

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

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Abstract: In many organizations, capital construction projects fail at an alarming rate despite the adoption and application of sophisticated project management techniques and tools. Utility organizations that lack effective strategies to deliver construction projects on-budget and on-schedule are at a high risk of experiencing project failure. Grounded in the contingency theory, the purpose of this qualitative multiple case study was to explore strategies successful project executives in utility organizations use to deliver construction projects on-budget and on-schedule. The participants comprised 3 project executives from 3 utility organizations located in the northeastern United States who implemented strategies to complete construction projects on-budget and on-schedule. Data were collected from semistructured interviews, the organizations' project documents, and the organizations' websites. The following themes emerged from the analysis of research data: develop a detailed project scope, apply relevant project management tools, customize project management processes and procedures, and capture knowledge and share lessons learned. A key recommendation is that project executives develop a robust format or template for the project scope development before construction.

Keywords: Project management, contingency theory, construction, utilities, project overrun.

1. INTRODUCTION

Executing projects is one of the strategies that many business organizations, large or small, across the United States are using to either maintain or expand their market base or respond to ever-changing events in their environment, to ensure their long-term survival (Adesina, Omoregbe, & Oyewole, 2015; Kiehne, Ceausu, Arp, & Schüler, 2017; Serra & Kunc, 2015). These organizations, though expending vast sums on executing projects, are experiencing massive project overruns or even complete failures every year and consequent financial loss. This project overrun or project failure phenomenon is particularly high for capital construction projects (Aljohani, Ahiaga-Dagbui, & Moore, 2017; Gbahabo & Ajuwon, 2017). Olawale and Sun (2015) mentioned that project overrun rates for typical construction projects ranged from 50% to 90% depending on the type of project and environmental context. Richardson, Marion, and Onu (2015) noted, the project overrun phenomenon persists despite the adoption of project-oriented structures by business organizations to integrate organizational functions and efficient application of traditional project management practices and sophisticated project management tools. As a consequence of project overruns and project failure, an estimated \$122 million is wasted for every \$1 billion invested in projects in the

United States (Project Management Institute, 2016). Loss of opportunity costs also run into the trillions of dollars. This issue has gradually become not only a major concern for business organizations involved in the construction of infrastructure projects but also for investors and, to some extent, is a public concern (Abusafiya & Suliman, 2017; Jatarona, Yusuf, Ismail, & Saar, 2016). The project overrun issue thus deserves attention and in-depth study.

The objective of this qualitative research study was to explore project overrun phenomenon in the context of the utility industry and answering the research question "What strategies do successful project executives in utility organizations employ to deliver infrastructure construction projects on-budget and on-schedule?". The interview questions applied during the research are as follows:

1. What criteria did you use to assess project performance of your construction projects?
2. What strategies did you implement to improve project performance rate of your construction projects?
3. What strategies did you implement to reduce cost overrun and how did you implement these strategies?
4. What strategies did you implement to reduce time overruns and how did you implement these strategies?
5. What challenges did you experience in implementing the strategies that you employed to reduce cost and time overruns?
6. How did you address the challenges that you faced

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

during implementation of strategies to reduce cost and time overruns?

7. How are management or project management software tools relevant to improving project performance of construction projects?
8. What advice would you give to a utility organization that is currently experiencing poor project performance of its construction projects and wants to improve performance?
9. What other information regarding strategies to deliver infrastructure construction projects on-budget and on-schedule do you wish to share that I have not asked you about?

The targeted population for this multiple case study were three project executives from different utility organizations located in the northeastern United States who have implemented strategies that have led to reduction in budget and schedule overruns. The contingency theory was the conceptual framework through which the researcher explored and analyzed the construction project overruns phenomenon. The contingency theory was an appropriate conceptual framework for this study because the theory relative to other major management theories was more aligned to achieving the goal of this study. Project management researchers have found that comprehensive study of a project-related issue can only be achieved by considering the relationship between the project and external contingencies that may impact the effective operations of the project (Hanisch & Wald, 2012). Sauser, Reilly, and Shenhar (2009) noted that application of contingency theory can enable a project management researcher to gain new insight for a deeper understanding of project success and failure beyond applying the traditional success factors.

The paper is structured as follows: Section 2 presents the overall research approach and the specific techniques used in collecting the direct and indirect data from research participants, analyzing and understanding collected data, and validating the quality of the research study. Section 3 provides the findings of the field research, analysis and discussion of the project management strategies deduced from the findings. Section 4 presents the discussion on the potential impact of the findings on project management in the utility industry. Section 5 presents motivation for the research, summary of the research findings and significance of the research to the utility organizations achieving their business goals.

2. METHODOLOGY

2.1 Research Method

The research method that was used in implementing this study is the qualitative research method. The qualitative

research method presents the most appropriate and efficient process to explore the research focus and ultimately achieve the research objective, opposed to quantitative research method or mixed method. The qualitative research method is anchored on constructivism paradigm, a philosophy that supports the notion that a researcher needs to view and explore issues in its various complexities, because meanings to an issue can be varied and multiple (Adom, Yeboah, & Ankrah, 2016; Creswell & Creswell, 2018; Mogashoa, 2014). The qualitative research method enables the researcher to collect data from direct observation and interview questions to understand the participants' viewpoint from an "insider" perspective rather than using a standardized questionnaire that evaluates from an "outsider" position (Antwi & Hamza, 2015; Barnham, 2015; Creswell & Creswell, 2018). Mohajan (2018) stated that the qualitative research method is useful for the researcher to explore and understand possible relationships, causes, effects, and dynamic processes relating to an issue or phenomena. Mohajan also stated qualitative research method provides the researcher a basis upon which new concepts and theories can be developed from the phenomena (Creswell & Creswell, 2018; Mohajan, 2018).

2.2 Research Design

A research design is an overarching strategy a researcher intends to apply to execute a research study. Researchers use a research design to set the direction and procedures that will be followed by the researcher to achieve the goals of the research (Khalid et al., 2012; C. Williams, 2008). A case study is a research approach used to explore in depth activities of an individual, group of people, individual institutions, or explore a phenomenon, process or problem within a specific system or context (Starman, 2013). A case study research approach can either be a single case study or a multiple case study. The single case study is applied by researchers to explore and understand a phenomenon using a unique or extreme case of interest (Gaikwad, 2017). The multiple case study is used by researchers to explore and understand the similarities or dissimilarities of the phenomenon that occur at different places (Baxter & Jack, 2008; Gaikwad, 2017). The multiple case study approach was applied for this qualitative research study. Applying the multiple case study, a more robust process than a single case study, enabled the researcher to explore deeper the research focus better than would have been achieved with a single case study (Baxter & Jack, 2008; VanWynsberghe & Khan, 2007).

2.3 Data Collection

This multiple case study was conducted using the semistructured interview technique and organizational documents review method to collect relevant data to achieve the objectives of the study. Applying the semistructured interview involves a researcher asking a set of predetermined open-ended questions. The semistructured interview method enables a researcher to ask questions that are specific to the research topic and also have the opportunity to explore other issues that may be relevant to the research (Alsaawi, 2014; Khan, 2014). The researcher applying the semistructured interview technique; initial probing questions and follow-up explorative questions, enabled in-depth exploration of participants' experience, observations, and context of phenomenon under study.

Aside from the semistructured interview session, data were collected from organization's project documents and organization's website, in order to apply methodological triangulation strategy. Information were collected from the organization's project documents such as record of schedules and costs, planning and execution procedures reports and analyzed to extract the required secondary data for the study. Creswell and Poth (2018) stated the review and analysis of the organizations' documents will enable a qualitative researcher to validate critical information and or fill in any omissions in information derived during the interview. Bowen (2009) indicated that document review and analysis provides a researcher with the background information and historical insight into a phenomenon, and also enables the researcher to understand the context within which the participants that are taking part in the research operates.

In line with the focus of the research study, three prominent utility organizations located in the northeastern United States and that used in-house project management teams to manage construction of infrastructure projects participated in the research. Used specific eligibility criteria to select one project executive (PT1, PT2, PT3) from each of the three participating utility organizations for the qualitative multiple case study. The eligibility criteria were that project executive must have 10 years minimum of experience in direct project management or management oversight responsibility over infrastructure construction projects and a record of delivering projects on-budget and on-schedule for the utility organizations.

2.4 Data Analysis

Methodological triangulation involves the application of more than one research method to collect and analyze

research data (Denzin (2006). For this study, the methodological triangulation approach was applied, which entailed collecting, analyzing, and comparing information derived from the semistructured interview method applied on the participants and review of information derived from the review of project documents and website of the utility organizations. Applying methodological triangulation enabled the researcher validate data from the interview method through cross verification from two other sources, organization's project documents and

websites. Aside from validation of the research data the application of methodological triangulation also enabled the researcher conduct an in-depth study on the phenomena and related issues and thereby deepening and widening researcher's understanding of the phenomenon.

The Yin's five phase analysis approach was used in analyzing the research data collected during the research process. The Yin's five phases are as follows: phase 1, compiling and organizing phase; phase 2, disassembling phase; phase 3, reassembling phase; phase 4, interpreting phase; and phase 5, concluding phase (Yin, 2011). The Yin five phase approach is a prominent approach used by qualitative researchers in case study research, the approach provides a well-structured approach to data analysis, and enables the researcher to ensure the trustworthiness and credibility of a qualitative research (Durodola, Fusch, & Tippins, 2017; Nowell, Norris, White, & Modules, 2017).

For phase 1, compiling and organizing phase, the interview and document research data were sorted and assembled into a meaningful and orderly arrangement. The phase also entailed the researcher transcribing the interview into texts, reading and familiarizing with information therein the texts, and understanding contexts noted in the interviews. Phase 2, disassembling phase, entailed disassembling the data compiled in phase 1 and then grouping together words or phrases that characterize different aspects of the issue under focus to form emergent codes. Qualitative researchers normally apply any of the following three coding techniques during data analysis process; (a) a priori coding (codes developed beforehand based on what the researcher believes is important in reference to the research problem), (b) emergent coding (codes that are words or phrases in participant's statements), and (c) combination of a priori coding and emergent coding (Bengtsson, 2016;). During phase 2, disassembling phase, emergent codes were used to validate, realigned to, or combined with priori codes to form new codes. The priori codes were developed prior interview based on the researcher's experience and

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTSON-BUDGET AND ON-SCHEDULE

relevant literature on the phenomenon and used for initial analysis during the semistructured interview process. Phase 3, reassembling phase, entailed analyzing and examining the ways with which the identified codes were linked to consolidate and create categories or themes. When the researcher finds a coherent and consistent experience related to the research purpose in each of the three participants' interview transcripts, a link is made. Themes represent a pattern of meaning within the codes that captures something important relating to the research questions (Castleberry & Nolen, 2018).

Phase 4, interpreting phase, the researcher used the identified interrelationships and connections within the constructs of the themes to discuss and interpret the reassembled data in relation to the research phenomenon. The researcher applied qualitative data analysis software, NVivo 12, in this phase and found the tool useful in determining relationships and connections among constructs that are not easily recognizable. Castleberry and Nolen (2018) mentioned that it is common for qualitative researchers to make some preliminary interpretations during the first three steps (compiling, disassembling, and reassembling phases), and building upon those interpretations to derive the final interpretation. Phase 5, concluding phase, compared and related the key themes and interpretations that emerged from research data with the review of recent studies on project overrun and the major constructs of the contingency theory. The overlapping meaning deduced from correlating the key themes and interpretations with the review from the recent study on project overrun and the contingency theory frameworks was used to create a coherent narration about the research results and draw conclusions (Green et al., 2007; Sutton & Austin, 2015).

2.5 Reliability and Validity

To establish reliability of the research the member checking technique was used to assess the accuracy of the interpretation of the interview data as suggested by Amney (2014). Member checking, which is basically a feedback process, not only enables a researcher to determine any inaccuracies in the reconstruction of the participant's experience, the process will provide the participants the opportunity to reflect on the information they have earlier delivered and self-correct if necessary (Livari, 2018; Morse, 2015). The reliability of the study was enhanced by establishing an audit trail of documentation that a different researcher can follow to examine the study's inquiry process and reestablish the study conclusions as suggested by Elo et al. (2014). A researcher can establish

audit trail by keeping rich records on sampling, research materials adopted, interview protocol, interview data, and observation notes, field notes, categorization process and emergence of findings, and data management procedures (Forero et al., 2018; Korstjens & Moser, 2018).

To establish validity of the research the researcher constantly compared the underlying characteristics of the codes against that of the category to ensure the meaning attributed to the codes remains a fit to the assigned category throughout the data analysis process. Vaismoradi, Jones, Turunen, and Snelgrove (2016) mentioned a researcher needs to continually compare attributes of a code to that of the category to avoid deducing the wrong meaning from the codes.

The researcher also applied peer debriefer technique and purposeful sampling technique to the study to establish validity. Liao and Hitchcock (2018) stated the use of peer debriefer technique for a qualitative research study is an indicator of a strong qualitative inquiry and establishing of credibility. The peer debriefer for this study, an independent researcher, reviewed the study process and asked critical questions about the study to identify any issues that may be inherent in the study process; no inherent errors were found. The purposeful sampling technique was used to identify and select three participants from the three organizations that are the focus of the study. Detailed information on the three participants' professional background, experiences of the project overrun phenomenon, and project management environmental context of the three organizations were considered. Palinkas et al. (2015) affirmed that application of purposeful sampling method by a researcher to identify and select individuals with specialized experience about a phenomenon of interest for a study increases the transferability of the research study's outcome to other populations by other researchers.

The methodological triangulation technique was another technique that was used to establish reliability and validity of the research. Methodological triangulation involved a researcher using information derived from one data collection method to corroborate information obtained from another data collection method, and using the outcome to answer the research question (Kihn & Ihantola, 2015; Morse, 2015). The researcher triangulated the data derived from the semistructured interview with the data obtained from examining relevant organizational project documents and organizational website to enhance the confirmability of the research data. Methodological triangulation enables a qualitative researcher to reduce personal bias and verify

the truthfulness of participants' responses resulting in a more in-depth understanding of and faithful description of the phenomenon of interest (Anney, 2014; Carter, 2014).

In conducting this research study, the researcher was guided by the concept of data saturation. The researcher conducted the semistructured interviews on the three participants from the utility organizations participating in the qualitative research study and data saturation was assumed when no new codes or themes emerge at the end of the third interview. Having established data saturation was reached, conducting additional interviews on more participants was not required as recommended by Vasileiou, Barnett, Thorpe, and Young (2018). The researcher ensuring data saturation was reached during the semistructured interviews process ensured the reliability and validity of the qualitative research study.

3. ANALYSIS AND DISCUSSION OF FINDINGS

The NVivo 12 software tool was used to organize, sort, and analyze the interview data. Using the NVivo 12 software, certain sentences and phrases that were found to be significant to the phenomenon being investigated and were attached with different labels or codes. These codes were later grouped into categories based on similarities in meaning. The categories were in turn grouped or merged to form themes based on patterns in meaning or overarching ideas identified across the categories. The key themes that emerged from the analysis of the interview data were (a) developing a detailed project scope, (b) applying relevant project management tools, (c) applying effective project management skills, (c) customizing project management processes and procedures, and (e) capturing knowledge and sharing lessons learned.

TABLE 1 SHOWS THE FREQUENCY OF WHICH THE THEMES WERE REFERENCED IN THE INTERVIEWS.

Emergent theme	Frequency		
	Participant 1	Participant 2	Participant 3
Develop detailed project scope	1	3	2
Apply relevant project management tools	3	2	3
Customize project management processes and procedures	4	3	3
Capture knowledge and share lessons learned	3	2	2

3.1 Theme 1: Develop Detailed Project Scope

The first theme (see Table 1) that emerged from the analysis of the interview data collected from the participants is to

develop a detailed project scope. Banda and Pretorius (2016) indicated that the essence of developing a project scope is to provide enough details about a project to emphasize the tasks that need to be performed to meet the set of deliverables required by the project owner. A well thought out project scope will contain details on planned time, budget, and quality parameters required to complete the tasks successfully. Banda and Pretorius stated that the project scope should also contain information on potential risks identified and strategies that can be deployed to reduce the likelihood of the occurrence of the risk or reduce the impact if it does occur. All three project executives, participants (PT1, PT2, and PT3) mentioned that it is quite important during project planning that the project executive develops a detailed project scope which, among other information, should include a detailed description of the project complemented with a target schedule and target budget before the project is approved and commenced. The project scope measures indicated in the project scope by the participants were used by them to implement scope management, which was, in turn, was applied to guide and monitor the project to achieve expected project performance.

Shirazia, Kazemipoor, and Tavakkoli-Moghaddam (2017) noted that it is important to develop a proper project scope at the onset of a project. Shirazia et al. mentioned that details from the project scope provide the parameters that can be used to control changes and which will be used in measuring the project performance. The project scope developed by the participants normally contains information on the specific service problem the organization is trying to solve or avert and an outline of technical details that confirm implementing the scope will address the problem. PT1 noted if the problem the organization (Organization A) is trying to resolve is an inadequate level of supply to a section of the public during the summer, then the goal detailed in the scope will be to ensure completion of the project to provide the required supply level during the summer is attainable. PT2 noted that if an infrastructure is critical to the organization (Organization B) for maintaining a much higher winter load than in the summer, the goal emphasized in the scope will be to ensure that the infrastructure project is completed before winter.

PT3 indicated they provide information on conditions of an underground facility to be replaced, risks of unknown locations of crossing utilities, and quality expectations from upgrades. PT3 said "users' expectation and satisfaction and commercial value is the goal." Implementing a project to address service problems is a major part of an

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

organization's strategy of responding to complexities and changes in its business environment, which includes ever-growing demand of customers, aging facilities, and the threat of competitors (Itegi, 2015; Kiehne et al., 2017).

Amoatey and Anson (2017) mentioned the assumptions, requirements, and endpoint for a project must be robustly but concisely detailed in the project definition to ensure everyone obtains a clear and noncontradictory understanding of the intent of the project. PT2 and PT3 inferred that in the project scope, it is important to list out the assumptions used to establish the baseline for the schedule and budget, which can then be updated with lessons learned as project progresses. PT2 and PT3's review of the changes in the assumptions provided valuable information that was used to determine issues that were causing a project to overrun.

Correlation with recent studies. Participants' experience on the importance of developing detailed project scope to project performance confirms the research findings presented by Samset and Volden (2016) and Banda and Pretorius (2016). Samset and Volden found the fundamental problem that lead to major public investment projects not achieving the intended purpose can be traced back to deficiencies in the written project scope or lack of written project scope at the earliest preparatory phases. Samset and Volden asserted that front-end planning and detailing of scope is crucial to improving project performance and ensuring project success. Banda and Pretorius implemented extensive research on performance of some select infrastructure projects implemented by some public and private agencies. Banda and Pretorius discovered applying a detailed and concise project scope definition positively impacts performance of infrastructure projects.

Participants emphasized project management implementation built out from a clear and detailed scope ensures that the right work necessary to achieve the organization's goals and objectives is implemented. The participants demonstrated that the project scope details the organization's response to the specific technical, environmental or business challenge. Derenskaya (2018) indicated that justification and information used in developing the scope are normally based on the organization's project purpose, impacts of the environment, and the organization's internal dynamics in relation to the project. Cristóbal, Carral, Diaz, Fraguera, and Iglesias (2019) in their findings on complexity in project management stated that project scope provides

a window to defining and understanding the uncertainties and complexities associated with a project. Cristóbal et al. indicated that understanding the uncertainties and complexities enables the project manager to match the project implementation plan that best fit the complexities identified and can produce the best outcome.

Correlation with contingency theory. The participants' concept of developing a detailed project scope that adequately responds to the organization's complexities correlates to the perspective of Lawrence and Lorsch (1967) on contingency theory. Lawrence and Lorsch viewed an organization as an active system existing in an uncertain and dynamic environment, with a tendency to reach out to bring order to its complex environment. Lawrence and Lorsch indicated that the effectiveness of the organization would be contingent on the extent to which its system structures fit environmental conditions. Shenhar (1998) extended the contingency theory into project management. Shenhar found that during the project planning and scope stage, the project manager must set practices to fit project uncertainty and complexity to increase the chances of success.

The participants emphasized the need for a project executive to evaluate and ensure the various technical and management complexities surrounding the organization and project reflect in defining the scope, setting the target schedule, target budget, and in the implementation process to achieve the set objectives. Suda et al. (2015) mentioned that contingency theory should be used for complex managerial and project management decision making that involves large infrastructure projects, especially during project definition stages, instead of other concepts that are usually employed for project planning. Suda et al. cautioned that the adoption of the wrong project management approach to a major infrastructure project might lead to problems.

3.2. Theme 2: Apply Relevant Project Management Tools

Applying relevant project management software tools was the second theme (See Table 1) that emerged from the analysis of the data collected from the three participants. Pellerin, Perriera, Guillota, and Léger (2013) indicated that a project management software package is an information technology program developed to provide users with complete and documented information on project performance. The participants expressed that after establishing clear and detailed project scope, the next essential step is applying a project management software tool capable of pulling together information, process it, and

provide actionable results. Wali and Othman (2019) noted the huge amount of information and varied considerations is required now for pre-construction planning to develop and schedule the activities sequence, defining work tasks and responsibilities, determine applicable construction methods, and allocation of resources.

The participants cited they typically use project scheduling software as against writing down what is to be done day by day. The participants mentioned the software is applied to list out in detail all the activities that are going to take place, which is linked to estimates, and then some logic is applied to chart the project execution path. PT1 said "I use excel sheet to plan critical paths milestones for the months, permitting applications, vetting and contract awards processing and overall budget." Using this particular tool enabled PT 1 to present a concise picture of the state of each project to the top executives at any moment. PT1 indicated mistakes of the past were avoided where people assume tangential tasks without understanding the effect on project target. PT1 said "they now know when to say no or when they should say we will address that at the end of the project if the project is on time and budget."

PT3 said "depending on the contract, I use either Microsoft Project or Primavera to forecast resource demand, scheduling, costing and budgeting, and contract valuation." PT2 demonstrated a preference for primavera. PT2 said "primavera is a great tool to set an overall schedule and expectations." PT2 and PT3 demonstrated that using a tool enabled them to plan and document project information effectively and monitor the implementation of project tasks. Desmond (2017) and Valenko and Klanšek (2017) inferred that no particular project management software is found to be most effective across the board, in choosing project management software an organization needs to consider the industry, adaptable to organizations functions, project management needs, project type, and tasks.

All participants mentioned that the application of the project management tool enables them to effectively document and incorporate information sorted and contributed from different stakeholders, especially those directly involved in the project management into the schedule. The participants indicated adopting contributions from different stakeholders into the schedule enables the project team members to understand better the responsibilities and accountabilities expected from each individual during the project implementation process. PT2 emphasized that a project executive does not have to cajole anyone into implementing what they are required to implement once

you have received their initial "agreement" during the development of the project schedule. PT2 indicated that the use of a project management tool enables a project manager to reinforce accountability without it becoming a personal issue. PT2 said "let the project schedule be the bad guy."

Pellerin et al. (2013) stated project leaders use project management software to facilitate the flow of information from one subsystem to another, integrate various data from multiple sources into a more manageable data file, and depict the interaction and interrelation of roles and enterprise systems within an organization. PT3 mentioned using the project management tool. I was able to detail the complex integrations and overlaps between the engineering tasks to the project team and the contractor, thereby reducing ambiguities in the understanding of expected project deliverables. PT2 made a similar assertion on importance of project management tool. PT2 mentioned adopting the Primavera tool, a versatile software, enables the project manager to accurately and graphically illustrate the roles, interdependence of roles, and impact of each individual's role on meeting the overall project objective. PT1 mentioned routinely reviewing with the contractor the project schedules generated using a project management tool enables the team to determine overlapping or conflicting work schedules, unrealistic schedules, and works on the verge of slippage. Wali and Othman (2019) noted the relevance of project management tools has increased in the field of construction project management because of the number of interacting elements in the environment and strength of its impact that are now needed to be considered in managing a project.

Correlation with recent studies. The application of relevant project management tools strategy to improve project planning, scheduling, costing, and implementation of project management processes expressed by the participants correlates with the findings of the study implemented by Radujkovića and Sjekavica (2017). Radujkovića and Sjekavica performed case study research of three public water projects to determine the contribution of project knowledge and practices in the area of construction management. Radujkovića and Sjekavica found the application of relevant project management software to be a key enabler or influencer of project management success. Radujkovića and Sjekavica buttressed that project management software can enable an organization to enhance its project planning, monitoring, and control process better.

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

PT1 said “normally we use the scheduling tool to access the progress of the project” on regular bases. PT2 and PT3 highlighted that using a management tool enables the project leadership to aggregate and integrate project related information and deliver a consistent message across to field operations and other stakeholders. Bor and Kiptum (2017) stated project management software typically contains functions that enable organizations to implement multidimensional information integration, access comprehensive project information, and facilitate information distribution and communication and visualization of the projects. Bor and Kiptum found that persistent use of an efficient project management software tool has a significant positive impact on engineering project performance. Bor and Kiptum asserted organization leaders that want to implement a meaningful project plan and maintain the motivation of projects' stakeholders need to employ a system that can effectively review and relate information on the project to the broader organizational context.

Correlation with contingency theory. Theme 2 correlates with Wooton's (1977) perspective on contingency theory. Wooton postulated that an organization has to continually evolve its systems to respond appropriately to the persistent instability in the organization's environment. Islam and Hu (2012) indicated an organization where the organization's internal characteristics, including control systems, technology, and structure, are aligned with the complexity in its environment would experience higher performance. The participants on realizing the perceived inefficiency or need for improvement in their project implementation process started emphasizing the use of specific applicable capabilities in the existing software application or adopted the use of completely different software applications to respond to the changing realities in their environment.

The participants used different software tools for managing projects, software they believed is most appropriate to their particular situation. PT1 employed a simple project management software tool, Excel, to monitor schedule and financials, especially of several different types of construction projects being implemented at the same time at a high level. PT1's focus is detecting contracts at risks of slippage, facilitating issues to be resolved at the project level or project executive level, and ultimately ensuring the projects are completed within overall budget goals. PT1's focus was aligning the project to complexities in the immediate and broader environment of the project. PT2 used robust project management software, Primavera,

and PT3 preference is for either Primavera or Microsoft Project to manage each of the projects that they have oversight responsibility over. PT2 and PT3 used the project management information software to communicate project tasks, derive stakeholder's input, determine and demonstrate the impact of potential risks, and reinforce accountability. PT2 and PT3 focus was the project at the process level and task level aligning to complexities in the environment. Zheng and Carvalho (2016) indicated that a flexible project management approach is required to manage a project existing in an increasingly complex environment. Cole (2017) noted for a project in uncertain and complex surroundings, the project management approach should not only focus on the project process but should extend the same to the project tasks.

3.3 Theme 3: Customize Project Management Processes and Procedures

Customization of project implementation processes and procedures to suit the specific project implementation requirements of each organization was the fourth theme that emerged from the analysis of the data collected from the three participants. All the participants' organizations have existing standard project management processes, but based on past experience of project performance, participants adopted or adapted some new strategies or steps into their standard project management process to improve its effectiveness. Kononenko and Lutsenko (2018) indicated that there are several project management processes and procedures developed over the years by professional institutions for application in different industries and project management needs. Kononenko and Lutsenko stated it is imperative for the project management team to apply the best existing standard process or create adaption to guide the project implementation and address problems as both the project parameters and the quality of its product will depend on it.

PT3 demonstrated establishing a standardized step-by-step project inspection procedure to provide details and guide the construction execution phase of the project management process. PT3 stated the “construction managers follow the format in starting, inspecting tasks and ensuring the quality, communication, documenting, handing over of each deliverable.” PT1 asserted that the project management process entails formalizing and breaking the design review procedure into a 3-step review process to increase the extent of operations input into the design prior construction phase. PT1's new process involved sending the engineering design to the operations for review and feedback at the initial stage, foundations, next

when the design is in an advanced stage, superstructures, and finally, at the completion of the design. PT1's new procedure was implemented within the project planning phase of the project management process, whereas PT3's project execution procedure was implemented within the construction execution phase.

PT2 explained instituting a new project management process whereby the project manager coordinates the project from beginning to the end, and a supportive process was created for engineering and design activities, and another supportive process for construction and operations activities. PT2 indicated that the new procedure ensures that engineering focuses on engineering and operations focus on construction and operations. PT2 indicated that the new system increased contributions and representation from other stakeholders into the project planning. PT2 mentioned “in the past engineering just run their project from the inception to completion,” and that engineering permitted limited contributions from other stakeholders. Joslin and Muller (2015) asserted customized processes in combination with standardized methodology needed to be employed for project management. Joslin and Muller noted that the combination of both customized processes and standardized methodology presents a comprehensive process that enhances project effectiveness and increases the chance of project success. The participants affirmed that the new customized processes provide better structure, flexibility, and a more inclusiveness approach to project implementation. The new process ensured that project stakeholders' interests are considered early in the engineering phase resulting in potential issues or disputes being identified and resolved before execution and loss of project time avoided. PT3 remarked “unlike in the past the inspection team and contractor now have a clear and concise understanding of the project manager's expectations, especially in terms scope of each specific task.”

Karaman and Kurt (2015) expressed that an organization needs to choose a process and supportive processes or procedures that best fit the organization's project management philosophy, stakeholder management, project execution, or risk perspective. Kononenko and Lutsenko (2018) highlighted that the application of appropriate procedures and templates assigned to selected processes enhances the implementation of the process. The participants discussed utilizing customized procedures or techniques to manage specific processes that have been found problematic in the recent past. PT3 mentioned establishing a procedure to better track

requests for information (RFIs) and reduced incident of delay in response between the contractor and design engineer, and between contractor and organizations' operations during construction. PT3 mentioned the new RFI procedure involved using a new RFI form template, communication flow chart, and emailing distribution and notification protocol to necessary parties.

PT2 and PT1 adopted procedures similar to the process applied by PT3. PT2 narrated the introduction of a project schedule tracking documentation to track progress, identify and mitigate issues, project risks as early as possible through collaborative efforts. PT1 introduced a project procedure to track and manage change order requests during the project execution process, and the goal is to limit change orders to 5%. PT1 indicated the system involves project managers collecting the data on cause and source of the change order, documentation of the nature of the change orders, periodical review of change order requests, stakeholder inputs, and resolution of issues. All the participants indicated they were able to make a quicker and better decision over their construction projects by instituting the new process and procedures. PT1 indicated with the new system “I get informed and involved in finding solutions to an issue much faster, and avoid the issue having a serious negative impact on a task.” PT3 asserted “improved process allowed us to more efficiently resolve minor gaps or differences in understanding of design drawings, technical specifications, or contract provisions on time.” Cole (2017) noted that it is important to establish a project process that hastens decision making during project execution. Cole stated frequent delay or slow decision making often result in scope creep, rework, and contribute to project overruns.

Correlation with recent studies. The participants' perception on the importance of customization of project management processes and procedures on implementation of project aligns with the outcome of recent studies on the impact of project management methodologies on project success implemented by Abdulla and Al-Hashimi (2019). Abdulla and Al-Hashimi found that applying a combined standard process and procedure customized to fit the particular organizational or project situations enables a project manager to efficiently and effectively manage critical infrastructure projects leading to an increase in project performance. Joslin and Muller (2015) argued that an organization project management process is deemed incomplete or limited if the process does not encompass processes, procedures, and techniques that are appropriate to the organization and executing certain

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

types of tasks or projects. Joslin and Muller postulated that determining and applying an appropriate process requires understanding the organization's governance paradigm and industry context.

The participants' use of customized project management procedure enabled the project team to make better judgment and decisions in managing the project, especially at the task level, and respond more effectively to the existing challenges in the project environment. Pace (2019) asserted project manager experience, ability to work with people, understanding organization culture, and expressing of technical capabilities and tacit knowledge is maximized in the environment where the project process is conditioned to the assumptions and sensitivities in the environment which it exists. Radujkovića and Sjekavica (2017) noted that there is possibility for a right project to succeed without successful project management, but successful project management significantly enhances the possibility of project success. Radujkovića and Sjekavica asserted applying the right project procedure and practices is important for the integration of human interaction, management, and technical perspectives needed to achieve successful project management of technological and engineering projects.

Correlation with contingency theory. The participants' customization of project management processes and procedures correlates with Lawrence and Lorsch (1967) perspective on contingency theory. Lawrence and Lorsch perceive an organization as an active system in which its environments can range from highly dynamic to extremely stable and tends to reach out to bring order to this complex environment to effectively cope with the situation. Lawrence and Lorsch indicated an organization is not a single system entity but consisting of various interrelated subsystems or sub task levels. Lawrence and Lorsch postulated that similar to an organization's need to cope with the surrounding environment, the subsystems need to cope with the characteristics of their respective segments of the total external environment. All the participants demonstrated that the new procedures adopted were targeted and applied to manage either at the process level or task levels specific challenges in the project's environment impacting the performance of their projects. The challenges in the participant's project's environment include concern about the contractor's competence, procurement issues, communication issues, and construction and technical complexities.

Beach and Mitchell (1978) stated that decision making

entails making a rational appraisal of an issue and following a process in deciding among alternative options of action required to solve the issue. Tarter and Hoy (1998) postulated that there is no particular best course of a solution to a problem best approach is the one that fits the circumstances. The participants on the evaluation of the issues, understanding the impact of the situation on effective implementation of the project, rationalized and decided on the particular course that they deemed best mitigates the issue within the context of the project (Beach & Mitchell, 1978; Tarter & Hoy, 1999).

3.4 Theme 4: Capture Knowledge and Share Lessons Learned

Capturing knowledge and implementing lessons learned is the fourth theme (see Table 1) that emerged from the study. All the participants narrated the method that they used in capturing tacit and explicit project implementation knowledge from individual members or groups within their teams. The participants explained the impact of sharing and applying lessons learned from the project performance knowledge has on the implementation and performance of their projects. Du, Zhou, Yuan, and Liu (2019) indicated that project knowledge-sharing is an important part of knowledge management; it involves collection, processing, and sharing of lessons learned deemed critical to cooperation and overall performance.

PT3 stated that documenting and sharing lessons learned enabled the project team to initiate and execute projects more quickly as relevant information from one project can be transferred and applied to another project. PT3 said,

When we start a project we don't start from scratch, we start from lessons learned and communicate what we have on contractor competence, affected community and other issues driving the performance, and process options to follow in the project context.

PT3 indicated the project team follows a process flow chart to implement the lessons learned for each project. PT3's process flow chart indicates these steps (a) end of project, (b) completion of questionnaire and identify issues, (c) team meets to discuss questionnaire, (d) document and save lessons learned to database, and (e) retrieve and communicate lessons learned for use in current project. McClory, Read, and Labib (2017) noted organizations that actively facilitate and capture the lessons learned through a structured procedure as recommended by the professional bodies stand to benefit significantly from process improvement than organizations where personal experience and individual learning are shared on an

informal basis.

PT1 mentioned holding regular project management meetings with the organization's project managers, where project managers discuss project progress, discuss pertinent project issues, and share project performance experience. PT1 demonstrated that lessons learned from past project experience enabled project management teams to become better at managing the schedule by being savvy with the submittals process and eventually improving project performance. PT1 stated project managers now at the beginning of the project identify all items on the contract that are going to take the longest time to arrive and ask the contractor to provide the submittals for those items first on the job. PT1 indicated early approval of these items means the contractor can place orders for the items and know exactly when the items will be delivered to the site and plan accordingly. PT1 mentioned in the past there have being situation where a contractor will make order for an item close to when the item is needed for construction thinking it will take the normal 4 to 6 weeks delivery period, but due to an unforeseen reason, the contractor's supplier took 14 months to supply the item to project site, resulting in serious schedule delay. Terzieva (2014) inferred that project manager should pay close attention to both failures and success stories experienced in any specific phase during the project implementation, as both stories can provide valuable information that can, in turn, be used for practice learning and shared with project team member on future projects or pass on to other project managers.

PT2 demonstrated that capturing and sharing of project experience amongst project managers was also an important strategy used in reducing project overrun. PT2 discussed the method the organization used in implementing the strategy. PT2 indicated that the organization brought together people of the same position to develop a project management community of practice. PT2 stated that the focus of the community was to facilitate the learning and sharing of lessons learned amongst project managers and provide the necessary support to overcome any specific project challenges a project manager may be facing. Pyrko, Dörfler, and Eden (2017) explained that a community of practice is the bonding together of a group of people who faces similar types of problems in their professional practice to find solutions to such problems, and in the process, they share tacit knowledge and store knowledge. Du, Zhou, Yuan, and Liu (2019); Paver and Duffield (2019); and Tshuma, Steyn, and van Waveren (2018) inferred that beyond using procedures in the form

of documentation, templates, and charts, that professional meetings and community promotes willingness to share knowledge among individuals in an organization and positively impacting knowledge management.

Correlation with recent studies. The participants' perspective on the importance of capturing knowledge and implementing lessons learned to achieve a reduction in project overrun correlates with the outcome of the study on project management and lessons learned process by Paver and Duffield (2019). Paver and Duffield found in their study that for the few organizations that ensured lessons learned are factored into the implementation of their project, program and portfolio management were less likely to repeat mistakes of the past. Noranga and Nooshinb (2016) stated that it is important to record all positive and negative experiences derived from executing a task. Noranga and Nooshinb postulated that past experiences highly influence the success of any new project development. PT1 and PT3's lessons learned experience provided the bases they used to evaluate and understand the causes of gaps or inefficiency observed in the project implementation process, and to deriving appropriate method used to address the situation.

The participant's concept of the relevance of capturing and implementing lessons learned to improve the effectiveness of project process is corroborated by Lindhard and Larsen (2017). Lindhard and Larsen found organizations that improve their sharing of lessons learned experience are able to reduce their project deficiencies by improving competences and collaboration among the management team. Lindhard and Larsen inferred that improvement of the underlying factors of competences and collaboration tends to increase the performance parameters of time, cost, and quality of construction projects. Lindhard and Larsen also noted that an organization establishing a structured process of capturing experiences from the project environment enhances the communication process. Lindhard and Larsen mentioned that well-functioning communication, in turn, reduces the impact of the uncertainties and complexities in the project environment on the project.

The three participants discussed different types of methods their project team used to capture knowledge and lessons learned. PT1 and PT3's methods for capturing lessons learned is informed mostly by the contractor's competences, and project planning issues. PT2's current methods for capturing lessons learned is informed by the organizational structure and new project implementation process. Terzieva and Morabito (2016) asserted that for an organization to manage knowledge successfully, the organization must

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

adopt a knowledge reporting strategy that will suit the organization's nature. Aerts, Dooms, and Haezendonck (2017) confirm Terzieva and Morabito findings indicated that in large scale infrastructure development projects that it is pertinent for the knowledge management system to be of dynamic nature and adaptable to environmental change.

Correlation with contingency theory. Theme 4 correlates with Wooton's (1977) perspective on contingency theory. All the participants developed and employed the lessons learned methods to constantly collect feedback from the project process and use the information collected to avoid mistakes of the past and resolve related issues that developed in the course of a new project. Wooton noted it is pertinent for an organization to imbibe the notion of constantly scanning the environment, learning, and changing the organization to respond to persistent instability associated with modern organizational environments appropriately.

The participants emphasized different types of procedures for capturing and implementing lessons learned. PT3's procedure was focused on capturing knowledge from the process, and task levels and sharing lessons learned with the entire project team. PT1's procedure was focused on capturing knowledge and sharing lessons learned among project managers for managing at the process level. PT2's procedure was focused on capturing knowledge and sharing lessons learned among professional project managers and other professionals in senior positions in the organization that is involved in the project implementation process. Zeithaml, Varadarajan, and Zeithaml (1988) report on contingency theory application indicated that it is important for organizations to choose the most suitable management systems for knowledge sharing based on the prevailing internal situations including strategy on structure, process, and project expectations. Becerra-Fernandez and Sabherwal (2001) study on contingency theory in relation to knowledge management made a similar conclusion but from a task focus perspective. Becerra-Fernandez and Sabherwal argued that a manager should understand the specific characteristics issues affecting their tasks, based on the task environment and orientation and focus on developing a particular knowledge reporting process.

4. SIGNIFICANCE AND APPLICATION OF STUDY

The findings of this study indicate project executives in utility organizations that (a) develop a detailed project scope, (b) apply relevant project management tools, (c) apply a customized project management processes and procedures, and (d) capture knowledge and share lessons

will be able to enhance their project management practices and potentially improve their project management performance and save funds. The revenues saved can be re-invested in utilities infrastructure maintenance and growth, resulting in increased service quality and enhanced well-being for the people serviced by the utilities. Allen, Clark, Cotruvo, and Grigg (2018) indicated that adequate maintenance of water distribution infrastructure can enhance public health and increase the economic potential of a community.

Developing a detailed project scope enables a project executive to detail and emphasize factors that are pertinent to achieving project success required by the organization. Project executives that implement detailed project scope are better able to align the project planning with project strategic goals and organization strategic business goals, and also improve the project benefit realization management. Implementing detailed project scope can enhance the capability of an organization to strategically integrate the new project into the functioning of the organization and its management system on completion of the project (Ferrer Romero, 2018). Project executives should consider developing a robust format or template for the project scope development prior to construction. The project scope should, at a minimum, cover details on project objectives, target cost and schedule, justifications for the project, key milestones and key deliverables, acceptance criteria, known constraints and assumptions, potential issues or risks, and organizational leadership requirements.

Project executives should ensure procedures are adapted to key issues at the project task level; this can be achieved by reviewing project historical data, lessons learned, and analysis of project environment using applicable management analysis tools. Project executives should develop a robust monitoring system for the change order process and setting acceptable change order limits above which a review of the project implementation process will be triggered to determine factors causing the change order, source of the change order, and means of addressing the increase in change order request.

Applying project management software enables project executives to develop and display information about the project to stakeholders, information such as the work breakdown structure, works schedule, task costs, resources, and financial expenses. Using project management software that is relevant and a best fit for the project context can enable the project executive to develop

accurate schedule, and better determine full cost of the project and enhance the accuracy of the costs. Starting a project based on a realistic project cost and project schedule projection is essential for achieving project success. Applying relevant project management software can increase an organization capability to detect weaknesses in the project process and capacity to respond faster to such weaknesses. Applying relevant project management software increases the project management process agility in responding to specific issues in the project environment (Pellerin, Perriera, Guillota, & Léger, 2013).

Customizing project management processes and procedures to meet the specific challenges experienced in the implementation of certain tasks or by gaps in the system enable the project executive to manage the project implementation process better. Customized project management processes and procedures strategy can be employed to target and improve specific project task challenges such as delay in RFIs processing, a high number of change order requests, and poor project communication. For instance, Project executives could develop a robust monitoring system for the change order process and setting acceptable change order limits above which a review of the project implementation process will be triggered to determine factors causing the change order, source of the change order, and means of addressing the increase in change order request. Applying customized project management processes and procedures potentially can lead to an improvement in assessing the project team's responsibilities and accountabilities, project decision making process, and effectiveness in responding to challenges in the project environment (Cole, 2017; Kononenko & Lutsenko, 2018). Having a customized and adaptable project management process ensures project management processes and procedures are agile and responsive to key issues in the organization's environment that may impact project implementation. Some of these issues include public concerns on project activities, conflict with other utilities, environmental pollution issues, local contractor's capabilities, and changing construction methodologies and technologies.

Capturing knowledge and sharing lessons learned of project performance experience among project team members could have a profound impact on the project implementation process and meeting project goals. Capturing knowledge and sharing lessons learned enable a project executive to better assess the underlying causes of inefficiency in a past project implementation process, and find appropriate solutions to such problems. Further,

using the solution found as basis project executive can develop relevant best practices that can be used to avoid repeating past mistakes in future projects.

5. CONCLUSION

Project management researchers have implemented several studies to identify causes of project overrun phenomenon and postulated relevant solutions to the issue, but these studies and its findings are mostly not targeted at the utility industry. The researcher set out to explore project overrun phenomenon in the context of the utility industry and answering the research question "What strategies do successful project executives in utility organizations employ to deliver infrastructure construction projects on-budget and on-schedule?" Using data collected from the project executives that participated in this study, the research question was answered. The researcher determined from the analysis of the interview data that project executives in utility organizations can improve project management performance of construction projects applying following strategies (a) developing detailed project scope, (b) applying relevant project management tools, (c) customizing project management processes and procedures, and (d) capturing knowledge and sharing lessons learned.

The infrastructures that utility organizations use to produce and deliver utility services such as telecommunications, electric power, natural gas, or public water and wastewater services to the public are typically very expensive to design, construct and manage to project completion. The high cost of acquiring and owning these utility infrastructures makes it imperative for a utility organization wanting to achieve a high level of project management performance to ensure the organization avoids waste or expending resources more than is necessary and achieve adequate returns on its investments. The findings and recommendations presented in this study provide utility organizations with information that the organizations can potentially apply to achieve high levels of project management performance of infrastructure construction projects.

This research study has some limitations which are worthy of note. The project executives that participated in this research study are persons in senior management positions at their respective utility organizations with the responsibility of overseeing several project managers and managing multiple projects across the organization. In the future, researchers can conduct the research on field project managers or construction managers and project superintendents to collect data and compare the

STRATEGIES UTILITY BUSINESS ORGANIZATIONS USE TO DELIVER CONSTRUCTION PROJECTS ON-BUDGET AND ON-SCHEDULE

perspective of different project management levels on methods to reducing project overrun. The study can also be conducted using a different research method. Future researchers could use the quantitative research method to assess the level of influence that any of the themes that emerged or specific techniques that were mentioned by participants in this study have on project performance of construction projects in the utility industry.

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