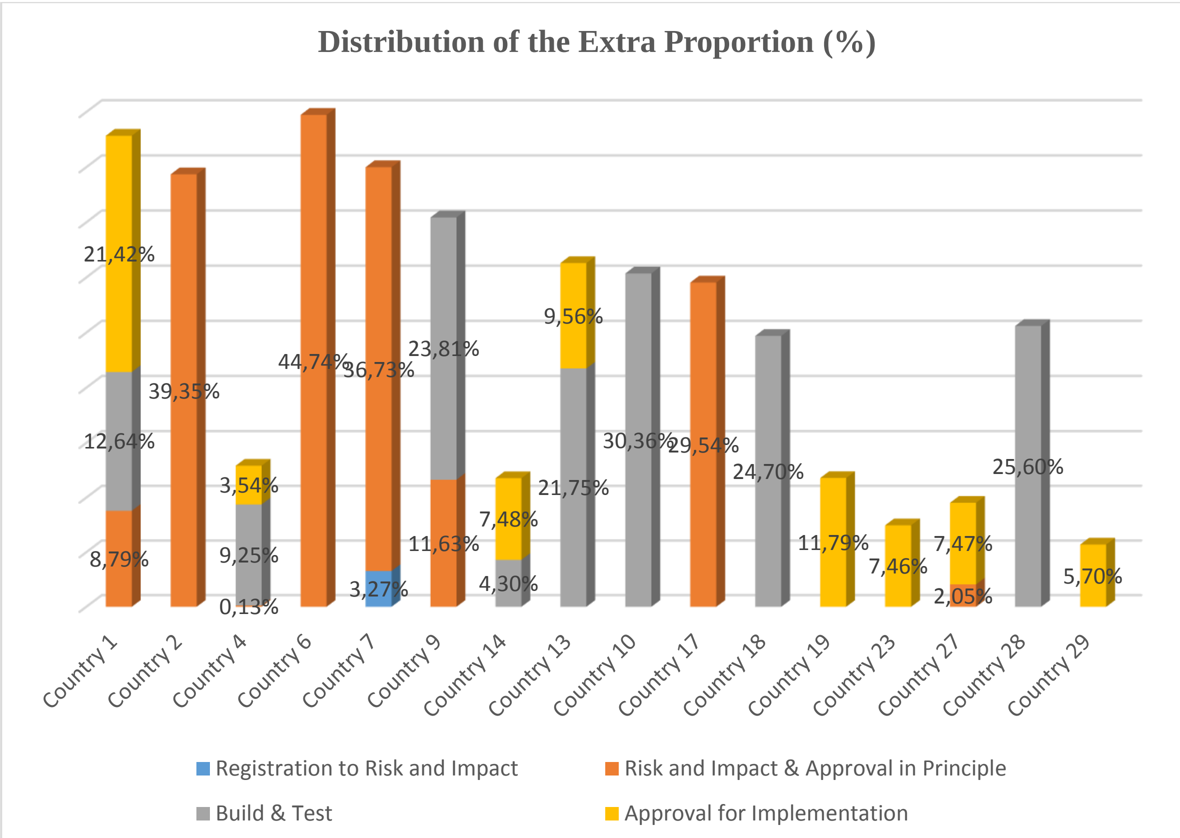
n= Phase number

$C_{n,k}$ = Total duration of n^{th} phase of project

C_{total} = Total project duration

After analyzing 35 projects from 16 countries based on the given conditions, it was found that three countries in project type 1, six countries in project type 2, three countries in project type 3, six countries in project type 4, and four countries in project type 5 faced time overrun issues with values more than the average. When time distribution data of each project and proportional values of each phase are compared to the weighted average values; ten projects experienced delays in the first phase, ten projects experienced delays in the second phase, eighteen projects experienced delays in the third phase, and fifteen projects experienced delays in the fourth phase. Figure 19. 1 illustrates the results of the comparison based on the country location of delayed projects and their specified phases with larger proportional values.

Figure 19. 1: Country-wise distribution of the project phases with larger proportional values ($C_{n,k} > \bar{x}_{n,k}$).



Source: Own research.

4.10.4 Summary

This chapter investigated the statistical findings based upon the data and information gathered from one hundred Server Build (RIM) projects of Project Management Office (PMO) in DHL IT Services Prague. In the first step of the analysis, the percentage project time overruns and underruns are presented with a country-wise comparison. After that, total amount of time spent on each for phase for each country was counted and visualized. Based on the high numbers of the delayed projects, the investigation followed with determining the dispersion of each country's time overrun data around total time variance mean of the particular project type.

Hence, countries with higher values than the average delays are selected and narrowed down to a list of thirty- five delayed projects of 16 countries.

To understand the time- effort tradeoffs between project phases throughout their processes, the actual and weighted- averages of time distribution of each project is compared, the projects which experienced proportional increase in their phase durations were estimated, and demonstrated in Figure 16. 1 accordingly. It was found that majority of the delayed projects experienced time overruns in different phases during the process flow. One project in the first phase, ten projects from eight countries in the second phase, eighteen projects from eight countries in the third phase, and fifteen projects from nine countries in the fourth phase had bigger proportional values than the distributed weighted-averages.

When each project was observed with regard to their sequence of events in the process flow, there was no evidence that associates the delays in the first phase with delays of the total project. For seven projects, the proportional overrun in the second phase was the only reason for total project delays; for twelve projects, the proportional overrun in the third phase was the only reason for total project delays; for five projects, the proportional overrun in the fourth phase were the main reason for total project delays; for the remaining eleven projects, proportional overruns were found in multiple phases. The results showed that there is a statistically significant correlation between both measures of project total duration and time effort distribution among single phases. Besides, it was found that larger variances of delay in the second, third or fourth phases of the projects were the main reasons of total time delay in sixteen countries. The proportional tradeoffs between project phase durations are analyzed, and it was found that majority of the projects experienced significant time- effort tradeoffs throughout their processes in order to meet the deadlines. Due to the limited information and the results of the budget performance analysis, the cost performance of Server Build (RIM) projects are unexamined in this study.

The next chapter focuses on the discussion and the recommendations based on the main reasons of each delay in the determined phase and project type by using the personal interview results and interpretations.

5 Discussion and Recommendations

5.1 Discussion

As emphasized in the first chapter, the journey of project management discipline goes very far back in history. Throughout the years, there have been many improvements in technology as well as in understanding project management effectiveness, project success, project managers, leadership styles, project process, organizational structure et cetera. In addition to that, new approaches, new scheduling methods, performance analyses, team leadership methods and new forms of relationship between human capital and technology are emerging in our everyday life (Newton, 2018). Majority of the IT projects found to be dependent on both human capital and the technology, whereas time and resources can be critical for project managers because it has an impact on the business outcomes (Sauer and Reich, 2009). When most of the literature concerning IT project success and IT project management success was reviewed, it was found that the concept of project success was heavily employed as synonymous to project management success. As De Bakker, Boonstra & Wortmann (2010) stated in their research, the majority of the publications in the literature were addressing project success by using traditional methods such as meeting time and budget constraints and requirements. It was found that IT project managers are also experiencing troubles with negotiating time overruns, milestones, and scope problems just like in the classical project management; they optimize a balance between project constraints in order to overcome the difficulties and to satisfy end-users (Sanchez, Terlizzi, De Moraes, 2017).

After the cost analysis, the IT projects are found to be cost neutral in the selected company branch. Where the costs are not considered as the only constraint that affects a project's life cycle, the only indicators which were actual project budgets were compared to planned budget values. The only financial indicator was shared for this study was evaluated, and it was found that all the projects in the selected sample met the budget which was allocated before the master project start date. For that reason, expedited or delayed Release the Production (RTP) date was considered as the main focus in observing the process performance throughout the project life cycle. After an analysis with a specific focus on time, schedule comprehension behaviors and agile methodologies were observed in the schedule controlling within estimated lead times. In order to understand the main reasons for expediting or delaying the Release to Production (RTP) date in Server Build (RIM) projects in DHL IT Services Prague, each process flow of the delayed projects were scrutinized with regard to their schedule data.

5.1.1 Reasons for Delay

In this Chapter, the discussion on the results are demonstrated with particular activities and events that took place in estimated schedule overruns. Each problematic project and phase are evaluated based on the personal interviews with relevant project managers. The real causes were inspected and grouped based on their similarities; major findings of the research are shared under each relevant phase.

- **Phase 1: Registered to Risk and Impact**

In the light of the findings presented in Figure 18. 1, the duration of the first phase took approximately 1% of the total project's duration in every project type. Thus, initiation phase of a change request is estimated around a day or less if the request provides all the necessary information required by the change management. After comparing the actual and weighted averages of time distribution, only 7% of the projects were found to be significantly far from the average duration in the first phase of their life cycle. The projects which experienced proportional increase in the first phase are identified by their schedule performance. From seven determined projects, only one of them diverged from the variation with a larger phase proportion and a project lead time. Based on 99% of the projects, there was no significant relationship found between the individual delay values in the first phase and total delay values in the lead time.

After personal interviews were performed with the relevant project managers of each project; it was found that most of the delays in the first phase are generally resulted from unrealistic schedule planning, pending approvals and from minor scope changes; none of them were related to the project's country, business unit or type.

- ***Phase 2: Risk and Impact & Approval in Principle***

Considering the findings presented in Figure 18. 1, the duration of the second phase took approximately 30% of the total project's duration in every project type. In this phase, every project goes through a similar process of check-ups and various approvals which are required by the change management. After comparing the actual and weighted averages of the time distribution, 75% of projects were behind the average duration; 25% of the projects were found to be significantly far from the average duration in the second phase of their life cycle. The projects which experienced proportional increase in the second phase are identified by their schedule performance. After evaluating the delayed projects and their time performance in the second phase, ten projects from eight countries diverged from the variation with a larger phase proportion and a project lead time as illustrated in Figure 19. 1.

After each individual phase in the change was reviewed, and personal interviews were performed with the relevant project managers of each project; it was found that most of the delays in the second phase are resulted from the particular activities or events which are described as follows.

- Unexpected changes in the scope
- 3rd parties, or customer related communication issues
- Late delivery of hardware and other technical equipment
- High numbers of pending clarifications
- Additional confirmations for the local IT unit
- Simultaneous server-commissioning at a time

When the proportional tradeoffs between the second and the third phases of ten projects were visualized, it was found that nine of them completed their third phase with approximately 13, 5% lower proportions than the weighted average. Hence, it was discovered that when projects have major delays in the second phase, the third phase tend to have lower distribution proportions of time due to the compressing techniques applied by the project managers.

- ***Phase 3: Build & Test***

Considering the findings presented earlier, it was found that every project type has a particular duration range since each building and testing steps involve different numbers of server and services. However, all project types showed some similarities based on the weighted average time spared for the third phase. According to Figure 18. 1, projects spent from 50% to 65% of their total lead time just on the Build & Test phase. After comparing the actual and average durations for each project phase and type, it was found that 44% of all projects were ahead of the average in their third phase. The projects which experienced proportional increase in the third phase are identified by their schedule performance. After evaluating the delayed projects and their time performance in the third phase, eighteen projects from eight countries diverged from the variation with a larger phase proportion and a project lead time as illustrated in Figure 19. 1.

When Operational Acceptance Testing (OAT) performance of all these eighteen projects are investigated, seven projects from five countries diverged from the average with significantly larger test durations in their third phase. For these five countries, the extra time spent on completing the OAT was found to be a causative factor for the delays in third phase and project's RTP date.

After each individual phase in the change was reviewed, and personal interviews were performed with the relevant project managers of each project; it was found that most of the delays in the third phase are resulted from the particular activities or events which are described as follows.

- Large amounts of existing data to be cleaned and archived
- Queue mapping issues
- Back-up issues with the computer applications which are not supported by DHL IT Services
- Bandwidth bottlenecks, exemptions for FTP and HTTP
- Lack of experience in specific local IT teams especially with newly adopted IT solutions
- Insufficient distribution of the workload in local- IT business teams

- Unsuccessful sync-up calls, postponed appointments and meetings due to the time zone differences between the local IT business and service providers.
- Internet connection problems to the environment
- Confusions about group policy settings for the new servers
- Installation exemptions for specific servers
- Holiday clashes of build- task assignees
- Unsuccessful OAT attempts

- ***Phase 4: Approval for Implementation***

In this phase, every project goes through a similar process of check-ups and various approvals which are required by the change management. Based on the findings presented in Figure 15. 1, it was found that the duration of the fourth phase took approximately 13, 01% of the total project duration in every project type. After comparing the actual and weighted averages of the time distribution, 65% of projects were behind the average duration; 35% of the projects were found to be significantly far from the average duration in the fourth phase of their life cycle. The projects which experienced proportional increase in this phase are identified by their schedule performance. After evaluating thirty- five delayed projects and their time performance in the fourth phase, fifteen projects from nine countries diverged from the variation with a larger phase proportion and a project lead time as illustrated in Figure 16. 1.

After each individual phase in the change was reviewed, and personal interviews were performed with the relevant project managers of each project; it was found that most of the delays in the fourth phase are resulted from the particular activities or events which are listed down below.

- Complications with privileged access requests and user names
- Standardization issues with external link management solutions
- Clarifications for the service level agreement
- Clarifications for the support model
- Clarifications for the related hostnames and configuration items

- Changes in the contact matrix/ approval matrix
- Holiday clashes of approval assignees

When the proportional tradeoffs between the third and the fourth phases of eighteen projects were visualized, it was found that twelve of them completed their fourth phase with approximately 6, 8% lower proportions than the weighted average. Hence, it was discovered that when projects have major delays in the third phase, the fourth phase tend to have lower distribution proportions of time because of the upcoming RTP dates and business expectations to any avoid further delays.

5.2 Recommendations

Based on the findings and interview results, no significant relationship was found between the individual delay values in the first phase and total delay values in the lead time. Subsequently, 25% of these projects were found to be significantly far from the average duration in the second phase of their life cycle; 44% of all projects were found to be significantly far from the average in their third phase; 35% of the projects were found to be significantly far from the average duration in the fourth phase of their life cycle.

When the delayed projects are examined according to their visualized time distribution, the proportional tradeoffs between the second and the third phase were calculated. Almost 90% of the projects which had a delay in second phase completed their third phase with approximately 13, 5% lower proportions than the weighted average. When the proportional tradeoffs between the third and the fourth phase were calculated for each delayed project in the third phase, it was found that 75% of them completed their fourth phase with approximately 6, 8% lower proportions than the weighted average.

- **Using a Baseline for Total Time Distribution**

By considering these evidences, the highest values in terms of delay were spotted in the Build and Test phase of the projects. This phase was also found to be the most time consuming part of the projects, and it can take from 50% to 65% of the total duration in different project types. Risk and Impact & Approval in Principle phase placed second, and Approval for Implementation placed as the third time consuming phase in this order. For that reason, this study suggest that project managers should definitely consider weighted averages of each phase, and the phase monitoring actions should be maintained carefully during every project manage. If the RTP date is already estimated by local the IT business and project manager has no option to postpone, or if there is a limited time for both sides, these proportional values can be considered as baseline values for the time distribution.

For example, when the project gets stocked in first phase, and the 15% of the estimated time has already been used, a manager can make decisions to increase their efforts by considering these proportional values. According to the sequential transition of the proportional tradeoffs in delayed projects, majority of the project managers completed the remaining project phases with lower values than the weighted average. If time overruns occur in early phases, project managers in PMO can benefit from these values in expediting or delaying the duration of other phases to meet the project deadline as planned.

- **Re-planning the schedule**

Sometimes there might be a missing document in the change, the human resources might not be available at the project time, customer and technical tests might not be passed, or approvals cannot be placed on time as expected. As seen from the interview results, these milestones do exist for the project managers in PMO, DHL IT Services Prague. If project managers face this kind of situations, they can consider re-planning their project schedule. Change management suspends the RFC when given deadline is exceeded due to missing approvals and incomplete build and test tasks. For that reason, project managers might be able to avoid potential delays by avoiding unrealistic schedule- planning. This option is recommended (Sanchez, Terlizzi, De Moraes, 2017) especially in the first and second phase of the projects where project managers are unclear about the future course of events.

- **Additional Trainings**

In a large organizations like DHL where IT projects are usually executed simultaneously, it is mandatory to have a sequence of prioritized projects to maximize the resources for every project. Because, the beginning of an activity can depend upon the completion of other projects occupying the essential resources (Sanchez, Terlizzi, De Moraes, 2017). Even though the project management team performs a good quality work with efficient interventions, the projects can still be ahead of the schedule due to the other role players in the lifecycle. The lack of experience and the insufficient allocation of the members in local IT teams can play an important role in this matter especially when there is no access for additional help. Depending on the experience level of the local employee, additional and/or more detailed trainings can be provided to the local teams in advance. Based on the improvement, some early actions can be taken such as increasing the total project management effort in that particular task, or postponing the RTP date totally until someone else is available.

- **Effective Communication**

Even though the diversity among the teams might be beneficial for various things, virtual communication instruments may discourage individuals from speaking up, or from being open and inclusive during the work. Especially, when the project teams are remotely located from each other, with large time zone differences, the risks of facing communication based problems can get greater (Hill and Bartol, 2018). Based on the interview results, it was found that most of the Server Build (RIM) projects experienced unfruitful sync-up calls, communication problems, clashing holidays, or meeting postponements.

If the effective communication could not be maintained with some particular projects, improvements are expected to be made by those virtual teams to improve their communication and performance in the future projects. This study suggest that making the intentions more clear before the project start can help both of the sides especially if regional holidays or personal vacation days of the assignees are overlapping with the project lead time. When projects reach an agreement in which both of the sides make concessions for a better communication, issued caused by time zone gaps might be handled more efficiently as well. Based on RIM project experience level of the local IT teams, additional trainings/orientations in virtual teaming can be provided for those who need.

In the next chapter, final conclusions of the study will be drawn based on the reviewed literature, empirical findings and recommendations of this research.

6 Conclusion

Despite almost seventy years of efforts to advance the management of Information Technology (IT) projects, recent studies are still reporting high rates of failure. Historical data shows that there is no single factor that can be addressed by a project manager to guarantee success or avoid failure. Both in classical and IT project management practices, project managers are facing difficulties. This is an interconnected problem with multiple causes based on the unique nature of each project and their objectives. Based on the different approach, activity and conditions; the behavior and the performance of the project managers may show variety in terms of design, execution, monitoring, and evaluation process of the projects.

The main aim of this research is to investigate this phenomenon through a case study by using the available data sample extracted from one hundred remotely managed Server Build projects which were performed by DHL IT Services Prague Project Management Office (PMO) for the infrastructural development of thirty countries in one and a half years. In order to correctly address and build the case study, and to understand how and why, if any, mentioned project overruns or tradeoffs occurred in the schedule performance; the relevant literature, project performance analyses and other empirical studies are examined with a specific focus on schedule and time distribution as well as scope verification from a phase-to-phase perspective.

After the analysis on the schedule performance of one hundred IT projects was completed, just like in the other empirical studies, the project time overruns were also found in this type of projects. Unlike the classical project management constraints, and due to the cost neutral environment of the projects, time effort distribution of individual projects were taken into consideration. When the budget data of two master projects were reviewed, no significant relationship was able to be drawn in between the delayed projects and the role of the cost performance of the project managers. The only country which has budget overruns was spotted out of the sample projects, consequently the budget constraints were unexamined. When the time performance of the projects were examined, it was found that 65% of the projects were behind, and 35% of the projects in the sample were significantly ahead of the average of usual

RTP delays. After these projects were scrutinized and each determinant factor was provided by the project managers, the causes are encapsulated and discussed accordingly.

The results showed that there is a strong correlation between both measures of project total duration and time effort distribution among single phases. Besides, it was found that larger variances of delay in the Risk and Impact & Approval in Principle, Build & Test and Approval for Implementation of the projects were the main reasons of total time delay in sixteen countries. The proportional tradeoffs between project phase durations are analyzed, and it was found that majority of the projects experienced significant time- effort tradeoffs throughout their processes in order to meet the deadlines. According to the findings and personal interviews, the recommendations such as using a baseline for total time distribution, avoiding unrealistic schedule- planning, providing additional and/or more detailed trainings, and keeping the communication open and inclusive are proposed.

The empirical findings and statistical results of the analysis is expected to be beneficial for future studies on Remote Infrastructure Management (RIM) time performance analysis and process improvement studies.

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In-house resources from DHL IT Services

- In-house Resource A: DHL IT Services Prague, Welcome to ITS, 2018.
- In-house Resource B: DHL IT Services Prague, ITS Process, 2018.
- In-house Resource C: DHL IT Services Prague, ITS Change Management, 2018.

8 Appendix

8.1 Personal Interview Questions

Q1. How would you describe your experience with “Project …”?

Q2. What, if any, were the key challenges for the “Project …”, and how those challenges affected your work?

Q3.What was done to tackle those challenges?

Q4. How would you describe your communication experience during “Project …”?

Q5. What, if any, were the key challenges in your communication experience, and how those challenges affected your work?

Q6) How would you describe the project milestones, and why, if any, they occurred?

Q7. Did you experience any technical challenges in “Project …”, and why, if any, those challenges occurred?

Q8. Did you experience any challenges with unexpected scope changes, and why, if any, those challenges occurred?

Q9. How would you describe the main reasons for the RTP delay in “Project …” ?

Q10. How would you summarize your overall time-effort performance in “Project …”?