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Title: The Influence of Organizational Factors on the Delivery of Public Construction Projects: A Case Study of University of the Philippines Quezon Hall Project

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The Influence of Organizational Factors on the Delivery of Public Construction Projects: A Case Study of University of the Philippines Quezon Hall Project

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Summary

University of the Philippines (UP) have been experiencing infrastructure boom since 2010. Projects being undertaken in the university includes renovation and rehabilitation of existing buildings, construction of new buildings, among others. With the upsurge in the government funding for the university capital outlay, managing the increasing number of construction projects have become more challenging. Confronted with challenges concerning the capacity of its personnel, in terms of managing construction projects' processes, bureaucratic nature of public institutions and lack of IT integration to its processes, as of 2016, it has been documented that almost 70% of the university projects procured through GAA 2011-2015 were not yet complete.

One of the many university projects that experienced delay was the UP Quezon Hall Project which was procured through GAA 2013. This project involves the renovation of the university's main administration building that was planned to be completed within a year. The construction started in early 2014 but was finished beyond the schedule as per the contract.

This study aims to explain how organizational factors, people, process, and technology, influenced the delay of UP Quezon Hall Project. The delays in university construction projects impact the university, as project owners, in many ways such as disturbing the university's overall development plan, delayed benefits of projects that are still in the pipeline, etc., This study is important as it will show how organizational factors influence the delivery of construction projects in the public sector. Using several theories as guide for analysis which includes, HRM, bureaucracy theory, and RBV, an in-depth analysis was performed in order to understand how and why the completion of UP Quezon Hall Project was delayed.

This research is a qualitative case study that utilized semi-structured interview as the main source of primary data. Respondents belong from both the owner and the contractor side. Secondary data was also used to substantiate the main findings. The main limitations encountered involves the sample size as some of the expected respondents were not able to participate due to considerations in schedule while some decline to take part. The data collected from the interview were analysed by clustering them into similar *idea*. Afterwards, data were presented using frequency tables. Based on the results obtained, it was found that for people-related factors, *inadequate number of staff to manage the construction project, lack of training and development,* and *hiring process* negatively affected the delivery of the project. For process-related factors, the *lack of project operations manual, inefficiencies in the procurement* and *(bureaucratic) process of making design decisions* negatively affected the project's timely delivery. In terms of technology-related factors, the *lack of relevant database* and *low level of IT* were found to negatively affect the schedule of the project. Apart from organizational factors, *other factors* which includes *failure of the university to provide right-of-way on schedule, absence of independent/in-house project manager,* and *lack of capacity of BAC in implementing the procurement law* also negatively affected the schedule of the project. From these findings, the project was delayed due to combinations of various factors.

To conclude, it was found that people, process, technology related, and other factors significantly influenced the delay of UP Quezon Hall Project. Collectively, the three elements

of organizational factors plus other factors do not have an equal share of magnitude as each factor influences the others. As the main resource necessary to achieving a successful project, people are responsible for streamlining the process and managing the existing technology for the benefit of the project. A good process and adequate technology will further enhance the quality of human resource by increasing their efficiency and productivity for a successful project delivery. The study therefore recommends that the university, as project owner, address the factors identified in this study. Moreover, a balanced attention among the people, process, and technology within the university can enhance their project delivery performance.

Keywords

Construction projects, people-related factors, process-related factors, technology related factors, delays

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Abbreviations

IHS	Institute for Housing and Urban Development
UP	University of the Philippines
GAA	General Appropriations Act
CO	Capital Outlay
ICT	Information, Communication and Technology
LGU	Local Government Unit
OVPD	Office of the Vice President for Development
IT	Information Technology
HRM	Human Resource Management
RBV	Resource-based View
UPQHP	UP Quezon Hall Project
HRD	Human Resource Development
SPMO	Supply and Property Management Office
TOR	Terms of Reference
VO	Variation Order
BAC	Bids and Awards Committee

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Chapter 1: Introduction

1.1 Background

Delay in construction is a common problem worldwide (Mukuka et.al., 2014; Divya, 2015). It is considered the biggest challenge in construction industry especially in many developing countries (Pourrrostam and Ismail, 2012). Delay is defined as the extension of time necessary to complete a certain project, a period in which part of the project is extended due to certain conditions (Abdul-Rahman, 2011). It usually occurs when the actual accomplishment of the project is moving slower than the planned accomplishment (Hamzah et.al., 2016). In construction, the required accomplishment of a project is provided by the owner as per project stakeholders' agreement (Elawi, 2016; Mukuka et.al., 2014) which is formalized in a form of a contract. However, due to the complexity of construction projects, delays are becoming a big concern for project stakeholders especially for owners. In previous studies, researchers categorized delays in construction into excusable and non-excusable delays (Hamzah et.al., 2011; Elawi et.al., 2016; Mukuka et.al., 2013; Samarah and Bekr, 2015). Excusable delays are caused by the owners or incidents beyond human control while non-excusable delays are caused by the contractors (Hamzah et.al., 2016). Whether excusable or non-excusable, delays are considered to be a major hindrance in the execution of public projects (Elawi, 2016). For years, researchers have studied the nature of causes and effects of delays within construction industry (Marzouk and El-Rasas, 2014; Pourrostam and Ismail, 2012; Sambasivan and Soon, 2007; Samarah and Bekr, 2015; Elawi et.al. 2016; Hamzah et.al., 2011; Aibinu and Jagboro, 2022). With the aim to minimize delays, many studies have focused on improving construction practices and project delivery mechanisms through the investigation of various techniques (Divya and Ramya, 2015; Indhu and Ajai, 2014, Alzara et.al., 2016; Ling and Poh, 2008). From a great number of the studies performed in the past, researchers found that most of the causes of delays in construction projects are related to owners. Among the owner-related causes of delays, the major factors include, i) change orders, ii) late revision and approval of designs, iii) slow decision making, and iv) poor communication and coordination (Pourrostam and Ismail, 2012; Samarah and Beker, 2016; Divya and Ramya, 2015). Majority of these causes were encountered during the construction stage. Moreover, it was found that a high correlation exists between the overall performance of a project and the construction stage (Gebrehewit and Luo, 2017). In many countries, construction sector is considered as one of the component of macroeconomics, any loss due to delays of construction projects significantly affects the local economy. Thus, it is crucial to investigate how certain factors affect the delivery of construction projects in order to come up with strategies to minimize delays (Tafazzoli and Shrestha, 2010).

For this research, the study will focus on the case of the University of the Philippines (UP), a state university, which experiences delays in the delivery of its construction projects. For the past seven years, UP is undergoing an infrastructure boom. From 2010-2015, the university received a total share of $217 million from the government's General Appropriations Act (GAA) for its infrastructure projects. Infrastructure capital outlay (CO) for the university covers construction of new buildings, new roads, rehabilitation of power and water lines, procurement of ICT system, and renovation and upgrading of existing buildings and facilities. With the huge increase in funding from 2010 ($27.5 million) to 2015 ($98.63 million), quality infrastructure must be delivered on time to achieve the set targets. The university's infrastructures are very important because it serve as the key engines to deliver improved educational and operational outcomes. However, many of the university projects are experiencing long delays while some even suffered from termination. As of February 2016, only 32 out of the 106 projects funded

through GAA CO 2011-2015 have been completed - 34 were on-going, 36 were still under the bidding stage, and 4 projects were terminated.

To investigate the delays in the university, this study adapted the concept of *Taxonomy of Change Causes and Delays* in construction projects proposed by Sun and Meng (2009). Loosely defined, change causes are events or conditions that contribute to project delays. It is classified into three groups: i) external factors, ii) organization factors, and iii) project-internal factors. First, external causes are the factors that are out of hand of the project stakeholders. It includes environmental, political, social, economic, and technological factors. Second, organizational factors include people, process and technology related causes. Lastly, project internal causes deals with causes generated by any of the project stakeholders. In the case of UP construction projects, the causes of delays are significantly related to organizational factors – people, process and technology related factors.

Delays in construction have been explored by many authors in the past. In a study by Arditi and Diamci (2017), they found that owner-related causes of delays dominate the delays in construction. Further, they recommended to investigate the relationship between the owner's organizational culture and delays in construction. In another study, Sun and Meng (2009) acknowledged that construction projects are complex processes that involves many uncertainties. From there, they developed a taxonomy of causes of delays and recommended to use it as a framework for evaluating construction project performance in terms of time (cost and productivity). Combining the recommendation of both studies, there is a knowledge gap on how severe the owner's organizational factors affects the performance of construction projects in terms of timely completion (cost and productivity).

Despite the increase in funding for UP infrastructure projects, the university is still facing various challenges in the delivery of its projects due to factors related to *people, process,* and *technology*. First, *people-related* factor is linked to the lack of project management expertise of the university's offices involved in construction projects. Second, *process-related* factor is evident in the problems encountered due to internal processes and bureaucratic procedures governing the university which results to long delays of projects and in some cases termination. Third, *technology-related* factors include the lack of database for streamlining the complicated university procurement procedures and for monitoring construction project accomplishments. In relation to these, the university recently developed an *infrastructure projects database* to ensure proper storage of information related to infrastructure projects for easy access and updating. It also launched the procurement information system to simplify and standardize the procurement procedures of the university (Zamora, 2016).

1.2 Problem Statement

From 2010-2015, the university fund for physical development experienced a remarkable upturn. With the increase in funding, physical development is expected to flourish which will serve as the key engine to deliver improved services within and outside the university. From all the projects funded between 2011-2015, only 30% were completed: 32 out of the 106 projects.

For year 2011, 100% of the budget for construction projects was disbursed, 20.82% for 2012, 2.16% for 2013, 0.12% for year 2014, and 0% 2015 (Zamora, 2016).

This study will focus on the context of UP Quezon Hall Project, one of the many construction projects in the university, which was procured in 2013. The building serves as the university's central administration building which rooms several key offices such as the Office of the University President and Office of the Vice Chancellor. Like other university projects, the UP Quezon Hall Project also experienced a considerable amount of time to complete. This project is a design and build project which was procured to renovate the Quezon Hall Building in UP campus in Quezon City. A design and build project delivery method is a very useful method to reduce the total design and construction time because the design development and construction phase overlap one another. However, during the construction phase of UP Quezon Hall Project, the project experienced series of delays. These difficulties have led the university, as project owners, to continuously adjust the original completion date as stipulated in the contract to compensate the contractor for the time loss. As per contract, the UP Quezon Hall Project was expected to be finished in 2015. Conversely, due to several circumstances, it was completed in November 2017.

Apparently, there are many factors that influence the delivery of construction projects in the university, but among them, it is the organizational factor which will be highlighted in this study. Organizational factor is divided into three categories, *people, process, and technology related factors. Other factors* will also be taken into consideration given the fact that causes of delays in construction projects are developed due to different circumstances.

The first factor that considerably affects the delivery of construction projects in the university is the *people-related factor*. As project owners, the university must be equipped with the sufficient project management skills and knowledge to ensure successful delivery of projects. However, the university experiences some issues that are attributed to lack of knowledge on project management. For example, in the preparation of project brief, some projects are beset with errors. Miscalculations and omissions in the project brief results to variation orders and time extension during the construction phase. Common problems encountered during the construction project delivery includes "*failure of bidding, work extensions, variation order, and sometimes termination or cancellation of the project*". The importance of decision-making related to these issues was also highlighted because of the serious and long-term impact it has on the projects (Zamora, 2016).

The second challenge being faced by the university is linked to *process-related factors*. UP is a public university governed by internal procedures and bureaucratic processes brought about by the existing laws. In this kind of environment, approval and resolution of project issues takes a significant amount of time due to its hierarchical structure. Many parties are becoming involved in the decision-making process which leads to *clashing demands* that contribute to the delay of projects. Another issue is linked to the procurement process of the university which is subject to the Philippine Procurement Law and its Implementing Rules and Regulation. For the procurement system, the university is spending an enormous amount of time to come up with a decision trying to resolve inconsistencies in the interpretation of procurement's implementing rules and regulations which contributes to the delay of projectexecution. All of these processes

and procedures, before and during construction, significantly affect the implementation of university construction projects (Zamora, 2016).

The third factor that also influences the delivery of university construction projects is the *technology-related factor*. In order to improve its project monitoring and reporting, the university recently developed and launched the infrastructure projects data collection and reporting system. It aims to store infrastructure project related information for better assessment. It is a database that project staff can use to input and access information related to project accomplishments (schedule, cost, etc.,) that are very helpful to evaluate project status in a convenient manner. Another database was also released to address the issues in the university procurement system. In line with this, the university *procurement information system* was developed to simplify the complicated procurement process to avoid multiple interpretation of the IRR (Zamora, 2016).

Delay occurs when the project is completed beyond the planned schedule due to various circumstances (Abdul-Rahman, 2011). In order to assess the delays in university construction projects due to organizational factors, three measures will be used. First is the schedule efficiency which is a time performance indicator for construction projects. Cha and Kim (2011) proposed the use of *schedule efficiency* which reflects the amount of time saved or exceeded (to complete the project) relative to the original schedule as per contract. A negative schedule efficiency means that the project was completed beyond the planned schedule. On the other hand, a positive schedule efficiency means that the project was completed before the planned schedule. Finally, a zero value means that the project was completed exactly on schedule. Thus, a zero and positive value of schedule efficiency are always preferred which indicates the early or on time delivery of a project. Second indicator of delays in projects is based on the *number of variation orders* due to owners. According to Memon et.al. (2014), variation orders (additional works) usually leads to extension of project schedule which results to delays. When a variation order comes from the owner, it entails additional time to the project schedule. These kinds of delays which are subject to *time compensation* are considered as *excusable delays*. The higher the number of variation orders, more extra time is granted to the contractor to execute the additional work. As a result, planned schedule of project completion is also moved. Lastly, *time compensation* due to waiting time for approvals and resolutions is also considered as a measure of delay. In bureaucratic organization like in public sector, approvals of project related issues usually take a lot of time due to the inherent hierarchical structure and the governing rules in decision-making. Therefore, any lost time by the contractor while waiting for information and issues to be resolved is subject to time compensation. This eventually leads to the adjustment of the original schedule which results to delay (Sullivan and Harris, 1986).

1.3 Research Objectives

The main objective of this research is to explain the extent to which the university's organizational factors have influenced the delay of UP Quezon Hall Project and to identify other possible factors that contributed to its delay. This study will contribute to fulfilling the gap on how owner's organizational factors influence the delay of public construction projects.

This study will focus on the organizational factors of the university, as project owners, based on three aspects: people, process, and technology-related factors. This study is being undertaken

based on the evidence that UP is experiencing a significant amount of delay in the completion of its projects due to issues, such as but not limited to, lack of project management expertise of the university (people), bureaucratic processes and internal procedures (process), previously lack of information technology adoption for data collection, procurement standardization and reporting system (technology), among others.

1.4 Research Objectives

To what extent do organizational factors influence the delays in the delivery of UP Quezon Hall Project?

The research aims to address the following questions

1. How do people-related factors affect the delay of UP Quezon Hall Project?
2. How do process-related factors affect the delay of UP Quezon Hall Project?
3. How do technology-related factors affect the delay of UP Quezon Hall Project?
4. What other factors influence the delay of UP Quezon Hall Project?

1.5 Significance of the Study

This study aims to provide a practical and theoretical contribution to explain the delays in UP construction projects due to organizational factors – people, process, and technology related. In a practical point of view, the study will be helpful for the university to identify areas within its organization that needs improvement in order to minimize delays in construction projects. Having a clear understanding of the relationship between the people, process, and technology-related factors and delays in construction projects can be helpful in identifying areas of improvement in the university to help enhance the project delivery mechanisms. Projects being undertaken by the university play a vital role in fulfilling its mandate for academic and operational excellence in order to provide better services. Specifically, university infrastructures are important building blocks for the advancement of research and development in the country, contributing to the dissemination and application of knowledge as its commitment to national development, and providing technical assistance to the government, private sector, and civil society. All of these overlap with the university's social responsibility of providing public service.

In a study by Arditi and Diamci (2017), it was recommended to investiagate the relationship between owner's organizational culture and delays in construction projects. This study will contribute to fulfilling that gap by investigating how owner's organizational factors influence the delay of public construction project by using the taxonomy of delays which was developed and recommended by Sun and Meng (2009).

In a theoretical point of view, this study will contribute to the academic body of knowledge by looking at how owner's organizational factors influence the timely delivery of locally funded government projects. By recognizing, in a significant number of circumstances, that organizational factors substantially affect the overall performance of projects, it is timely to investigate the relationship between people, process, and technology-related factors which influence the delays of public construction projects. In addition to that, it will also identify how

a design and build project, which was expected to shorten the delivery schedule due to overlap in design and construction, ended up being delivered beyond the contract schedule. There are a large number of studies that investigated various causes of delays in the construction industry. However, despite the numerous studies performed about the causes of delays, it is not clearly established how organizational factors, people, process, and technology related, affect the delivery of public construction project.

1.6 Scope and Limitations

The study seeks to explain the relationship between the organizational factors (people, processes, and technology-related factors) and the delays in university construction projects. Specifically, this study will focus on the organizational factors of the university (project owner) as evident from the challenges being faced by the institution in the delivery of its construction projects brought about by factors inherent to it. The study will put emphasis on the owner-related causes of delays since it was identified in previous studies and the evidence from the university that owners have a significant influence on the timely delivery of construction projects (Pourrostam and Ismail, 2012; Samarah and Beker, 2016; Divya and Ramya, 2015; Arditi, 2017). However, despite the emphasis on the university's organizational factors, other causes of delay are also recognized in this study.

Aside from organizational factors, it is acknowledged that there are various combinations of *other factors* which might influence the delays of project completion. These categories of delays are further discussed in Chapter 2 using the *taxonomy of change causes and delays* by Sun and Meng (2009) which classified three factors of causes of delays – i) external, ii) organizational, and iii) project internal. The study is confined to the delays which fall under the category of organizational factors that includes people, process, and technology related aspects. It is based on the premise that owners have significant contribution in the delay of construction projects as evident in previous researches and also the experience of the university as project owner (Gebrehewit, 2017).

From the many projects within the university, this study will only focus on the case of UP Quezon Hall Project. It is one of the several university projects that were completed beyond the schedule as stipulated in the original contract. The case of UP Quezon Hall Project was selected in order to have a clear and deeper understanding of how organizational factors (people, process, and technology related), of the university, as project owners, affect locally-funded government projects in the university. In doing so, a better understanding of the delays in the construction of university projects can be made. Moreover, doing a single case study allows the researcher to explore a new set of relationships that can either enhance or refute the theoretical relationship between organizational factors and delays in university construction projects. Furthermore, due to the limited time available, assessment of similarities and differences between two or more cases will be difficult.

According to Gustafsson (2017) "*the page length, the number of cases or the length of the researchers' stay in the field per se is not the big issue. The issue is instead the researcher's ability to understand and describe the context of the scene in question in such a way so the reader can understand the context and to produce theory in relation to the context.*"

Chapter 2: Literature Review / Theory

The following literature review provides an overview of delays in the construction industry, the taxonomy of change causes and delays, and the indices to assess organizational factors in terms of people, process, and technology-related factors.

2.1 Introduction

The construction industry has a great impact on a country's economy. To achieve urban and rural development, the physical progress of construction projects must be delivered on time. In the public sector building construction, the completion of projects is estimated and reflected in contracts. However, despite the introduction of science and engineering techniques to improve the construction processes, delays seem to be unavoidable during the project lifecycle (Hussain et.al., 2018; Tafazzoli and Shrestha, 2010).

In this study, the *Taxonomy of Change Causes and Delays* was adapted to explain the delays experienced in the delivery of university construction projects. Among the three main factors of delays, it was identified that organizational factors have the most significant influence on the delivery of university construction projects. The organizational factor is subdivided into three elements: people-related, process-related, and technology-related. Though the focus of the study will be on the organizational factor, it is acknowledged that *other factors* might also contribute to the delay of construction projects. This chapter will provide a discussion of the variables, sub-variables, and their corresponding indicators.

At the end of this chapter, a conceptual framework was presented to show the relationship between the variables and sub-variables. The underpinning theory of this study includes the *Human Resource Management, Bureaucratic Theory, and the Resource-based View Theory* that explains the connections of the people, process, and technology-related factors to the delays of construction projects.

2.2 Delays in Construction

Delay is the most frequently encountered problem in construction projects (Hisham and Yahya; Mukuka et.al., 2014; Divya, 2015). In many previous studies, there are various circumstances that leads to the delays of projects. Causes of delays, in general, can be owner-related (i.e. change order, slow decision making, late revision and approval of design, poor communication), contractor-related (rework due to error in execution, ineffective planning and scheduling), design-related (misunderstanding of owner's requirement, design changes by owner, delays in producing design documents), material-related (delay in material delivery, late procurement of materials), equipment-related (shortage of equipment, lack of equipment and skilled operators), labor-related (low productivity, shortage of labor), and external-related (extreme weather conditions, changes in government regulations and laws) (Hisham and Yahya; Hussain et.al., 2018). These delays can be classified into i) excusable, ii) concurrent, and iii) non-excusable. On one hand, excusable delays are caused by the client/owner wherein contractor will be compensated or get extra payment and time extension for the delay caused. On the other hand, non-excusable delays, are caused by the contractor and are not subject to time-extension and additional compensation from the owner. In cases like these, the contractor needs to provide a

catch-up plan to accelerate the pace of the project. Lastly, concurrent delays are caused by neither the owner nor the contractor. In which case, it involves fire, flood, and other natural causes that are not subject to extra cost from the owner (Hamzah et.al., 2011; Elawi et.al., 2016; Mukuka et.al., 2013; Samarah and Bekr, 2015).

For this study, the *Taxonomy of Change Causes and Delays,* developed by Sun and Meng (2009) will be used. This study will focus on the organizational factors - people, process, and technology-related factors of the university as project owners. In previous studies, several researchers pointed out that owners do have a significant influence on the delays of construction projects (Elawi et.al., 2016; Haseeb et.al., 2011; Marzouk and Rasas, 2014; Motaleb and Kishk, 2010; Samarah and Bekr, 2015). Table 1 shows a summary of major causes of delays in construction projects from twenty-three (23) different countries. These causes of delays were collected by researchers from different countries like Jordan, Egypt, Malaysia, China, Saudi Arabia, Nigeria, Iran, Kuwait, Thailand, Malaysia, Vietnam, and Pakistan. From this tabulation, the most common causes of delays were found to be related to owners such as i) design changes during construction (change orders), ii) delays in contractor's payment by owner, and iii) incomplete design.

In order to assess the delays in construction projects, Cha and Kim (2011) proposed the use of *schedule efficiency*. Schedule efficiency is a measure of how well the project schedule was met by comparing the *planned schedule* and the *completed schedule*. *Planned schedule* is the original project duration as per contract while *completed schedule* refers to actual duration necessary to complete the project. The higher the value of schedule efficiency, the more efficient the project is, and vice versa. Schedule efficiency is expressed in terms of percentage that can have a value of negative, zero, or positive. A negative value means that the project was finished beyond the schedule stipulated in the contract while a positive value means that the project was finished earlier than the planned scheduled. On the other hand, zero schedule efficiency means that the project was finished exactly on time. Schedule efficiency is calculated using the following formula (Cha and Kim, 2011).

Schedule efficiency = (Planned Schedule – Completed Schedule)/Planned Schedule

Delays in construction projects can also be assessed based on the number of variation orders. Variation orders are the deviations experienced from the project's original contract. Strictly defined, *"variation order is a written agreement between the contracting parties that represent an addition, deletion, or revision to the contract documents, identifies the change in price and time and describes the nature of the work involved".* Variation orders are a result of various causes, and in many cases, it entails a corresponding time extension depending on the extent of the work required. Among the three categories of delays, it is only the excusable delays that merit a time extension since it is caused by the action of the owner. It includes *i) change in scope, ii) poor procurement process, iii) poor project brief* and many others. Variation orders affect construction projects in various ways. One consequence of variation order is the delay in project completion. In previous studies, it was reported that variation orders delay projects by an average of 9% of the original schedule. In general, a project delayed by 3 months or more is already considered as a poor project (Memon et.al., 2014; Ling and Poh, 2008).

Another way to measure delays in construction projects is by assessing the *approved time extension* to compensate for the waiting time of the contractor. In public organizations, when bureaucracy is practiced excessively, resolutions and approval of project related issues take a lot of time. Waiting time is related to the time spent by the contractor anticipating for a reply from the owner regarding project-related concerns. From this, it is clear that the contractor is at the receiving end of the effect of the delays in approval or resolution of project issues. For cases when the waiting time already affects the project's schedule, the contractor will be compensated in terms of the time extension. The owner's response in providing information on time depends on the efficiency of their decision-making processes (Sullivan and Harris, 1986).

Table 1 Major Causes of Delay in the Construction Industry

Researchers	Country	Causes of delay																		
		Poor site management and supervision	Problems related to subcontractors	Poor planning and scheduling	Inadequate contractor experience	Late delivery of materials	Design changes during construction / Change orders	Incomplete or improper design	Contractor's financial difficulties	Delays in contractor's payment by owner	Shortage of materials / equipment / manpower	Unforeseen geological conditions	Difficulties in obtaining permits and excessive bureaucracy	Weather condition	Slow decision-making process	Economic problems (e.g., inflation, fluctuation)	Poor contract management	Poor labor productivity
Ruqaishi and Bashir (2013)	Oman	•	•	•		•												
Gunduz et al. (2013a, 2013b)	Turkey	•		•	•	•	•											
Fallahnejad (2013)	Iran		•			•						•						
Doloi et al. (2012)	India					•	•	•	•									
Kazaz et al. (2012)	Turkey						•		•	•			•					•
Mahamid et al. (2012)	Palestine						•			•	•		•					
Yang and Wei (2010)	Taiwan			•	•		•			•								
Kaliba et al. (2009)	Zambia						•			•						•		
Al-Kharashi and Skitmore (2009)	Saudi Arabia					•		•		•								
Tumi et al. (2009)	Libya						•	•	•		•				•			
Toor and Ogunlana (2008)	Thailand		•	•	•			•										
Sweis et al. (2008)	Jordan						•		•		•							
Abd El-Razek et al. (2008)	Egypt						•		•	•							•	
Sambasivan and Soon (2007)	Malaysia	•	•	•	•					•								
Alaghbari et al. (2007)	Malaysia									•	•				•			
Assaf and Al-Hejji (2006)	Saudi Arabia						•	•		•								
Abdul-Rahman et al. (2006)	Malaysia			•			•	•		•	•							
Abinu and Odeyinka (2006)	Nigeria		•					•	•	•	•							
Faridi and El-Sayegh (2006)	UAE	•		•				•			•				•			
Lo et al. (2006)	Hong Kong	•		•								•						
Koushki et al. (2005)	Kuwait						•			•								
Ahmed et al. (2003)	United States						•	•										
Frimpong and Oluyowe (2003)	Ghana								•	•		•				•	•	
Odeh and Battaineh (2002)	Jordan	•			•			•		•								•
Al-Momani (2000)	Jordan					•	•	•				•		•		•		
Al-Khalil and Al-Ghafly (1999)	Saudi Arabia					•				•		•	•					
Mezher and Tawil (1998)	Lebanon		•				•	•					•					
Couto and Teixeria (2007)	Portugal						•	•					•					
Kaming et al. (1997)	Indonesia			•			•											•
Chan and Kumaraswamy (1997)	Hong Kong	•			•							•						
Chan and Kumaraswamy (1995)	Hong Kong	•										•			•			
Ogunlana et al. (1996)	Thailand					•		•			•				•			
Assaf et al. (1995)	Saudi Arabia						•		•	•					•			
Mansfield et al. (1994)	Nigeria									•	•					•	•	
Semple et al. (1994)	Canada						•							•				
Dlakwa and Culpin (1990)	Nigeria									•						•		
Okpala and Aniekwu (1988)	Nigeria									•	•						•	
Arditi et al. (1985)	Turkey								•	•	•							
Baldwin et al. (1971)	United States		•				•			•	•	•		•				
Frequency		8	7	9	6	7	18	14	9	20	12	8	6	3	6	5	4	3

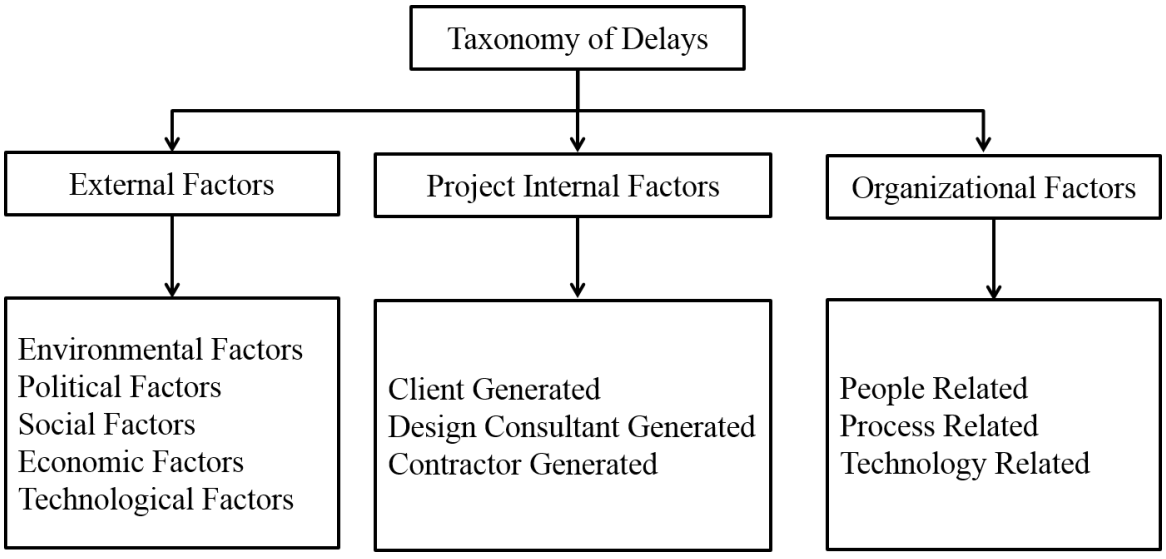
Source: Arditi and Diamci (2017)

2.3 Taxonomy of Change Causes and Delays

The *Taxonomy of Change Causes and Delays* is a classification system of causes of delays in the construction industry. It was developed through an extensive literature review of hundreds of papers from leading construction engineering and management journals. In the past, many researchers proposed categories of causes of delays in construction, but none have provided a taxonomy. Until in the recent decade, Sun and Meng (2009) proposed the *Taxonomy of Change Causes and Delays* (refer to Figure 1) wherein they grouped the causes of delays into three main categories: external factors, organizational factors, and project internal factors.

The *Taxonomy of Change Causes and Delays*, as shown in Figure 1, is composed of three levels. Level 1, Taxonomy of Delays, is divided at Level 2 into external, organizational, and project internal factors. Level 2 is further divided into subfactors according to the source of delay. For external factor, it is composed of five factors namely environmental, political, social, and economic factor. These are project independent factors in which the project stakeholders do not have a direct control. The second factor is the organizational factors which consist of people, process, and technology-related factors. Unlike the external factors, organizational factors are those factors that concern stakeholders directly involved in the project. In many cases, organizations handle many projects at a time. In this premise, organizational factors are considered as project independent. The last factor is the project internal factor which is project dependent. It is divided into four aspects which include client-generated, design-consultant generated, contractor-generated, and others (Sun and Meng, 2009).

Figure 1 Taxonomy of Change Causes and Delay by Sun and Meng (2009)



Source: Adapted from Sun and Meng (2009)

2.3.1 External Factors

External causes of delays are factors that are beyond the control of any of the project stakeholders. It includes environmental, political, social, and economic factors. In most cases, construction projects are subject to the external environment when being carried out. Natural phenomena such as variation in climate and weather significantly affect the progress of the project and in multiple cases, it resulted in less accomplishment and stop operation. On the economic side, changes in the cost of materials, equipment, and labor due to the fluctuation of prices in the market also affects the project construction (Sun and Meng, 2009). It usually happens during the construction stage wherein contractors already submitted their bids and price in the market starts to fluctuate (Mishra, 2017). Political factors also affect the project construction in situations like a change in administration, rules and regulation, security, and corruption (Bekr, 2017).

2.3.2 Project Internal Factors

Project internal factors are project specific and are attached only to a definite project (Sun and Meng, 2009). Causes of delays in construction are varying from one geographical location to another due to various combinations of different factors. In Nigeria, the main causes of delays are poor contract management, changes in site condition, and financing payment for completed works (Aibinu and Jagboro, 2002). This is relatively different from the major causes of delays in Iran which includes poor site management, delayed progress payment by the client, and change orders (Pourrostam and Ismail, 2011). Different geographical location can be argued as a reason for these differences. However, even within a country, on a project to project basis, causes of delays also differ. For example, in the study of Elawi et.al. (2016), they found out that land acquisition, contractor's lack of expertise, redesigning, and line services (underground utilities) are the main causes of delays in Saudi Arabia. Conversely, in the same country, Al-Kharashi and Skitmore (2009) showed that the major causes of delays in construction are a failure to develop strategic plans, level of involvement of participants in the construction process, and disagreement between project stakeholders (in terms of technical and management causes). Overall, despite the cases where there are similarities in construction methods, organizational set-up, and project delivery method, the causes of delays are different from one context to another. This difference puts into the equation the aspect of project internal factors. At some level, organizational factors overlap with project internal factors because project stakeholders are organizations involved in the project delivery.

2.3.3 Organizational Factors

One definitive aspect of an organizational factor that explains the success and failure of any organization is the collaboration between the people. It also touches on the aspect of the human resource, the governing system or process, and the means by which people interrelate. Organizational factors encompass many aspects related to the system in which people operate. It includes *"organizational culture, leadership, personnel selection, resource allocation, communication, management, coordination of work, organizational knowledge, goal prioritization, technical knowledge, problem identification, roles and responsibilities, performance evaluation, and training"* (Hadikusumo et.al., 2017).

In this study, the organizational factor will be investigated under three lenses*: people, process, and technology-related factors* which are based on the *Taxonomy of Change Causes and Delays* developed by Sun and Meng (2009). Table 2 shows the components of organizational factors

used in this study. First, people-related factors are composed of competence and culture. Second, process-related factors include organizational strategy and organizational procedure. Lastly, the technology related factor is concerned with information technology (IT) (Sun and Meng, 2009). In this chapter, the following indicators are discussed with their corresponding aspects used to measure them. These indicators are in-line with the challenges being experienced by the university in the timely delivery of its construction projects. In Chapter 3, these indicators were operationalized using the aspects discussed in this chapter.

"Because of their weak measurement properties, subjective indicators can also be designated as quasi-quantitative *measures."* (Nagpaul, 1995)

Table 2 Organizational Factors Indicators according to Sun and Meng (2009)

Organizational Factors	**Indicators**
People Related	Competence (and skills)
	Culture and ethics
Process Related	Organizational strategy
	Organizational procedure
Technology Related	Information technology

Source: Adapted from Sun and Meng (2009)

2.3.3.1 People-related Factors

Human Resource Management (HRM) in Construction Industry

Human resource is the most significant asset of any organization. It is very vital for undertaking any kind of decisions that can influence the success or failure any organization. Human resource management (HRM) is commonly attributed to the three aspects of i) recruitment, ii) compensation and benefits, and iii) legal affairs of manpower. However, it also deals with the management of human resources to ensure that organizational goals are met by maintaining the right level of productivity (Richman, 2015).

HRM plays an important role in achieving organizational vision and mission with the help of people as primary actors. Contrary to the traditional personnel management theory, where people are considered to be mere instruments in achieving organizational goals, human resource management recognize the people as the most important resource in accomplishing organizational objectives. To further improve the organization, researchers suggested that it is important for organizations to put people at the top priority and make them feel important. As part of the organization's aim to improve its performance, top management are expected to provide enough attention to training and development. Training and development are acknowledged to equip the employees with the necessary set of skills, knowledge, and attitude to perform their responsibilities at an optimum level (Itika, 2011).

HRM has also recognized that the way employees are managed in any organization reflects two important measures - organizational performance and differentiator between successful and

unsuccessful organizations. However, despite the labor intensive nature of construction industry, not much attention is given to investigate the issues concerning its human resource management. Departing from the conventional set of roles and responsibilities of HRM such as administrative and transactional requirements of personnel, the call for new responsibilities includes the *building of organizational culture* and introducing innovations. Moreover, it also involves the identification and development of skills and knowledge (*competence*) of personnel to increase organizational performance (Wilkinson, 2012).

Overall, the quality of organization's HRM affects a wide array of issue related to the level of work quality, project delays, and innovation, among others […] (Wilkinson, 2012).

This study will focus on the competence and culture & ethics components of human resource. Based on the evidence from the university and previous studies, it is recognized that these two components significantly influence the success and timely delivery of construction projects.

2.3.3.1.1 Competence

One important role of HRM is to identify and enrich the competency of people in an organization. An approach to measure competency in project management is through *relevant work experience*. It is a combination of the knowledge learned and the skills gained through its application. Work experience is a kind of learning that cannot be attained by any other means or substitutes. It contributes significantly to the expertise of staff within an organization. In many cases, greater work experience translates to more effective project management. Consequently, it was found that managers with higher experience in project management are more capable of handling change orders to avoid inefficiencies (Zadeh, 2016). In contrast, Enshassi and Al-Raee (2010) found that inadequate experience of owner's staff is one of the main causes of *"variation orders which leads to delays"*. In developing countries, the lack of experience in project management is very common. Knowledge and skills in project management have been acquired through experience and interaction with other individuals in the field of construction (El-Dash, 2007). In a very dynamic workplace like construction projects, the operation significantly depends on the continuous flow of information from one party to another. Lack of project staff qualification may lead to information delivery beyond the due time which may affect the project deadline (Kalinova, 2008). Therefore, to assess competence, one important indicator proposed by Zadeh et.al. (2016) is the *number of years of relevant work experience*. This indicator reflects the project management competency of the university staff.

The concept of competence in management strategy gained popularity in the 1990s when scholars started to distinguish that organizations can capitalize on it to develop competitive advantage (Le Deist and Winterton, 2005). Competence is defined as *"a skill, a personal characteristic or a motive demonstrated by various behaviors which contribute to outstanding performance in a job. Generally, competency is the quality of being adequately or well qualified, having the ability to perform a job"*. It encompasses many facets of an individual such as knowledge, skills, self-concepts, motives, and traits of a person. In any organization, the performance depends not on the human asset itself but rather on the proper matching of competencies to the available work position (Cernusca and Dima, 2008). In the past two decades, competence has been acknowledged to improve the performance of personnel in

organizations. It serves as a measure of differentiating excellent from regular personnel (Kalinova 2008). With the upsurge of the demand for competent professionals in various fields, assessment of competence is becoming very important. In many organizations, competence is being measured to assess critical thinking, analytical reasoning, communicating skill, and problem-solving skill. The need for competent personnel means having personnel who not only *know* but rather *know how* to apply the knowledge. The demand is for the combination of *knowing* and being able *to use* the knowledge (Shavelson, 2010).

2.3.3.1.2 Culture and Ethics

Apart from enhancing the competence of employees, HRM is also concerned with the building of organizational culture. Organizational culture is recognized to have a significant influence on the performance and long-term effectiveness of organizations. In the past, many empirical types of research demonstrated the effect of culture on the organizational performance. The concept of organizational culture gained popularity in the 1980s when scholars started to investigate corporate organizations to identify factors influencing performance (Jung, et.al, 2009). One dimension of organizational culture which is identified to influence success is the workforce orientation. Part of workforce orientation is *training and development* (Nguyen and Watanabe, 2017). Strictly defined in human resource, training and development pertain to *"a planned and systematic effort to modify or develop knowledge, skills, behavior and attitudes through learning experiences, to achieve effective performance in an activity or a range of activities"*. As part of the human resource development, a training session is considered as a vital aspect that can help nurture, educate, and develop employees. In this sense, researchers recognized that training and development must be part of the top priorities of organizations. Moreover, it is suggested that it should be closely tied to the organization's overall strategy.

In a study by Teixeira and Pires (2006), they found that delays in construction projects are related to the lack of construction project management training. They acknowledged that project managers who are responsible for the planning and coordinating the various construction activities of the project should be able to optimize the resources in order to achieve the project objective. This can be attained by increasing the efficiency through training and better education.

In a multifaceted industry like construction, training and development are very important to keep employees updated in terms of skills and expertise. Many forms of training and development were found to be very helpful in educating construction project members. These methods include training courses in centers, on-site training, and independent learning to take accreditation through examinations. Therefore, it is very essential that training and development should be part of an organization's strategic priority to enhance organizational culture (Tabassi et.al., 2011). From this view, culture and ethics will be measured based on the aspect of *training and development* within the organization.

2.3.3.1.3 Project to Staff Ratio (Adequacy of Project Staff)

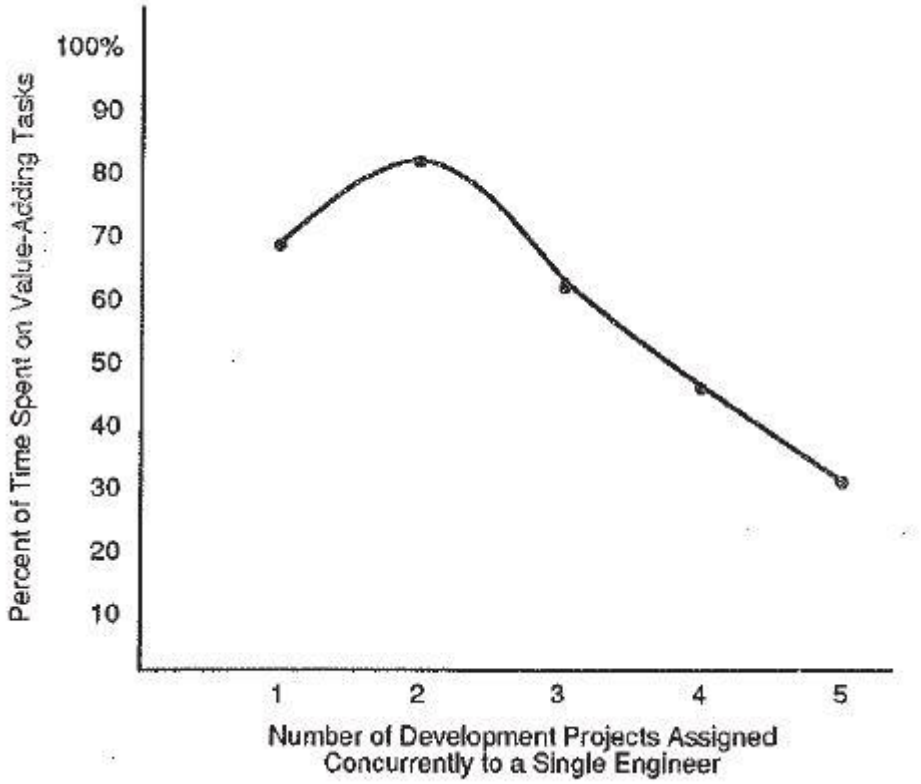
In the construction industry, it is common for organizations to handle multiple projects at the same time. In many cases, the project staff need to handle several projects simultaneously. However, even if project staff are assigned with more than one project, there is still a limit to how many projects an individual can manage efficiently. As a rule, *"the number of projects that*

key resources can handle should determine the number of active projects within the organization – not the other way around". If in case an individual is handling too many projects at the same time, there are risks involved in it. These risks include bad-decision making, slow-response times, among others (Steyn and Schnetler, 2015).

It is normal for organizations to handle many projects simultaneously. But, a large number of projects should not be executed at the same time especially when there is not enough workforce to handle it. If the organization became saturated with too many projects, individuals will be assigned with more than what they can handle efficiently. One manifestation of this condition is when same personnel appear at different projects repeatedly. When projects fall behind their planned schedule, top management usually transfer their personnel from one project to another. However, instead of putting the project back on track, this only leads to *productivity deterioration* that finally results to a *domino effect of delayed projects* (Steyn and Schnetler, 2015).

On the other hand, managing many projects at the same time not always leads to negative effects. This is in line with the fact that handling many projects at the same time can minimize the *idle time* when certain parts of the project cannot be worked on yet. Recognizing that handling many projects at the same time has positive and negative effects, Steyn and Schnetler (2015) suggested that there must be an optimal number of projects that an individual can handle at the same time. Figure 2 shows the relationship between the number of projects that can be handled at the same time by a single engineer and the percent of time spent working on value-adding activities. From the graph, it is evident that the optimal number of projects that can be handled by a single engineer at the same time is two. It can also be observed that from 1-2 projects, there is a slight increase between the percent of time spent on value-adding activities. This increase can be attributed to the idle time being reduced making the individual occupied and work efficiently. However, in the third project, the value-adding activities begin to drop due to more coordination and monitoring of information. Based on this premise, researchers agreed that the optimal number of projects that an individual can handle at the same time is two to three projects (Steyn and Schentler, 2015).

Figure 2 Productivity of Engineers on Development Projects



Source: Steyn and Schnetler (2015)

2.3.3.1.4 Hiring Process

Another important aspect of HRM is the hiring process. Hiring process is divided into two functions: recruitment and selection. In any organization, the quality of HRM is highly influenced by the effectiveness of these two functions. The main objective of recruitment and selection is to get the candidates who are best fit with the organization's culture and has the capability of achieving the organization's objectives (Saddam and Mansor, 2015).

The initial step in the hiring process is the recruitment. It covers the activities that helps attract potential applicants who will meet the organization's requirements in terms of skills and attitude. The main purpose of recruitment is for an organization to create a pool of candidates where potential members of the organization will be selected. The most common form of recruitments are referral and word of mouth. It helps provide information to an employer even before the employee applies for the job vacancy (Saddam and Mansor, 2015).

The last step in the hiring process is the selection. Selection process involves choosing the most suitable candidates from the set of applicants gathered for the job vacancy. Selection involves rejecting many applicants and selecting only a few that best fit the organization's requirements. To do this, the process of selection uses one or more methods to determine the best candidates that are suitable for the job. This process is very important because it will determine an organization's performance which depends on the quality of its people whose objectives can be aligned or not with the organization (Saddam and Mansor, 2015).

2.3.3.2 Process-related Factors

Bureaucratic Theory and its criticisms

The Bureaucratic Theory, also known as Weber's Theory of Bureaucracy, describes a form of organization where authority follows a rational framework. Bureaucratic organizations are subjected to laws, rules, and regulations in order to deliver at an optimum level. Moreover, Weber believed that bureaucratic process is geared towards problem-solving in a more efficient and predictable way (Jain, 2004).

According to Weber, bureaucratic organizations are characterized by three main features: hierarchical structure, systematic division of labor, and governed by formal and exhaustive rules used in decision-making. Originally, the purpose of bureaucracy is to achieve maximum efficiency. This efficiency is derived from the rules and regulations in which employees adhere to perform their tasks in the best possible way (Jain, 2004). However, the word *bureaucracy* today connotes a different perspective. It is now viewed from a negative standpoint, contrary to how Weber conceived it before. According to Lam and Liu (2005),

"Bureaucracy excessively requires people to adhere to rules and procedures. Moreover, some (if not all) of those rules may become meaningless […], i.e. the original purpose of setting those rigid rules may become redundant […]. It results in red tapes which refer to delays as results of excessive rules and procedures […]"

The following describes some of the criticisms of bureaucracy. First, bureaucracy prevents organization to achieve its goals when employees practice excessive adherence to rules and regulations. Imposing rules and procedures in unsuitable situations usually end up being counterproductive. Thus, organizations fail to achieve its desired results. Second, bureaucratic organizations are mostly not open to change. Due to the hierarchical structure, members of the organizations prefer to continue with the system and are anxious about any kind of adjustments. This kind of attitudes results in very slow improvement because of reluctance to innovate. Third, it was observed that bureaucracy encourages mediocrity. Employees in bureaucratic organizations tend to comply with the *minimum* requirement, as per rule and regulations, just to finish a certain task. This results to the poor performance of the organization. Other criticisms include poor decision-making, corruption, inefficiency, and organizational conflict (Jain, 2004).

For this study, the focus will be on the internal processes and bureaucratic procedures of the university that directly contributes to or triggers the delay in the delivery of construction projects. Since the university is a public institution, the decision-making process is governed by a bureaucracy which influences the rate of project turn over.

2.3.3.2.1 Organizational Strategy

In bureaucratic organizations, the hierarchical structure allows for top management control over the organizational strategy. Because of the rigidity of bureaucratic organizations, innovations in most cases are not encouraged very well. Organizational strategy in operation perspective is defined as *"a long-range plan for the operations function".* It involves the cycle of identification, implementation, and evaluation of the decision made within an organization.

Organizational strategy is closely linked to the organization's mission and vision and how the operation will be undertaken to achieve organizations' objectives (Lidelow and Simu, 2015; Skoien, 2014).

In many organizations, it is widely accepted that organizational strategy translates to project strategy. Project strategy deals with how projects must be executed based on the organization's chosen direction. Any project is assumed to be under the influence of a more dominant *parent organization* whose standard operation must be followed. Project strategy in this sense is defined as *"a direction in a project that contributes to the success of the project in its environment".* Direction encompasses things relating to goals, plans, and guidelines, among others that may affect the course of the project. While success pertains to how well the organization satisfies its objectives based on their own criteria of success (Artto, 2008).

In order to evaluate organizational strategy, one important aspect to assess is the presence of *operations manual* and level of its effectiveness. The operation manual serves as a guide on how decisions will be made in every organization. It also sets the procedure on how things will function to achieve the most desirable results parallel to the organization's goals. In construction projects, operation manual translates to project execution plan. According to Pandit and Bhangale (2015), project execution plan *"is a process describing how, when and by whom a specific target or set of goal is to be achieved."* This plan is used to assess and monitor construction project performance to ensure that project needs are met. Based on this, the availability of strategy within an organization to manage construction projects help minimize the possible causes of delays.

2.3.3.2.2 Organizational Procedures

To purchase goods and services, public institutions spend a significant amount of time going through long bureaucratic processes of project procurement (Kabega, 2016). In public sector, bureaucracy deals with the administrative practices that govern the *decision-making processes*. The procurement process is an aspect of project delivery which is very important to achieve construction project success (Eriksson and Westerberg, 2009). However, public procurement experiences delays due to various reasons which lead to poor delivery of public goods and services.

Apart from the procurement process, *changes during construction* are also common causes of project delays. In a significant number of cases, delays in construction projects are results of *variation orders* during the course of the project due to some misunderstanding between project stakeholders (Enshassi et.al., 2010; Sun and Meng, 2009). In these situations, claims and disputes happen as a result of a disagreement between parties. Any changes in the original contract will lead to an equivalent adjustment of the schedule which requires more often than not more efforts from the project staff to compensate for the loss of time (Sun and Meng, 2009). In order to evaluate the effectiveness of organizational procedures in addressing construction related issues, the *number of late approval and resolutions* is one key indicator. This reflects how fast issues are resolved in an organization. For government-funded projects, approval and resolution of project issues usually take a long time due to standard processes. Changes in construction projects can have negative impacts, depending on the criticality, which results in

delays in project schedule. This kind of changes must be addressed immediately to avoid project disputes or worst, project failure.

In general, the issues being handled by owners in construction projects includes but are not limited to i) change in specifications, ii) change in scope of work, iii) change in design brief, and iv) change in codes and regulations. To come up with a good decision, owners need to assess the impacts of changes to the project to develop a strong basis for the decision-making. Even though not all changes results to delays, it is necessary for the owner to properly manage the changes to avoid them. In various cases, most frequent causes of changes in construction projects that require immediate decisions are those related to design changes. It includes design approval and checking of design errors coupled with additional item works. Changes in projects during construction phase when addressed immediately through efficient decision-making process will not seriously affect the project schedule. During the construction phase, owner-related factors that requires immediate decisions, to avoid over extension of project schedule, includes i) change orders, ii) revision and approval of designs, and iii) decision on other matters. To ensure efficient delivery of the project, it is very important to know where the gap in the flow of decision-making process or approval is happening (Hao et.al., 2008).

Another key indicator to assess organizational procedure, suggested by Lam and Liu (2005), is the *number of mandatory approvals* as a measure of the perceived extent of the bureaucracy by the project participants. This means that as the number of rules governing an organization increases, the more number of approvals are required in the operation process. Moreover, the higher the number of hierarchies, the amount of rules and procedures also increases. This indicator is very important because there is a high correlation between the rules and procedures and red tapes. In a positive note, researcher recognized that rules and procedures are very important elements to facilitate the operations of an organization. However, *excessive* implementation of rules and procedures only waste the organization's resources because of the need to comply. In addition to that, it does not contribute to the organization's process by becoming red tape (Lam and Liu, 2005).

2.3.3.3 Technology-related Factors

Resource-based View Theory

Resource-based View Theory (RBV), is commonly associated with private organizations because of its market perspective. But in general, RBV *focuses on the potential of a specific resource to be used as a strategy in achieving a sustainable competitive advantage, and at the same time improve organizational performance*. In the public sector, RBV is commonly used in strategy making (Szymaniec-Mlicka, 2014). Every organization is made up of resources and capabilities that when properly restructured, will better equip them to face new challenges (Konnur and Hundekar, 2008). In the past, researchers recognized that successes of organizations are significantly influenced by the resources and capabilities that it owns. Consequently, it was observed that organization who capitalizes on their resources and capabilities tend to become more efficient.

In the recent years, RBV was adopted to analyze the impact of information technology (IT) in the performance of organizations. Moreover, it has been used to study the competitive advantage that organizations acquire in adopting IT as a strategy. Because of this, researchers

proposed that combining IT with other organizational resources will be helpful in achieving better performance. By providing proper attention to IT capability, through investment, organizations will be able to improve their efficiency (Yin and Yang, 2011). In a bureaucratic environment like most public organizations, characterized by hierarchy, strict allocation of responsibilities and strong adherence to rules and regulation, processes become rigid and impassive to other approach. With the use of IT, there can be improvement in information sharing which can make public offices more flexible and efficient (Jain, 2004).

In construction projects, this improved efficiency (brought about by use of specific resource) influence the decision-making process of the organization which also affects the schedule of project delivery (Toor and Ogunlana, 2008).

According to Konnur and Hundekar (2008), there are 3 artifacts of RVB that will positively affect organizations.

1. To attain competitive advantage, organizations must capitalize on its rare and valuable resources and capabilities
2. Organizations will obtain advantage from resources that are inimitable and non-substitutable
3. Advantages attained by organizations from resources are beneficial to improve both the short-term and long-term performance

For this study, the emphasis will be on the implementation of IT in the university (project owner) construction projects because of its use in monitoring and procurement. Though there are other technical aspects involved in the process of project construction, like availability of equipment, *electronic support* is the main technology resource that is being utilized by the owner to improve the efficiency of its processes. In most public projects, equipment is not part of the owner's technology resource because it is the responsibility of contractor(s) to provide the necessary equipment as part of their contracts as service providers. In this case, use of technology on the owner-side are mostly dedicated to improving the processes with the use of information technology (IT). However, during the study, several aspects of technology that affects the delivery of construction projects may arise and will be considered along with IT.

2.3.3.3.1 Information Technology

One resource that an organization can use to improve its performance is the use of information technology. *"Information technology (IT) is the technology involved in the operation, collection, transport, reserve, offering access to, and transformation of information in all its forms".* In simple terms, IT pertains to all the technology that an organization utilizes to collect, process, and disseminate information in any form. IT includes software, hardware, and telecommunication devices. Due to the fragmented nature of construction industry, organizations require IT to improve information flow. As a matter of fact, IT was recognized as an important element to ensure smooth flow of information in professional practice. Many organizations acknowledge IT as one of the most strategic and effective ways to improve their productivity. Within an organization, IT is essential for the information dissemination between offices and employees. It also helps to manage information to avoid overload within an organization. In managing projects, IT is very important for project monitoring and reporting (Gaith et.al., 2012). In line with this, to determine the impact of IT in construction projects, key

indicators to be used includes i) *availability of data storage medium (database)*, ii) *strategic use of IT*, and iii) *perceived benefits of the use of IT* (Ahuja, 2010).

Data storage system (database) has a significant impact on the work processes in the construction industry. It is very helpful in *reducing the time for processing data and information* which results in effective and efficient decision-making and better coordination among project staff. With the help of IT, convenient exchange of information is possible which includes files, updates, and request for information (Serpell et.al., 2005)

While the presence of data storage system is critical for the success of IT integration in organizations, the *strategic use of IT* is also equally important. *Strategic use of IT* refers to the *"present strategic and long-term strategic goals of the organization with respect to IT adoption in the organization".* As part of adopting IT in the organizations, managers are responsible for encouraging employees to accept the new technology through proper orientation (Ahuja, 2010).

Aside from database and strategic use of IT, *benefits of the use of IT* are also an important indicator as it reflects the benefits of adopting the IT. The benefits of IT is measured based on the project's success as reflected in the time-saving. Other aspects of benefits of the use of IT include increased organizational efficiency, effective team management, and effective use of technology (Ahuja, 2010).

In a very dynamic environment like the construction industry, the exchange of information is very high in the form of documents. In a single project, parties involved are constantly exchanging documents for design drawings, project schedule, transmittals, etc., As these documents goes through different offices, some of these documents are sometimes lost even before being recopied and filed. To address these challenges, the recommended form of communication model for managing any kind of information in the construction industry or project is through a *central project model* (Hore, 2006).

According to Hore (2006), a report was released in UK which examined the application of IT in the construction industry. The report found that *software application* is necessary to support the multi-faceted need of a construction project. These software are considered vital in addressing design and analysis related matters. Software are divided into 6 categories (Hore, 2006):

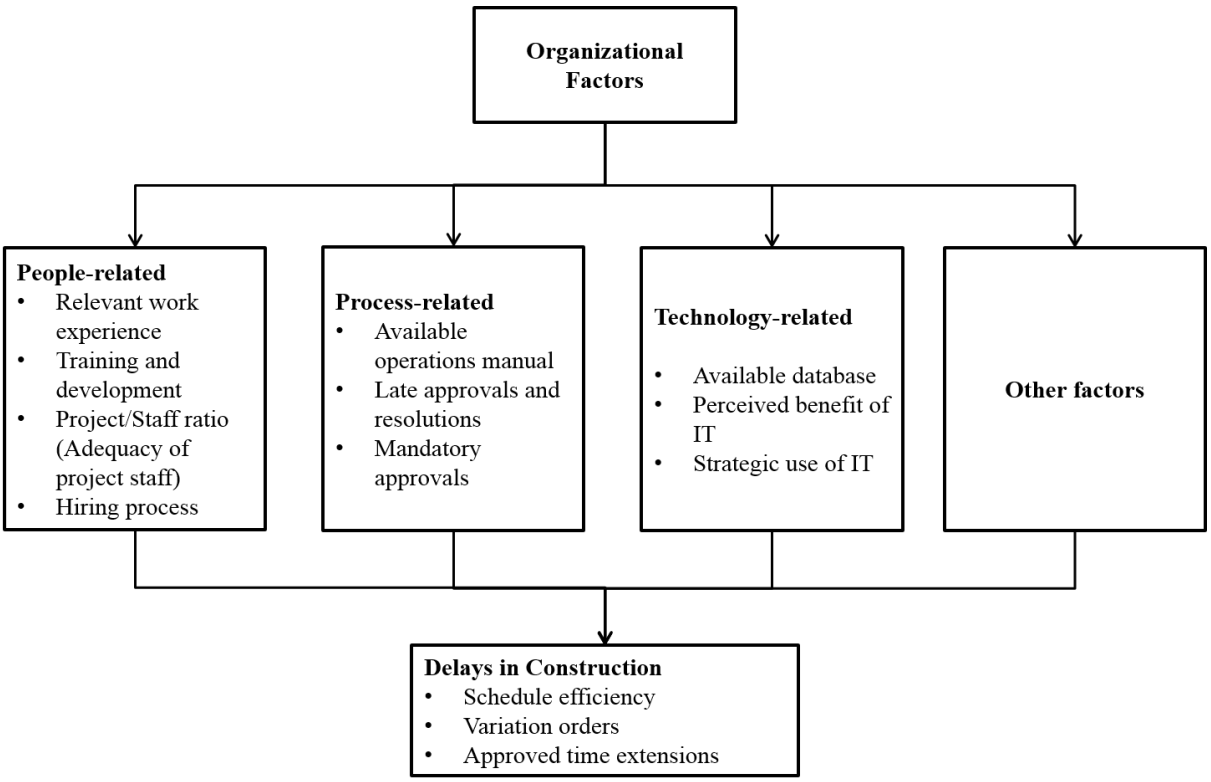
1. Business and information management - "*software that can create an environment within which disparate forms of information can be linked together, in the context of a project or organization, to achieve easy access and control"*
2. Computer aided design and visualization – *software dedicated for 2-D and 3-D drafting*
3. Building engineering applications – s*oftware dedicated for the evaluation of alternative design and solutions in order to achieve optimum design while ensuring compliance to building regulations."*
4. Computer aided estimating – *"software dedicated to produce project estimates and keeping track of project spending."*

5. Planning, scheduling and site management – *"software dedicated to assist site personnel to plan, coordinate and generally to become more efficient in the administration of the project."*
6. Computer aided facilities management – *"software dedicated for building operation and maintenance and the recognition of the impact that they have on the life cycle cost of the building."*

2.4 Conceptual Framework

Figure 3 shows the concept of an organizational factor and its underlying sub-variables that contribute to the delay of construction projects. The main variables of the study include organizational factor and delays in construction projects. In order to analyze organizational factors, it is divided into four sub-variables namely *people*, *process*, *technology*, and *other factors*. This study revolves around the concept of organizational factors in the context of locally-funded government projects within the university. The dependent variable is the delay in construction projects which is measured in terms of schedule efficiency, approved time extensions, and variation orders.

Figure 3 Conceptual Framework



Chapter 3: Research Design and Methods

3.1 Introduction

This chapter is a discussion of the research design and methods used in the study. It describes how the variables were measured including the sampling method and data collection instruments. It also includes a discussion on how validity and reliability were addressed in the study. In the end, the method of data analysis and the limitation of the study were discussed.

3.2 Overall Research Question

To what extent do organizational factors influence the delays in the delivery of UP Quezon Hall Project (UPQHP)?

3.2.1 Specific Questions

The research aims to address the following questions

1. How do people-related factors affect the delay of UPQHP?
2. How do process-related factors affect the delay of UPQHP?
3. How do technology-related factors affect the delay of UPQHP?
4. What other factors influence the delay of UPQHP?

3.3 Operationalization: Variables and Indicators

Definition of Concepts/Theories and Variables

3.3.1 Human Resource Management

According to Richman (2015), HRM is the *"process of managing human talents to achieve organization's objective".* It involves the recruitment of the appropriate talents, handling labor relations, managing legalities related to employees, and many others. One of the main aspects of HRM is the *human resource development* (HRD). It is defined as *"a series of activities that support behavioral change and learning opportunities for employees".* In addition to that, it also aims to develop the employees' skills through training and development in order for them to handle their daily tasks and future challenges. This concepts of HRM and HRD puts into its core the human resource and the importance of recruitments process and the training and development. The concept of HRM will be used as the general concept for people-related factors.

3.3.2 Bureaucracy Theory

During the second half of the 19th century, Weber recognized that there was an emerging organizational form in the Western world which was later described in Weber's Theory of Bureaucracy. In this new form of organization, Weber believed that authority follows a more rational framework compared before which will later be known as the bureaucratic form.

According to Jain (2004), "*organizations that function under bureaucratic form follows strict laws, rules and regulations derived from consistent, disciplined, rationalized and methodical*

calculation of optimum means to give ends. Further, it is oriented towards solving problems and that bureaucratic decision-making was guided by the objectives of efficiency, calculability and predictability." However, this efficiency in decision-making is very ideal because it does not take into consideration the *"personal, irrational, and emotional aspect of people".* This theory serves as the foundation for the process-related factors used in this study.

3.3.3 Resource-based View Theory

Resource-based view theory "*assumes that success of the organization lies within the organization itself, or to be exact – in its valuable, intangible and not perfectly imitable resource allowing it to achieve a sustainable competitive advantage."*

In this study, RBV was used based on the aspect of IT as an important "resource" in supporting the reform of bureaucracy in public institutions. According to Jain (2004), *"IT can be a driver and enabler of change and reform due to its boundary challenging nature, and governments can be reengineered and reinvented via IT to serve society better".* This theory is used as the principal theory for technology-related factors.

3.3.4 Organizational Factors (Independent Variables)

The organizational factor is composed of three aspects: people, process, and technology-related factors that either directly trigger or contribute to project change and delays (Sun and Meng, 2009).

People-related factor (sub-variable 1): Causes of delays related to *competence* and *culture* of the project teams involved in the construction project (Sun and Meng, 2009).

Process-related factor (sub-variable 2): Causes of delays related to processes in construction projects such as *organizational procedures* and *organizational strategy* of parties involved in the construction project (Sun and Meng, 2009).

Technology-related factor (sub-variable 3): Causes of delays related to the use of *information technology (IT) system* within and among the project teams (Sun and Meng, 2009).

3.3.5 Delays in Construction Project (Dependent Variable)

Delays in a construction project are defined as the extension of time necessary to complete a certain project, a period in which part of the project is extended due to certain conditions (Abdul-Rahman, 2011). In construction, time performance of projects can be measured in terms of schedule efficiency, number of approved time extensions, and number of variation orders. Specific elements to measure schedule efficiency includes planned schedule and completed schedule of the project (Cha and Kim, 2011).

3.4 Measurement of Variables (Indicators)

The following are indicators proposed by Sun and Meng (2009) in their *Taxonomy of Change Causes and Delays* to assess people, process, and technology-related factors. To operationalize the indicators effectively, the author identified several aspects of each indicator that were identified in the literature review. These aspects of the indicators were then used to assess each indicator.

3.4.1 People-related Factors

Competence – according to Zadeh (2016), competency in project management is linked to the number of relevant work experience. For this study, relevant work experience was used to assess the project management competence of project staff.

Culture and ethics – according to Zhang and Li (2013), one artifact that can be used to measure culture in organizations is based on the aspect of training and development. Therefore, availability of training and development for project staff was used to assess the culture and ethics within the organization.

Project/Staff ratio (Adequacy of project staff) – one important aspect to measure optimal staffing level is the *number of projects assigned among project staff at the same time* (Steyn and Schnetler, 2015). In previous studies, it is recognized that each project staff should handle a specific number of projects simultaneously to become efficient in terms of output and contribution.

Hiring Process – according to (Saddam and Mansor, 2015), hiring process is composed of recruitment and selection process. They recognized that these two stages of hiring process, which aims to filter the most suitable applicants, has a significant effect on the organization's aim to realize its objectives.

3.4.2 Process-related Factors

Organizational strategy - in operations perspective, it refers to *"a long-range plan for the operation's function".* In organizations, it translates to the operations manual which is a set of document that details the process that serves as the organization's guide to perform its decision-making process efficiently (Lidelow and Simu, 2015).

Organizational procedure - in public sector, organizational procedures are subjected to bureaucratic rules and procedures. When excessively implemented, this kind of procedures leads to red tapes which refer to "*delays as a result of excessive rules and procedures causing irritations and vexation".* Researchers recognized that red tapes have a negative impact on organizational operations. This indicator was used to assess the extent and effectiveness of bureaucratic processes based on the i) number of late approvals and resolutions of project related issues and ii) number of mandatory approvals (in the procurement process and in resolving project-related issues). In this study, the organizational procedure was measured in

terms of red tapes based upon managerial perceptions (Lam and Liu, 2005; Pandey and Kingsley, 2000).

3.4.3 Technology-related Factors

Information Technology – according to Serpell et.al. (2005), the *availability of data storage medium (database)* has a significant impact on the work processes in the construction industry. It makes the processing of data and information faster and effective. The database also supports the storage of files and project updates. Other measures are the *strategic use of IT* and the *perceived benefit of IT* among the project staff. *Strategic use of IT* pertains to the short-term and long-term goals of the organization to integrate IT in the organization while the *perceived benefit of IT* refers to the perceived time-saving benefit of the new technology (Ahuja, 2010).

3.4.4 Delays in Construction Project

Delays in the construction according to literature are time-related. It means that delays can be measured relative to the original schedule of projects. There are a few benchmarks that were proposed by researchers to measure delays in construction projects. However, this study will only focus on the aspect of *schedule efficiency, approved time extension,* and *variation orders*. These three indicators that affect the schedule of construction projects are related to the extension of time relative to original schedule as per the original contract.

Schedule efficiency – this is the ratio of the difference between planned and completed project schedule and the planned schedule expressed in terms of percentage (Cha and Kim, 2011)

Approved time extension – in the public sector, many organizations are characterized by the rigid hierarchical structure. This kind of structure translates to a high level of bureaucracy where resolution and approvals of requests and issues take a lot of time. Thus, time-extension is normally awarded to contractors to compensate for the *waiting time* spent anticipating for replies to their request and queries (Sullivan and Harris, 1986)

Variation orders – variation orders such as additional works are subject to a time extension. Additional works can be due to various causes, such as poor project brief, which results in excusable delays. Excusable delays are caused by the owner and it entails corresponding extra time to expedite the additional work (Ling and Poh, 2008).

Table 3 shows the list of sub-variables that will be measured in this study in order to establish the relationship between the main variables.

Table 3 Operationalization of Variables and Indicators

Theory or Concept	Variable	Sub-variables	Indicators (Focused Aspect)	Analysis
Human Resource Management	Organizational Factors	People-related	No. of relevant work experience (Competence)	Factual/Descriptive
			Training and development (Culture and ethics)	Qualitative/Descriptive
			No. of projects assigned to each project staff (Optimal staff leveling)	Factual/Descriptive
			Hiring process (Recruitment and Selection)	Qualitative/Descriptive
Bureaucratic Theory		Process-related	Available operations manual (organizational strategy)	Factual/Descriptive
			No. of late approvals and resolutions (Organizational procedure)	Factual/Descriptive
			No. of mandatory approvals: managerial perceptions on the efficiency of i) procurement process and ii) process of resolving project-related issues (organizational procedure)	Factual/Descriptive
Resource-Based View Theory		Technology-related	Available data storage medium or database (Information technology)	Factual/Descriptive
			Perceived benefit of use of ICT: time savings for project monitoring, time saving for project procurement (Information technology)	Qualitative/Descriptive
			Strategic use of ICT: short term and long term plans (Information technology)	Qualitative/Descriptive
	Delay in Construction		Schedule efficiency: percentage of excess time in construction schedule	Factual/Descriptive
			No. of approved time extension: due to late approvals and information and excusable delays	Factual/Descriptive
			No. of variation orders	Factual/Descriptive

3.5 Research Type and Strategy

According to Van Thiel (2014), there are different aims in conducting a research. The most common form of research aim includes exploratory, descriptive, explanatory, and testing. Among others, selecting the most appropriate research aim depends ultimately on the purpose of the study. In addition to that, the position of the problem on the empirical cycle is also an

important consideration on choosing the most appropriate research type. The empirical cycle is divided into two phases – inductive and deductive. Utilizing either of the two approaches depends on the amount of existing knowledge about the problem.

For this study, the main objective of the author is to *explain* the delays in university construction projects due to organizational factors – *people, process,* and *technology-related factors* and *other factors*. It aims to provide an in-depth analysis of the problem based on the existing causes of delays and other possible factors within a precise context. This means that data was collected from a limited number of individuals to come up with a detailed contextual analysis. Based on these premises, the type of research for this study is *explanatory* due to the existing knowledge related to delays in construction projects.

Given the explanatory nature of this study, qualitative data was utilized in order to establish the extent of the relationship between the variables identified in this study. Since projects within the university are under the same management and subjected to standard mechanisms, a single case study is the appropriate research strategy. Considering these principles, a case study is the most appropriate strategy due to the following reasons; i) several unknown independent variables, ii) the study is context-based, and iii) in-depth analysis and description is the target. Moreover, doing a case study can help extract other factors which may explain the delay of university construction projects.

In this study, it is identified that university construction projects are experiencing delays in completion due to various circumstances related to its human resource, internal processes, and absence of necessary information system to support the process of construction project delivery. The case of UP is not unique in a sense that there are many other public-funded projects which also experiences delays. However, being a higher education institution with its own internal procedures and organizational structure separate it from other public agencies. Despite the increase in funding for its physical development, the majority of its projects are experiencing delays. Based on records, only 30% of the projects funded from 2011-2015 were completed as of 2016. Consequently, it is not clear whether the 30% turnout was completed within the schedule or not.

3.6 Data Collection Methods and Sampling

3.6.1 Study Area

The study was conducted in the University of the Philippines Diliman Campus in Quezon City which is the flagship campus of UP System. As part of its physical development plan, the university is handling projects which include new buildings, new roads, rehabilitation of dormitories, among others (Zamora, 2016)

3.6.2 Unit of Analysis

The unit of analysis in this study is the UP Quezon Hall Project (UPQHP) which is one of the many projects under UP System funded in 2013. The project started in 2013 and was scheduled to finish in 2014. However, the project was completed in 2017 due to various circumstances encountered by the university related to people, process, and technology factors. In line with

this, the population of the study was considered to be composed by the project staff who were involved in the procurement, construction, and management of the UPQHP.

One consideration in the design of case study is the number of research methods that will be used in order to ensure validity. To counter the issue of small sample size, Van Thiel (2014) suggested considering *different units* within the case study. This approach is also known as *layering* or the *nested design*. For this study, to increase the validity of results, interviews were conducted in different teams involved in the UP Quezon Hall Project. It includes the university project team and the contractor. Moreover, the study also considered the differences in the roles and responsibilities of the respondents to ensure multiple views towards the projects.

3.6.3 Primary Data

The main method for data collection in this study is the *semi-structured interview*. It is composed of the introduction, actual questions, and the concluding portion. In order to cross-verify the data and increase the validity, the semi-structured interview was administered among several project staff in the university and the contractor.

The *semi-structured interview manual* was prepared prior to data collection based on the indicators identified in the previous chapters of this paper. The theme of the interview follows the format of the variables and sub-variables which includes people-related factors, process-related factors, technology-related factors, other factors, and delays in construction projects. In order to increase the accuracy of capturing the respondents' responses, the author asked permission to record the conversation.

A copy of the questionnaire can be found in the Annex 2.

3.6.4 Secondary Data

Secondary data in this study were gathered through desk research from online sources and from the university project management team, as a source of additional information, to support in addressing the specific research questions.

Secondary data from the university includes *training and development policy*, *operations manual, project procurement process manual/flowchart, and a copy of time extension requests granted by the university.* First, training and development policy will be helpful in determining whether the university provide training for its staff to develop their skills, knowledge, and experience in the field of project or construction management. It will also be useful to check the kinds of training that employees are receiving to become more knowledgeable project owners. Second, operations manual will reveal how decisions are being made in addressing/resolving construction-related issue. An operations manual will also tell how the university operates to deliver the project within the schedule as per contract. Third, the copy of time extension requests will be used to determine the causes of delays in the university related to, but not limited to, people, process, and technology, and other related factors. Lastly, the time extension report will be useful in tracing the events that contributed to the delay in project delivery. It can help uncover how various events build up which eventually lead to the time extension of the project schedule.

3.7 Sample Size and Selection

According to Jansen (2010), doing a qualitative research requires a qualitative sample (counterpart of probability sample in quantitative research) which *"represent the diversity of the phenomenon under study within the target population".* However, this method is not very efficient since it requires a large random sample. To compensate for this, he suggested to *purposively select* the respondents that will constitute the *diversity sample* instead in order to encompass all possible information related to the issue under investigation. By doing so, saturation of information can be achieved by increasing the diversity of source of information. For this study, purposive sampling was used to take the sample from the population of the project teams that are involved in the implementation of UP Quezon Hall Project. It includes different administrative center such as top management (owner-side), middle and first-line management (owner-side) and individual-contributors (contractor). The technical support on the owner side was also included in order to acquire the state of the art on the development of the information system in the university and its relationship to the construction development. The rationale for selecting the respondents was based on their involvement in the project which reflects their familiarity with how the UP Quezon Hall Project progressed. The project teams that were selected are those involved in the pre-construction and construction phase of the project. The UP Quezon Hall Project was selected because it is one of the many important public projects in the university which was not delivered as per the original contract schedule. Moreover, the building also houses several key offices which perform important responsibilities which cannot afford to be interrupted of their day to day operations.

Table 4 shows that the population size is 16. By using non-probabilistic sampling, specifically purposive sampling, 16 respondents were selected to participate in a one-on-one interview. For cases where the total research sample is limited, the whole population is taken as the representative sample. In this study, with a limited population size of 16, there is no need to draw a sample. The population size will also be the sample size because sampling will be redundant (Van Thiel, 2014). Even with the small number of sample size, it is very well represented by the owner and contractor from different managerial levels – top management, middle management, first-line management, and individual contributors.

Table 4 Sample Size and Distribution

Position	Department	Role	Hierarchy	No.
Vice President	Project Management	Owner	Top Management	1
Director	Project Management	Owner	Middle Management	1
Architect	Project Management	Owner	First-line Management	2
Electrical Engineer	Project Management	Owner	First-line Management	1
Civil Engineer	Project Management	Owner	First-line Management	1
Mechanical Engineer	Project Management	Owner	First-line Management	1
SPMO	Procurement	Owner	-	2
BAC	Bid and Awards Committee	Owner	-	2
Project Architect	Project Management	Contractor	Individual contributors	1
Project Manager	Project Management	Contractor	Individual contributors	1

Project Engineer	Project Management	Contractor	Individual contributors	2
IT Director	Technical Support	Owner	Middle Management	1
Total Sample (n)				**16**

3.8 Field Visit and Experience

Originally, the proposed main research technique aims to be personal interview directly applied by the author. However, due to considerations in the availability of some respondents, online interview was used instead. In addition, not all respondents were interviewed online due to their busy schedule. Thus, the respondents requested to answer the question via writing instead. After receiving the answers, the researcher made follow-up questions in order to gather more information and gain deeper understanding of the subject.

There were several methodological limitations encountered during the data gathering phase of this study.

Sample size – the proposed original sample size of the study is 16 which comes from different layers of the organizations involved in the delivery of UP Quezon Hall Project. At the end of the field visit, due to some difficulties explained later, only 12 interviews were successfully applied. The three main factors that has affected the non-achievement of the planned original number of respondents were: first, the researcher was not able to do a field work, but instead, sent emails to invite for an online interview. From the 12 respondents, 6 participated in an online interview while the rest requested to answer the questions due to conflict with their busy schedules. To make sure that the quality of data is not compromised, follow-up questions were sent to respondents for clarifications and additional information. Second, the researcher was not able to receive any response from other potential respondents. Emails were sent to other respondents and some did not reply while others declined to participate due to busy schedule. Third, during the data gathering phase, the researcher found that only a few project staff from the university are involved during the pre-construction phase of the UP Quezon Hall Project. Further, majority of them were no longer part of the university which makes it more challenging to connect and request for their time to participate. It would be valuable if SPMO and BAC members during the UP Quezon Hall Project participated in the case study as they can give more insights about the problems related to the procurement. To ensure that a significant relationship was established between the variables and sub-variables, data saturation was observed from representative groups of respondents whom results can be generalized.

For the interview questions under “technology-related factors”, only 10 respondents provided their statements as the remaining respondents declined to provide their views and opinions regarding the topic.

3.9 Validity and Reliability

3.9.1 Validity

i. Internal Validity

According to Van Thiel (2014), there are two requirements in order to determine whether internal validity is achieved or not. First, the variables should be adequately operationalized into measurable indicators. Second, the relationship between the independent and dependent

variable must be clearly established. In order to ensure internal validity, indicators were carefully selected and questions were developed in such a way that it establishes the relationships between the variables. Based on this, internal validity was enhanced through *data triangulation approach* and *content analysis* (Gibbert et.al, 2008). According to Guion et.al. (n.d.), data triangulation is one type of triangulation in qualitative research. It involves collecting information from *multiple perspectives* or *different sources.* It means that project teams from different hierarchy within the university and the contractor were considered in the data gathering. The identified groups include the managing group from the owner side, and the contractor. Validity was ensured by conducting interviews with each group to gain information about their perspective on the delays in the delivery of UP Quezon Hall Project. To further enhance the internal validity, secondary data was also be utilized by performing a *content analysis* of university documents to enrich and validate the results of the interview with the project staff.

ii. External Validity

External validity is the extent to which the results of the investigation can be confidently generalized to other groups (Van Thiel, 2014). Conversely, this study utilizes a single case study approach that will make it challenging to generalize due to a small number of the population involved. Based on this, the findings of the study will only be applicable to the case under investigation. To address this issue, Flyvbjerg (2006), argue that even though generalization is quite difficult, he suggested that citing single case study, experiment, and experiences can contribute to the advancement of social and natural science. Furthermore, Reis (2017) argue that for a case study, *"they do not attempt to simplify what cannot be simplified. It is precise because case study includes paradoxes and acknowledges that there are no simple answers, that it can and should qualify as the gold standard".* Therefore, conclusions from case studies are generalizable only to small sample upon which more qualitative research can be based. According to Moriceau (2012), the generalizability of the case study is only confined only within similar contexts when similarities are identified and are being practiced. Consequently, the theoretical findings of this study are only generalizable among the UP construction projects.

3.9.2 Reliability

According to Van Thiel (2014), *reliability* is a function of accuracy and consistency. In an explanatory type of research, reliability means having a high level of explanation to the phenomena and ensuring that the explanation is the most accurate one. In order to ensure the reliability of case study, Van Thiel (2014) suggested using a *database* or a *log* to record all the procedures performed in the study. This documentation will be useful for traceability such as checking and reviewing. With the use of a *case study protocol*, the study can be performed in a more systematic way that will allow for its replication in the future.

3.10 Data Analysis Methods

From the primary data gathered through semi-structured interview, transcripts were prepared and were sent to respondents for validation. This process of validating the researcher's interpretation of interview conversation is called the member check (Van Thiel, 2014). To analyze the data, Excel Spreadsheet was used to cluster the respondents' statements into the same category.

After clustering the data according to codes/themes using Excel Spreadsheet, frequency distribution was used to present the data in a logical order and tabular format following the sequence of research sub-questions. Using this method, the relative frequency of interview responses (data) was expressed as a ratio of the number of times a response (falling under the same code/theme) occurs divided by the total number of respondents. Secondary data gathered during the data collection were then used to substantiate the findings and to increase the validity of the results.

The frequency distribution was presented in a tabular form following the questions in the semi-structured interview. Thereafter, a narrative of the findings were presented, discussed and compared to what is in the literature review.

Chapter 4: Research Findings

4.1 Introduction

This chapter is focused on the presentation of research findings gathered through the method as described in Chapter 3. A brief description of the study is also presented which includes the units of analysis and a short background of the research. In the data presentation, the findings were presented in a format following the order of variables and the corresponding indicators as presented in the operationalization in the previous chapter. To address the main research question, responses gathered through interview and writings were arranged according to codes using Excel spreadsheet. To finish, the findings were presented using a frequency table and was discussed following the format of conceptual framework. Moreover, secondary data was used to substantiate the primary data and to check for similarities and variations.

4.1.1 Description of the Case

This research is based on the case of the UP Quezon Hall Project which is one of the many construction projects in the University of the Philippines (UP) that experienced delay. The objective of this study is to explain the extent of the influence of organizational factors (people, process, and technology-related factors) in the delay of UP Quezon Hall Project.

The UP Quezon Hall Project was a design and build renovation project which was funded through GAA 2013. As per contract, the approved duration of the project was 365 calendar days. The construction started in early 2014, however, it was completed in November 2017 which is approximately 3 years beyond the approved duration of construction. UP Quezon Hall Project is just one of the several university construction projects, funded using GAA 2011-2015, that suffered delay. To investigate the influence of organizational factors on the delay of UP Quezon Hall Project, 12 respondents from both the owner and contractor-side participated in the study. Originally, the plan was to conduct a personal interview for each respondent. But due to considerations specified in Section 3.8 of the previous chapter, 6 were interviewed online while the rest answered the interview questions instead.

4.2 People-related factors that influence the delay of project construction

This section provides an analysis of how people-related factors affected the timely completion of the project. Table 5 shows a summary of the responses to questions related to causes of delays of the project, relevant work experience of project staff, adequacy of project staff, training and development, and hiring process. A full copy containing all the quotations of the respondents used for this part can be found in Annex 3.

Table 5 Questions on people-related factors and corresponding responses

	Questions	Summary of Responses	Frequency
1	RELEVANT WORK EXPERIENCE	• The project staff have 1-3 years of relevant work experience prior to joining UP Quezon Hall Project.	5

	How many years have you been in the construction prior to joining the UP Quezon Hall Project?	• UP Quezon Hall was the first construction project that the project staff handled.	5
		• Prior to UP Quezon Hall Project, project staff have more than a decade of experience in the construction industry.	2
2	TRAINING AND DEVELOPMENT	• The university does not provide training (like seminars) for its project staff.	9
	Does the university provide training and development for the project staff?		
	IMPORTANCE OF PROJECT MANAGEMENT TRAINING	• Project staff agreed in the importance of having project/construction management training. They believe that it will make project staff more knowledgeable and flexible.	12
	In your view, how important is training and development for project staff?		
3	PROJECT/STAFF RATIO (ADEQUACY OF EMPLOYEES)	• The project staff are handling more than 2 major projects and other minor projects at the same time.	9
		• The project staff are handling 2 major projects at the same time.	3
	How many projects are you handling simultaneously with UP Quezon Hall Project?	• The university does not have enough project staff.	9
		• The contractor has enough project staff.	3
4	HIRING PROCESS: RECRUITMENT AND SELECTION	• Project staff were recruited through referral and word of mouth without rigid selection process like competency assessment.	9
	Can you tell me about the university hiring process?	• Most of the project staff were still young and inexperienced when hired	4

No. of respondents = 12

i. *Relevant work experience prior to UP Quezon Hall Project*

From Table 5, 5/12 respondents stated that UP Quezon Hall Project was their first construction project. 5/12 respondents noted that they have an average of 1-3 years of relevant work experience in the construction industry prior to joining the UP Quezon Hall Project. Meanwhile, 2/12 respondents indicated that they are equipped with more than a decade of experience in the construction industry prior to joining the UP Quezon Hall Project.

From the literature review, it was found that the competence of project staff, which is gained through work experience, is very important for the success of a construction project (Enshassi and Al-Raee, 2010). In the case of UP Quezon Hall Project, more than half of the project staff have prior experience in construction and project management. It helped them gain the necessary knowledge and skills to perform their duties and responsibilities.

However, it is the first project for almost half of the respondents. Some are fresh graduates while others just received their professional licenses when they became part of the project. It suggests that while others already have a knowledge on construction project management, some of the personnel are still getting used to the dynamics of a construction project. Due to the limited experience in managing construction project coupled with the need to understand how public projects are being undertaken, at some point, makes it difficult for some of the project staff to handle the project.

In a construction project were the performance of each project staff is dependent on the continuous exchange of information from one project staff to another, once the information is not received on the right time, other project staff cannot proceed with their work. As a result, delays in meeting the project deadlines are encountered.

These findings were verified by external respondent – R11 which stated that most of the project staff were still young when recruited by the university. Respondent 9 added that the project staff are mostly fresh from receiving their professional licenses while some have only few years of experience when hired.

ii. *Training and development*

9/12 respondents stated that the university does not provide training and development for its project staff. The most common form of training available for the project staff is self-training. According to respondent- R7, "*None. What happen is individual/self-development. On our own, we need to look for trainings and seminar".*

From Chapter 2, it was stated that training must be considered as a top priority for any organization in order to nurture and develop their employees. Training is very important for personnel to receive to become updated in terms of skills and expertise especially in a very dynamic environment like construction (Tabassi et.al., 2011). Training and development is very important for project staff for them to carry out their responsibilities efficiently and effectively. Moreover, it is important in

inculcating the required skills, knowledge, and values that every project staff should possess to accomplish the objective of the project. Every project staff should have the required knowledge in engineering, architecture, management, and other domains such as contracts, specifications, etc., in order to properly manage every stage of the project. This can be realized by promoting project efficiency through training.

The absence of training in the university suggests that some of the project staff may not have the required proficiencies to do new and different tasks that will increase their contribution at the time of their appointment which could have resulted to low production level. Moreover, it could have affected the project staff's ability to provide more positive contribution to meet the needs of the project. With the help of skills gained through training, the possible number of excusable delays related to slow decision-making could have been minimized as it increases their familiarity in construction processes.

These findings are supported by external respondent – R12 which noted that the university does not offer training for its project staff. External respondent – R11 added that the university does not sponsor any kind of training for project staff. Further, R11 added that some of the project staff does not have a firm knowledge about the flow of construction projects delivery.

Importance of training and development

Despite the absence of training and development in the university, 12/12 respondents indicated that training and development is very important.

Majority of the respondents believe that training will help them become more knowledgeable project staff that are well-rounded and better in decision-making. These results are expected as the literature review indicates that some UP project staff in general should consider taking project management training to become more responsible and knowledgeable project owners (Zamora, 2016). The lack of project management training among university project staff not only suggests that the university has yet to incorporate it in their overall strategy but also reflect their capacity to handle projects like the UP Quezon Hall Project. Given the fact that majority of the project staff were still new or have few years of experience in handling construction projects, training and development could have provided them with increased efficiency that will add value to the project and minimized excusable delays due to slow decision-making.

iii. Project/Staff Ratio (Adequacy of employees)

9/12 respondents indicated that the university does not have enough manpower to manage its construction projects. Meanwhile 3/12 respondents stated the contractor have enough number of project staff. Overall, 9/12 respondents noted that they are handling more than 2 major projects plus few minor projects simultaneously.

For the university project team, the average number of projects being handled simultaneously by each project staff ranges from 3-5 major projects excluding the minor projects. With the increasing number of university construction projects, the respondents agreed that they lack the necessary manpower to address the increasing challenge of managing multiple projects at the same time.

According to Steyn and Schnetler (2015), the recommended optimal number of projects that each project staff should handle simultaneously should be 2 major projects. This is based on the premise that 2 projects reduce the idle time for project staff and at the same time minimizes the risks due to late response time and bad decision-making if it exceeds. In the case of UP Quezon Hall Project, majority of the project staff were handling multiple projects simultaneously with different demands. Irrespective of the nature of the project and the project staff's participation on it, this suggests that some of the project staff are faced with the challenge of managing the projects without compromise. Respondent - R7 stated, *"Handling multiple projects that have their own deadlines affect the focus and effort that is consumed by the staff for each project."* External respondent - R11 added that the average number of projects being handled by each project staff in the university is 3 projects simultaneously. It affects the time, focus, and energy being spent by each project staff in managing the projects. Moreover, the amount of attention being received by each project also vary and may not be well provided on time due to handling of multiple projects and tasks simultaneously. This may result to one project waiting for a decision before the other. From these findings, it is evident that majority of the project staff are handling more than the *optimal number of projects.* However, though it still depends on the capacity and skills of the project staff and the quality of projects they were handling alongside with UP Quezon Hall Project, it could have influenced their productivity, especially on the owner-side (university), which could result to poor decision-making and slow response-time.

iv. Hiring process: Recruitment and Selection

9/12 respondents stated that project staff in the university are recruited through referral and word of mouth.

Most of the respondents stated that the university does not have a rigid hiring process. The most common form of recruitment is through word of mouth. However, there is no rigid process for measuring the competency of applicants to determine if they are appropriate for the responsibility being offered aside from a one-to-one interview. Respondents – R3 stated that the recruitment and selection process is not very strict which requires meeting the required years of experience and passing the interview. Respondent – R3 added that though the university, at some point, need more project staff, hiring also takes time as it depends on the availability of funds. Meanwhile, respondent – R9 stated that the work being offered in the university as a project staff constitutes the training for young applicants with high potentials. This suggests that some of the project staff were still young and inexperienced when hired by the university which provided them the opportunity to learn.

This statement gives light into the dilemma that though the university needs more personnel to become a part of its project team, it does not attract a good number of applicant because of the concern on budget clearance. Before hiring a professional, it takes time for the university to secure a budget for the compensation of the new hire because of the required public processes. Another aspect that makes it relatively unattractive to many applicants is the fact that the position offered for the project team is contractual which is renewable every 6 months. R1 stated that the reason why the job postings for project staff in the university does not attract to many applicants is because of the concerns with the type of employment, *"The university doesn't do job postings formally because the position being offered is not regular."*

According to Saddam and Mansor (2015), recruitment and selection are two significant aspect of HRM that are vital in the attraction and selection of candidates that will best fit in the culture of the employing organization. With referrals and word of mouth considered to be the common form of recruitment in the university, Saddam and Mansor (2015) stated that referrals and word of mouth are two of the most effective forms of recruiting employees. However, selection is more important since it involves the process of choosing the most suitable applicant. It involves a single or couples of methods to assess the suitability of an applicant. In the case of the university, the selection process is not very strict. Respondents – R2 stated, the recruited applicants are qualified, but most did not undergo further assessment for competency.

These findings revealed that the recruitment process of the university is effective. However, the selection process requires more attention since it is during this process that quality and most suitable applicants are chosen. Though the university has a good recruitment process, a more rigid selection process is still not on site which may affect the quality of the selected applicants. This aspect is closely linked to the aspect of hiring applicants with lack of project management skills and experience which could have influenced the delay of the project. The lack of rigid selection in the hiring process affects the project schedule as it takes time for personnel to gain the necessary experience to understand the details of how construction projects are being undertaken. Thus, decision-making is slow which affects the exchange of information necessary to meet the project deadline

In summary, the main people-related factors that influenced the timely completion of UP Quezon Hall Project were the *project/staff ratio (inadequate number of project staff),* which is vital to ensure proper delegation of responsibilities in managing university construction projects. Another factor is the *absence of training and development* for the university personnel which have also affected their project management skills. This is closely linked to the experience of project staff during the time of their appointment in the university. Lastly, the *hiring process* was also considered as a factor that could have affected the timely completion of the project as it serves as the doorway for examining the suitability of personnel to perform construction related responsibilities.

4.3 Process-related factors that influence the delay of project construction

This section focuses on the discussion about process-related factors and how it affected the timely delivery of UP Quezon Hall Project. The questions cover topics about availability of standard operating procedures, efficiency of the procurement process, efficiency of university in resolving project related issues, and the frequency of granting time extension for late approvals. Regarding the efficiency of procurement processes and the efficiency of resolving project-related issues, respondents were asked to expound on their answers to get a justification of their view of the processes' efficiency. Moreover, this will also provide a clear view of how bureaucracy affects the efficiency of processes in public sector. Table 6 shows a summary of the responses associated to the process-related factors. A full copy of the quotations containing all the answers of the respondents for this part can be found in Annex 3.

Table 6 Questions on process-related factors and corresponding responses

	Questions	Summary of Responses	Frequency
5	ORGANIZATIONAL STRATEGY: AVAILABLE OPERATIONS MANUAL	• The university uses the procurement law as their reference in resolving any procurement related concern(s). However, its stipulations are generic in nature that when interpreted are subject to various interpretation. As a result, when implemented in the university, processes consume a lot of time.	12
	Does the university have manuals (SOP) on how to address construction-related issues?	• The university does not have an operations manual which outlines the standard processes and procedures for their project operations. Project execution planning usually happens along with the project construction which affects the fast implementation of the project.	9
6	ORGANIZATIONAL PROCEDURE: NO. OF LATE APPROVALS	• Most often, the university spends a lot of time making design decisions (before implementation) and processing of variation orders during the construction of UP Quezon Hall Project which resulted in late approvals.	10
	During the construction of UP Quezon Hall Project, did the project experienced late approval s/resolutions? If yes, how many?	• There were a few late approvals experienced during the construction of UP Quezon Hall Project.	2
7A	ORGANIZATIONAL PROCEDURE (NO. OF MANDATORY APPROVAL): PERCEIVED EFFICIENCY OF THE PROCUREMENT PROCESS	• The university has a standard procurement process. However, it has lots of steps and leeway. The procurement law where it is based is not strict and exhaustive which makes it prone to different interpretations. Thus, impeding the whole process and affects the construction schedule.	12

	On a scale of 1-5, how would you rate the efficiency of the university's "procurement system" in the procurement of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)	• The university procurement process is "ineffective"	7
		• The university procurement process is "effective"	2
		• The university procurement process is "moderately effective"	2
		• Not sure	1
7B	ORGANIZATIONAL PROCEDURE (NO. OF MANDATORY APPROVAL): PERCEIVED EFFICIENCY OF RESOLVING PROJECT-RELATED ISSUES	• The university lacks formal standards and guidelines in addressing project-related issues which results in personal dealings with the contractor. • However, the university is currently developing their own project management operation standards.	7
	On a scale of 1-5, how would you rate the efficiency of the university's "internal processes" in resolving project-related issues of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)	• Resolving project-related issues is "ineffective"	6
		• Resolving project-related issues is "moderately effective"	2

		• Resolving project-related issues is "effective"	
		• Resolving project-related issues is "very effective"	1
		• Not sure	1

No of respondents = 12

v. Available operations manual

12/12 respondents stated that the university has an available operations manual for its procurement processes. Meanwhile, for its project management operations, 9/12 respondents indicated that the university does not have a standard operating procedure for its operations.

For the procurement process, the respondents indicated that the university adheres to the procurement law. Respondent – R1 indicated that the project does not have its own manual for its project management operation. In resolving project-related issues like variation orders, the university refers to the procurement law which provides general guidelines on how to process such concerns. According to Respondent - R7 however, though the university adheres to the procurement law, there are some discrepancies in the interpretation and implementation of the policy within the university.

These findings agree with the paper of Zamora (2016) which stated that despite the availability of the procurement law and its good intentions, specific provisions are subject to various interpretation which makes the implementation inconsistent among various public offices. This results in a significant amount of time spent on interpreting the procurement law.

It was expected that most of the respondents stated the absence of any documented project plan that shows the project's roadmap to achieving its objectives. Though the project has its terms of reference (TOR) which outlines the project's background, purpose and the requirements, among others, it does not have a *project plan*. External respondent – R12 noted that the university project team usually follows the schedule that the contractor provides in monitoring the project.

According to Artto (2008), the project plan as a form of project strategy is helpful in setting the project's direction to satisfy its objectives based on the established criteria of success. The project plan alone does not always guarantee the success of any project. However, the presence of project plan allows for a strategy to be utilized

appropriately that will show how a project will progress in terms of cost, schedule, etc., (Pandit and Bhangale, 2015).

The absence of a project execution plan suggests that the schedule of UP Quezon Hall Project could have been influenced by the lack of an established approach on how to undertake the whole project. Implementing the project without a clear approach on how to meet the scope and requirements makes it difficult for the team to realize the project schedule. Due to the absence of the project execution plan, the project team may also not able to utilize the most effective method for the project implementation. Add into that the possible risks that were encountered during the construction stage that were not lessened in the most efficient way due to lack of mitigation plan which is part of the project execution plan. From these, the project could have been implemented in a more tactical way by minimizing the risks which could have sped up the project implementation process.

External respondent - R11 noted that project execution plan is not part of the contractor's requirements during pre-construction. Moreover, project execution planning in the university usually happen during the construction stage of the project.

In resolving procurement related issues, the university resort to the procurement law as its manual. Though the university has a standard procedure on how to address issues related to the likes of variation orders, its implementation was relatively problematic which may also influence the timely completion of the project. The inefficiencies in decision-making brought about by the poor interpretation of the procurement law influenced the timely completion of the project by delaying the decisions that need to be made in due time.

vi. No. of late approvals and resolutions

10/12 respondents indicated that during the construction of the UP Quezon Hall Project, late approvals and resolutions were encountered several times. Most of these are related to design decisions and processing of variations orders. As respondent - R1 stated, late approvals/resolutions happen about 90% of the time. However, according to 2/12 respondents, there were very few late approvals encountered during the construction phase of the project.

The process of design decision-making in the university takes a lot of time before being implemented. It involves design development, internal agreement among different offices, and negotiation between the university project team and the contractor. In some cases, when the process for design decision-making already exceeded the amount of time allotted for it, the project schedule is disturbed. Thus, resulting to project schedule adjustment. This kind of situations where design decisions take a lot of time on the owner side also constitute an excusable delay that may have also affected the schedule of the project.

According to Lam and Liu (2005), rules and procedures are very important for organizations in facilitating their operations. However, in the case of the university, excessive implementation of rules and procedures for compliance results to slow decision-making and eventually delays. These findings are expected since the university has its own internal processes while adhering to the existing laws. This is supported by Zamora (2016) whose findings indicated that the management of university projects are affected by the university's internal processes and bureaucratic procedures. This suggests that despite the availability of the procurement law, the university is still struggling regarding its interpretation and implementation which in turn could affect the fast implementation of university construction projects. This can be validated by external respondent – R11 who argued that the process is subject to different interpretation depending on who's interpreting it. Further, based on UP Quezon Hall's document for time extensions, there were several instances when the university experienced late approvals for variation orders such as the installation of sprinkler systems, roof repair, and installation of AC units.

vii. No. of mandatory approvals: perceived efficiency of the procurement process

According to 12/12 respondents, the university has standard procurement processes. 7/12 indicated that the processes are "ineffective". 2/10 stated that it is "very effective" while 2/12 said that it is moderately effective. As stated by one respondent – R7, *"It's prone to change. The standards are prone to change, or the interpretation of the guidelines are prone to change depending on who's handling the papers or the documents."*

From these findings, it suggests that the problem is not in the process of the university itself. The issue lies in each step of the process wherein uncertainties in requirements arise. Consider for example the processing of variation orders. It involves developing the design and the approval of the procurement team. Developing a design usually takes a lot of time because of the number of coordination among different discipline. Once the design and supporting documents are furnished, it will go through the procurement for approval. This is where the complications usually happen because approval of variation orders in the university does not follow a standard set of documentary requirements. List of document or level of information that needs to be provided by the project team to the approving offices is usually uncertain. This results in documents going back and forth from one office to another to comply with any deficiencies. Respondent – R2 added that the university seems to have an "unspoken" rule or procedure. Due to these uncertainties in the university's processes, decisions that could have been made earlier were also delayed. This, in turn, affects the project schedule as any additional work cannot be implemented without the prior approval of the owner. Unless in some cases, where the schedule of the project is at risk of delay, works are being implemented even without prior approval from the owner at the risk of the contractor. But nevertheless, a lengthy process characterized by slow decision-making results to time extension of the project.

No. of mandatory approvals: perceived efficiency of resolving project-related issues

According to 7/12 respondents, the university does not have a set of guidelines in resolving project-related issues. The most common technical issues encountered during the construction of UP Quezon Hall Project were the variation orders and design decisions. Regarding the respondents' perception about the efficiency in resolving project-related issues, 6/12 respondents stated that the university is "ineffective" in resolving project-related issues. For 2/12 respondents, it is rather "effective". But for 1/12 respondents, the process is very effective.

a. Variation orders - for the processing of variation orders, the university adhere to the guidelines of procurement law. The technical staff needs to prepare supporting documents such as design drawings, cost, schedule, etc., Variation orders go through the procurement process where delays are usually encountered as discussed in the previous section.
b. Design decisions - design issues encountered during construction stage are minimal. Moreover, they are addressed immediately. According to respondent – R5, *"There are very few problems relating to technical and design issues"*. In resolving design concerns, respondent - R4 noted that the university project team immediately addresses issues related to design concerns. For respondent R8, the university is also very accessible in attending to project-related issues. According to R8, *"Concerned departments were very receptive during the course of the entire project. It helps to know who you need to speak to and make follow-up […]."*

According to Pandey and Kingsley (2000), formalization is an element of red tape which can be measured using managerial perception. This is based on the premise that formalization takes the form of *"burdensome rules and procedures"* which eventually results in delays. In the case of the university, processes are lengthy and inefficient. Constituting a variation order takes a lot of time from design development up to approval. Based on the procurement law, the processing of variation order, from conception to approval should only take a maximum of 30 calendar days. But for the case of UP Quezon Hall Project, there are several times that it takes more than 30 calendar days as evident in the document for time extensions. Based on this, it is apparent that the schedule of completion of UP Quezon Hall was adjusted several times due to time extensions brought about by the tedious internal processes of the university.

In summary, the findings suggest that the main process-related factors that affected the timely completion of UP Quezon Hall Project are the problem concerning *no. of late approvals and resolutions* related to lengthy design decision-making and the inefficient procurement system that results in late approval of variation orders which affected the schedule of project execution. The design coordination on the owner side (university) significantly affected the construction schedule. Without the clear design drawings, construction cannot go full blast. Another factor is the university's *lack of operations manual.* The project does not have a project execution plan which could have served as a guide in the actual execution of the project.

4.4 Technology-related factors that influence the delay of project construction

This section deals with the discussion about how technology, specifically the use of IT, contributed to the timely delivery of the UP Quezon Hall Project. To gather relevant information about this relationship, topics of the questions include the availability of database, managerial perception on the benefits of IT, and short-term and long-term plan for the use of IT. This section will provide details on how IT contributed to the streamlining of the processes involved in the delivery of university construction projects. Table 7 shows the summary of responses. A full copy of the quotations containing all the answers of the respondents for this part can be found in Annex 3.

Table 7 Questions on technology-related factors and corresponding responses

	Questions	Summary of Responses	Frequency
8	AVAILABLE DATABASE: TO SUPPORT PROJECT MANAGEMENT AND PROCUREMENT	• The university has an online database developed for information sharing like project status which allows the project staff to report to the top management regarding the progress of the project • The university procurement does not have a database (apart from the national government's procurement database) to assist in fast-tracking the (parts of) procurement process	9
	What sorts of database does the university use for the project management and procurement of UP Quezon Hall Project?		
9	PERCEIVED BENEFITS OF IT: TIME SAVING FOR PROJECT MANAGEMENT AND PROCUREMENT	• The university project team uses basic software, but acknowledged that more advanced software could help prepare the plans faster and visualize the design better to minimize risks	7
	How did the introduction of IT influence the management/procurement of UP Quezon Hall Project?	• The university design and planning office did not use any project/construction management program or software. Availability of more advanced software could have minimized the risk that have	3

		been encountered during the construction phase.	
10	STRATEGIC USE OF IT: SHORT AND LONG-TERM GOAL TO INCORPORATE IT IN PROJECT MANAGEMENT AND PROCUREMENT	• Not sure if there exist any plans to incorporate IT in improving the procurement process and the management of university construction project	5
	Does the university have a short-term or long-term plan for adopting/using IT in construction project implementation?	• The university project team is planning to adopt more advanced computer programs in the future for design and construction project implementation	3
		• The university already adopted IT to a certain extent for the management of university construction projects. Moreover, it is still being developed to become better.	3

No. of respondents = 10

viii. Available database

According to 9/10 respondents, the university does not have a database to assist in fast-tracking the procurement process. However, the respondents indicated that it does have a database for project monitoring of UP Quezon Hall Project.

Respondent – R9 stated that their office was established in 2010. During that time until the start of UP Quezon Hall Project in 2013, there was no available database dedicated to fast-tracking the procurement process and facilitate the project monitoring of construction projects. Respondent – R1 stated, *"At the beginning, we didn't"*, pertaining to the absence of any project monitoring database during the start of UP Quezon Hall Project. The respondents indicated that the database was only developed in the latter stage of the project. Aside from that, the university has also a database for tracking its documents (transmittals). According to respondent – R3, the database is dedicated for tracking of billing documents. It helps them monitor the route of the document through different approving bodies within the university.

These findings show that the university has its own database that caters documentation of project updates. These databases allow the top management to monitor the project and make urgent decisions based on the uploaded progress.

From the literature review, Serpell (2005) stated that the presence of a database is beneficial to an organization because it allows them to exchange files and updates easily. In a construction project, this database also translates to a central project model which serves as the common basis from which information is disseminated (Hore, 2006). However, in the case of the university, the majority of the respondents believe that despite the availability of the database, it is not helpful in improving specific aspects of the construction process. There is no *reliable* central database dedicated for the project that caters to the efficient transfer and exchange of files and updates that can fast-track the paper-based flow of work. By using a common email address for receiving and sending project files and updates, messages for project concerns could be mixed with other unrelated messages in the email. This can result in a disorganized documentation of the project and inefficient exchange of information among project staff. This also has affected the progress of the project construction as issues that need to be disseminated or resolved are not immediately circulated to the concerned parties. Thus, it results in an excusable delay of late implementation which also contributed to the delay of the whole project.

ix. Perceived benefits of IT: Time saving for project management and procurement

7/10 of the respondents indicated that the level of IT available in the university does not contribute much to improving the performance of UP Quezon Hall Project.

For the database, it allows the top management to make an important decision, when necessary, based on the updates being uploaded. It provides a platform that permits the instant provision of project updates online. However, despite the availability of database in the later parts of the UP Quezon Hall Project, its implementation and scope need further improvement. Its main purpose is only to provide project information to the top management but its implementation is problematic. R1 stated that the database provides information about all the on-going projects in the university but there are uncertainties on who must provide updates and how often it should be updated. In terms of scope, respondent – R2 noted that the database can be further improved by incorporating other paper-based processes such as change orders, and request for information (RFI). The respondents agreed that the availability of a database does not contribute to streamlining the processes.

In terms of the available software, 3/10 respondents indicated that they were not using any project management software or program to successfully organize and control the project variables given the various risks inherent to the project. Referring to the capacity of the available database, R2 added, *"You will only see the gap, but I don't think that it can directly improve the process. The IT can only suggest but they don't have the power to influence the schedule of the project."*

The findings suggest that the university project staff does not see any significant added value from the current level of IT that the university has in terms of improving the processes involved in the management of construction projects. These results are expected since during the start of the UP Quezon Hall Project, the university project team has just been formed 3 years earlier. Acquiring advanced software and developing high-end database requires time for budget approval and lots of coordination, respectively.

According to Ahuja (2010), one benefit of adopting IT is the time saving which comes from the effective use of technology. However, in the case of the UP Quezon Hall Project, the university has yet to capitalize on the possible benefits of IT by providing more advanced software that could have improved the project management capacity of the university in terms of producing design faster and monitoring the project better. The presence of better software could have minimized the risks that were encountered during construction by tracing possible conflicts in plans among various disciplines of the project, i.e. architectural and engineering, to avoid delays.

External respondent – R11 stated that the university has advanced software (such as BIM), however, no one is trained to use it which could have saved the university a significant amount of time for designing (by avoiding revisions) and monitoring of the project. Basic software such as AutoCAD requires a lot of labor and does not allow automatic update of all drawings when a revision is made. Unlike BIM, any change in the design is automatically updated in all design disciplines which could have saved time. Thus, better software could have made the development of design more efficient and minimize excusable delays such as design revisions due to lack of synchronization and coordination of design from different disciplines which eventually affected the project schedule.

x. Strategic use of IT: Short-term and long-term goal to incorporate IT in the project management and procurement

According to 5/10 respondents, they are *not sure* if there exist a short-term and long-term plan to incorporate or improve IT for the management of university construction projects. Contrary to that, 3/10 respondents indicated that the university is planning to acquire more advanced software to support its design and project management capacity. Also, 3/10 respondents noted that the current database available in the university is being further developed to become more useful for the project staff.

Respondent – R2 stated that the university has a database and set of software but is not sure if it will progress beyond the current level. Moreover, commenting on this issue, respondent – R1 stated that there is a lack of coordination among university offices involved in the project delivery to standardize the processes using IT. However, other respondents noted that though there might be plans to improve the project delivery with the help of IT, the IT office is not conducting any training due to the reason that most of the university personnel are old and technologically averse.

In the future, the university is planning to adopt more state of the art software like Building Information Modelling (BIM) in order to improve project performance and reduce changes during construction. Respondent - R2 stated that there were already suggestion to acquire BIM, *"Many have suggested. Since the Quezon Hall was started in 2014, around 2015 there were already suggestions to incorporate BIM."*

According to Ahuja (2010), strategic use of IT refers to the short-term and long-term plan of an organization regarding IT adoption. It is important because it helps improve the performance of an organizations by providing noticeable short-term results related to project management processes. It is also a representation of how flexible an organization is in terms of instilling necessary change in adopting new technology that will help improve employee performance. In the case of the university, most respondents do not see any plans of upgrading the current level of IT. This perceived lack of short-term and long-term plan to incorporate IT in the management of construction projects justifies the preceding item that the university has low level of IT adoption in terms of the level of software that the project team are using during the construction of UP Quezon Hall Project.

According to Hore (2006), for an IT or any software to succeed in the construction industry, there should be enough number of skilled people that will use it. Therefore, it is very important that technology must be *accessible* to the people by providing the necessary software and training to the potential users. In a *mostly* paper-based environment like the university construction projects, inefficiencies arise due to the huge amount of information that needs to be transferred. In order to make the use of IT become more effective, there must be an increased and enhanced collaboration among different project teams. Moreover, the awareness of the benefit that IT provides should be high to further increase the demand side. In relation to this, when asked about the use of IT in the university, respondent - R1 noted that there is a lack of coordination among different offices in terms of standardization of the processes involved in the project delivery.

Findings from this question shows that majority of the respondent does not see any possible further step to incorporate or improve IT for the management of university construction projects. The results from this section is opposite to the recommendation of Hore (2006) in utilizing IT to integrate the whole project management process for a more efficient construction process, *"ICT should support the entire construction process from inception through to the operational maintenance of the building asset."* Moreover, it also shows an opposition to what Ahuja (2010) stated that employees must be encouraged to accept new technology by providing proper orientation as part of adopting IT. The findings suggest that the lack of short-term and long-term plan for improving IT adoption in the university could have also influenced the delivery of UP Quezon Hall Project due to their failure to exploit the potential of IT to increase the efficiency and productivity of the university personnel.

In summary, the main technology-related factors that influenced the delay of UP Quezon Hall Project includes the lack of relevant database and the low level of IT. The presence of a more relevant and inclusive database could have provided better document tracking system to avoid any document getting mixed-up in a wrong pile or to get lost. This results to an added time necessary to recreate the lost information. With the help of a database, a digital copy which is readily searchable can be traced in an instant. Another benefit of a database is the fast approval of documents from one person to another as documents are accessible in digital form. Lastly, the low level of IT may have limited the productivity of project staff in producing design

faster and monitoring the project better which also contributed to the delay of the project.

4.5 Other factors that influence the delay of project construction

This section analyses the *other factors* that triggered or contributed to the delay of UP Quezon Hall Project. Opinions were obtained from respondents about *other factors* that they considered to have significantly influenced the timely delivery of UP Quezon Hall Project. Table 8 shows the findings based on the views of the respondents. A full copy of the quotations containing all the answers of the respondents for this part can be found in Annex 3.

Table 8 Questions on other factors and corresponding responses

	Questions	Summary of Responses	Frequency
11	OTHER FACTORS	• The construction started later than scheduled because of the end-users' failure to provide right-of-way.	10
	Could you identify what you will consider as other factors that significantly influenced the delivery of UP Quezon Hall Project?	• Absence of independent project management team on the side of the university.	7
		• BAC members are not well versed with the procurement law and technicalities of construction which results to slow-decision making.	6
		• High turn-over rate of project personnel which resulted to discontinuity of knowledge and requires more time and effort to turn-over project details.	2

No. of respondents = 12

xi. *Other factors*

The respondents were asked about their view regarding the *other factors,* that they believe have contributed to the delay of UP Quezon Hall Project. Answers provided by the respondents that fall under people, process, and technology were assigned respectively. What remains is the common view of the respondents:

a. *Failure to give right-of-way on time* - according to 10/12 respondents, the end-users' failure to provide right-of-way as per schedule significantly contributed to the delay of the UP Quezon Hall Project. The end-users of the offices included in the renovation failed to leave and clear their offices on time. As a result, the contractor also failed to start their work on time. According to respondent – R9, the time necessary for the end-users to vacate their offices was not in the

schedule. This response agreed with the project's compilation of time extensions wherein the owner granted the contractor several time extensions until late 2015. This series of events was a serious concern since the contractor was not able to work smoothly in the area with the end-users and their office materials still on the construction zone. A lot of time was also spent on the procurement of container vans necessary for the storage of office stuffs while the project is on-going. This also affected the clearing of the offices which resulted to time extension due to excusable delays.

b. *Absence of independent Project Management Team (owner-side)* – this factor is related to the view of respondents regarding the lack of project staff during the construction of UP Quezon Hall Project. 7/12 respondents indicated that the university does not have an independent project management team to closely monitor the project. The design team of the project also work as the project managers at the same time which could have affected how they differentiate being designers and at the same time being managers. The respondents believe that having a project manager on the side of the university is very important to facilitate the smooth delivery of construction projects. According to Ling and Poh (2008), project owners that does not have an in-house project manager experiences significant number of challenges compared to those with in-house project managers. This suggests that the lack of in-house expertise could have affected the timely delivery of the project. The project manager could have provided the university project team with technical support that would allow the project team to focus on their responsibilities as designers. Moreover, it could have also helped them identify the risks (like the possible variation orders) that would be encountered during construction and provide recommendations on how to minimize them.

c. *Competence of BAC members* – 5/12 respondents indicated that some of the BAC members are not well versed in the procurement law and technicalities of construction projects. These findings agree with the study of Navarro and Tanghal (2017) where they found that the TWG and BAC of the university lack the capacity to implement the stipulations of the procurement law. The TWG is composed of end-users which according to them *"may not have the know-how to properly identify the technical specifications nor the appropriate budget for the good and service needed."* This lack of know-how on the proper interpretation and implementation of the procurement law may lead to poor decisions that could have affected the project schedule. These results are expected as proven in the study of Arditi and Diamci (2017) and Pourrostam and Ismail (2012) which identified slow decision-making on the owner-side as one of the main causes of delays in construction. External respondents – R12 also noted that the BAC is slow in decision-making due to lack of know-how in infrastructure projects.

d. *High-turn-over rate of project personnel* - 2/12 respondents specified that the high turn-over rate of university project staff may have contributed to the progress of the project. They observed that when project staff resign, a significant amount of time is required for the new project staff to get on-board the project. Respondent – R7 stated, *"The continuity of knowledge as well as the time and effort consumed in order to turn over project details properly affect the quality and timeliness of project delivery."* This turn-over rate has an impact on the project team's performance as it affects the dynamics of the group. Since the project is already underway, a newly assigned project staff will face the

difficulty of understanding what is already going. This will result to succession development which affects the project time frame.

In summary, the *other factors* found to be influencing the delay of the project were late provision of right-of-way which prevented the contractor from starting the construction on time which technically merited time extension. Also, the absence of an in-house project manager affected the project team's decision-making and time spent attending to design-related concerns. Finally, the BAC's lack of thorough understanding of the procurement law was also seen to influence the delay of the project.

4.6 Delay of construction project

This section discusses the performance of UP Quezon Hall Project in terms of meeting the scheduled project completion as per original contract. According to Cha and Kim (2011), the schedule performance of a construction project can be measured using the *schedule efficiency* which is expressed in terms of percentage of how early or late the project was completed. Sullivan and Harris (1986) suggested that delays in construction projects can also be assessed in terms of the *number of approved time extension* due to the excusable delays. For Ling and Poh (2008), construction projects can be delayed due to the *occurrence of variation orders* which also results to a time extension. This occurrence of variation order due to *excusable delays* can serve as the basis of how often time extensions are granted which affects the original construction schedule. Table 9 shows the summary of the responses regarding the performance of UP Quezon Hall Project in meeting the original schedule of completion. A full copy of the quotations containing all the answers of the respondents for this part can be found in Annex 3.

Table 9 Questions on the delay of the project and the corresponding responses

	Delays in Construction Project	**Summary of Responses**	**Frequency**
12	SCHEDULE EFFICIENCY	• The project was delayed for more than a year. It started in 2014 and was completed in 2017.	12
	When was the project started? When was it completed?		
13	VARIATION ORDERS	• The designs kept on changing which contributed to the delay of the construction project completion. The end-users cannot properly communicate what they wanted.	10
	What are the causes of variation orders in UP Quezon Hall Project? How did it affect the schedule of the project?	• There are unforeseen on-site conditions/problems that appeared only during the construction which affected the construction schedule of the project because of the added time extension	7

14	APPROVED GRANTING TIME EXTENSION	• Most often the university grant time extension for late approvals related to variation orders (includes the process of designing, costing, approval) which is incorporated to the extra work schedule	10
	How often does the university granted time extension for late approvals/resolutions?		

No. of respondents = 12

xii. Schedule efficiency of the project

12/12 respondents indicated that the UP Quezon Hall Project was delayed for more than a year. The project was started in 2014 and was completed in 2017.

This delay is evident from the schedule efficiency calculated using the formula presented by Cha and Kim (2011).

$$Schedule\ efficiency = \frac{Planned\ schedule - Completed\ Schedule}{Planned\ Schedule}$$

$$Schedule\ efficiency = \frac{1\ year - 4\ years}{1\ year}$$

$$Schedule\ efficiency = -300\%$$

The actual construction duration of the project was more than the the planned construction duration which suggests that the project was delayed. Using the formula, a negative 300% schedule efficiency was calculated which means that the project was completed beyond the planned schedule. In the case of UP Quezon Hall Project, it suggests that the project is approximately 300% late of the original construction schedule (365 calendar days - based on the UP Quezon Hall Project Terms of Reference). This finding is expected as only 2.16% of university infrastructure projects funded using GAA 2013 was completed as of 2016 (Zamora, 2016). External respondent – R11 substantiated the finding by noting that the average schedule efficiency in the university design and build projects is -300%.

Based on the project's terms of reference (TOR), the UP Quezon Hall Project Phase 1 has a schedule of 365 calendar days. The Phase 1 of the project covers the construction works of 4th floor, 3rd floor north and south wing, and 2nd floor north wing. The construction started in the 4th floor area in January of 2014 and was finished after a year. Consequently, Phase 1 was finished in November of 2017 due to the various circumstances discussed in Table 5, 6, 7, and 8. It took almost 4 years to finish the Phase 1 of the project.

xiii. Variation orders

According to 10/12 respondents, the main cause of variation orders is the end-users' failure to properly communicate what they require in terms of design. It usually happens when there is a change in space requirement, change in design taste, and change in leadership. Meanwhile, 5/10 respondents indicated that the main cause of variation orders are the unforeseen on-site conditions.

Secondary data was collected from the UP Quezon Hall Project's time extension documents. Table 10 shows a summary of the major variation orders.

Table 10 Summary of major variation orders

Unforeseen site condition which resulted to variation order	**Time Extension for Additional Work**
• Installation of 4th floor sprinkler system	• 4.5 months of time extension was granted by the university • 3.5 months to cover for the delay in design, layout and approval of VO • 1 month to cover for the construction period
• Re-roofing at 4th floor	• 2.5 months tome extension to cover for approval and construction of 4th floor roofing
• Installation of 3rd floor sprinkler system	• 101 working day time extension to cover for approval and construction of 3rd floor South Wing's sprinkler system

Source: UP Quezon Hall Project Compilation of Time Extension (2018)

According to Ling and Poh (2008), one significant effect of variation order is the delay in project completion. Variation orders are results of various causes that can either be foreseeable or unforeseen. Due to this kind of events, some parts of the construction project have been extended which contributes to the delay of the overall completion of the project. According to Memon et. al. (2014), variation orders on the average delays project by 9%. But for the case of UP Quezon Hall Project, considering the variation orders listed in Table 10, variation orders delayed the project by almost 85% of the original schedule.

Time extensions are a by-product of variation orders. Aside from the additional works, it also entails a corresponding time extension for processing and approval. Projects are delayed not because of the variation order itself, but rather the time extension that comes with it. Table 10 shows that variation orders result to time extensions that affect the original schedule of the project. This time extensions are divided into two: time extension for the construction period of the additional works and the time extension for the excusable delay that comes with the processing and approval of the variation order.

In the case of the university, time extensions due to variation orders comes from various sources such as lack of strategic planning (due to inadequate number of project staff), absence of project execution plan (operations manual), low level of IT (low perceived benefit of IT), and no. of mandatory approval (inefficient procurement process).

First, strategic planning is an important factor necessary for the success of a construction project (Memon et.al., 2014). For the case of UP Quezon Hall project, the lack of strategic planning due to the absence of the as-built plan of the building and the inadequate number of personnel to perform it prevented the university to perform a detailed engineering and architectural investigation of the building. Add into that the limited time available for the university to prepare all the necessary documents for the bidding as budget must be appropriated and disbursed within 2 years based on the existing law. As a result, several problems were encountered during the construction phase of the project which eventually resulted to variation orders.

Second, a project execution plan serves as a guide on how the construction project will be executed (Pandit and Bhangale, 2015). It also includes the risk management strategy which provides a framework on how to identify, assess, and manage the risks that will be encountered during the project implementation. As a form of risks to the project, the variation orders could have been anticipated and minimized only if there was a project execution plan. For example is the variation order for the sprinkler system. The extent of the delay it caused the project is not only confined with the installation of the additional work, it also caused time extension for other items that were affected by this extra work such as the installation of the suspended ceiling. With the absence of the project execution plan, risks like this could have been anticipated and the project delay could have also been minimized.

Third, the low level of IT also contributed to the length of the time extension granted for variation orders. Constituting variation orders in UP Quezon Hall Project normally starts with design development. With the absence of more advanced software such as BIM, producing plans also takes a lot of time (excluding the internal design decision making on the side of the university). Thus, plans that could have been developed faster were completed in later dates. Considering the long time necessary for the development of design, the time extensions granted for variation orders also expands which further push the schedule of project completion.

Lastly, the hierarchal structure in the university also contributed to the magnitude of the time extension granted for the variation order. Constituting variation orders in the university takes a lot of time because of its hierarchical structure. In between design development to approval, there are lots of processes involved which causes delays due to the confusion on documentary requirements and the approving offices. Given this kind of scenario, the time extension granted for variation orders could have been optimized only if there is a standard and efficient procurement process characterized by clear documentary requirement (per step) and specific approving personnel.

xiv. Approved time extensions

According to 10/12 respondents, most often, the university granted time extensions to the contractor.

These time extensions are due to various elements such a people, process, and technology related factors.

For people related factors, time extensions are experienced due to the project staff's lack of relevant work experience and inadequate number of project staff. Construction project execution is a very dynamic process. It is characterized by a network of decision-making processes that when experienced bottlenecks may affect the project. In the same way, inexperienced project staff that cannot make immediate decisions may affect the decision-making of other project team members which may also disturb the schedule of the whole project. This can also be related to the project staff's lack of training in construction project management that could have provided them with added knowledge and skills. A collection of this scenarios at various portions of the project implementation will significantly affect the timely completion of the project in a negative manner.

Another factor that leads to a time extension is the inadequate number of project staff. Due to the small number of university project staff during the construction of UP Quezon Hall Project, managing the increasing number of construction projects in the university becomes more difficult. Each project staff is faced with the challenge of handling multiple projects simultaneously. For that reason, there are instances when the demands of other projects cannot be addressed in due time as the project staff cannot provide equal attention to each project as much as they wanted. Thus, it results to late decisions from the university project staff which may affect the contractor's implementation on site.

For process-related factors, the number of mandatory approval which leads to the inefficient procurement process and resolution of project related issues also contributed to the delay of the project. Procedures are made to make the process more efficient and predictable. However, these procedures may have also impede the processes when excessively implemented or when there is a confusion with its interpretation. For the UP Quezon Hall Project, time extensions were granted to cover for the slow decision-making process in the procurement system due to inconsistencies in its implementation. An example is the approval of variation orders which usually takes a lot of time because of the confusion on *who will approve* and *what is needed* for the variation order to be approved.

For technology-related factors, the low level of IT and lack of relevant database also contributed to the delay of the UP Quezon Hall Project. In the preparation of design, clashes between plans of different disciplines (i.e. engineering and architectural) are encountered which may jeopardize the project schedule. With the use of more advanced software, multi-disciplinary plans could have been synchronized earlier before implementation which can help minimize the chances of redesign and time extensions related to other risks.

Aside from the low level of IT, the lack of relevant and more inclusive database also resulted to time extensions. These factors are related to the fact that most of the construction-related processes in the university are paper-based. Due to the hierarchical structure of the university, construction-related documents go through a lot of approving offices. In the process, the possibility of documents getting lost or not being processed immediately due to the files of other documents becomes a problem and the lack of reliable database to monitor its flow makes it more difficult to trace. As a result, the process of rerouting documents repeat and the chances of

making early decisions through information dissemination becomes slower. Thus, resulting to time extension of the project due to lost time in decision-making process.

Other factor that also resulted to time extensions includes the failure of end-users to provide right of way as per schedule. As this scenario was not anticipated in the project schedule during the planning stage, the end-users took some time before they were able to completely vacate the areas for renovation. This was worsened by the fact that the containers necessary for the storage of office materials needs to be procured which means that it will take a lot of time due to the slow nature of the procurement system. Due to this problem, the project was executed by phase (per floor) to allow for the end-users to vacate their respective areas. These events resulted to several time extensions that were granted per phase of the project which affected the project schedule.

In summary, the timely delivery of UP Quezon Hall Project can be said to be affected by many factors. Based on the findings of the study, the project failed to meet the original target schedule of completion due several variation orders which resulted to contract time extension. Further, the schedule was also affected by the late approvals which resulted to several time extensions. Overall, the delays caused by various factors is reflected in the negative schedule efficiency of the project.

Chapter 5: Conclusions and recommendations

5.1 Main Findings of the Research

This chapter provides a conclusion based on the findings presented in Chapter 4. This case study is founded on the premise that the delivery of university construction projects is influenced by challenges related to organizational factors. The challenges experienced in the management of university construction projects is evident from the low turn-over rate of government-funded university projects from 2011 to 2015; the university managed to complete only 30% as of 2016. These challenges are caused by concerns associated with the university's capacity to efficiently handle infrastructure projects. Problems were also encountered because of the bureaucratic procedures and internal processes of the university which results to slow decision-making. The delays in the delivery of construction projects have been a serious concern for the university administration.

This study aims to explain the extent to which organizational factors influenced the delay of UP Quezon Hall Project. Based on the findings presented in the previous chapter, which were gathered through online interview and secondary data, there are several factors that contributes to the delay of university construction projects as reflected in the case of the UP Quezon Hall Project. Based on the conceptualization of this study, the three components of organizational factors are people-related, process-related, and technology-related.

To answer the main research question, it is first necessary to address the three sub-research questions based on the primary and secondary data obtained.

5.1.1 People-related Factors that Influenced the Delay of UP Quezon Hall Project

How do people-related factors affect the delay of UPQHP?

Based on the evidence obtained from the study, the results suggest that the most important people-related factors that influenced the delay of UP Quezon Hall Project includes *inadequate staff to manage the construction project, lack of training and development,* and *hiring process.*

First, 9/12 respondents stated that the university does not have adequate project staff to efficiently handle the increasing number of construction projects in order to deliver them on time. This is evident from the university's current project to staff ratio of between 3:1 to 5:1 which is beyond the optimal level that is 2:1 recommended by Steyn and Schnetler (2015). Add to it the number of minor projects that the project staff also need to manage. According to Steyn and Schnetler (2015), this kind of situation of attending to multiple projects simultaneously requires a lot of time, effort, and focus from the project staff which affects their productivity that results to the poor performance of the project.

Second, 9/12 respondents stated that the university does not provide project management training to its project staff. According to Jung et.al. (2009), training and development is an important aspect of human resource management that can help upgrade the quality of an organization's culture. It is very vital in updating the knowledge and expertise of project staff by providing a new set of skills (Tabassi et.al., 2011). With the help of training, project staff

from the different discipline of construction like design and project management will become more knowledgeable of the construction processes and be able to make firm and intelligent decisions that could save time in decision-making. This situation is exacerbated by the inadequate number of project staff which put more pressure on them to manage the project and delivers it without compromising the cost, quality, and schedule.

Lastly, 9/12 respondents indicated that the university has a hiring process that involves recruitment process and less rigid selection process. According to Saddam and Mansor (2015), the hiring process is very important to ensure that an organization is acquiring the most suitable applicants for a specific responsibility. The quality of employees before being appointed highly depends on the selection process which can influence the way construction projects are being managed and implemented. For the case of the university, more attention should be given to the selection process. By choosing applicants with knowledge on project management, decision making on and off-site will improve, and some forms of bottlenecks will be minimized.

Together, these factors negatively influenced the schedule of the UP Quezon Hall Project which eventually lead to its delay. During the pre-construction stage of the project, the inadequate number of project staff could have affected the quality of the tender documents, including the designs, which resulted to variation orders. In the construction phase of the project, the number of late approvals is relatively linked to the inadequate number of project staff that handles the design and management. Development of design, which takes a lot of time, coupled with the responsibility to manage the project at the same time, results in saturation on the part of project staff which affects their productivity and efficiency. Time extensions which are granted for the excusable delays such as delays in design development, slow decision-making, failure to recognize construction risks are linked to the absence of training and development which affects their efficiency. Excluding any external factors, the overall performance of the project is dependent on the quality of people handling it. Construction is a complex process and change is inevitable. However, hiring the most suitable set of people with the right set of experience and attitude can help improve the management of construction projects. These factors contributed to the delay of the project as evident from the schedule efficiency of -300% which is over the recommended 0% and above.

This relationship between the people-related factors and the delays in a construction project is consistent with the concept of human resource management wherein the quality of organization's HRM which includes the staff's *level and quality* of work influence the project delays which is evident from the schedule efficiency indicator.

5.1.2 Process-related Factors that Influenced the Delay of UP Quezon Hall Project

How do process-related factors affect the delay of UPQHP?

From the findings presented in the previous chapter, the most relevant factor that influenced the delay of UP Quezon Hall Project includes *lack of project execution plan, inefficiencies in the procurement,* and *inefficiencies in resolving project-related issues.*

First, 9/12 respondents stated that the university does not have an operation manual in the form of a project execution plan. According to Artto (2008), in many organizations, project strategy

is very important because it shows how projects must be executed based on the direction that the organization chooses to pursue. As a form of project strategy, a project execution plan (PEP) is a strategy that serves as a guide on how a project will be implemented by showing the procedures and priorities that will be adopted by the project team. In the case of UP Quezon Hall Project, the lack of project execution plan could have influenced how the project progressed.

Second, 12/12 respondents stated that the university has standard procurement processes. However, they indicated that the processes are inefficient due to concerns related to the inconsistent interpretation of the governing procurement law which leads to lots of steps and leeway. In a bureaucratic organization, rules and regulations are implemented to achieve efficiency (Jain, 2004). But in the case of the university, the bureaucracy has a negative impact on the timely delivery of UP Quezon Hall Project.

Lastly, 10/12 respondents indicated that the university takes a lot of time making internal decisions regarding design issues. According to Hao et.al. (2008), one of the most common issues in construction that requires immediate decision are those related to design decisions. However, the university's process of making design decisions (prior to submission to the contractor for detailed design and implementation) influenced the delay of UP Quezon Hall Project. The progress of reaching an internal consensus among the concerned offices within the university regarding the final design takes a lot of time. For the UP Quezon Hall Project, several design coordination were made internally, on the owner-side, which also affected the schedule of the project.

Collectively, these factors negatively affected the schedule of UP Quezon Hall Project. All these factors in some way contributed to the delay of the project. During the construction phase of the project, several time extensions were granted to the contractor due to concerns with the provision of right-of-way which the university project team failed to anticipate during the planning stage. With the presence of project execution plan, this kind of scenarios could have been avoided. Time extensions were also granted to cover for the slow processing of variation orders due to the confusion on the university's procurement processes. The process of making design decisions within the university also took a lot of time which affected the progress of the construction and the completion of the project. These factors lead to several bottlenecks that is reflected on the negative schedule efficiency of the project.

This relationship between the process-related factors and delays in construction projects is consistent with the oppositions of bureaucracy theory which states that bureaucracy requires people to adhere to the rules and procedures that when excessively implemented becomes redundant and results to delays. The rules and procedures are the university's internal processes (based on procurement law) that contributes to the delay of the project.

5.1.3 Technology-related Factors that Influenced the Delay of UP Quezon Hall Project

How do technology-related factors affect the delay of UPQHP?

Based on the evidence presented in the previous chapter, the technology-related factors that could have contributed to the delay of the UP Quezon Hall Project includes *lack of relevant database* and *low level of IT*.

9/10 respondents stated that the university have a database that allows project staff to provide project updates to the top management; the database is only dedicated for project reporting. It does not support other processes involved in the construction and project management like the paper-based processes. According to Hore (2006), a central database is beneficial to achieving efficient processes especially in a dynamic environment like construction projects. However, with the lack of a central database for project monitoring and related processes, the university is not increasing its efficiency in information sharing and streamlining its processes. Ideally, a central database can support or replace the paper-based workflows with the adoption of new technology. Implementing technology allows organization to improve their standard operating procedures to become more efficient and productive. During the construction of the UP Quezon Hall Project, the university have not fully incorporated the use of technology in managing the project by relying on paper-based workflows. This is supported by the study of Toor and Ogunlana (2008) which stated that enhanced efficiency in construction can be achieved by improving the efficiency of resources (such as IT) which also affects the project's performance. In addition to that, Yin and Yang (2011) said that by providing attention to improving IT capability, organization's will also improve their efficiency.

7/10 respondents stated that the university lacks better computer software that can increase their efficiency as project staff. Also, 3/10 respondents added that the university does not have any project management software. Ahuja (2010) stated that adopting IT (one aspect is software), can result to increased organizational efficiency. However, with the low perception on the benefit of the level of IT used for the management of university construction projects, it suggests that the university is missing out on the potential of using better software by foregoing organizational efficiency. Acquiring more advanced software, coupled with proper training, could enhance the flow of tedious processes.

Together, these factors contributed to the delay of the UP Quezon Hall Project. Technically, the university's lack of central database to streamline its internal processes suggests that the construction projects are operating under a disadvantage. By relying on paper-based work flow and not fully realizing the advantages that IT can provide, the university's processes is still plagued with inefficiencies. The low level of IT also poses a serious disadvantage for the project team because ideally, improved level of IT could help increase efficiency and productivity of the organization.

According to the resource-based view theory, improving a specific resource (such as IT) can be used to achieve competitive advantage and at the same time improve the organizational performance. However, in the case of the university, IT as a resource was not fully develop which could have possibly improve the efficiency of processes and increase the productivity of the human resource.

5.1.4 Other Factors that Influenced the Delay of UP Quezon Hall Project

What other factors influence the delay of UPQHP?

Apart from the aspects of organizational factors identified in the conceptualization of this study, several other factors were considered to have contributed to the delay of the UP Quezon Hall Project. It includes *failure of the university to provide right-of-way on schedule, absence of independent in-house project manager*, and *lack of capacity of BAC*.

First, 10/12 respondents stated that the late provision of right-of-way contributed to the delay of the UP Quezon Hall Project. The process of vacating the offices by the end-users was not anticipated in the original schedule. Some of the end-users were also not able to totally move-out of their respective offices, including their materials, because of the lack of storage areas aside from their reluctance to vacate. This can be linked to the poor planning due to the failure to estimate the required number of container vans to room the materials of the vacating offices and the failure to anticipate the required time necessary for the end-users to move out.

Second, 7/12 respondents stated that the lack of in-house project manager influenced the delay of the UP Quezon Hall Project. This is in line with the study of Ling and Poh (2008) which stated that in-house project managers can help minimize the number of challenges that owners without project managers experiences. By not having an in-house project manager, the university was not able to increase its ability of completing the project earlier than the actual completion due to lack of expertise.

Lastly, 5/12 respondents indicated that the BAC's failure to properly interpret and implement the procurement law influenced the delay of UP Quezon Hall Project. From the study of Navarro and Tanghal (2007), they found that one of the reasons for the poor implementation of the procurement law is due to the lack of capacity of the BAC to interpret and efficiently execute the procurement law, several decisions that could have been made earlier were delayed due to the slow-decision making process. Technically, delays due to slow decision-making equate to time extensions.

Collectively, these *other factors* negatively affected the schedule of the UP Quezon Hall Project. The failure to give right-of-way on time resulted to an equivalent time extension. The lack of project manager to support in the management of the project could have lessen the number of risks during the pre-construction stage which resulted to variation orders during the construction stage. Moreover, it could have provided support to make immediate decisions during the construction process. The lack of BAC's capacity to implement the procurement law also contributed to the delay of the project. Theoretically, any delay in the decision-making process on the part of the university would result to an equivalent delay on the side of the contractor in their implementation of the project.

5.1.5 The Extent of the Influence of Organizational Factors on the Delay of UP Quezon Hall Project

To what extent do organizational factors influence the delays in the delivery of UP Quezon Hall Project (UPQHP)?

The previous sections individually explained the influence of organizational factors in the delay of UP Quezon Hall Project. For this section, the integrated influence of the aspects of organizational factors will be discussed.

The results showed that all the elements of organizational factor have significantly influenced the delay of UP Quezon Hall Project. However, the degree of the influence of each factor to the delay of UP Quezon Hall Project is not equal. Moreover, it is also necessary to view the elements of the organizational factors in a perspective as overlapping in such a way that one factor support the others. As Morris (2011) stated, the "Iron Triangle" of Project Management which includes people, process, and technology, must be balanced and given enough attention depending on the needs of an organization.

First, people-related factors influenced the delay of the project in ways such as inadequate number of project staff to manage the construction project, lack of training and development, and hiring process. Based from the HRM Theory, people are the most important resource necessary to accomplish any kind of organizational objectives. In the same way, people in the university should have more control over the internal processes and the available technology in order to efficiently delivery construction projects. A right combination of more efficient hiring process, provision of training and development, and addition of more project staff could significantly improve the delivery of construction projects to avoid delays.

Second, process-related factors influenced the delay of the project through lack of operations manual, inefficiencies in the procurement, and process of making design decisions. According to bureaucracy theory, processes are laid out to make problem-solving more efficient and predictable. However, if not properly implemented, the result would be the opposite. In reference to that, the case of the university is no different. Since the university is a public institution, certain rules and regulation must be followed for its operations. Despite the fact that rules and regulation are sometimes time-consuming, there are times that problems are not because of the processes itself but because of "*human-borne difficulties"* to properly execute the existing rules governing the process.

Third, technology-related factors influenced the delay of the project because of the lack of efficient and inclusive database and low level of IT. Though people and process-related factors are considered to contribute to the delay of the project, the use of technology is no exception. Depending on how well the technology is adopted to support the processes and the level of technology available, technology has the capability to impact the performance of an organization which will eventually reflect on the project's performance. Considering the resource-based view theory in terms of technology, it states that when IT is combined with other organizational resources, like human resource, better performance can be achieved. With the university's current level of IT, the possible increase in people and process efficiencies have yet to be realized.

5.3 Recommendations

From the results of this study, it is recommended that in order to improve the delivery of university construction projects, the university should focus on improving certain aspects of organizational factors identified in this study.

First, it should invest on its human resource by adding more manpower and providing the necessary training. Every project should have a dedicated project management team that works side-by-side with the university design team. Their duties and responsibilities should be established to achieve effective and efficient collaboration. The number and quality of projects being handled by each personnel should also be taken into consideration in such a way that it matches the personnel's capacity. To ensure the flexibility and continuous development of each project staff, both inexperienced and experienced, each of them should undergo construction project management training in order to become more aware of the construction processes and become better owner representatives. Moreover, the hiring process should also be enhanced by increasing the requirements in terms of experience. With the good intention to provide opportunity to young professionals to learn and gain training in the construction and project management, the university should also consider the aspect of relevant work experience in selecting applicants who wants to become part of the project team. Young and talented professionals bring a lot of energy, enthusiasm, and ideas to a team. However, training would take some time before they get to know the details of how a construction project progress. This can be neutralized by the possibility of first providing more guidance to new hires before giving them big responsibilities beyond their current capacity when hired.

Second, the university should also consider adding project execution plan in its requirements for contractors before the start of the project. With the use of project execution plan, the team will have higher chances of minimizing the risks and be able to provide clearer direction for the project. In terms of the university's internal processes, action must be taken towards the development of regulation on how to implement the provisions of the procurement law to avoid confusion in documentary requirements that leads to slow-decision making. The university should study how to develop its own *implementing rules and regulations* of the procurement law to ensure that there is a standard way of interpreting and implementing it among different offices. This would also help avoid the confusion encountered during processing and approvals of project-related documents.

Third, the university should consider upgrading its current IT level by acquiring more advanced software for design and project management. Acquiring advanced software and providing proper training to personnel on how to properly utilize them will increase their efficiency and productivity. It will also lessen the possible risks encountered on site by anticipating them through better planning with the help of advanced software. In addition, the university can also consider upgrading its current database by providing more features that can support the university's vastly paper-based workflow. Currently, the database is only for reporting and reference purposes, however, it can be upgraded to a central database by making it a repository for documents and by including several constructions related processes such as processing and monitoring of documents like RFIs, change orders, etc.,

Lastly, other factors also contributed to the delay of the UP Quezon Hall Project. The failure of the end-users to provide right-of-way on time could be avoided through better planning and coordination among the involved university offices. For the lack of in-house project manager, establishing a dedicated project management office for the planning, organizing, and controlling of construction-related activities will help minimize the risks to successfully deliver the project. Concern regarding the BAC's capacity to implement the procurement law should also be addressed by providing training and seminars and implementing a more rigid selection process for its members. In addition to that, a regulation must be developed in order to ensure a standard manner of interpreting and implementing the procurement law.

5.4 Limitations

This study experienced several limitations. First, the responses gathered from both the owner and the contractor are based on their perception which is subjective. Second is the under representation on the contractor side (n = 3) and the failure of other university offices involved in the delivery of construction projects to participate. This can pose a bias on the representation of the main issues and stories that will be gathered. As a recommendation, more respondents from other concerned parties can be engaged for a more balanced analysis.

Bibliography

Abdul-Rahman, H., Wang, C., Takim, R. and Wong, S. 2011. Project schedule influenced by financial issues: Evidence in construction industry. 6 (1), pp. 205-2012. Available at: http://ftp.iza.org/dp6106.pdf [Accessed March 29, 2018].

Ahuja, V., Yang, J. and Shankar, R., 2010. Benchmarking framework to measure extent of ICT adoption for building project management. *Journal of construction engineering and management*, *136*(5), pp.538-545.

Aibinu, A. A. and Jagboro, G. O., 2002. The effects of construction delays on project delivery in Nigerian construction industry. Available at: http://www.sciencedirect.com/science/article/pii/S0263786302000285 .

Al-Kharashi, A. and Skitmore, M., 2009. Causes of delays in Saudi Arabian public sector construction projects. *Construction Management and Economics*, *27*(1), pp.3-23.

Alzara, M., Kashiwagi, J., Kashiwagi, D. and Al-Tassan, A., 2016. Using PIPS to Minimize Causes of Delay in Saudi Arabian Construction Projects: University Case Study. Available at: http://www.sciencedirect.com/science/article/pii/S1877705816301278 .

Anumba, C. J. and Evbuomwan, N. F. 1997. Concurrent engineering in design-build projects. *Construction Management & Economics,* 15 (3), pp. 271-281.

Artto, K., Kujala, J., Dietrich, P. and Martinsuo, M., 2008. What is project strategy?. *International Journal of Project Management*, *26*(1), pp.4-12.

Arditi, D., Nayak, S. and Damci, A., 2017. Effect of organizational culture on delay in construction. Available at: http://www.sciencedirect.com/science/article/pii/S0263786316303052 .

Bekr, G., 2015. Causes of Public Construction Projects in Iraq. *Journal of Civil Engineering,* 9 (2), pp. 149-162. Available at: https://www.researchgate.net/publication/281698741_Causes_of_delay_in_public_construction_projects_in_Iraq [Accessed May 5, 2018].

Bekr, G., 2017. Factors Affecting Performance of Construction Projects in Unstable Political and Economic Situations. *APRN Journal of Engineering and Applied Science,* 12 (19), pp. 5384-5395. Available at: http://www.arpnjournals.org/jeas/research_papers/rp_2017/jeas_1017_6365.pdf [Accessed May 5, 2018].

Cha, H.S. and Kim, C.K., 2011. Quantitative approach for project performance measurement on building construction in South Korea. *KSCE Journal of Civil Engineering*, *15*(8), pp.1319-1328.

Cernuşca, L. and Dima, C., 2008. Competency and human resource management.

Divya, R. and Ramya, S. 2015. Causes, Effects and Minimization of Delays in Construction Projects. *National Conference on Research Advances in Communication, Computation, Electrical Science and Structures (NCRACCESS-2015),* pp. 47-53. Available

at: http://internationaljournalssrg.org/IJCE/2015/Special-Issue/NCRACCESS-2015/Part-2/IJCE-NCRACCESS-P107.pdf [Accessed March 26, 2018].

Elawi, G. S. A., Algahtany, M. and Kashiwagi, D., 2016. Owners' Perspective of Factors Contributing to Project Delay: Case Studies of Road and Bridge Projects in Saudi Arabia. Available at: http://www.sciencedirect.com/science/article/pii/S1877705816301837

El–Dash, K., 2007. Assessing human resource management in construction projects in Kuwait. *Journal of Asian Architecture and Building Engineering*, *6*(1), pp.65-71.

Enshassi, A., Arain, F. and Al-Raee, S., 2010. Causes of variation orders in construction projects in the Gaza Strip. *Journal of Civil Engineering and Management*, *16*(4), pp.540-551.

Eriksson, P.E. and Westerberg, M., 2009. Effects of procurement on construction project performance. In *International Conference on Management of Technology: 05/04/2009-09/04/2009*.

Flyvbjerg, B., 2006. Five misunderstandings about case-study research. *Qualitative inquiry*, *12*(2), pp.219-245.

Gaith, F.H., Khalim, A.R. and Ismail, A., 2012. Application and efficacy of information technology in construction industry. *Scientific Research and Essays*, *7*(38), pp.3223-3242.

Gebrehiwet, T. and Luo, H., 2017. Analysis of Delay Impact on Construction Project Based on RII and Correlation Coefficient: Empirical Study. Available at: http://www.sciencedirect.com/science/article/pii/S1877705817330825 .

Gibbert, M., Ruigrok, W. and Wicki, B., 2008. What passes as a rigorous case study?. *Strategic management journal*, *29*(13), pp.1465-1474.

Gustafsson, J., 2017. Single case studies vs. multiple case studies: A comparative study.

Hadikusumo, B. H. W., Jitwasinkul, B. and Memon, A. Q., 2017. Role of Organizational Factors Affecting Worker Safety Behavior: A Bayesian Belief Network Approach. Available at: http://www.sciencedirect.com/science/article/pii/S1877705817303296 .

Hamzah, N., Khoiry, M. A., Arshad, I., Tawil, N. M., et al., 2011. Cause of Construction Delay - Theoretical Framework. Available at: http://www.sciencedirect.com/science/article/pii/S1877705811030013 .

Hao, Q., Neelamkavil, J. and Shen, W., 2008. *Managing changes in construction*. Institute for Research in Construction, National Research Council Canada.

Hisham, S.N.A. and Yahya, K., Causes and Effects of Delays in Construction Industry.

Hore, A., 2006. Use of IT in managing information and data on construction projects-A prespective for the Irish construction industry. *Information Technology in Construction Project Management Engineers Ireland Project Management Society*, .

Hussain, S., Zhu, F., Ali, Z., Aslam, H.D. and Hussain, A., 2018. Critical Delaying Factors: Public Sector Building Projects in Gilgit-Baltistan, Pakistan. *Buildings*, *8*(1), p.6.

Indhu, B. and Ajai, P. 2014. Study of Delay Management in a Construction Project - A Case Study. *International Journal of Emerging Technology and Advanced Engineering,* 4 (5), pp. 108-113. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.643.8673&rep=rep1&type=pdf [Accessed March 26, 2018].

Itika, J., 2011. *Fundamentals of human resource management: Emerging experiences from Africa* (p. 232). African Studies Centre [etc.], Leiden [etc.].

Jain, A., 2004, January. Using the lens of Max Weber's theory of bureaucracy. In *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on* (pp. 127-136). IEEE.

Jung, T., Scott, T., Davies, H.T., Bower, P., Whalley, D., McNally, R. and Mannion, R., 2009. Instruments for exploring organizational culture: A review of the literature. *Public administration review*, *69*(6), pp.1087-1096.

Kabega, C., Kule, J.W. and Mbera, Z.R., 2016. Effect of procurement practices on performance of public projects in Rwanda. *International Journal of Economics, Commerce and. Management United Kingdom, IV, 5*, pp.377-397.

Kalinova, G., 2008. Project Manager and his Competencies (Knowledge, Skills and Attitude Perspectives). *Slovak Journal of Civil Engineering*, *1*, pp.29-36.

Konnur, B.A. and Hundekar, A.L., 2008. Restructuring strategy for construction companies through RBV theory. *Journal of Mechanical and Civil Engineering*, *6*, pp.24-29.

Lam, B.C. and Liu, A.M.M., 2005. Bureaucracy and Red Tape in Public and Private Construction Project Organizations. *Surveying & Built Environment*.

Le Deist, F.D. and Winterton, J., 2005. What is competence?. *Human resource development international*, *8*(1), pp.27-46.

Lidelöw, H. and Simu, K., 2015. Understanding construction contractors and their operations strategies. *Procedia Economics and Finance*, *21*, pp.48-56.

Ling, F. Y. Y. and Poh, B. H. M., 2008. Problems encountered by owners of design–build projects in Singapore. Available at: http://www.sciencedirect.com/science/article/pii/S0263786307000695 .

Lynch, J., 2018. 8 Causes of Delays in the Public Procurement Process and How to AVoid Them. Available at: https://procurementclassroom.com/causes-of-delays-in-public-procurement/ [Accessed 2018].

Marzouk, M. M. and El-Rasas, T. I., 2014. Analyzing delay causes in Egyptian construction projects. Available at: http://www.sciencedirect.com/science/article/pii/S209012321200104X.

Memon, A.H., Rahman, I.A. and Hasan, M.F.A., 2014. Significant causes and effects of variation orders in construction projects. *Research Journal of Applied sciences, Engineering and Technology*, *7*(21), pp.4494-4502.

Mishra, A. K. and Regmi, U. 2017. Effects of Price Fluctuation on the Financial Capacity of "Class A" Contractors. *International Journal of Creative Research Thoughts (IJCRT),* 5 (4), pp. 1920-1937. Available at: https://www.researchgate.net/profile/Anjay_Mishra/publication/321729836_Effects_of_Price_Fluctuation_on_the_Financial_Capacity_of_Class_A_Contractors/links/5a2eb4910f7e9bee6918a3e8/Effects-of-Price-Fluctuation-on-the-Financial-Capacity-of-Class-A-Contractors.pdf [Accessed May 5, 2018].

Morris, R., 2011. The Iron Triangle of the PMO: People, Processes, and Technology. Available at: http://www.pmthatworks.com/2011/06/iron-triangle-of-pmo-people-processes.html [Accessed 2018].

Motaleb, O. and Kishk, M., 2010, September. An investigation into causes and effects of construction delays in UAE. In *Procs 26th Annual ARCOM Conference* (pp. 6-8).

Mukuka, M. J., Aigbavboa, C. O. and Thwala, W. D., eds., 2014. A Theoretical Review of the Causes and Effects of Construction Projects Cost and Schedule Overruns, [International Conference on Emerging Trends in Computer and Image Processing]. Pattaya, Tahiland, Dec. 15-16, 2014. Thailand: (ICETCIP 2014). pp. 112-115.

Nagpaul, P.S., 1995. Quasi-quantitative measures of research performance: an assessment of construct validity and reliability. *Scientometrics*, *33*(2), pp.169-185.

Navarro, A. M. and Tanghal, J. A. April 2017. The Promises and Pains in Procurement Reforms in the Philippines. *Pids*, 16 pp. March 25, 2018-1-57. Available at: https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps1716.pdf [Accessed March 25, 2018].

Nguyen, L.H. and Watanabe, T., 2017. The Impact of Project Organizational Culture on the Performance of Construction Projects. *Sustainability*, *9*(5), p.781.

Pandey, S.K. and Kingsley, G.A., 2000. Examining red tape in public and private organizations: Alternative explanations from a social psychological model. *Journal of Public Administration Research and Theory*, *10*(4), pp.779-800.

Pandit, K. A. and Bhangale, P. 2015. Major Elements Of Project Execution Planning For Construction Of Buildings.

Pourrostam, T. and Ismail, A. 2012. Causes and Effects of Delays in Iranian Construction Projects. *IACST International Journal of Engineering and Technology*, 4 (5), pp. 598-601. Available at: https://www.researchgate.net/publication/265571642_Causes_and_Effects_of_Delay_in_Iranian_Construction_Projects[Accessed March 26, 2018].

Reis, R., 2017. Strengths and Limitations of Case Studies. Available at: http://cgi.stanford.edu/~dept-ctl/tomprof/posting.php?ID=1013 [Accessed 2018].

Saddam, A. K. and abu Mansor, N. N. 2015. The Role of Recruitment and Selection Practices in the Organizational Performance of Iraqi Oil and Gas Sector: A Brief Literature Review. *Review of European Studies,* 7 (11), pp. 348.

Samarah, A. and Bekr, G. 2016. Causes and Effects of Delay in Public Construction Projects in Jordan. *American Journal of Engineering Research (AJER),* 5 (5), pp. 87-94. Available at: http://www.ajer.org/papers/v5(05)/M0505087094.pdf [Accessed March 25, 2018].

Serpell, A., Barai, S.V. and Oladapo, A.A., 2005. An investigation into the use of ICT in the Nigerian construction industry.

Shavelson, R.J., 2010. On the measurement of competency. *Empirical research in vocational education and training*, *2*(1), pp.41-63.

Skoien, J., (unpublished) The Role and Function of Organizational Strategy. Master of Science. Norway: Copenhagen Business School.

Steyn, H. and Schnetler, R., 2015. Concurrent projects: How many can you handle?. *South African Journal of Industrial Engineering*, *26*(3), pp.96-109.

Sullivan, A. and Harris, F.C., 1986. Delays on large construction projects. *International journal of operations & production management*, *6*(1), pp.25-33.

Sun, M. and Meng, X., 2009. Taxonomy for change causes and effects in construction projects. *International Journal of Project Management*, *27*(6), pp.560-572.

Szymaniec-Mlicka, K., 2014. Resource-based view in strategic management of public organizations–a review of the literature. *Management*, *18*(2), pp.19-30.

Tabassi, A.A., Ramli, M. and Bakar, A.H.A., 2011. Training and development of workforces in construction industry. *Ángel F. Tenorio, Prof. Dr.*, p.150.

Tafazzoli, M. and Shrestha, P.P., 2017. Investigating causes of delay in US construction projects. In *53rd ASC Annual International Conference Proceedings, Associated Schools of Construction*.

The University of Edinburgh (unpublished) 2013. Interview Consent Form. Interview Consent Form.

Toor, S.U.R. and Ogunlana, S.O., 2008. Problems causing delays in major construction projects in Thailand. *Construction management and economics*, *26*(4), pp.395-408.

Van Thiel, S., 2014. *Research methods in public administration and public management: An introduction*. Routledge.

Wilkinson, A., Johnstone, S. and Townsend, K., 2012. Changing patterns of human resource management in construction. *Construction Management and economics*, *30*(7), pp.507-512.

Yin, G. and Yang, B., 2010. The Construction of Firm's IT Capability and Its Impact on IT Assimilation: An Empirical Investigation in China. In *PACIS* (p. 74).

Zadeh, M.T., Dehghan, R., Ruwanpura, J.Y. and Jergeas, G., 2016. An index to assess project management competencies in managing design changes. *International Journal of Construction Engineering and Management*, *5*(1), pp.11-24.

Zamora, E., 2016. The Challenges in Managing University Infrastructure Projects. 11 (1), pp. 22-37. Available at: https://www.jstage.jst.go.jp/article/iappmjour/11/1/11_22/_pdf [Accessed February 1, 2018].

Zhang, X. and Li, B., 2013. Organizational culture and employee satisfaction: An exploratory study. *International Journal of Trade, Economics and Finance*, *4*(1), p.48.

Annex 1: Protocol log file

The data gathering was conducted from June 25 – August 13, 2018. A total of 12 respondents participated in the case study: 6 were interviewed online while 6 answered the interview questions. Originally, all respondents were supposed to be interviewed. But due to conflicts with the respondents' busy schedule, some of them requested to answer the interview questions instead by writing.

Sampling and respondents

Respondents for this study was taken using purposive sampling, specifically, stratified sampling based on the position and participation in the project. Table 11 shows the original sample size for the interview.

Table 11 Proposed sample list of respondents for interview

Position	Department	Role	Hierarchy	No.
Vice President	Project Management	Owner	Top Management	1
Director	Project Management	Owner	Middle Management	1
Architect	Project Management	Owner	First-line Management	2
Electrical Engineer	Project Management	Owner	First-line Management	1
Civil Engineer	Project Management	Owner	First-line Management	1
Mechanical Engineer	Project Management	Owner	First-line Management	1
SPMO	Procurement Office	Owner	-	2
BAC	BAC	Owner	-	2
Project Architect	Project Management	Contractor	Individual contributors	1
Project Manager	Project Management	Contractor	Individual contributors	1
Project Engineer	Project Management	Contractor	Individual contributors	2
IT Director	Technical Support	Owner	Middle Management	1
Total Sample (n)				**16**

Source: Author

During the data gathering phase, only 12 respondents participated to either undergo online interview or answer the questions by writing. The researcher tried to reach to the other respondents in the proposed sample size but there were no replies. As a result, Table 12 shows the final respondents for the case study. From this revised list of respondents, 1 respondent was added on the contractor side through snow ball sampling. Other respondents on the proposed sample size were no longer hold the same position they had during the UP Quezon Hall Project. when asked about the committee members, some of the respondents no longer remember who the members were as they became part of the university when the project was already bid out.

Table 12 Revised sample list of respondents

Position	Department	Role	Hierarchy	No.
Vice President	Project Management	Owner	Top Management	1
Director	Project Management	Owner	Middle Management	1
Architect	Project Management	Owner	First-line Management	1
Electrical Engineer	Project Management	Owner	First-line Management	1
Civil Engineer	Project Management	Owner	First-line Management	1
Mechanical Engineer	Project Management	Owner	First-line Management	1
~~SPMO~~	~~Procurement Office~~	~~Owner~~	~~-~~	~~2~~
~~BAC~~	~~Bids and Awards Committee~~	~~Owner~~	~~-~~	~~2~~
Project Architect	Project Management	Contractor	Individual contributors	2
~~Project Manager~~	~~Project Management~~	~~Contractor~~	~~Individual contributors~~	~~1~~
Project Engineer	Project Management	Contractor	Individual contributors	1
~~IT Director~~	~~Technical Support~~	~~Owner~~	~~Middle Management~~	~~1~~
Independent Respondent	Project Management	-	First-line Management	3
Total				**12**

Source: Author

Annex 2: Semi-structured Interview Guide Questions

The interview will take about an hour.

- The interview will be recorded and a transcript will be produced
- The transcript of the interview will be analyzed by the researcher
- Any summary interview content, or direct quotations from the interview, that are made available through the thesis or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- Any variation of the conditions above will only occur with your further explicit approval

Source: Adapted from The University of Edinburgh (2013)

As part of my thesis, I am conducting this interview to look at the factors that influence the delays in the delivery of public construction projects. I appreciate your participation in this interview. I will treat the information in this interview as confidential.

Before we start, do you have any question?

	QUESTIONS	**INDICATORS**	**MEANS OF VERIFICATION**
	People-related		
1	How many years have you been in the construction prior to joining the UP Quezon Hall Project?	Relevant work experience	
2	Does the university provide training and development for the project staff?	Training and development	Copy of employee training and development
	In your view, how important is training and development for project staff?		
3	How many projects are you handling simultaneously with UP Quezon Hall Project?	Project/Staff Ratio	
4	Can you tell me about the university hiring process?	Hiring Process: Recruitment and Selection	
	Process-related		
5	Does the university have manuals (SOP) on how to execute and manage construction projects?	Available operations manual	Copy of operations manual (project management and procurement)

6	During the construction of UP Quezon Hall Project, did the project experienced late approvals/resolutions? If yes, how many?	No. of late approvals and resolutions	Copy of times extension requests
7A	On a scale of 1-5, how would you rate the efficiency of the university's "procurement system" in the case of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)	No. of mandatory approvals: managerial perception	Copy of operations manual (procurement)
7B	On a scale of 1-5, how would you rate the efficiency of the university's "internal processes" in resolving project-related issues of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)	No. of mandatory approvals: managerial perception	Copy of operations manual (project management)
	Technology-related		
8	What sorts of database does the university use for the project management and procurement of UP Quezon Hall Project?	Available database	
9	How did the introduction of IT influence the management/procurement of UP Quezon Hall Project?	Benefits of IT: time-saving for project monitoring and procurement	
10	Does the university have a short-term or long-term plan for adopting/using IT to construction project implementation?	Strategic use of IT: available short-term (incl. current) and long-term plan	
	Other factors		
11	Could you identify what you will consider as other factors that significantly influenced the delivery of UP Quezon Hall Project?	Other factors affecting the delay of delivery	
	Delays in Construction Project		
12	When was the project started? When was it completed?	Schedule efficiency	Negative, Zero, Positive (Value should be zero or positive)
13	What are the causes of variation orders in UP Quezon Hall Project?	Variation order due to excusable delays	Copy of time extension requests
	How did it affect the schedule of the UP Quezon Hall Project?		

14	How often does the university granted time extension for late approvals/resolutions?	Approved time extension due to late approvals and resolutions	

I appreciate the time you took for this interview.

Is there anything else you would like to add?

I already have all the necessary information I need. The next procedure would be to transcribe the interview. After that, the transcript will be processed using qualitative analysis in order to address the research questions. Findings from the interview will be used in the thesis to develop recommendations and will be submitted to the Institute of Housing and Development. Would it be alright to call/message you if I have any more questions? Thanks again.

Annex 3: Respondents' Quotations

Respondent	Hierarchy
Respondent 1	First-line Management
Respondent 2	First-line Management
Respondent 3	First-line Management
Respondent 4	Individual Contributor
Respondent 5	Middle Management
Respondent 6	Individual Contributor
Respondent 7	First-line Management
Respondent 8	Individual Contributor
Respondent 9	Top Management
Respondent 10	Project Management
Respondent 11	Project Management
Respondent 12	Project Management

Responses are presented following their order of appearance in Chapter 4

Quotations:

1. How many years have you been in the construction prior to joining the UP Quezon Hall Project?

   Respondent 11:

   "I've been in the university for 5 years now. I joined the university project team after graduation."

   "At first, we didn't know the project flow. We were not oriented of the bidding process. We studied it on our own. We listen and absorb whatever we can, that's how we learn."

   Respondent 9:

   "When we started hiring people, most of them either just earned their licenses or were under licensed. And we allow them some period to review and prepare for the board exam. To be honest, except for the director, the people we got in barely had work experience. That includes myself."

Other quotation(s):
Respondent 3:
"Second, those who lead the project during that time, on the part of the university, are still inexperienced. They listen to the project management group but… […] is still young and inexperienced. Those handling the project are also still young."

Respondent 2:
"For example, UP Quezon Hall Project was handled by […], some project staff just got their licenses. So, some of their decisions are not yet very firm and strong. They need to consult first with the top management before making a decision. But now, after years of exposure, they are now making firm decisions."

2. Does the university provide training and development for the project staff?
Respondent 7:
"*None. What happen is individual/self-development. On our own, we need to look for trainings and seminar".*

Respondent 12:
"None I know."

Respondent 11:
"That's what the university is lacking. We really lack on that aspect. We are proposing if we can just look for own seminars. So far, we were only attend master planning workshop. Nothing about design, […] I haven't attended any seminar sponsored by the university. […].Workshop only within the office."

"At first, we didn't know the project flow. We were not oriented of the bidding process. We studied it on our own. We listen and absorb whatever we can, that's how we learn."

Respondent 2:

"Yes, it poses a challenge to the productivity of lead personnel. In my experience in the private company, I was handling […], architectural… I am not handling the structural aspect but I'm responsible for coordinating it. Suppose to be, we must be able to handle it all because we're part of the management team. Obviously, you need help, but since there's one person for each discipline of the project like structural, electrical, architectural, most of us no longer interfere with the other disciplines. Like for me, since I'm in charge of the […] aspect, I no longer interfere with the structural part."

In your view, how important is training and development for project staff?
Respondent 11:
"I think, training is still important for the office. But not like before, because the university already have a new office for project management. We are now more focused on the design. I think it is more important for the construction management office. But, it would be good if we can also get some training so that we will be familiar of how the project flows. So that we will also know their side like their considerations. We will not just focus on design but also have a balance of the other side to avoid any conflict."

3. How many projects are you handling simultaneously with UP Quezon Hall Project?
   Respondent 7:
   "Handling multiple projects that have their own deadlines affect the focus and effort that is consumed by the staff for each project.

   Respondent 11:
   "We really lack project personnel. Like the ratio is 3:1. That's just for the architects. How much more for the interior designer? We only have one interior designer. The same also goes for the engineers. We only have one engineer before for electrical, mechanical, and civil."

4. Can you tell me about the university hiring process?
   Respondent 3:
   "Before, the hiring process was not very strict. They are not strict with the requirement and the interview. If you have the required number of years of experience, that's already enough. The style was more of a referral. Now, they are becoming stricter. The hiring process now takes longer which I sometimes think to be also not beneficial at some point because we need project staff. Another cause of the slow process in hiring is the availability of budget. Of course, we need to seek budget clearance first before a person gets hired."

   "Most of the time the applicants are referred by their colleagues with CV's and qualifications, then one-time interview and its done."

   "I think the office filters qualified staffs, of course they are knowledgeable because its their respective profession, but some are lacking the enough knowledge which can be learned through actual work experience."

   Respondent 9:

   "[…]But the work here actually constitutes the training. We consider that as a benefit for the young people that we hire. Hire very good young people who have the energy and who are willing to learn. I guess that works. Except that because of the number of infra projects that are on-going. It's really difficult for just a few people to be handling all of these efficiently."

   Respondent 1:
   "The university doesn't do job postings formally because the position being offered is not regular."

   Respondent 2:
   "Well, maybe because… I'm not totally sure about the hiring process. But in my case, it's only through word of mouth. And since it's not a job item, it is not listed in the university's HR job openings… And we have lack of personnel, so we're only getting people through word of mouth. Like friends of friends, that even without assessing their competencies, they will be accepted for the job."

5. Does the university have manuals (SOP) on how to execute and manage construction projects?

   Respondent 1:
   "The university itself does not have anything like that. Well, it turns to RA 9194 for guidance. The IRR, implementing rules and regulations of the RA 9184, so it's not very exhaustive. It has just some parts there about what to do or how to document variation orders or what sort of work can qualify as variation orders. Just like that, very basic."

   Respondent 7:
   "Although the system adheres to GPPB and the local Government SOP, the execution is sometimes dependent on the authority available to decide upon the process to be followed. As mentioned in the first question, there are sometimes gaps or discrepancies on the interpretation as well as the execution of policies or protocols."

   Respondent 12:
   "None. Usually we follow the schedule given by the contractor based on the duration that the agency requires."

   Respondent 11:
   "We don't have project execution plan. We don't have that kind of document. We don't require that. We only have S-curve to monitor the project. […] We require them along the process. There is no guideline or outline. It depends on the CM. But I think it's important. Like when I started, I was deployed into construction management without any idea without much idea of the standard practices. You make your own strategy ad its difficult. The good thing about having an outline is it will also be clear for the contractor what the owner really requires before they start."

6. During the construction of UP Quezon Hall Project, did the project experienced late approvals/resolutions? If yes, how many?

   Respondent 1:
   "I'd say 90% of the time."

   Respondent 11:
   "I'll just explain the culture of the construction industry in the government. So first, any kind of approval is very difficult in the government because it goes through a lot of offices. Here in Diliman for example, it will even go to the Director, Dean, and sometimes the President. And sometimes the end-user also gets involved. There are lots of approval. And it's not linear like from bottom upwards. It branches out and it's difficult to control. There are many involved in the project. And of course, they have their own opinions. Like for example the color of the paint. We need to agree first the final color and each one have their own preference. With the kind of situation, we are already spending a lot of time to come up with an agreement. After we reach an internal agreement among the university stakeholders, we will talk to the contractor. And the contractor has also their own proposal based on cost considerations. Sometimes they will provide proposals with the same quality but lower cost. Then it will be checked by the CM. Once there is already an agreement between the CM, end-user and the contractor, the next step is where the confusion comes in. Some said that it will go through the BAC. Sometimes the approval would be just within the office. Then there

are some who says that it needs the approval of the Executive Vice President. The problem is where the files should be submitted and who will approve. There are lots of approval."

Respondent 11:
"In my view, sometimes it confusing. The interpretation are different depending on who is in the position. The interpretation would just eventually change. But I think there is really a process. It is based on the procurement law. What is needed is to have a fix set of processes. A flowchart is needed."

7. a. On a scale of 1-5, how would you rate the efficiency of the university's "procurement system" in the case of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)

   Respondent 7:
   "It's prone to change. The standards are prone to change, or the interpretation of the guidelines are prone to change depending on who's handling the papers or the documents."

   Respondent 2:
   "Based on what I have experienced, there's seems to be an unspoken process without any documentation. Like it is known by the majority in the university by words, but it's not written. There is no specific process like after step 1, there's step 2, and so on. There's no written document."

   "We have an unspoken process known by the majority. Based on my experience, inefficiency comes from the university's inability to take responsibility. Basically, no one wanted to take responsibility for the decisions. Those people who are willing to give the go signal and say yes."

   b. On a scale of 1-5, how would you rate the efficiency of the university's "internal processes" in resolving project-related issues of UP Quezon Hall Project? Please explain. (1 – very ineffective, 5 – very effective)
   Respondent 5:
   "There are very few problems relating to technical and design issues".

   Respondent 4:
   "Immediate call for a meeting with the affected parties."

   "It makes the work easier for everyone since we already settled the issues/concerns."

   Respondent 8:
   "Concerned departments were very receptive during the course of the entire project. It helps to know who you need to speak to and make follow-up […]."

8. What sorts of database does the university use for the project management and procurement of UP Quezon Hall Project?
   Respondent – R9:
   "ODPI was established I think in 2010. So that was before my time. I came in 2011. When I came in, we already has the office of design and planning initiatives. But it only

had a Director and no staff. So we started getting people in 2011. We started out with just 4 people."

Respondent 1:
"At the beginning, we didn't."
Respondent 3:
"Mostly only during the billing… more on billing."

"Billing, salary of employees,… mostly for billing matters. For construction related matters, the IT wasn't able to develop anything."

9. How did the introduction of IT influence the management/procurement of UP Quezon Hall Project?

   Respondent 1:
   "There is. There is a website. OVPDCares. It was supposed to be a database of all on-going infrastructure projects for the entire UP System. It also includes the other constituent units like Visayas, Cebu, Baguio. Then the problem was, inside each campus or CU, it wasn't clear who has to update it and how often they were supposed to update it. Of course, OVPD would time and again ask them to update the database/website, but I noticed, especially with Diliman, the database was seldom updated."

   Respondent 2:
   "Of course, OVPDCares is very basic like its only for the BOR, the President. It's very simple. But we don't have a database that addresses issues concerning change orders, RFI,… a database which enhances the process. We'll, by mind we know the process."

   "You will only see the gap, but I don't think that it can directly improve the process. The IT can only suggest but they don't have the power to influence the schedule of the project."

   Respondent 11:
   "For design, we have software like BIM. But we don't trained personnel to use it. It's very helpful for designing. Any revision easily reflects to other drawings. If you made any change(s), there's no need to draw it again on another plan. It will automatically reflect. That's what we don't have that I think is very helpful. […] The IT level is currently below average. Especially this times when CAD seems to be obsolete already."

10. Does the university have a short-term or long-term plan for adopting/using IT to construction project implementation?

    Respondent 2:
    "We have OVPDCares. That's the only thing I see. I'm not sure if it will progress more than that. What's important is that the IT should have an idea of the database or software that they will develop."

"Many have suggested. Since the Quezon Hall was started in 2014, around 2015 there were already suggestions to incorporate BIM."

Respondent 1:

"Right now maybe there's lack of coordination among different offices in terms of standardization like […] should also be involved. They should have been giving training. They should give enough training for all the people. Because a lot of the administrative staff in UP are old and technologically averse. They don't like new technology. So I think that was one mistake of […] back then or that was one of their shortcomings that they didn't give enough training especially even with the knowledge that a lot of people in UP System and UP Diliman are not very adaptive to technology."

11. Could you identify what you will consider as other factors that significantly influenced the delivery of UP Quezon Hall Project?

    Respondent 9:

    "First of all, we didn't anticipate that there was a serious need for relocation of occupants. We assumed that the occupants of the various offices would be vacating their offices and transfer to relocation areas. But what happened was, most of the offices, most of the occupants of the offices, decided that they would rather stay and bare the noises and difficulties that will be encountered during the renovation. But there were certain offices that really had to vacate cause there's no other space inside the building. SO that caused a lot of delays because vacating the spaces took a while. We did not anticipate that. It was not in the schedule. Also while some offices were able to transfer, they had left behind their files, their equipment, etc., and we had to look for spaces for this things. So we had to procure container vans. And procurement following the Philippine laws on procurement is very rigid. It also took a while to procure the container vans. And then we also did not estimate properly. So, we initially procured less than the required number of container vans. We needed to have a second set of procurement and a third."

    Respondent 12:

    "The BAC doesn't have a technical member who is experienced in infrastructure projects. Also, it took a long time before the NTP was released (not sure how long)."

    Respondent 7:

    "The continuity of knowledge as well as the time and effort consumed in order to turn over project details properly affect the quality and timeliness of project delivery." This turn-over rate has an impact on the project team's performance as it affects the dynamics of the group.

12. When was the project started? When was it completed?

    Respondent 11:

    "For design and build, almost all the projects are 3 times delayed the intended duration. There's not even one which is at least close to the target completion date."

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