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A Qualitative Open-Ended Interview Study Using A Comparative Multiple Case Study Approach of Bus Rapid Transit (BRT) Construction Projects Within the United States

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Santiago Cruz-Roveda

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by Santiago Cruz-Roveda

This dissertation written by

Santiago Cruz-Roveda

has been approved by the

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Rick Ardito, D.B.A., Committee Chair

Riste Simnjanovski, D.P.A., Committee Member

Henry Petersen, Ph.D., Committee Member

Dirk Davis, Ed.D., Associate Vice President of Academics

ABSTRACT

Purpose. The purpose of this qualitative study was to research and develop a comparative multiple case study of eight bus rapid transit (BRT) projects within the United States. The eight BRT projects selected for this study encompassed five states. The comparative multiple-case study approach permitted the researcher to explore and validate whether six predetermined contingency theory and scientific management theory (SMT) themes provided the perception that BRT projects within the United States were built on time and under budget.

Theoretical Framework. The six predetermined contingency theory and SMT themes explored and validated in this study were (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures, (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts. The seven research questions in this study were (a) What organizational structure was used during the construction of the BRT projects? (b) What strategic conflict resolution efforts were used during the construction of the BRT projects? (c) What decision-making procedures were used during the construction of the BRT projects? (d) What bureaucratic forces permitted the construction of the BRT projects to be completed on time? (e) What stakeholder forces permitted the construction of the BRT projects to be completed under budget? (f) What scientific management efforts permitted the construction of the BRT project to be completed on time? and (g) What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Methodology. The research design for this study was a semistructured, open-ended interview of nine participants. The researcher validated the responses and information

gathered from the open-ended interviews using the Delphi method and OSINT. The responses from the participants were cross-referenced with public records and publicly available peer review articles from the eight BRT projects. The researcher developed a robust understanding of the qualitative data and the emergent themes from the participant responses by using an online utility text analyzer. The researcher also developed an affinity diagram that helped validate genuine relationships and the predetermined themes.

Findings. The perceived degree to which the six predetermined contingency theory and SMT themes impacted the construction phase of the eight BRT projects varied among the participants. But all the participants agreed that the six predetermined themes had a significant impact to the construction budget and schedule of BRT projects.

Conclusions and Recommendations. This study helped bridge the gap of public administration researchers focusing on the public transit sector and BRT projects. Future public administration researchers should continue developing studies on why and how public transportation projects were completed on time and under budget within the United States.

Keywords: BRT, Contingency Theory, Scientific Management Theory, Public Transportation, Public Transit Agency, Organizational Structure, Decision Making, Quality Control, Bureaucratic Forces, and Stakeholder Forces

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CHAPTER 1: INTRODUCTION

Background

In 2019, approximately 6,800 organizations within the United States provided public transit through a variety of modes (American Public Transportation Association, 2021). Approximately 4,580 of the 6,800 public transit organizations are considered nonprofit (American Public Transportation Association, 2021). According to the Office of the Associate Director for Policy and Strategy (n.d.), "Transportation systems help ensure that people can reach everyday destinations, such as jobs, schools, healthy food outlets and healthcare facilities, safely and reliably" (p. 1). A detailed cost analysis examined the value of the health benefits when a high proportion of the population had access to public transit. The cost analysis demonstrates a reduction in traffic accidents, less air pollution, and increased physical fitness when there was more access to public transit (Office of the Associate Director for Policy and Strategy, n.d.). Therefore, the construction of public transit projects directly impacts the health, economy, and environment for millions of residents within the United States.

Many public transit projects around the country, including bus rapid transit (BRT) systems within the United States, are financed using Federal Transit Administration (FTA) funds. FTA has been conducting its risk assessments since 2005. Risk assessments allow FTA to become more knowledgeable about the reoccurring construction risks to major capital projects. The risk workshops permit FTA to witness some of the project sponsors' lack of management capacity and capability and appropriate project controls for some projects and to study the reasons for cost and schedule changes on many major capital projects (Project Management Oversight, 2020).

In 2019, 13 fixed-guideway BRT systems were operating within the United States, double the number from 2010 (American Public Transportation Association, 2021).

Since January 20, 2017, FTA has advanced funding for 40 new Capital Investment Grant (CIG) projects through the United States (FTA, 2020a). The discretionary grant program funds transit capital investments, including heavy rail, commuter rail, light rail, streetcars, and BRT projects (FTA, n.d.-b). The FTA CIG oversight program partners with state and local governments to create and enhance public transportation systems. According to K. Jane Williams,

> FTA invests more than $13 billion annually to support and enhance rail, bus, ferry, and other transit services. This investment has helped modernize public transportation and extend service into large and small urban areas as well as rural communities across our nation. (*Oversight of the Federal Transit Administration's Capital Investment Grant Program*, 2019, p. 1)

Public transit projects deal with unexpected inefficiencies and delays during construction. Abderisak et al. (2015) stated, "This has been particularly noticeable for large public construction projects where cost overruns and time delays have been long regarded a common occurrence" (p. 747). A delay during construction is when performed work occurs later than expected or when work is not performed in a timely manner (Trauner, 2009). To mitigate delays, God has taught us that they are mitigated through diligence, employing foresight, building character, and patience. According to Proverbs 21:5, "The plans of the diligent lead surely to abundance, but everyone who is hasty comes only to poverty" (*English Standard Version Bible* [ESV], n.d.). This qualitative study focused on efficiency during the construction phase of eight BRT

projects in the United States. This study defines efficiency as a BRT project that was built under budget and on schedule. This study explored efficiencies that allow BRT projects to be constructed under budget and on schedule within the United States. A comparative multiple case study approach of eight BRT projects was used by the researcher.

This qualitative research methodology implemented a semistructured, open-ended interview combined with open-source intelligence (OSINT). OSINT allowed the researcher to gather publicly available information that had been discovered, determined to be of intelligence value, and exploited the information to validate the relevance, accuracy, and actionable use by consumers (H. M. Williams & Blum, 2018). The goal of this study was to assist public transit agencies as they continue to plan and construct BRT projects in the United States.

This qualitative study explored efficiency through the lens of contingency theory and scientific management theory (SMT) during the construction of BRT projects within the United States. Donaldson (2001) stated, "The essence of contingency theory paradigm is that organizational effectiveness results from fitting characteristics of the organization, such as its structure, to contingencies that reflect the situation of the organization" (p. 1). SMT focuses on accomplishing tasks, standardizing processes, and finding the most efficient methods by using good data (Darmody, 2007). Contingency theory and SMT interlink through consistent fair and just decision-making processes, expectations, and outcomes.

God provides us the opportunity to make our own decisions. The gift of freedom and decision making was one of the greatest gifts given to human beings. But we must

remember that a fair and just decision-making process should follow in the footsteps of the Lord. 1 John 5:14 states, "And this is the confidence that we have toward him, that if we ask anything according to his will he will hear us" (ESV, n.d.). Contingency theory and SMT are intertwined when information is gathered during a dispute resolution process in construction. Efficiency is maximized by a structure that is centralized in decision making, formalized, and low on complexity (Hage, 1965).

A public transit agency has open and honest communication throughout the decision-making process. Hurley (2006) stated, "Not surprisingly, open and honest communication tends to support the decision to trust, whereas poor (or no) communication creates suspicion" (Level of Communication section). BRT projects should use standard procedures to facilitate effective control and management of the finances, schedule, and quality (Parsons Brinckerhoff, 2014). According to the *Project Management Plan: C-Tran*, "Additionally, standard procedures provide a clear audit trail of activity, which results in improved and effective communications and problem solving" (Parsons Brinckerhoff, 2014, p. 1).

Contingency theory and SMT seek to improve processes, analysis of data, and decision-making methods. Both theories have a direct impact on the construction of BRT projects within the public transit sector. This study provides additional research, lessons learned, and analysis focused on contingency theory and SMT within the construction phase of BRT projects in the United States.

Contingency Theory and Scientific Management Theory

Contingency theory and SMT were the basis for the literature and foundation of this study. The analysis included critical theorists, background and evolution,

controversies, and confirmations of contingency theory and SMT. Contingency theory proposed "that organizational performance is a consequence of the fit between a set of contingencies, e.g., structure, people, technology, strategy, and culture" (Deng & Smyth, 2013, p. 1). Contingency theory is an organizational theory that claims there was no best way to organize or lead a project. Contingency theory perceives that maximum performance results from adopting the appropriate level of structural variability that fits the contingency (Donaldson, 2001).

BRT construction projects deal with changing site conditions, technical capacity limitations, utility relocation issues, unforeseen risks, permitting and third-party agreement restrictions, and political pressures (FTA, 2020b). Contingency theory allowed this study to explore contingency themes during the construction of BRT projects within the United States. Contingency theory promotes flexibility in actions to succeed within an uncertain environment (Bakar et al., 2008).

SMT promotes the reduction of costs through ongoing measures of quality and performance. Wrege and Hodgetts (2000) stated, "Anecdotes typically smooth out inconsistencies and lead to misinterpretation of data—and these actions result in erroneous conclusions" (p. 1290). SMT seeks to ensure the best results through observation, recordings, analyzing and comparing essential facts about wages, supplies, expense accounts, and all else that enters into or affects the economy of production and the cost of the product (Taylor, 2003). The SMT suggests that employees work harder and faster to get the job done (Kanigel, 1996). SMT has the potential to reduce costs and improve the schedule during the construction of BRT projects.

This study explored how agencies within the United States apply contingency theory and SMT themes to build BRT projects on time and under budget. Gresov (1990) found that the efficiency of organizational work units was related to the fit of their structures to the task uncertain contingency and the horizontal dependence contingency.

The research questions and problem statement for this study incorporate the foundation of contingency theory and SMT. This qualitative study explored efficiency through the lens of contingency theory and SMT. This study defines efficiency as a BRT project that was built on time and under budget while maintaining quality within the United States.

Statement of the Research Problem

The statement of the research problem is "Explore and validate six predetermined contingency and SMT themes that provided perceptions of completion on time and under budget during the construction of BRT projects within the United States." For example, the Pulse BRT route along Broad Street in Richmond, Virginia experienced construction delays for approximately 8 months (Robinson, 2018). Carrigan et al. (2019) stated, "The delay exacerbated some of the public's frustration with the construction impact" (p. 118). The schedule delay was because the city of Richmond implemented network changes, and the BRT team worked with businesses throughout the corridor to understand their customer parking and loading needs (Carrigan et al., 2019). In California, the High-Speed Rail Authority originally anticipated completing the Central Valley track in 2017, but the federal risk analysis estimated this will not occur until 2024. This placed the California High-Speed Rail project 7 years behind schedule (Mitchell, 2017). According to Vartabedian (2019),

> Significant portions of this work have been flawed or mismanaged, according to records reviewed by the Times and interviews with dozens of people involved in the project. Despite repeated warnings since 2010 about weaknesses in its staffing, the rail authority believed it could reduce overall costs by relying in consultants and avoiding large permanent workforce. (p. 1)

Both examples demonstrate the history of delays and cost overruns while building major public transit projects, including BRT systems.

In contrast, this qualitative study sought to explore and validate six predetermined contingency theory and SMT themes that provided the perception of completion on time and under budget during the construction of BRT projects within the United States. This study explored the following six predetermined contingency theory and SMT themes during the construction of BRT projects: (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures, (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts. The researcher used the research methodology of semistructured, open-ended interviews combined with OSINT. This study will uncover lessons learned to public transit decision makers and assist in uncovering themes that permit a BRT project to be built on time and under budget within the United States.

BRT systems have progressed throughout the United States over the last decade (2015a). Additionally, as congestion increases, community leaders and the public choose BRT systems (2015a). "BRT is appealing for very simple reasons: It is much faster, cheaper, and more flexible to specific city conditions than a rail system" (Institute for Transportation & Development Policy [ITDP], n.d.-c, para. 3). This study will provide a

better understanding of how to build a BRT project on time and under budget within the United States.

Purpose Statement

This study focused on efficiency during the construction of BRT projects within the United States through the lens of contingency theory and SMT. Public transit is one of the most robust and comprehensive transportation systems in the United States. There are approximately 1,240 public transit systems that provide bus services (American Public Transportation Association, 2021) that support millions of daily commuters. Public transit improves the health and economic stance of millions of residents throughout the United States. According to FTA (2016c), "Public transportation can help metropolitan areas meet national air quality standards by reducing overall vehicle emissions and the pollutants that create smog" (p. 1).

Major public transit projects deal with unexpected inefficiencies and delays during construction. According to FTA (2011), "Delays in resolving critical issues can usually be attributed to the way in which the decision-making process flows through the organization controlling the project" (FTA, 2011, p. 5-2). Public transit agencies should develop an organizational structure to ensure clear responsibilities and lines of communication (FTA, 2011). This study explored efficiency during the construction of BRT projects within the United States through the lens of contingency theory and SMT.

The purpose/objective of this qualitative study was to research and develop a comparative multiple case study of eight BRT projects within the United States. The comparative case study approach permitted the researcher to explore and validate six predetermined contingency theory and SMT themes that have the potential to construct

eight BRT projects within the United States on time and under budget. For example, bureaucracy and unforeseen circumstances because of FTA discretionary funding practices can impact a BRT project. The U.S. Secretary of Transportation has the authority to make grants or loans to states and local public agencies to finance the development of corridors to support fixed guideway systems (Intermodal Surface Transportation Efficiency Act, 1991). FTA has the authority to administer BRT grants within the United States. The comparative case study approach permitted the researcher to validate contingency theory and SMT themes that extend across the eight BRT projects within the United States.

This study will contribute to a stream of research in the area of BRT projects (A. E. Brown, 2016; Flynn et al., 2011; Levinson et al., 2003; Swope, 2006; Weinstock et al., 2011), contingency theory (Deng & Smyth, 2013), and SMT (Darmody, 2007). The Transit Cooperative Research Program (TCRP) completed a study that explored 26 different BRT systems in urban areas through North America (Levinson et al., 2003). The Institute for Transportation and Development Policy researched BRT projects in cities throughout the United States (Weinstock et al., 2011). Over the last decade, there have been various studies focused on the Los Angeles Metro Orange Line BRT project (A. E. Brown, 2016; Flynn et al., 2011; Swope, 2006).

Deng and Smyth (2013) completed a study that examined the development of contingency theory within construction management. Deng and Smyth recommended developing future studies focused on construction contingencies by using a set of appropriate performance indicators. Lastly, Darmody (2007) completed a study that focused on the importance of SMT within the construction industry. This study will

contribute to the stream of research by analyzing and exploring themes through the lens of contingency theory and SMT while building BRT projects within the United States.

The eight BRT projects selected within the comparative multiple case study approach were in the maintenance/operations phase. The eight BRT projects provided a diversity of locations and a variety of audiences within the United States. The researcher completed nine video interviews from the eight BRT projects. The eight BRT projects selected within the United States provided the researcher abundant qualitative data. Limiting this comparative multiple case BRT study within the United States reduced additional cultural, political, and external stakeholder conflicts.

BRT projects progress through four major phases: (a) planning and conceptual design, (b) engineering and design, (c) construction, and (d) maintenance/operations. The first phase is known as planning and conceptual design. During this phase, a public transit agency typically completed planning initiation documents and sought a feasible alternative. The second phase is known as engineering and design. During the engineering and design phase, the public transit agency completes the environmental process, right-of-way (ROW) acquisitions, design plans, detailed schedule, and cost estimate package. According to Far East Mobility (2017), "The genesis of a failed or poorly performing BRT system can usually be traced back to errors made during the conceptual and preliminary planning stages which are propagated through the later stages of the project" (p. 1).

The third phase of a BRT project is known as the construction phase. Typically, BRT projects are built in one to two construction seasons. The construction schedule and cost can potentially impact the characteristics of the chosen corridor and other

contingencies. The fourth phase of a BRT project is known as maintenance/operations. During the maintenance/operations phase, the public transit agency focuses on maintaining and optimizing the system to meet the needs of the public.

The BRT projects selected for this study completed their planning initiation documents, environmental permits, ROW acquisitions, design plans, schedule, and cost estimate package. This study focused on budget and schedule during the construction phase of BRT projects. The researcher identified and analyzed projects that completed their risk and contingency review. Federal grants were not allocated to the project grantee until the risk and contingency review was completed. This study did not focus on the planning, engineering, and maintenance/operations phases of the eight BRT projects selected. If the researcher uncovered common hindrances during construction, the researcher pointed them out. Revealing hurdles minimized potential sources of biases and stereotypes throughout the analysis of this study. This study focused on the budget and schedule during the construction phase of BRT projects within the United States.

Selected Bus Rapid Transit Projects

The ITDP categorized two of the BRT projects for this study as a Bronze BRT based on the BRT Standards (ITDP, n.d.-b). The eight BRT projects selected for this study encompassed five states throughout the United States. BRT Project 1 was 15.7 miles long connecting two cities. Within the project limits, 5.4 miles include a dedicated busway. BRT Project 1 combined two contracts into the project. The first contract focused on the corridor, and the second contract built a vehicle maintenance facility. This study focused on the BRT Project 1 corridor contract. The BRT Project 1 corridor contract included 11 miles of street widening, 16 new bus stations, and a system-wide

corridor. Today, BRT Project 1 service runs every 10 min during peak hours and 15 min during off-peak hours. BRT Project 1 included dedicated busways and mixed-flow lanes throughout the system. BRT Project 1 was built on time and under budget during construction. BRT Project 1 began revenue service in 2014.

BRT 2 project was 9.5 miles long connecting various cities and a metro system. The BRT Project 2 included enhanced station lighting for improved safety, card readers for speed boarding, new level boarding for easier access, and median stations to reduce street crossing distance. BRT Project 2 provided a dedicated busway to improve the frequency and integration of new technology to reduce delays and enhance safety for riders. The new technology includes traffic signal priority (TSP), real-time message signs, and innovative ticket vending machines. The BRT Project 2 operates hybrid-electric buses every 7 min during peak hours. BRT Project 2 was under budget and approximately three years behind schedule during construction. BRT Project 2 began revenue service in 2020.

BRT Project 3 was a six-mile-long corridor with 34 stations that connects a regional mall and the downtown of a city. BRT Project 3 runs in a Southwest to Northeast direction. Most of the residents along the corridor are low-income and minorities. The west end of the corridor reconstructed a big plaza and a station. The east end of BRT Project 3 relocated and rebuilt a mall transit center. Three construction contracts were part of BRT Project 3: (a) BRT stations and corridor; (b) mall transit center; and (c) modernizing, expanding, and remodeling the public transit maintenance facility. BRT Project 3 was built on time and under budget during construction. BRT Project 3 began revenue service in 2017.

BRT Project 4 was approximately 13 miles east to west, connecting the downtown of a city and a local town. The town is home to an NCAA Division II university. The university has approximately 27,000 students. BRT Project 4 corridor runs through some neighborhoods as it exits downtown. Before connecting to the university, the last six to seven miles of the corridor are rural and agricultural. During the construction of BRT Project 4, there were two statewide mandatory shutdowns because of the global pandemic. Regardless, BRT Project 4 was built on time and under budget during construction. BRT Project 4 began revenue service in 2020.

BRT Project 5 was the first and only BRT system within the public transit agency's service area. BRT Project 5 was the pioneer system for the public transit agency. The route is a 7.6 miles long corridor that operates in two jurisdictions. BRT Project 5 connected to an overall redesign of the long overdue local fixed-route bus network. The new local, fixed-route bus network and the BRT system provide additional routes throughout the region. The public transit agency added Saturday and night services as part of the services delivered. BRT Project 5 was built on time and under budget during construction. BRT Project 5 began revenue service in 2018.

BRT Project 6 began revenue service in 2018 with ridership surpassing several million in the first year of operations. BRT Project 6 is approximately 15.7 miles long. The BRT corridor has 51 stations and a transit center, providing off-board and onboard fare payment system. BRT Project 6 runs 10-min headways at peak hours and has fewer stops within the corridor than a traditional bus system. BRT Project 6 is more flexible than a light-rail system and provides opportunities for riders to access shopping centers,

hospitals, and other destinations within the city. BRT Project 6 was built on time and under budget during construction.

BRT Project 7 is in one of the busiest corridors in the region. BRT Project 7 provides a limited-stop rapid transit service every 10 min and improvements to the surrounding landscape. BRT Project 7 service includes enhanced stations, rapid all-door boarding, TSP, and a dedicated busway. BRT Project 7 began utility relocation in the fall of 2013 and civil construction in spring 2014. Originally, the project was scheduled to be completed in the fall of 2015. BRT Project 7 completed the construction phase approximately 1.5 years behind the original schedule. Because of the delay in schedule, BRT Project 7 approved relief grants to businesses hurt by the upheaval after an emotional public forum. An estimated $1.5 million was needed from the agency's reserve fund to help pay the more than 220 businesses affected by the delays from construction. BRT Project 7 was built behind schedule and over budget. BRT Project 7 began revenue service in 2017.

BRT Project 8 incorporated two BRT corridors. The first BRT corridor was 21-miles long, and the second BRT corridor was 16.5 miles long and shared a three-mile section of downtown. BRT Project 8 built 77 stations between the two routes. BRT Project 8 built branded stations and buses and dealt with underground utility relocations and adjustments throughout both corridors. BRT Project 8 incorporated technology upgrades for the public transit agency. The technology upgrades are (a) TSP, (b) mobile ticket fare system, and (c) an automatic vehicle location system. The automatic vehicle location system provides real-time and prediction of bus arrivals.

Table 1, “BRT Projects Selected for This Study,” provides a summary of the BRT projects in this study. The researcher reached out to 22 organizations that recently built BRT projects throughout the United States. Eight BRT projects agreed to participate in this study. The researcher completed a qualitative comparative multiple-case study approach that explored and validated six predetermined contingency and SMT themes during construction of eight BRT projects within the United States.

Table 1

BRT Projects Selected for This Study

	Construction phase	
BRT Project X (year service began)	Schedule	Budget
BRT Project 1 (2014)	On time	Under budget
BRT Project 2 (2020)	Behind schedule	Under budget
BRT Project 3 (2017)	On time	Under budget
BRT Project 4 (2020)	On time	Under budget
BRT Project 5 (2018)	On time	Under budget
BRT Project 6 (2018)	On time	Under budget
BRT Project 7 (2017)	Behind schedule	Over budget
BRT Project 8 (2014)	On time	Under budget

Research Questions

The study implemented the following seven research questions:

1. What organizational structure was used during the construction of the BRT projects?
2. What strategic conflict resolution efforts were used during the construction of the BRT projects?

3. What decision-making procedures were used during the construction of the BRT projects?
4. What bureaucratic forces permitted the construction of the BRT projects to be completed on time?
5. What stakeholder forces permitted the construction of the BRT projects to be completed under budget?
6. What scientific management efforts permitted the construction of the BRT project to be completed on time?
7. What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Significance of the Problem

The dissertation topic adds to the current perspective and rhetoric of contingency theory and SMT within BRT projects throughout the United States. For example, Taylor (1903, 1911), Fiedler (1966), Evans (1970), Heller (1973), and Greenwood et al. (1975) developed studies that centered on organizational structures. Paget-Seekins (2016), Grandori (1984), and Elgharbawy and Abdul-Kader (2013) completed studies on strategic conflict resolution efforts. Fiedler (1966) and Heller (1973) studied the decision-making procedures. Gupta et al. (1994) and Singh (2010) explored the impacts of bureaucratic forces. C. B. Thompson (1914, 1916), Collins and Rowe (2005), Zahra and Newey (2009), Manzoor (2014), the *Infrastructure Project Streamlining and Efficiency* hearing (2017), Yao et al. (2019), and the TSP deployment study (Anderson et al., 2020) researched stakeholder forces. This researcher explored the organizational structure, conflict resolution efforts, decision-making processes, bureaucratic forces, and

stakeholder forces themes during the construction of BRT projects. This study adds to the understanding of contingency and SMT themes while building BRT projects in the United States.

The significant problem this study confronted was the public perception that major public transit projects, including BRT projects, were behind schedule and over budget during construction within the United States. According to Caltrans (n.d.-b), "BRT is an innovative and cost-effective form of public transportation" (p. 1). Unfortunately, there have been an increased number of media inquiries and public complaints in BRT projects. Clark et al. (2004) stated, "For a mega project to success in its media relations, a Public Information Team has to be set up" (p. 80). Taxpayers want to be assured of representation throughout the process. Representation provides taxpayers a voice during the construction of BRT projects within the United States. According to Johnson (2015), "The effective representative bureaucracy offers a public administration of all people in terms of demographics so that true representation of all groups is involved in the decision making process of the public administration and government" (The Issue of Representation section). Taxpayers, the media, local government officials, and public transit agencies within the United States will benefit from this study. This study will help solve the significant problem facing construction of BRT projects by exploring and validating themes that provide the perception of building BRT projects on time and under budget in the United States.

Definitions

This section provides the definitions of terms, a list of terms within the dissertation that requires a definition for the reader. The definitions of terms are valuable

because there may be words and phrases used that have a specific implication within this study. The definitions of terms provide an inherent understanding of the word in the context of the study.

Alum Rock/Santa Clara BRT. This BRT project provides limited-stop rapid transit service from Eastridge Transit Center to the Arena Station in downtown San Jose using Capitol Expressway, Alum Rock Avenue, and Santa Clara Street (Santa Clara Valley Transportation Authority [VTA], 2016, p. 1). This was the first of three planned BRT corridors by VTA. The two additional BRT corridors were in El Camino Real and Stevens Creek.

Americans with Disabilities Act (ADA). A broad civil rights statue that prohibits discrimination against individuals with disabilities in all areas of public life. (ADA, 1990).

Best practices. "A procedure that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption" (Merriam-Webster, n.d.).

Bus procurement. The purchasing process public transit agencies undergo to expand their high tech bus fleets.

Bus rapid transit (BRT). According to the FTA, a BRT system is a high-quality bus-based transit system that delivers fast and efficient service that includes dedicated lanes, busways, TSP, off-board fare collection, elevated platforms, and enhanced stations (FTA, 2015a).

Busway. This is typically the dedicated transitway for buses within the BRT corridor. A busway generally improves the capacity and reliability of the BRT system. Refer to dedicated busway within the definitions for more information.

California Department of Transportation (Caltrans). The California state agency that oversees more than 50,000 miles of highway and freeways lanes, provides intercity rail services, permits more than 400 public-use airports, and works with local agencies (Caltrans, n.d.-a).

Capital investment grant (CIG). This is an FTA discretionary grant program that funds capital investments within public transit. The grants include heavy rail, commuter rail, light rail, streetcars, and BRT projects.

Critical path. The minimum time to complete a construction project using the sequence of stages or steps.

Critical path method (CPM). This is the most widely implemented scheduling technique that is often referred to as critical path scheduling. Refer to critical path within the definitions for more information.

Dedicated busway. A common term within BRT systems that describes an exclusive roadway for buses.

Dedicated lanes. These are dedicated lanes established and restricted for certain vehicles.

Dispute resolution board (DRB). An impartial professional board formed at the beginning of the project to follow construction progress, encourage dispute avoidance, and assist in the resolution of disputes for the duration of the project (Dispute Resolution Board Foundation, n.d.).

Efficiency. To deliver a product or service on time and under budget while maintaining quality. The service explored in this study was the delivery of a BRT project during construction.

Engineer of record (EOR). This is the professional engineer who drew, reported, documented, and professionally sealed the design drawings.

Federal Highway Administration (FHWA). A U.S. federal agency, also referred to as mode, underneath the U.S. Department of Transportation. The agency provides support to state and local governments in the design, construction, and maintenance of the nation's highway system and various federally and tribal-owned lands (FHWA, n.d.).

Federal Transit Administration (FTA). A U.S. federal agency, also referred to as mode, underneath the U.S. Department of Transportation. The agency provides financial and technical assistance to local public transit agencies, which included buses, subways, light rail, commuter rail, trolleys, and ferries (FTA, n.d.-a). The federal agency also oversees the safety measures and assists in developing next-generation technology research within the public transit sector.

High occupancy vehicle lanes (HOV). High occupancy vehicle lanes that restrict vehicles with two or more passengers, typically found on freeway and highway systems. Carpools, vanpools, and transit buses typically use the designated lanes.

Institute for Transportation & Development Policy (ITDP). A global organization with offices in all five continents that is at the forefront of innovation, using technical expertise, direct advocacy, and policy guidance to mitigate the impacts of

climate change, improve air quality, and support prosperous, sustainable, and equitable cities (ITDP, n.d.-a).

Integrated project management (IPM). The consolidation and coordination of various resources and stakeholders to make sure each department is working together. Refer to integrated project management office within the definitions for more information.

Integrated project management office (IPMO). The integration of company processes, competencies, and structure significantly increase the effectiveness of project and portfolio management. This practice allows a company to strategically develop an office that integrates company processes, organizational structure, and project management culture within an organization (Bodych, 2012).

Light rail transit (LRT). An urban rail transit system that combines a tram and metro. This system generally has a lower capacity and speed when compared to a heavy-rail and metro system. A BRT system mirrors an LRT system without the tracks.

Los Angeles County Metropolitan Transportation Authority (Los Angeles Metro). The agency that plans, designs, constructs, and operates public transit systems within the Los Angeles metropolitan region. Los Angeles is one of the country's largest and most populous counties (Los Angeles County Metropolitan Transportation Authority, n.d.).

Memorandum of understanding (MOU). This is a formal written agreement and document between two or more parties. An MOU is not a legal binding document. Instead, the document demonstrates the willingness of the parties to collaborate. The document is used during the development and construction of BRT projects.

National Environmental Policy Act (NEPA). The national environmental policy of the federal government to use all practicable means and measures to foster and promote the general welfare, create, and maintain conditions where man and nature can exist in productivity harmony (U.S. Department of Transportation, 2020b).

Open-source intelligence (OSINT). A data collection method used to gather publicly available resources, for example, collecting data from public records or published articles.

Program evaluation and review technique (PERT). Program evaluation and review technique is a method that examines the tasks that are in a construction schedule. This technique helps analyze and determine the CPM. Refer to critical path method within the definitions.

Program evaluation and review technique (PERT) chart. A standard project management tool that illustrates graphical representations of the project timeline.

Project management. The knowledge, skills, tools, and techniques to manage activities to meet the project requirements (Project Management Institute, 2017).

Project management oversight (PMO). A project manager who assists with the planning and execution of the project. The PMO represents a permitting agency or grantee.

Project manager (PM). The individual who oversees planning, coordination, and execution of the project.

Project manager oversight consultant (PMOC). The contractor or consultant who oversees and ensures compliance with statutory, administrative, and regulatory requirements for the FTA.

Public administration (PA). The implementation of government bodies and the study that are relevant to determining policies and programs of governments (Mosher et al., 2020).

Public information officer (PIO). "The PIO is the individual responsible for communicating with the public, media, and/or coordinating with other agencies, as necessary, with incident related information requirements" (U.S. Department of Energy, 2016, Attachment 2, p. 7).

Public transit. According to FHWA, this public service provides mobility to residents who do not have access to a personal vehicle. Public transportation service is also a common definition of public transit. Refer to public transportation service within the definitions.

Public transportation. Public service providing residents mobility and access to employment, recreational areas, medical facilities, and community facilities. The public service improves safety, quality of life, economic competitiveness, and environmental sustainability for local and regional communities.

Public transportation service. According to FTA, this term replaced the obsolete term of mass transportation service. FTA interprets this term to include any transportation service provided using vehicles purchased with FTA capital assistance including BRT systems (FTA, 2015b).

Request for information (RFI). This is a common business term that refers to the purpose of collecting written information. In construction, contractors use this practice to acquire additional information before submitting their bid.

Revenue service. The operation of vehicles for the transportation of passengers as anticipated by the recipient (FTA, 2016a).

Right-of-way (ROW). A designated area where there is legal right by the user. This is a common term used in public transportation and public transit construction projects. Additionally, right-of-way is also commonly referred to as real estate.

San Francisco Municipal Transportation Agency (SFMTA). The department of the city and county of San Francisco responsible for the management of all ground transportation (SMFTA, n.d.). "SFMTA has oversight over the Muni public transit system, bicycling, paratransit, parking, traffic, walking, and taxis" (SMFTA, n.d., p. 1). Refer to San Francisco Van Ness BRT within the definitions for more information.

Scientific management theory (SMT). This theory analyzes the efficiency of workflows within organizations and labor. Frederick Winslow Taylor developed SMT. This theory originally has grown in popularity within the manufacturing industry.

Subject matter expert (SME). An individual who possesses a deep understanding about a particular subject. For example, an individual who has decades of experience in ROW acquisition and has a deep understanding of real estate laws may be considered a ROW SME.

Traffic signal priority (TSP). A system of traffic controls in which BRT systems or LRT systems are provided priority to signals within a corridor.

Transit Cooperative Research Program (TCRP). This program is sponsored by the FTA and serves as one of the principal means by which the public transportation industry develops innovative near-tern solutions to meet demands placed on it (Transportation Research Board, n.d.).

Transportation Investment Generating Economic Recovery (TIGER). This program provides the U.S. Department of Transportation a unique opportunity to invest in road, rail, transit, and port projects to achieve critical national objectives (U.S. Department of Transportation, n.d.).

Transportation Research Board (TRB). This is part of the National Academies of Sciences, Engineering, and Medicine that provides leadership and research in transportation and innovation to improve infrastructure, technology, public health, and safety of the public (The National Academies of Sciences, Engineering, and Medicine, n.d.).

U.S. Department of Transportation. The federal government agency that oversees the nation's public transportation and public transit sector. The mission of the agency is to ensure our nation has the safest, most efficient and modern transportation system in the world, which provides the quality of life for all American people and communities, from rural to urban, and to increase the productivity and competitiveness of American workers and businesses (U.S. Department of Transportation, 2020a).

Valley Transportation Authority (VTA). An independent special district that provides sustainable, accessible, community-focused transportation options within the Santa Clara, California valley (VTA, n.d.). VTA provides bus, light rail, and paratransit services in the Santa Clara region. Refer to Alum Rock/Santa Clara BRT within the definitions for more information.

Organization of the Study

The remainder of the study encompasses a thorough review of literature relevant to BRT systems within the United States and California, contingency theory, SMT, and

public transportation construction schedules and budgets. The study provides the methodology of the study, which includes the following sections: (a) research design, (b) population, (c) sample, (d) instrumentation, (e) data collection, (f) data analysis, and (g) limitations. After, the study presents research methods, data collection, and analysis. In Chapter 5, the study concluded by presenting major findings, additional findings, conclusions, implications for action, and recommendations for further research.

CHAPTER 2: REVIEW OF THE LITERATURE

The review of the literature chapter focused on the following segments: (a) BRT Within the United States, (b) Contingency Theory, (c) Scientific Management Theory, (d) Public Transportation Construction Schedules, and (e) Public Transportation Construction Budgets. The review of the literature presents an explanation of significant themes in this study. The goal of the literature review is to provide a historical analysis of BRT systems in the United States, contingency theory, scientific management theory and public transportation projects that were completed on time and under budget.

BRT in the United States

In 2003, the Transit Cooperative Research Program (TCRP) completed a synthesis study that explored 26 different BRT systems in urban areas throughout North America, Australia, Europe, and South America (Levinson et al., 2003). The BRT systems explored were mostly in the operations phase, and a few of the systems explored were in the design and construction phases. Most of the systems explored had "several of the key BRT elements including running ways, attractive stations, distinctive vehicles, off-vehicle fare collection, application of [Intelligent Transportation System] ITS technologies, and a clear service pattern" (Levinson et al., 2003). The study provided several lessons learned during the development, construction, and operations phases of BRT systems. For example, early and continual community support was essential during the development of BRT systems (Levinson et al., 2003). BRT systems had demonstrated the ability to be successful in mixed traffic.

The 2003 TCRP synthesis study provided proof that BRT systems provide sufficient capacities for most corridors in highly urbanized areas within North American

cities (Levinson et al., 2003). According to Levinson et al. (2003), "The Ottawa and Pittsburgh busways carry peak-hour, peak-direction passenger flows of 8,000 to 10,000 people. These flows exceed the peak ridership on many U.S. and Canadian LRT lines" (p. 31). The study revealed that BRT systems work and can attract and retain riders. The study demonstrated that all the BRT systems investments experienced an increase in ridership and revenue. Levinson et al. stated, "BRT implementation and operating maintenance costs are generally less than those of rail rapid transit. However, developing an effective BRT system is not always low cost" (p. 31). BRT systems can be adapted to meet the needs of a corridor and the surrounding community. BRT systems flexibility, reliability, and low cost compared to light rail transit (LRT) systems was why BRT projects continued to be a preferred alternative in the United States.

In 2004, the Federal Transit Administration (FTA) published a study that provided transportation planners and decision makers basic information and data to support the development and evaluation of BRT concepts. The study was helpful during the analysis of alternatives and subsequent project planning. Analyzing and selecting alternatives during the planning phase was considered the first stage of a BRT project. There need to be clear directions and guidelines established early in the process to successfully construct and operate a BRT system. The study determined that BRT demonstrated relatively low capital costs per mile of investments compared to other alternatives. The study also noted that recently implemented BRT systems had focused on less capital-intensive investments as compared to the CIG program with FTA.

Three years later, the California Department of Transportation published a study focused on examples demonstrating the flexibility of BRT systems (Caltrans, 2007). The

research provided case studies of successful BRT experiences within the state of California. The study was tailored to the California Department of Transportation employees and local partners throughout the state of California. At the end of the study, a BRT Implementation Support Director's Policy was revealed. According to Caltrans (2007), "The intended result of this policy is improved mobility options through the full integration of BRT as an investment alternative into system and comprehensive corridor planning documents and project development processes" (p. 18). BRT systems are considered an investment alternative into systems, comprehensive corridor planning documents, and project development processes. The study provided examples of successful BRT projects in California along with policy updates to help implement BRT projects within the California Department of Transportation.

The same year, TCRP published a *BRT Practitioner's Guide* that was sponsored by the FTA (Kittelson & Associates, Inc., 2007). The goal of the practitioner's guide was to provide public transportation professionals a guide on how to identify and assess costs and impacts related to BRT projects. According to the guide, "BRT may be considered an alternative to rail, particularly light rail transit (LRT), in an urban area. BRT can provide rail-like operating characteristics in terms of operating speed, capacity, and dependability" (Kittelson & Associates, Inc. 2007, p. 1–3). The study revealed there are four primary components associated with BRT projects.

The first component of BRT projects includes running ways. The running ways are made up of lanes, TSP systems, and curb extensions. The second component of BRT projects includes bus stations. The third component of BRT projects includes vehicles, which are generally completed using procurement contracts. Procurement vehicle

contracts must consider the size, automation, fuel technology, and low-floor boarding accessibility for riders. The final component of a BRT project is the service and operation. The service and operation component considers service plans, fare collections systems, and branding of the overall system.

The *BRT Practitioner's Guide* also provided general guidelines communities should consider while developing a BRT system (Kittelson & Associates, Inc., 2007). Public transit agencies must establish the need of the system, identify a possible market and BRT corridor, look at possibilities to integrate a BRT system with existing bus services, and consider funding options: "BRT can be developed incrementally, with each stage keyed to demand characteristics and the availability of resources" (Kittelson & Associates, Inc. 2007, p. 5–2).

The following year, the Transportation Research Board (TRB) completed a BRT study focused in San Francisco. The study described the planning approach and evaluation framework for analyzing and developing a broad multimodal goal project with a full-featured BRT system on two significant corridors within the city of San Francisco (Bent et al., 2008). The two significant San Francisco corridors explored were Geary and Van Ness. The San Francisco County Transportation Authority (SFCTA), in partnership with local and regional agencies, led the effort. The study explored the following variables: transit dependency, transit supply, transit demand, speed and travel time, parking, pedestrian facilities, bicycle facilities, and urban design elements. Bent et al. (2008) stated, "SFCTA organized an interagency team to review and evaluate BRT features from other systems that might be appropriate for the BRT corridors in question" (p. 91).

The study demonstrated that conveying the results to the community residents and decision makers was a challenge. The detailed traffic modeling and design used in the studies was highly informative to professionals yet frustrating to many in the public. The public expected finite answers to questions. The study concluded that having consistent and clear messages with the public was crucial during the planning, design, and construction phases of BRT projects.

The following year, FTA completed a study that provided further details on the major elements of BRT systems, BRT system performance and BRT system benefits (Tann & Hinebaugh, 2009). BRT systems can increase ridership numbers, cost effectiveness measures, and operating efficiency within the transit system. Tann and Hinebaugh (2009) stated, "The ability to attract riders reaffirms the attractiveness of the transit service and confers many benefits to a region, including reduced congestion, increased accessibility, and reduced pollution" (p. 4–2). The study also explored the benefits BRT systems provide in terms of operating costs, transit-supportive land development, and environmental quality. Tann and Hinebaugh reported, "Experience in the United States suggests that implementation of more complex BRT systems elements is just beginning. Implementation of running ways, stations, and vehicles suggests a wide variety of applications" (p. 5–1).

The FTA study revealed that BRT systems in general are reporting improvements in travel time within corridors (Tann & Hinebaugh, 2009). Moreover, the study validated that BRT systems operating along dedicated or exclusive lanes had lower variability between peak travel times and nonpeak travel times. BRT projects that implement exclusive running ways as a component of the system tend to improve travel times within

the corridor. There have been increases in ridership among the majority of the corridors once a BRT system was implemented (Tann & Hinebaugh, 2009). The study also revealed that further research was required to understand the effectiveness of safety, security, and accessibility of BRT systems across the United States. Safety, security, and accessibility are major components of a BRT project once it reaches the operations phase.

In 2010, TCRP published a *Bus and Rail Transit Preferential Treatments in Mixed Traffic* study. Danaher (2010) stated,

> Transit preferential treatments are not new, having been around for about 70 year for buses and longer for on-street rail systems. However, in recent years there has been increasing interest in the development of preferential treatments where bus or rail vehicles operate in a mixed-traffic environment, in particular on arterial streets in urban and suburban areas. (p. 3)

The study explored four large metropolitan regions throughout the country—San Francisco, Seattle, Portland, and Denver. The report uncovered the majority of the public transit agencies installed TSP systems. Unfortunately, the study also revealed, "There are no standard warrants being applied to identify the need for particular treatments" (Danaher, 2010, p. 78).

The TCRP study revealed common strategies implemented in bus designs by public transit agencies. First, public transit agencies stated, "Median transitways and exclusive lanes were perceived to have the greatest impact on general traffic operations, with limited transit stops the least impact" (Danaher, 2010, p. 78). Second, early green and red lights within the traffic signal timing modifications are commonly used. The study revealed that public transit agencies prefer exclusive median lanes and TSP

systems. ROW constraints, parking impacts, and accessibility impacts also play a role when selecting preferred bus alternative designs. If the preferred alternative increases ROW acquisitions because of the installation of median transitways or exclusive lanes, the construction schedule and budget risks will be impacted.

In 2011, the Institute for Transportation and Development Policy explored BRT projects in cities throughout the United States (Weinstock et al., 2011). The study explored existing and potential future BRT projects and classified the projects using the following categories: (a) gold, (b) silver, (c) bronze, or (d) not a BRT. The study implemented the following variables to classify the BRT projects: (a) service planning, (b) infrastructure, (c) station design and station-bus interface, (d) quality of service and passenger information systems, and (e) integration and access. Despite having built some of the earliest prototypes of BRT, the United States was lagging much of the world. Weinstock et al. (2011) stated, "Countries in Latin America, Asia, and Africa have been the world's leaders in building high-quality and service-oriented BRT" (p. 75). The study concluded the United States had been replicating BRT projects from other parts of the world. The replications had been substandard compared to BRT systems outside the United States. The study determined that no city had built a gold-standard BRT project in the United States. If no American city builds a gold-standard BRT project, there will be no gold-standard BRT project for other cities to replicate within the United States.

The same year, TRB completed a focused study on Stevens Creek Boulevard, which was an essential east-west throughfare linking San Jose and Cupertino (Iswalt et al., 2011). Stevens Creek Boulevard was one of the corridors selected for a BRT project. The corridor had existing factors that "limit any roadway widening and reconfiguration

required to provide sufficient space for dedicated BRT lanes and station platforms" (Iswalt et al., 2011, p. 27). The study determined that cities should consider single-lane reversible busways along with constrained segments as part of a strategy to implement premium BRT services (Iswalt et al., 2011).

The study recommended the project consider a short reversible lane with center platforms as the preferred alternative. The preferred alternative would allow the BRT project to move forward with the predetermined ROW limitations imposed on the project. Therefore, the study proposed that BRT projects within California should consider building short reversible center platforms to help mitigate ROW risks and expedite the construction phase.

The Santa Clara Valley Transportation Authority (VTA) published a study focused on strategies used to develop an integrated BRT throughout Santa Clara County (Chen & Naylor, 2011). The proposed BRT systems focused in regions where an LRT system was not well served (Chen & Naylor, 2011). The study applied a transit preference survey using a market research model prepared for VTA. The model in the study provided a reasonable forecast on future BRT ridership within the region.

Eleven different scenarios, including 10 operating plans and one no-build option, were selected in the BRT strategic plan for Santa Clara County using the market research model. The three proposed BRT projects presented in the study were (a) Alum Rock between the Hewlett Packard Pavilion to Eastridge Mall, (b) El Camino from Palo Alto Transit Center to Hewlett Packard Pavilion, and (c) Stevens Creek between De Anza College to Downtown San Jose. The study determined that ridership would increase up to 36% on the proposed BRT projects in Santa Clara County. At the time of the study,

the Alum Rock BRT project was in the final design with a scheduled completion of design in 2013. Chen and Naylor (2011) determined that future before and after studies of the proposed BRT projects would help refine the market research model.

In October 2011, FTA published a study focused on the Metro Orange Line BRT project (Flynn et al., 2011). After more than 20 years of planning for the BRT system in the San Fernando Valley, the Los Angeles Metro Orange Line debuted as one of the first-service BRT Lines in the United States. This monumental BRT project was the first exclusive busway in the city of Los Angeles. The study concluded that one of the main challenges was the question of how to achieve the projected time savings while also complying with modifications that were implemented because of safety concerns (Flynn et al., 2011). Several accidents occurred at intersections early in the operations of the BRT project. Fortunately, since the Los Angeles Metro BRT Orange Line began operations in October 2005, the ridership performance has been impressive. By May 2006, the Los Angeles Metro Orange Line had attracted nearly 22,000 average weekday ridership numbers. The BRT system achieved a ridership level in just a few months that was forecasted to occur in 2020. The case study shined a light on a successful design, construction, and operations of a BRT project. The Los Angeles Metro BRT Orange Line was one of the most popular and replicated BRT projects throughout the country.

The ensuing year, a peer exchange study of BRT projects was sponsored by FTA (Panero et al., 2012). The purpose of their study "was to foster a dialogue among peers at transportation and planning agencies about their experiences with promoting public transit" (Panero et al., 2012, p. iii). The study focused on the challenges participants faced related to BRT projects. The researcher instructed the participants to also provide

solutions they had developed in response to issues or problems. The results of the study made it clear that better public transportation and BRT projects can be cost-effective. BRT projects are useful tools for improving transportation, the environment, and the livability of America's cities.

One issue raised during the peer-to-peer sessions was the lack of a comprehensive national database exclusive for BRT. Despite the fact that FTA required reporting for a National Transit Database (NTD), there was no national database exclusive to BRT projects. A transparent U.S. database of BRT projects permits public transit agencies to share best practices during the planning, design, construction, and operations phases of BRT systems.

In 2013, the acting deputy director from the California Department of Transportation signed a deputy directive focused on BRT systems (Ortega, 2013). The deputy directive provided continual policy initiatives supporting the implementation of future BRT projects within California. According to Ortega (2013), "The California Department of Transportation (Caltrans) supports the integration of BRT projects and operations on the California state highway system where most effective, through partnership with BRT stakeholders" (p. 1). The deputy directive stated that the California Department of Transportation ensures that relevant procedures, standards, and guidance include direction that addresses BRT systems during the preliminary planning concept stages. The directive recommended updating the BRT procedures, standards, and guidance during the formal stages of planning, design, construction, operation, and maintenance of its facilities and properties. The deputy directive perpetuated the 2007

California Department of Transportation director's policies to plan, design, construct, and operate BRT projects in California.

That same year, the subsequent director from the California Department of Transportation developed a director's policy focused on the implementation support of BRT Systems (Dougherty, 2013). The director's policy stated, "The California Department of Transportation recognizes and supports the concept and implementation of BRT systems as a potentially cost-effective strategy to maximize people throughput" (Dougherty, 2013, p. 1). The intended result from the director's policy was improved mobility options through full integration of BRT systems as an investment alternative into systems, comprehensive corridor planning documents, and project development processes. The California Department of Transportation director's policy illustrates a continued commitment to plan, design, construct and operate BRT systems throughout California.

Three years later, TRB completed a second study that focused on the Los Angeles Metro BRT Orange Line (A. E. Brown, 2016). The study examined the neighborhood effects of the BRT Orange Line within the Los Angeles County Metropolitan Transportation Authority since 2005. The study gathered data from 2000–2013 using the U.S. Census and concentrating on demographics, economics, mode choice, and housing (A. E. Brown, 2016). The study revealed data showing that cost of housing and values of properties around the Los Angeles Metro BRT Orange Line stations increased. The study determined that BRT projects had the potential to gentrify neighborhoods in the United States. BRT projects had the potential to impact neighborhood housing prices and provide economic growth. The study demonstrated that if a BRT project was built in

California, the BRT project had the potential to impact residents' quality of life and economic sustainability in a positive trend for years to come.

The same year, a Paget-Seekins (2016) focused on conflicts over public space and BRT implementers' response to conflicts. Paget-Seekins focused on the success and completion of BRT projects in relation to conflict resolution. The researcher interviewed decision makers, nongovernmental organizations, and other individuals involved with BRT projects. The BRT projects selected for the study were in various countries: Mexico, Chile, and India. After exploring the selected projects, the researcher determined that "in order to successfully implement BRT governments need to avoid or manage politic conflicts that have potential to derail the project" (Paget-Seekins, 2016, p. 176). The study recommended that BRT projects gain support if the implementer considers designing corridors that appeal to both residents and users. BRT projects should seek to avoid political conflicts while properly allocating the use of land in growing and highly populated cities.

The same year, an article in Transport Policy explored rider perceptions of BRT "light" projects within New York (Wan et al., 2016). The researchers worked with the Department of Engineering City College of New York and the New York City Department of Transportation. The article explored various BRT light systems in New York City. A BRT light system incorporated some, but not all, of the BRT features. The goal of the article was to identify perceivable attributes that significantly contribute to BRT rider satisfaction and/or ridership (Wan et al., 2016). The methodology integrated by the researchers was a survey design that lasted approximately 1 month. Random participants were interviewed in the study. Each participant was interviewed while they

were a passenger or waiting at one of the designated stops of the BRT light systems. The article concluded that rider satisfaction relates to frequency, on-time performance, and speed. The findings from the article demonstrated that BRT systems had the potential to maintain consistent loyalty while also attracting new riders. The article revealed that successful BRT systems had been developed and built in New York.

The FTA Office of Research, Demonstration and Innovation developed a study that provides guidance in developing BRT systems (FTA, 2016b). FTA staff provided guidance and direction of the study along with technical assistance from the Volpe National Transportation Systems Center (Volpe Center). The purpose of the study was to encourage U.S. cities to consider, analyze, and evaluate the benefits of BRT systems (FTA, 2016b). The study also provided a case study of the world-renowned BRT system in Curitiba, Brazil. FTA and the Volpe Center concluded that strategic policies that provide priority to bus operations will meet the objectives of BRT systems.

Implementation of BRT systems poses several challenges. The first challenge is the need for adequate cross sections on city streets to provide separate ROW for buses. The second challenge is maintaining the quality of general-purpose traffic flow. The third challenge is air-quality impacts to the environment. The study demonstrated the positive impacts of a BRT project while also considering the implementation challenges of a BRT system.

The subsequent year a study through the Journal of Transport Geography evaluated public participation processes during BRT development (Behrsin & Benner, 2017). The study also explored historical, economic, and political contexts relevant to BRT systems. The study investigated how public participation “influenced the design

and outcome of a Bus Rapid Transit (BRT) initiative in a low-income, predominantly Latino and African-American community in Oakland, California" (Behrsin & Benner, 2017, p. 95). Transportation planners tend to overlook the actual physical experience of riding public transit and the impacts on the community. The study revealed an existing divide between public transit planners and riders of BRT systems. The researchers demonstrated that public outreach during the planning, design, and construction of BRT projects was crucial. Behrsin and Benner (2017) validated that if BRT projects implemented continual public outreach efforts, this improved efficiency.

In 2018, the Maryland Department of Transportation (MDOT, 2018) published guidance on how to evaluate the feasibility of BRT systems: "The Maryland Department of Transportation (MDOT) produced this guide to provide local jurisdictions, transit agencies, and other stakeholders an outline of how to make careful and informed decisions about BRT" (p. 1). The guide stated that BRT systems had the following common characteristics: (a) some route operating in a dedicated lane, (b) defined and accessible stations, (c) intersection and traffic signal priority (TSP) systems, (d) a minimum of 10-min headways in the peak and 15-min during nonpeak hours, and (e) consistent BRT branding for potential riders. Once a BRT project was identified in Maryland, the MDOT (2018) assisted where possible: "BRT can be the best transit resource for the right corridors" (p. 14). Most importantly, the guide reinforced the fact that conducting studies early in the process plays a crucial role during the implementation of BRT elements within the corridor. During the planning and design aspects of a BRT corridor, the agencies identified and determined the first steps and early actions needed.

In many cases, the first phases focused on environmental and ROW constraints within the chosen BRT corridor.

In 2020, TCRP completed a TSP study focused on providing "readers with an up-to-date review of academic and professional literature on TSP and a synthesis of current TSP practices of North American transit agencies" (Anderson et al., 2020, p. 4). TSP systems were integral parts in the design and development of BRT systems in California and throughout the United States. The study focused on five case studies, with two of them being in California.

The TSP systems within San Diego Metropolitan Transit System (MTS) and the San Francisco Municipal Transportation Agency (SFMTA) were analyzed in the study. The study unveiled that transportation policies, technology limitations, and performance measurements are existing challenges during the implementation of TSP systems. The study concluded that "TSP to be generally effective at achieving desired outcomes—especially in reducing intersection delay, reducing travel times, and improving schedule adherence" (Anderson et al., 2020, p. 70). The study demonstrated that TSP systems are an integral part of BRT systems.

The same year, TCRP completed a synthesis study on the current state of practice of TSP (Anderson et al., 2020). TSP systems provide buses the technology to request traffic signals ahead of time. This rearranges timing on signals, reduces bus delays, improves the reliability of bus systems, and allows buses to respond to current conditions. TSP systems originally dated back to the 1970s with major deployments in the last 10-15 years (Anderson et al., 2020). The goal of the study captured deployment and

innovations of TSP systems by surveying 46 North American transit agencies and completing five case studies.

The study revealed that several different system architectures are possible within public transit agencies. Anderson et al. (2020) stated, “Several agencies are currently investigating centralized & GPS-based systems” (p. 14). The synthesis study determined that public transit agencies should consider coordinated responsibility, aligned priorities, and constantly monitored software and hardware changes with the TSP system. The first case study explored the King County TSP system that serves the Seattle region. King County Transit operated LRT, streetcar, and express buses using approximately 1,600 vehicles (Anderson et al., 2020). The TSP goal for King County reduced average travel times and signal interruptions within their corridors.

King County Transit continued to develop TSP strategies to adapt signal control by using a four-step process: (a) agree on overall project goals, (b) agree on strategy to use at individual intersections, (c) agree on TSP controller parameters, and (d) operations and maintenance (Anderson et al., 2020). The second case study explored the TSP system within the Toronto Transit Commission. The city of Toronto had four Subway Lines, 11 Streetcar Routes, 159 Bus Routes and Paratransit service. The system completed 1.2 million daily bus and streetcar trips, which included 19 very high ridership corridors (Anderson et al., 2020).

The city of Toronto has maintained 400 TSP intersections since 1990 (Anderson et al., 2020). Toronto Transit Commission integrated TSP technology in their streetcar and bus systems. The system permitted transit vehicles to extend the green light or alter the sequence of lights at the intersections. Toronto learned that benefits of the TSP

depend on the level of priority granted, the extent of conditions, and the recovery functionality (Anderson et al., 2020). The last three case studies explored TSP systems within the San Diego Metropolitan Transit System, San Francisco Municipal Transportation Agency, and Rhode Island Public Transit Authority.

The TCRP synthesis case study revealed that the transit agencies had difficulties obtaining stakeholder buy-in during the early stages of the TSP deployment (Anderson et al., 2020). The transit agencies experienced ongoing maintenance difficulties because of inexperience. The study revealed that implementation of pedestrian and TSP supportive policies assist in maximizing the benefits of the system. Constant communication with stakeholders and building strong partnerships are key to the implementation of TSP. The transit agencies learned that pilot testing, establishment of TSP policies and goals, investigating rules and contingencies, and operator behavior can influence TSP benefits (Anderson et al., 2020). The study recommended that future research be conducted on the measurements of TSP benefits during the construction and operations phases of BRT systems.

Contingency Theory

Fiedler (1966) conducted an experiment that compared the performance of 96 culturally and linguistically homogeneous and heterogeneous three-man teams under powerful and weak leadership positions. Fiedler focused the test on three types of tasks varying in structure and requirements. The experiment tested a previously described contingency model of leadership effectiveness. The experiment was conducted while Fiedler was a Ford Faculty Research Fellow under a contract with the Advanced Research Projects Agency.

Fiedler (1966) conducted the experiment with 240 recruits and 48 petty officers. He stated, "At the time of the study the recruits, ranging in age from 17 to 24, were expected to serve in the Belgian Navy for a term of 12 months after which most of them would return to civilian life" (p. 238). All the participants were given various pretests and questionnaires in their native language. The study was split into various categories: (a) description of least preferred coworkers (LPC), (b) verbal intelligence, (c) attitude scale, and (d) language comprehension. Fiedler (1966) stated, "As mentioned three types of group tasks were used which varied in task structure and in verbal interaction requirements" (p. 242).

Participants received unstructured tasks to develop a recruiting letter for boys of 16 to 17 years of age urging them to enlist in the Belgian Naval Forces (Fiedler, 1966). The letters were judged under the following five dimensions: (a) well written versus poorly written, (b) understandably presented versus confused, (c) interesting versus boring, (d) persuasive versus unconvincing, and (e) original and creative versus mundane. Participants received nonverbal tasks that were designed to be completed using a silent "coacting" situation (Fiedler, 1966). Fiedler (1966) stated, "At the conclusion of each task session all participants completed a number of questionnaires and scales designed to measure the group members' reactions to the tasks, and to permit some interferences about the group processes during the session" (p. 244).

Fiedler's (1966) working hypothesis was that homogeneous groups and those led by petty officers would be superior in performance to heterogenous groups and those having recruit leads. According to Fiedler, "The results of this study do not support the conclusion that groups with culturally and linguistically homogeneous membership

perform better than culturally and linguistically heterogenous task groups on all but highly verbal tasks" (p. 249). The experiment suggested that it was almost easier to change environmental factors than to change an individual's personality or his style of interpersonal relations (Fiedler, 1966). Fiedler stated, "The most eligible solution for increasing leadership effectiveness seems to lie, therefore, in engineering the group-task situation so that it will fit the leader's style" (p. 262). The study revealed that groups performed about as well in unfavorable as in favorable group situations. The experiment supported the hypothesis from the contingency model that specific leadership style required for effective group performance was contingent upon the favorableness of the group-task situation (Fiedler, 1966).

According to Verkerk (1990), contingency theory was developed by Fiedler in 1964 during his research of leader effectiveness in group situations. Fiedler argued that an individual's effectiveness to lead depends on how much control they had on the situation and their leadership style (Verkerk, 1990). The contingency model resulted from a chain of research. At that time Fiedler integrated his past research and added situational awareness. A new phrase in leadership research was born, contingency theory. Contingency theory described the idea that behaviors of leaders and organizations were contingent upon the situation. Over the years, numerous researchers have validated contingency theory.

In 1966, Fiedler completed the first study done to validate contingency theory. Verkerk (1990) stated, "The first study (Fiedler, 1966) investigated the effect of leadership experience, and cultural heterogeneity on performance" (p. 14). Fiedler studied 96 three-man groups and provided the groups two structured, one unstructured,

and one coacting assignment. Verkerk added, “No performance differences were found between the groups led by the petty officers and these led by recruits” (p. 14). The results of the experiment supported the hypothesis derived from contingency theory. Fiedler’s experiment revealed that effective group performance was contingent upon the circumstances presented to the group.

Fiedler’s (1966) findings had significant implications on future leadership training programs and evaluations relevant to organizational productivity and efficiency. Fiedler recognized that the contingency model indicated that effective group performance was contingent upon favorableness of the group-task situation. The contingency model was a useful theory to study public organizations and projects that faced multiple internal and external situations. The contingency theory hypothesis explored by Fiedler (1966) can be used as a foundation to research public transportation projects.

In 1970, Evans developed a study focused on understanding leadership behavior by examining path-goal theory within two organizations. The study revealed three aspects that impact path-goal instrumentality. First, an organization should create an environment that provides rewards and punishments to employees. Second, an employee should recognize that reward and punishments are coming because of a result of their specific behavior (Evans, 1970). Third, supervisors have the potential to make judgements about which path is considered high and which path is considered low for subordinates.

Evans (1970) developed numerous hypotheses from the path-goal theory focused on high performance, low performance, and variable paths. The various hypotheses were tested within a public utility company and general hospital. Evans sampled 311 workers

from the public utility company and 88 nurses from the general hospital. After analyzing the results of the tests, two interrelated theories appeared. The first theory uncovered was "Path-goal instrumentalities relate both to behavior and goal attainment" (Evans, 1970, p. 277). The second theory stated that supervisory behavior can relate to path-goal instrumentality and to worker satisfaction. A supervisor can be perceived as operating based on reward, coercion, or legitimate power (French & Raven, 1959).

In 1971, a study explored "the effects of leader behavior on subordinate satisfaction, motivation, and performance" (House, 1971, p. 321). The theory of path-goal asserted that behaviors are dependent on an individual's expectations of a specific outcome and personal satisfaction. House (1971) stated,

> According to this theory of motivation, an individual chooses the behaviors he engages in on the basis of (1) the valences he perceives to be associated with the outcomes of the behavior under consideration; and (2) his subjective estimate of the probability that his behavior will indeed result in the outcomes. (p. 322)

House completed three studies and explored various hypotheses.

The following hypotheses were explored in House's 1971 study: (a) A leader who initiated structure would positively increase subordinate satisfaction, (b) Role ambiguity plays a role in the relationship between leaders and subordinates, (c) Job autonomy affects the relationship between the leader and subordinate, and (d) A broad job scope decreases the correlations between leader and subordinate satisfaction and performance. The study validated the hypotheses and provided a confirmation of path-goal theory. House (1971) stated, "The findings, when viewed collectively, generally support the

theory" (p. 338). House and Mitchell (1975) completed a follow-up study 4 years later to support the path-goal theory of leadership.

In 1973, Heller completed a study focused on answering the following question: "How do managers make decisions in a variety of different circumstances?" (p. 183). Heller (1973) obtained data from a sample size of 360 senior managers in 20 British firms. With In the study, the human resources model was explored. This model postulated the relationship among variables needed to operate in all situations (Heller, 1973). According to the human resources model, the nature of the decision and the sociotechnical circumstances surrounding the model are irrelevant (Heller, 1973).

Fiedler (1966) explored and described a contingency view of leadership. The human resources model explored by Heller (1973) differs from Fiedler's (1966) model in three important aspects. First, Fiedler's LPC style does not change in relation to different situations in which a leader may find himself (Heller, 1973). Managers seek to match individuals with tasks and situations to which they are most suited. Second, a leadership style does not adjust to changing task structures, leader-member relations and a leader's position of power. Third, Fiedler's (1966) situational factors are confined to three categories and eight permutations. However, there is potential to have a broader range of important contingency factors (Heller, 1973).

Heller (1973) established that managers use highly autocratic and democratic leadership styles depending on the situation. Heller stated, "This finding suggests the possibility that managers are aware that relatively unimportant decisions can be made by using decision methods which demand little time" (p. 194). The study suggested that a contingency model of leadership was supported by organizations. Most senior British

and American managers vary their styles of leadership according to specific decision situations, and they make extensive use of alternative styles (Heller, 1973). The study concluded that leadership and decision-making behavior must be analyzed using a contingency approach rather than a universalistic perspective (Heller, 1973).

The follow-up study provided two general propositions related to path-goal theory (House & Mitchell, 1975). House and Mitchell (1975) stated, "The first proposition of path-goal theory is that leader behavior is acceptable and satisfying to subordinates to the extent that the subordinates see such behavior as either an immediate source of satisfaction or as instrumental to future satisfaction" (p. 4). The second proposition stated that increases of motivations among leaders and subordinates is dependent on two factors. The two factors are (a) contingency on the satisfaction of subordinates and (b) whether leaders provide subordinates coaching, guidance, support, and reward recognition of effective performance. House and Mitchell (1975) stated, "Therefore, we say that the relationship between leader directiveness and subordinate satisfaction is contingent upon the structure of the task" (p. 5).

Path-goal theory presented two contingency variables between leaders and subordinates. The first variable was the personal characteristics of the subordinates. The second variable was the environmental pressures and demands imposed on the subordinates as they seek to accomplish the goals of the project. House and Mitchell (1975) stated, "The acceptability of the leader's behavior is determined in part by the characteristics of the subordinates" (p. 6). A successful leader assists subordinates to cope with an ambiguous environment and deal with potential risks. A successful leader of a BRT project assists the construction team to cope with environmental, utility, public,

ROW, and other potential risks. BRT projects present a complicated environment during construction as the team seeks to build the project on time and under budget.

The same year, the Texas University Institute for University Research Grant examined the relationship of reward dependency (Justis, 1975). Reward dependency is when the follower's reward is dependent upon the performance level of the leader. The study also examined leader competency to effective leadership, which is when one of two leaders is perceived by followers to be more efficient in performing the leadership task. Justis (1975) implemented an analytical method experiment with eighty-four male undergraduate student participants. The participants joined in the experiment to earn a laboratory credit in junior organizational behavior courses at Indiana University.

At first, Justis's (1975) participants of the reward system were not informed. This action minimized any altered behaviors or biases during the study. Before each participant left the room, they were debriefed about the focus of the study and were told not to tell anyone else about the experiment (Justis, 1975). The data demonstrated that as the degree of the leader's task competency increases, the level of the follower's performance will also increase. The follower's level of performance will also increase as a joint function of increases in dependency and leader's task competency. The level of competency was a possible theme that impacted the construction budget and schedule of BRT projects.

Another contingency theory framework study described organization arrangements of new local authorities in England and Wales (Greenwood et al., 1975). The study used reports and documents from county authorities, metropolitan county authorities, metropolitan district authorities, and county district authorities. The

study reviewed the following contingent variables: (a) size, (b) environment, (c) interdependence, (d) political structure and (e) ideologies. Greenwood et al. (1975) stated, "Our principal purpose has been to reveal the variation that exists, as well as the widespread acceptance of a number of central concepts and of the corporate approach" (p. 22). The study arranged data using the complementary concepts of differentiation and integration (Greenwood et al., 1975). The study revealed that general adoption of coordinating devices was completed through policy and resources commitments. The English and Wales County districts demonstrated a much higher relationship between the various aspects of integration (Greenwood et al., 1975).

In 1976, Kanuk explored the relationship between managerial effectiveness and leadership styles in major department stores. Within the study, a test of leadership style was administered to 53 department managers. The department managers were employed for a major department store chain in branches located throughout the United States and Canada. The 53 participants held the same position within the same type of Department and division. Kanuk (1976) implemented the LPC sampling design and focused on the following variables: friendly, accepting, satisfying, enthusiastic, productive, warm, cooperative, supportive, interesting, and successful. The researcher implemented Fiedler's theory as a starting point and administered a group atmosphere scale for the 53 subjects.

Kanuk (1976) concluded that successful managers seem to have achieved a good balance between handling people while interacting well with employees and customers. Successful managers are goal oriented within the needs and objectives of their jobs, and they can utilize people effectively in fulfilling the objectives of their jobs.

In 1977, Luthans and Stewart published an article that explored contingency theory of management. The study presented a general contingency theory model of management that integrates diverse processes, behavioral approaches, and ambiguous environments. The general contingency theory model assisted in bridging the gap between management theory and practice (Luthans & Stewart, 1977). The general contingency theoretical model has three primary variables: (a) environment, (b) resources, and (c) management. The secondary variables of the general contingency theoretical model are (a) situation, (b) organization, and (c) performance. The primary and secondary variables produce the system performance. Luthans and Stewart (1977) stated, "The product of this interaction is defined as the set of system performance variables, which represents the actual performance output of the organization as measured by relevant performance criteria variables" (p. 187).

Luthans and Stewart (1977) presented a general functional relationship for system performance that is determined by the situational, management and performance criteria variables. To implement the general contingency theory model computer software code must be developed and verified. Luthans and Stewart (1977) stated, "In spite of the significant practical problems to be resolved, GCT offers the theorist, researcher and practitioner a real and potential framework for integrating existing contingency approaches and for orchestrating future management research and development" (p. 194).

In 1978, Longenecker and Pringle published an article titled "The Illusion of Contingency Theory as a General Theory". Longenecker and Pringle stated, "General contingency theorists attempt to fashion a general theory from the debris of other inadequate theories, repeatedly exposing limitations of earlier universal principles" (p.

680). The article argued that the general contingency theory model presented by Luthans and Stewart (1977) indicated that organizational members can effect changes in management and resources.

The environmental variable presented in the general contingency theory model was not subject to system control and performance. Longenecker and Pringle (1978) stated, "Any theory of management which claims to be general must incorporate this concept of dual contingency between organization and environment" (p. 682). Public transportation projects are generally financed by federal, state, and local grants. The complexity of financing public transportation projects increases the potential of external influences by lobbying groups, environmental mandates, federal regulations, state regulations, and local stakeholders. According to Longenecker and Pringle, "Saying that all the contingencies are somehow dependent on people and things, for example, will not help much" (p. 682).

The same year, a study from the University of Washington explored why decision makers choose different decision strategies when dealing with different decision problems (Beach & Mitchell, 1978). Individuals used a variety of strategies when deciding. Beach and Mitchell (1978) stated, "This article describes a framework for examining individuals" selection of strategies for decision making" (p. 439). The study proposed a framework that was contingent upon the characteristics of the decision task and decision maker. Beach and Mitchell added, "Models of this kind, called contingency models, are evident in many areas of management, but with some limited exceptions, such an approach has not been explored for decision psychology" (p. 440).

According to the study, there are various stages within a contingency model for decision strategies. The first two decision strategy stages involve recognizing the problem and evaluation of the decision task. Beach and Mitchell (1978) stated, "In stage 3, a strategy is selected to solve the problem, and in stage 4 the decision maker uses various heuristics to process information prior to implementing the decision strategy" (p. 440). The last two stages involve choosing the strategy among the alternatives and implementing the strategy selected.

The study revealed that individuals had three decision strategy categories to choose from. The first category was aided-analytic strategy, which required the decision maker to apply a prescribed procedure utilizing tools (Beach & Mitchell, 1978). The aided-analytic strategy involved the use of a pencil, paper, or a computer to implement a mathematical approach when analyzing the decision.

The second strategy was an unaided-analytic approach. If an individual used this approach, the decision makers restricted processing to the confines of their mind (Beach & Mitchell, 1978). The third strategy was a nonanalytic approach, which was a simple and preformulated rule that was applied by an individual. If individuals used this approach, they decided by flipping a coin (Beach & Mitchell, 1978). The major differences between the three strategies were the amount of time, effort, and funds required. Beach and Mitchell (1978) stated, "There are some similarities among the three categories but they are fewer than the differences" (p. 443). The major similarities of the three decision strategies were the predetermined rules and predecision procedures.

Beach and Mitchell (1978) determined there were several characteristics that had the potential to influence a decision maker's perception. The characteristics range from

interpretation, unfamiliarity, ambiguity, and complexity of the decision problem. The decision environment play a role within the situational factor that influenced the selection of a strategy (Beach & Mitchell, 1978). The decision makers can also be influenced by their knowledge, ability, and motivation. The degree of accountability for the results of the decision and time/money constraints also play a role in the decision maker's perception.

Beach and Mitchell (1978) proposed a framework model that demonstrated the selection of different decision strategies and contingencies upon the decision problem and the decision maker. They stated, "Strategy selection is viewed as a compromise between the press for more decision accuracy as the demands of the decision task increase and the decision maker's resistance to the expenditure of his or her personal resources" (p. 447). The decision-making framework is contingent upon a compromise between the decision makers' desire to make a correct decision and their feelings toward investing time and effort in the process. Beach and Mitchell stated, "Environmentally imposed time and money constraints reduce the number of strategies that can be selected" (p. 448). The strategy that is selected was one that yields the maximum net gain. Beach and Mitchell recommended that future research on decision making occur.

In 1981, Schoonhoven explored contingency theory and presented five distinct problems with the theory. The first problem revealed by Schoonhoven (1981) was the lack of clarity and ambiguity presented in contingency theory. Technology and structure need to be properly aligned (Khandwalla, 1974), and a coalignment should exist between environment and structure (Lawrence, 1975). Schoonhoven (1981) stated, "Contingency

theory currently requires greater precision than is provided by these richly suggestive but ambiguous statements" (p. 351).

The second problem presented by Schoonhoven (1981) was the lack of clarity in the connections presented between the variables. For example, the general contingency theory model presented by Luthans and Stewart (1977) does not explicitly recognize the interactions between the primary and secondary set of variables. The third problem was the lack of clarity in the mathematical functions related to contingency theory. This problem has important and consequential consequences. Schoonhoven (1981) stated, "Depending on one's interpretation of the theorists' ideas, contingency theory is capable of producing precise hypotheses as well as corresponding functions" (p. 352). Various assumptions must be made to produce contingency theory mathematical functions.

The fourth problem with contingency theory was that researchers tended to impose assumptions on an operational and computational model. Contingency theory was already known to be imprecise. If a researcher adds another layer of assumptions to a linear relationship between variables this may mask the results. Schoonhoven (1981) stated, "The researcher fails to check for nonlinear relations when linearity is unquestioningly assumed" (p. 353). The fifth problem with contingency theory was that ill-trained and ill-equipped staff were not the only reason effectiveness suffered. Organizations can become more effective if they seek to devise rules that generate greater control over the outcome of the project. The study revealed that technology, structure, and organization effectiveness support organization design. Organizational design begins with the following statement: *it all depends*.

In 1984, Fredrickson and Mitchell published a study focused on the research effort to test the relationship between the strategic decision processes and performance in an industry whose environment was unstable. The researchers interlinked the environment and strategic decision process. A stable environment identifies critical variables and elements (Fredrickson & Mitchell, 1984). An unstable environment makes it difficult to identify a strategic decision process and rational models.

Fredrickson and Mitchell (1984) structured interviews as part of their study. The interviews included 123 executives in an industry whose environment was known to be unstable. Scenarios were presented to the participants in which they had to make significant decisions about a product line, building a new plant, or other similar situations (Fredrickson & Mitchell, 1984). The study provided preliminary evidence that strategic decision processes are not consistent or based on rational models when environments fluctuate. There were variations in responses from participants in the study. According to Fredrickson and Mitchell (1984), there were no consistent and rational models within the strategic decision-making process. The inconsistencies uncovered in the decision-making process had a potential to impact the construction of public transportation projects.

The same year, Grandori (1984) completed a study that focused on reconstructing the specific properties of various decision models when dealing with two fundamental dimensions of decision making, uncertainty and conflict of interest. The study "proposes a methodology for selecting organizational decision strategies" (Grandori, 1984, p. 192). The contingency framework presented in the study provided a comparison between different organizational decision strategies. J. D. Thompson (1967) and J. D. Thompson

and Tuden (1959) hypothesized that decision strategies are contingent upon two dimensions. The two dimensions include the certainty and uncertainty about cause-and-effect relations and about their own preferences (Grandori, 1984).

According to J. D. Thompson and Tuden (1959), a solution can be reached through a computation strategy that considers the costs and benefits of various alternatives. Decision strategies are defined in terms of three sets of rules: (a) rules of search, (b) rules of choice, and (c) rules of learning (Einhorn & Horarth, 1981; Payne, 1982). With these observations in mind, five decision models were defined that have distinctive properties for dealing with two fundamental dimensions of a decision situation—uncertainty and conflict of interest (Grandori, 1984).

The first decision model was optimizing. This classic decision theory considers conditions of uncertainty in which outcome probability are unknown. Grandori (1984) stated, "An optimizing strategy can also be infeasible if the conflict of interests in the decision context is such that a collective preference function cannot be defined" (p. 195). The second decision model was known as satisficing. A satisficing strategy has a set of independent constraints that must be satisfied (Simon, 1964). A satisficing strategy makes the argument that if an acceptable decision is found, the search process stops (Grandori, 1984). A satisficing strategy is a good solution when trying to resolve complex situations in a value-added or value-maximizing framework.

The third decision model was defined as incremental strategies. An incremental strategy can be reconstructed as a set of procedures capable of dealing with circumstances that cannot be dealt with when using a satisficing or optimizing strategy (Grandori, 1984). An incremental strategy uses a risk-reducing approach to help

minimize major impacts. The fourth decision model was cybernetic strategies. Cybernetic strategies are used when an organization is faced with limited alternatives. Grandori (1984) stated,

> An example that illustrates this situation is an actor faced with a broken machine but with no knowledge of its internal structure. The decision maker can only adopt a blind trial-and-error procedure and observe when a trial succeeds. This is a cybernetic decision strategy. (p. 199)

The fifth decision model was known as random strategies. This strategy is commonly used when there was no initial knowledge by the decision maker. Grandori (1984) stated, "One should note that a random strategy can be consciously utilized to deal with conditions of extreme uncertainty and conflict" (p. 200). The study determined that a decision maker can select a feasible strategy depending on the level of uncertainties and conflict of interests. A decision maker selects a decision strategy that helps reduce the issues at hand or when their resources were restricted. According to Grandori, "From the point of view of empirical research we can draw hypotheses, such as that decision rules can be changed as experience grows in a particular decision area" (p. 206). The study demonstrated that effective organizational decision behaviors vary among the alternate contingent rational decision strategies.

Tosi and Slocum (1984) presented a model that argues that complex relationships exist among environmental, organizational, and individual/group variables. Tosi and Slocum stated, "Contingency theories have been an important part of the management literature for the past twenty years" (p. 9). Contingency theories were developed because the response of the classical theories advocated that there was one best way to organize or

manage. There were two reasons why contingency theories began to be widely accepted: "First, the logic underlying them was very compelling. It makes good sense that there is not one best way to manage" (p. 9). The second reason was that early research of Burns and Stalker (1961), Woodward (1965), and Lawrence and Lorsch (1967) provided similar results.

As time progressed, further research suggested problems with contingency theory. Schoonhoven (1981) articulated weaknesses because of a fuzzy conceptualization of the variables and the lack of specificity in the relationships among them. Schoonhoven made the argument that contingency theory was not more than an orientation strategy: "Suggesting ways in which a phenomenon ought to be conceptualized or an approach to the phenomenon ought to be explained" (p. 350). Tosi and Slocum (1984) argued that contingency models should be more complete and alternative explanations explored: "First, key concepts just be more fully developed and relationships between these clearly explicated. Second, the scope of contingency theory needs to be broadened" (p. 10).

There are three dimensions that need to be sharpened in contingency models: (a) effectiveness, (b) environment and (c) congruency. Effectiveness can be seen as the degree a decision maker or organization obtains a limited number of highly desirable outcomes (Tosi & Slocum, 1984). Tosi and Slocum (1984) provided hypothetical relationships of profitability, quality of work-life, and social responsibility when evaluating managerial control and organizational effectiveness. Predictions of the relationship between organizational characteristics and outcomes should be further explored.

The dimension of the environment have the potential to affect all organizations. For example, the studies by Burns and Stalker (1961) and Lawrence and Lorsch (1967) focused on the premise that organizations interacted with several environments. Tosi and Slocum (1984) stated, "A theory must include both the array of environmental sectors with which an organization interacts and the attributes of specific sectors" (p. 14). The study pointed out that businesses have the potential to be impacted by the following environmental sectors: (a) customers, (b) capital sources, (c) raw product supplies, and (d) technology and science. Tosi and Slocum added, "Moreover, specific environmental sectors will have different effects on organizations, even though the different sectors may have similar uncertainty characteristics" (p. 15).

Deeply embedded in contingency literature is the construct of congruency (Tosi & Slocum, 1984). Congruency is the central theme in most contingency studies. Tosi and Slocum (1984) stated, "Although clearly a construct of central importance, there are two major problems with the congruency concept: (a) methodological and (b) theoretical" (p. 15). The study argued that congruency may be necessary for an organization to adapt but not the best alternative if the organization sought profitability. Haas et al. (1966) stated, "The adding-on of an additional characteristic may completely differentiate mammals from amphibious creatures. The same thing may be true for organization" (p. 167).

The study proposed a contingent "theoretical structure be broadened to include systematically three classes of variables: 1) Individuals and groups, 2) Strategic and design choices, and 3) Cultural factors" (Tosi & Slocum, 1984, p. 17). Culture integrates into contingency models by examining its relationships to three different sets of variables. The first variable was the integration of individual responses, group factors,

and organizational culture. Tosi and Slocum (1984) stated, “Organizational cultures are antecedents and consequences of particular designs. The dominant values of top management are reflected in the choice of the general form of structure” (p. 21).

The second variable was organizational design. The third variable within the construct of congruency was strategic choices. Organizations become what they are because of the strategic choices related to the organizational design (Tosi & Slocum, 1984). J. D. Thompson (1967) stated, “Organizations are not determined simply by their environments. Administration may innovate on any or all of the necessary dimensions, but only to the extent that innovations are acceptable to those on who the organization can and must depend” (p. 27). Strategic choices made by an organization occur during the selection of the tactics for competing in a business (Tosi & Slocum, 1984).

The study found that contingency theory had support from various researchers. The proposed concepts by Burns and Stalker (1961), Woodward (1965), Lawrence and Lorsch (1967), and others provided narrow facets of contingency models. Tosi and Slocum (1984) stated, “Later research has led to rejection of some of the models, but to little incremental theoretical improvement. Instead of refining measurement instruments, we need stronger theory” (p. 24). Tosi and Slocum recommended that future analysis of contingency theory was broadened into new directions to help strengthen the theory.

The subsequent year, Drazin and Van de Ven (1985) published a study examining the selection, interaction, and systems approach that fit in structural contingency theory. Drazin and Van de Ven studied the relationship between contingency theory and task designs of 629 employment security units in California and Wisconsin. The study explored the following organizational characteristics: (a) intake and claims processing,

(b) adjudication, (c) placement, (d) counseling and rehabilitation, (e) work incentives, and (f) management/clerical duties.

Drazin and Van de Ven (1985) concluded that contingency studies should permit comparative evaluations. The contingency studies focused on developing systems approaches and future investigations on how large and small organizations address dilemmas. The study recommended future analysis of organizational structure design during the flexible construction environment of BRT systems.

The same year, Baird and Thomas (1985) completed a study that explored a contingency model of strategic risk taking. The contingency model incorporated environmental, industrial, organizational, decision maker and problem variables. Baird and Thomas stated, "The model is intended to be both a preliminary conceptualization of strategic risk taking and a stimulant for future research on risk taking in strategic management decisions" (p. 230). In recent years, there has been an increase in risk-taking strategies within businesses and corporations. Baird and Thomas added, "The process of handling risk appropriately has been problematic and also has received attention recently" (p. 230).

The level of risk and the handling of risk behaviors are critical to the success of a strategic decision-making process. Risks are typically defined as a condition in which the consequences of a decision and the probabilities associated with the consequences are known entities (Baird & Thomas, 1985). Baird and Thomas (1985) stated, "A method of characterizing strategic risk is useful only to the extent that it is incorporated into the strategy formulation process" (p. 232). The study presented several important and relevant dimensions of strategic risks: (a) exposure, (b) consequences, (c) time, (d) space,

(e) situation, (f) impact, and (g) group/individual factors. According to Libby and Fishburn (1977), the risk links with return in a hybrid model that combines compensatory and noncompensatory decision rules. Libby and Fishburn stated, "A model in which risk plays a role as a ruin constraint and then interacts with the mean as a tradeoff parameter defined as target semi-variance is most supportable" (p. 289).

A contingency model of strategic risk taking was developed by Baird and Thomas (1984) to help simplify the decision-making process. This model integrates the current risk posture and predicts the outcome of the risk evaluations. The level of risk acceptance is determined by summing up the following risk indicators: (a) general environmental, (b) industry, (c) organizational, (d) problem, and (e) decision maker. There are several categories associated with each risk indicator. Baird and Thomas (1985) stated, "For example, within the industry ring, there is likely to be a high positive correlation between the number of competitors and the intensity of competition" (p. 238). As the model was developed and evaluated, each risk indicator revealed interactions and influences.

Risk taking by individual decision makers has the potential to be extremely complex (Baird & Thomas, 1985). Contingency risk taking by organizations and businesses is even more complex because of the additional risk indicators. Baird and Thomas (1985) stated, "The proposed model of risk taking represents an attempt to formulate a framework that will serve as a basis for examination of normative and descriptive strategic risk taking" (p. 241). The paper recommended that the next step identify and explore the relationship between the variables and risk-taking behaviors. The next step provided continual growth in contingency modeling of strategic risk taking.

In 1988, Hill stated, “A contingency framework in which differentiation can be a means for firms to establish an overall low-cost position” (p. 401). Hill affirmed that a combination of differentiation and low cost may be necessary for organizations to establish a sustainable competitive advantage in their sector. Hill argued that organizations tend to differentiate their products contingent on the industry and consumers. There are two critical and significant contingent factors: (a) market structure and (b) the stage of product market evolution (Hofer, 1975). Consumer loyalty to products and organizations also become a factor. For example, Apple generated a legendary customer experience, and every product yielded a consistent Apple experience (Moorman, 2018).

Hill (1988) affirmed that organizations differentiate themselves by establishing a low-cost position through economic lessons learned, economies of scale, and economies of scope. Hill combined the explored contingencies and developed a contingency theoretical framework affecting the compatibility of differentiation and low-cost. The major contingencies that firms consider are (a) ability to differentiate, (b) commitment of users to products of rival firms, (c) product market environment, (d) learning effects, (e) economies of scale, and (f) economies of scope. Hill stated, “More generally, the simultaneous pursuit of differentiation and low-cost strategies is most likely to be consistent with superior performance in mature industries where all experience curve economies have been exhausted and several firms have achieved a minimum-cost position” (p. 411). The contingency theoretical framework presented by Hill argued that BRT projects can achieve low-cost strategies in a mature construction industry.

Unfortunately, the construction industry of BRT projects in the United States is still considered to be a relatively new industry.

The subsequent year, Weill and Olson (1989) published a study focused on exploring the use of contingency theory within the field of management information systems. The paper explored 177 articles and found that over 70% of the articles were judged using a contingency model (Weill & Olson, 1989). The general contingency theory approach implemented in the paper derived from Kast and Rosenzweig (1973): "The contingency approach attempts to understand the interrelationships within and among organizational subsystems as well as between the organizational system as an entity and its environment" (p. 60).

Weill and Olson (1989) argued that contingency theory has important underlying assumptions. The first assumption is that if there are strong correlations between contingency variables, this means the performance of the organization increased. The second assumption of contingency theory is that performance may not be measured in a study. The third assumption is "If critical variables requiring fit were known, organizational decision makers would adapt the organization to a better fit" (Weill & Olson, 1989, p. 61). These assumptions impact the outcome of a study and the efficiency of a project or process.

Weill and Olson (1989) determined four major criticisms related to the implementation of contingency theory within management information systems. The four critiques were "1. Use of naive metatheory, 2. Conflicting empirical results from studies measuring similar constructs; low correlations, 3. Ill-defined concepts of fit and performance, and 4. Narrow perspective of researchers" (Weill & Olson, 1989, p. 67).

The study recommended recognizing the need to use a less functional and subjective approach when exploring management information systems. Rather than using a quantitative contingency theory approach, researchers sought to complete qualitative case studies. The recommendation from Weill and Olson (1989) was taken into consideration when developing the qualitative research approach of this study.

Arinze (1991) completed a study focused on exploring a contingency model within a Decision Support System (DSS). A DSS is a computer program that supports determinations, judgements, and actions for organizations. The study analyzed various methodologies used to analyze and provide insight of DSS. Arinze (1991) explored the contingency theory model using two manufacturing scenarios.

The first scenario focused on a manufacturing company that had limited experience with transaction-based systems. The manufacturing company relied on traditional money-back coupons for promoting their products. The second scenario presented the manufacturing company with poor sales performances. The company president was asked to develop a DSS to improve the interface between production and marketing (Arinze, 1991).

The study recommended developing a DSS using contingency theory with predetermined guidelines and stages. This simplified the decision-making process as the manufacturing company sought to improve their sales using DSS. Further research of DSS was recommended to help implement, maintain, and integrate contingency theory within the organization. The framework of continency theory "is through to offer developers assistance in matching existing DSS methodologies to the encountered problem context" (Arinze, 1991, p. 164). Arinze (1991) argued that the contingency

theory framework can develop software systems-focused decision-making processes for organizations.

Two years later, Tomaskovic-Devey and Risman (1993) published a study exploring contingency theory and labor process changes in organizations. The study developed a contingency theory model focused on organizations reorganizing because of telecommuting (Tomaskovic-Devey & Risman, 1993). Because of the ambiguous environment of telecommuting, the contingency theory model included a series of interactions between management, employee, and organizational constraints (Tomaskovic-Devey & Risman, 1993). The study determined that smaller organizations with less bureaucracy tend to pursue more organizational constraints. Tomaskovic-Devey and Risman rejected the notion that primary managerial constraints are due to technological factors. Instead, managerial constraints come from the organizational motives and the status of the employees (Tomaskovic-Devey & Risman, 1993).

The study also argued that if employees give a voice, the organization and managers push toward innovative solutions that enhance productivity. The study revealed that innovation is the primary organizational constraint. The style of innovation is closely tied to the power and status of the jobs. Tomaskovic-Devey and Risman (1993) stated, "Both innovation and the character of the labor process are best seen as contingent on multiple and interacting organizational, managerial, and employee characteristics" (p. 382). Restructuring organizations because of telecommuting is contingent on organizational constraints and the power given to employees. Tomaskovic-Devey and Risman added, "Technology's effects on the labor process itself are contingent primarily on managerial goals and worker power and status" (p. 383).

The subsequent year, the U.S. General Accounting Office (GAO) completed a study focused on contingency and institutional theory perspectives (Gupta et al., 1994). The study used contingency and institutional theory to develop and test hypotheses of 96 audit teams within the U.S. GAO. The study determined that contingency theory focuses on the environment and technical nature of work GAO members perform. The more institutional the environment, the greater the organization relies on bureaucratic control (Gupta et al., 1994).

Contingency theory revealed the greater the task difficulty, the more the organization relies on personal and group modes of control. When projects confront difficult tasks, the performance is contingent on the modes of control enacted on the team (Gupta et al., 1994). The study contended that an organization within an institutional environment can perform by executing a bureaucratic contingency framework.

In 2002, Alford offered a study that explored the conceptualization of the factors inducing client coproduction. The factors were acquired using evidence from four Australian public-sector case studies. The study considered the distinctions between citizens, volunteers, and clients along with a review of the research to date on their respective motivations to coproduce (Alford, 2002). Alford stated, "The focus of this analysis is on the clients of government organizations, who are not the same as citizens or volunteers" (p. 33). Clients generally have a more direct interest in their relationship with the government organization.

According to Alford (2002), "Although the issue of what motivates clients to coproduce public services has received very limited consideration, there is a substantial literature concerning the factors inducing citizens and volunteers to do so" (p. 35). The

first case study explored the contributions of the Australian postal service. The Australian Postal Service provided optical character recognition machines in mail-sorting centers that eliminated much of the work done by 3,000 mail-sorting staff (Alford, 2002). For the machines to pay off for the postal service, customers had to write the addresses in a particular way. Alford stated, "In other words, a prerequisite to meeting customer's expectations of faster and cheaper delivery was that they write postcodes in a particular way" (p. 37). The postal service persuaded stationery manufacturers to print four small squares that guided customers to enter the addresses correctly.

The second case study explored the long-term unemployed clients of Australia's Department of Employment, Education and Training. The department learned that many of the programs could not attract job seekers to employers unless their clients also invested some time and effort (Alford, 2002). The department learned that clients must be ready to work and willing to accept job offers. The third case study explored the high-rise, public housing tenants in the Australian state of Victoria. According to surveys, the tenants wanted facilities that were in a reasonable state of repair, secure, and in a clean environment (Alford, 2002). The case study revealed that the tenants themselves had to contribute to the facilities. Alford (2002) stated, "Specifically, ministry staff cannot reduce elevator breakdowns unless some tenants take more care of these facilities" (p. 39). Communities applied behavioral norms and voluntary organizations to help secure and clean up their environment.

The fourth and final case study was related to the Australian Taxation Office (ATO), which oversaw the obligation of taxpayers across the country. Alford (2002) stated, "In the case of taxation, compliance is not just a matter of citizens refraining from

illegal actions such as deposition money in false bank accounts. It necessarily entails positive actions by taxpayers, especially in submitting tax returns" (p. 39). The ATO simplified the tax system and aided ordinary taxpayers to ensure a higher rate of compliance. The result was a measurable increase in tax revenue between 1986 and 1990 (Management Improvement and Evaluation Branch, 1989).

The four case studies presented by Alford (2002) demonstrated that the willingness of a client to coproduce was difficult to foster through economic exchange. Alford (2002) stated, "But when the task calls for extra-contractual favors, involving the exercise of discretion, tacit knowledge, or additional enthusiasm by the client, the requisite level and intensity of willingness will not be elicited by precise calculation of reciprocity" (p. 44). Public-sector clients are likely to respond to nonmaterial and intrinsic rewards. Alford added, "By doing these things, government is appealing to expressive values concerning collective purposes and distributive justice" (p. 46).

The four case studies presented by Alford (2002) could use a two-dimensional approach of contingencies for different types of incentives for client coproduction. The first dimension was whether the coproduction workload was considered simple or complex. The second-dimension concerned whether the value consumed was individual, group or public (Alford, 2002). The study revealed that it was difficult for government entities to deliver services without contributions by clients. Alford (2002) stated, "In these situations, the work of government agencies is not only to provide services or apply legal sanctions but also to encourage clients to engage in co-productive work" (p. 51). The study revealed that the more public the value for the consumers, the more complex the motivations are for coproduction.

In 2003, Christensen and Yoshimi completed a study that focused on new public management and contingency theory. The study explored two case studies from governments in Australia and Japan. The first case study explored the Australian New South Wales (NSW) second-tier government, which was the largest in population and wealth. Christensen and Yoshimi stated, "In terms of performance reporting, the NSW case is one of adoption of a new technology: service efforts and accomplishments (SEA) reporting" (pp. 73-74). NSW embarked on SEA reporting in 1996 under a special project by the Council on the Cost of Government (NSW COCOG, 1996).

The SEA moved forward with the special project by compiling almost 4,500 indicators in the first round. The indicators provided measurements for potential improvements and possible data problems in the reports. Christensen and Yoshimi (2003) stated, "In December 2001 a second series of SEA data was published for 12 areas of government with comparative data over the previous five years" (p. 74). The reports provided mixed success results across NSW. There was a danger that agency managers altered their work practices to artificially report improved performance (Christensen & Yoshimi, 2003).

The second case study explored the Hokkaido second tier of government that was based on prefectures in Japan. According to Christensen and Yoshimi (2003), "Hokkaido Prefecture covers the whole island and so the Hokkaido Government governs the largest land mass of any second tier government" (pp. 75-76). Hokkaido experienced two serious problems. The first problem was the lack of transparency of the accounting information from the government to the citizens. The second-tier government only provided 10 available hard copies of the accounting information within the administrative

information office. Christensen and Yoshimi stated, “As a result, most Hokkaido residents cannot get this brochure; indeed, most are not aware of its existence even though it is widely distributed within the Hokkaido public sector” (p. 76).

The second problem was the lack of transparency on the use of public funds for development projects. The lack of transparency made it difficult for the public to gauge the effectiveness of the investments of the public funds within the development projects. Christensen and Yoshimi (2003) stated, “Some of them are obviously not effective, but there has been no system to stop or reconsider the projects” (p. 76). The Hokkaido government introduced an initiative called time assessment in 1997. Time assessment called for checking, reevaluating, and changing measures. Once the government used the initiative, they assessed future projects using three criteria: (a) priority of the project, (b) awareness of the local citizens concerning the project, and (c) existence of alternative projects (Christensen & Yoshimi, 2003).

The importance of time assessment for Hokkaido and the Japanese experience was that governments recognize accountability. The Hokkaido government established a policy assessment to cover all expenditure programs and government funds. Christensen and Yoshimi (2003) recommended that the Hokkaido government cease funding five organizations and improve the operations of eight organizations. The Hokkaido government took the initiative to complete a comprehensive self-assessment while seeking ways to improve transparency with their citizens.

Both case studies revealed a need of improvement because of the falling level of trust between the government and citizens. There were several differences between the Australian and Japanese case studies. The changes administered in the Australian

second-tier government took more effort than the changes processed by the Japanese government. The study provided a brief view of the new public management approach through the lens of a contingency model. The contingency model of accounting innovation posited that the interactions between four modules explain the change: stimuli, structural variables of information users, structural variables of information producers, and implementation barriers (Luder, 1992). Christensen and Yoshimi (2003) suggested that there were apparent relationships between the variables, but the interactions and relative strength between the variables were uncertain.

The contingency model was used to explore the role of professional bodies as a stimulus for change (Christensen & Yoshimi, 2003). The study recommended future research focused on consultants and understood changed performance reporting within NSW and Hokkaido. Christensen and Yoshimi (2003) argued that contingency theory strengthens the understanding of complex relationships.

In 2005, Sillince published an article proposing a theory of rhetorical congruence. The article began with a definition of structural contingency theory. According to Donaldson (2001), structural contingency theory suggests an association between contingency and organizational structures. Contingencies help to determine organization structures and higher performance if contingencies are built in at different levels of organizational structures (Donaldson, 2001).

The article proposed a theory of rhetorical congruence that assists an organization in developing strategies and structures that fit with environmental contingencies. Sillince (2005) stated, “Under conditions of uncertainty, adaptations by the firm that increase structural differentiation are unlikely to succeed if they are not accompanied by the

rhetorical processes of emphasizing context and switching perspective" (p. 609). The article pointed out four common rhetorical processes faced by organizations: (a) emphasizing context, (b) switching perspective, (c) creating consistency, and (d) creating purpose. Rhetorical contingency claims that structure and strategy determine the performance of an organization (Sillince, 2005). Sillince stated, "That is top management coalitions use certain types of rhetorical processes in particular circumstances, they will achieve what contingency theorists have predicted" (p. 616).

The article developed a theory that when an organizational structure seeks to change, the organization should consider the accompanying rhetoric. The change includes rhetoric surrounding changes to resources, organizational charts, roles, responsibilities, and environmental integration. Sillince (2005) stated, "Rhetoric for integration would have to be followed with those differentiation, and vice versa, if the firm was to be effective and efficient over time" (p. 618). Rhetorical contingencies have the potential to impact the performance of organizations and processes of projects.

The following year, Ketokivi (2006) published a paper that developed a theoretical and empirical understanding of task-environmental contingencies that may either enable or constrain various flexibility strategies. Gerwin's flexibility strategies of storage, adaptation, reduction, and redefinition were in the study Ketokivi (2006). Ketokivi stated, "Gerwin's key argument is that flexibility is required, no matter what the strategic orientation of the company, to adapt to conditions of increasing uncertainty" (p. 216). Ketokivi explored a case study focused on Consolidated Metals Corporation (CMC). CMC was a multinational manufacturer of metal parts and components with annual sales of $2.0 billion in 2003.

General contingency theory framework helped collect the primary data from CMC in Ketoviki's (2006) study. The study used Gerwin's flexibility strategies, corporate strategies, demand, customer expectations and manufacturing flexibilities as contingencies. The observations from the case study revealed that managers at CMC were trying to close their systems to protect variability in their environments. The actions taken by managers had the potential to impact the entire corporate environment.

CMC corporate management understood that plants with similar flexibility strategies collaborate by benchmarking each other's production planning and control systems (Ketokivi, 2006). The study revealed that very few flexibility strategies are available in all the plants. Open and constant communication between managers assisted with allocating strategic corporate resources. Strategic corporate resources helped develop the flexibility that was beneficial to multiple plants. Ketokivi (2006) demonstrated that BRT projects develop and implement flexibility strategies that assist multiple processes during construction.

In 2008, a study explored the critical survival practices by local Malaysian construction companies during times of crisis (Bakar et al., 2008). Bakar et al. (2008) stated, "The objective of this paper is to determine survival strategies by evaluating the success factors practices by local companies" (p. 1227). Many industries, including construction, sought more efficient methods to survive the challenging markets. The data gathered for the study ranged from 1974 to 2005 and included the following variables: (a) joint ventures, (b) market specialization, (c) good company management, (d) diversity expertise, (e) skill workers, (f) quality of products, (g) technical expertise, (h) good financial backing, (i) internal efficiency, (j) good cash flow management, and (k) flexible

structures. The researchers determined that contingency theory was practiced more in a strategic management manner and not using a contingency perspective (Bakar et al., 2008). There were little to no in-depth studies that explored contingency theory for construction companies in Malaysia. The study concluded that researchers should identify and determine the practice of contingency theory for construction companies in Malaysia and abroad during times of uncertainties.

The following year, Figueiredo and Kitson (2009) published a study focused on defining the risk and contingencies of large pipeline projects. Similar to BRT projects, pipeline projects are linear and often stretch through multiple communities and regions. The study asserted global economic conditions impact large pipeline projects. In particular, the budget of pipeline projects is contingent on the price of steel and steel fabrication (Figueiredo & Kitson, 2009). Figueiredo and Kitson stated, "The identification of the risks involved in such projects is essential to ensure accurate information is available to base critical financial decisions as well as to minimize exposure to potential adverse impacts" (p. RISK.08.1).

The general conceptual formula calculated risk levels in construction projects by multiplying the probability and the impact. The formula determined risk levels before the construction of pipeline projects. Figueiredo and Kitson (2009) stated, "Risk can be mitigated by reducing or eliminating either the probability of occurrence or the impact if the event occurs" (p. RISK.08.2).

A risk manager sought project-specific risks by exploring the activities, resources, and components during the design and construction phases. Figueiredo and Kitson (2009) stated, "Best practice historical data shows that projects that use no risk

assessment experience an increase in variable cost growth, the execution schedule can become longer, they may experience start-up problems, and technical problems are more likely to arise" (p. RISK.08.6). Estimated contingencies are crucial in the risk management process. As a project progresses in the design and procurement stage, a project narrows the scope, schedule, and estimate. The contingency budget is expended during the design and procurement stage and used to control risk responses (Figueiredo & Kitson, 2009). The risk management process for pipeline projects was an integral step in outlining possible risks and contingencies. The lesson learned from the study was that effective strategic planning in risk management and contingencies helped maximize opportunities during construction.

In 2011, Lizarralde et al. published a study that explored contingency theory within the building sector. The building construction sector involves temporary multidimensional organizations. Temporary multidimensional organizations have four dimensions. The first dimension is the internal structure of the client organization (S. D. Green, 1996). The second dimension is the informal groups or teams within organizations, including internal pressure groups and communications (Mintzberg, 1979). The third dimension is the level of authority of actors within the organizations and across the project team (Walker, 2007). The fourth dimension is the relations between organizations (Jones & Lichtenstein, 2008). The study implemented an empirical approach and analyzed 27 construction cases that finished within the previous 10 years.

Lizarralde et al. (2011) analyzed the cases with a micro and macrolevel approach. They explored contingency factors that determined dynamic structuring of projects and the influence of contingency factors in the dynamic structuring. The study revealed four

findings: (a) The interfaces of authority and those of communication are not always identical (Dainty et al., 2006), (b) Actors play different roles within the project team (D. Moore, 2002), (c) Roles tend to change during the project (Boutinet, 1990, 2004; de Blois & DeConinck, 2009), and (d) Two types of organizational structures often coexist, the formal and informal. Organizational structures and actual formal and informal communication units and channels identify organizations.

Lizarralde et al. (2011) also stated that contingency theory has five setbacks. The first setback is that contingency theory assumes an oversimplified cause-and-effect relationship between the factors and dependent variables (Donaldson, 2001). The second setback states the relationships between variables are often considered linear and their effects symmetrical (Schoonhoven, 1981). Although some relationships between technology, structure, environment, and effectiveness may be linear, others are curvilinear (Savolainen, 1999). The third setback is the increased complexity of cause-and-effect relationships when multiple contingencies and effectiveness are considered (Betts, 2003). The fourth setback states that interactions and trade-offs might not fully capture the environment (Gresov, 1989). The final setback of contingency theory is the lack of clarity in the concept of "fitness" between the structure and the context is criticized (Daft, 1992; Rouleau, 2007).

The same year, Pires da Cruz et al. (2011) published an article focused on Fiedler's contingency theory. The study presented considerations about leadership using the contingency perspective and Fiedler's contingency theory (Pires da Cruz et al., 2011). The participants were board members, members in charge, humanitarian, and sports

leaders. To improve effectiveness in the study, the researchers integrated the participants and gave them responsibilities.

Pires da Cruz et al. (2011) revealed that contingency theory emphasizes the importance of adjusting between leadership style and situations. The researchers made the argument that efficient and inefficient leaders do not exist. Anyone can be a leader if they carefully select situations that adjust to their leadership style. The study determined that organizations could alter situations to the leader's style. The alteration increases or decreases the leader's formal authority or alters the task structure. These changes influence the relationship between leaders and organization members. Pires da Cruz et al. recommended future research integrated using the LPC approach and practical applications of Fiedler's model. Fiedler's model can be used to explore future leadership studies in the public transportation and transit sector.

Two years later, Elgharbawy and Abdel-Kader (2013) completed a study that developed a conceptual model for enterprise governance (EG) using contingency theory. Elgharbawy and Abdel-Kader stated, "Corporate governance (CG) received much attention because of the wave of financial scandals in the early 2000s and the more recent global financial crisis" (p. 99). The literature suggested a potential trade-off or tension between the conformance and performance dimensions of governance. Strain arose because the board of directors was required to play a dual role and acted in two different ways (Cornforth, 2004). The study addressed the tension between conformance and performance in the governance context.

The model presented in the study built on the notion that organizational performance represents the outcome of an interaction between accountability and

enterprise (Short et al., 1999). The model draws on the premise of contingency-based studies in management accounting (Abdel-Kader & Luther, 2008; Chenhall, 2007). The basic notion of contingency theory is that organizational performance is an outcome of the relationship between the environment, structure, and contingency factors. Elgharbawy and Abdel-Kader (2013) presented a contingency model that incorporated four contingencies: (a) environmental uncertainty, (b) strategy, (c) company size, and (d) agency conflicts.

Environmental uncertainty was an early and valuable factor developed within contingency theory models. Care should be considered when interpreting the results of various studies that examine the effect of the external environments on management accounting systems (Abdel-Kader & Luther, 2008). The study recommended considering value-based management and corporate entrepreneurship approach when developing a competitive atmosphere during a relatively high level of uncertainty (Elgharbawy & Abdel-Kader, 2013).

The study explored strategy as a contingent relationship within the contingency model. In many cases, organizations focus on strategies to find ways to control the cost and increase efficiency. Elgharbawy and Abdel-Kader (2013) stated, "It has been argued that cost leadership strategy is not positively associated with new product development and higher performance" (p. 113). Organizations that tend to be entrepreneurial minded are more appropriate to implement a value-based management approach. An entrepreneurial perspective permits organizations to consider and develop innovative ideas and decisions. A fit between strategy and corporate entrepreneurship has been

argued to be an important predictor of business success and improved performance (Miller, 1986; Zahra, 1991).

The size of an organization is an important factor within the contingency model. The study proposed that value-based management implementation is likely to be associated with large size companies. Elgharbawy and Abdel-Kader (2013) stated, "Company size has been related to the strength of corporate governance structure and the level of compliance of corporate governance codes" (p. 114). Corporate governance allows a company to set clear expectations, boundaries, and compliance throughout the organization. The study proposed that the strength of corporate governance structure is positively associated with company size (Elgharbawy & Abdel-Kader, 2013). Meanwhile, an organization that is recognized to corporate entrepreneurship is generally associated with smaller company size. A smaller company is associated with higher organizational performance and corporate entrepreneurship (Elgharbawy & Abdel-Kader, 2013).

The last contingency within the model is agency conflicts. Agency conflicts arise from the misalignment between the interests of owners and managers of a company, resulting in the separation between ownership and control (Elgharbawy & Abdel-Kader, 2013). The higher the agency conflicts, the more the demand increases for oversight and control mechanisms to align the conflicting interests (Dey, 2008). Agency conflicts are likely to be positively related to the strength of the corporate governance structure within the organization. Agency conflicts have the potential to create higher agency costs. Agency costs exhaust a company's resources and constrain innovation and corporate entrepreneurship (Miller, 2011).

The study utilized contingency theory to develop associations between four contingency factors, value-based management, corporate governance, and corporate entrepreneurship. The developed model suggests that a fit between the contingencies strengthens corporate governance structure, improves corporate entrepreneurship, and achieves a high level of organizational performance (Elgharbawy & Abdel-Kader, 2013). The information lacked empirical examination, limiting the study. The study recommended future research using empirical evidence to strengthen the relationship between the four contingencies: (a) environmental uncertainty, (b) strategy, (c) company size, and (d) agency conflicts.

In 2013, Deng and Smyth (2013) published a study examining the development of contingency thinking. The study included analyzing theoretical and analytical issues during the application of contingency thinking and measurement of firm performance within construction. The contingency theory approach proposes that organizational performance is a fit between a set of contingencies. The contingencies include structure, people, technology, strategy, and culture. Deng and Smyth stated, "This approach has been adopted implicitly and increasingly by construction management (CM) researchers" (p. 1). The study analyzed and explored American, Chinese, and Turkish construction firms: "The traditional performance indicators of projects—cost, quality, and schedule—are widely adopted to analyze project performance at the corporate level, showing the importance of the project performance and project management competencies" (Deng & Smyth, 2013, p. 7).

The study concluded that contingency theory is meaningful for construction management and is very promising for future explorations (Deng & Smyth, 2013). The

study recommended that contingency theory explore the relationship between organizational structures, environmental factors, and traditional performance measures during construction. Deng and Smyth (2013) stated, "Contingency approach has significant potential in context of construction, which involves a turbulent business environment and a number of various participants" (p. 11). The business environment of construction projects has adversarial relationships, fragmented operation processes, a lack of genuine cooperation over time, and complexity (Xue & Qiping, 2010).

The study recommended that future studies select a few appropriate performance indicators that are not ambiguous and occur at a project level within construction. Deng and Smyth (2013) stated, "Data source available should be consistent with indicator selection, and more importantly, relevant methodological issues should be considered seriously in different approaches of performance operationalization" (p. 11).

McGrandle (2017) published a paper that sought to develop contingency theory as a theoretical framework for examining and explaining different diversity management practices across governments. The study compared diversity management practices in two Canadian provinces, Ontario and Prince Edward Island (PEI). According to contingency theory, the internal and external environments of each organization create unique situations that require programs tailored to their distinctiveness to achieve optimal functionality (McGrandle, 2017). The study recognized that diversity management research lacks a theoretical foundation. Contingency theory is an appropriate theoretical framework that can be used to understand and improve decision making in times of uncertainty.

There are various definitions used for diversity management. Narrower definitions typically center on recruitment procedures representative of past affirmative action and equal employment opportunity (EEO) practices, with a focus only on larger social groups (Bleijenbergh et al., 2010; Sippola & Smale, 2007). Diversity management has definitions that stem from human rights and moral obligations to achieve equality within the organization. Human resource management scholars have demonstrated the importance of supporting the concept through a theoretical framework.

According to Kast and Rosenzweig (1973), the contingency view seeks to understand the interrelationships within subsystems and between the organization and its environment. Defining relationships and variables helps in understanding contingency views. McGrandle (2017) stated, "Essentially, contingency theory argues that there is no one optimal method for designing and managing organizations" (p. 528). Contingency theory provides an understanding of how job design and classifications link within diversity management. Contingency theory variables are a product of their internal and external environments (Hanson, 1979). The advantage of contingency theory is the ability to focus on environments to understand how the design and effectiveness of practices differ from organization to organization (P. Moore, 1985; Wadango & Abdel-Kader, 2014).

Ontario and PEI were both predominantly English-speaking provinces in Canada and were both bound by the same national and international legislation regarding human rights. The paper completed a comparison of diversity management practices of Ontario and PEI using document analysis. McGrandle (2017) stated,

> Ideally, document analysis in this case would be partnered with other research methods, such as surveys or interviews; but given the set of circumstances and the size of this work, document analysis is the most feasible comprehensive approach to comparing public sector diversity practices. (p. 529)

The purpose of the diversity management program in Ontario was to ensure that the organization achieved an all-inclusive, respectful, fair, and discrimination-free public service. In 2008, Ontario appointed a chief diversity officer to help inform and affect policies for the organization. In 2009, Ontario released a 3-year strategic plan to help achieve a diverse and inclusive organization. One year after the 3-year strategic plan, inclusion, diversity, equitability, and accessibility progressed (McGrandle, 2017). The organization consistently ranked as one of Canada's Best Diversity Employers, Canada's Top 100 Employers, Best Employer for New Canadians, and Canada's Top Employers for Canadians over 40 (Ontario Public Service Diversity Office [OPSDO], 2009).

PEI is Canada's smallest province in geographical size and population (Statistics Canada, 2006). PEI enacted its own Human Rights Acts in 1976, passed the Pay Equity Act in 1988, and in 1998 amended the Civil Services Act. PEI had four designated minority groups: (a) Aboriginal peoples, (b) members of visible minorities, (c) persons with disabilities, and (d) women in leadership and management. PEI added Public Service Week to recognize public servants and to try to celebrate diversity. McGrandle (2017) stated, "PEI acknowledges that there will need to be a change in the role of leadership, and that senior leaders are not integral to the implementation of diversity management" (p. 532).

McGrandle (2017) developed internal and external influencing variables for diversity management at Ontario and PEI using a contingency theory approach. McGrandle stated, “Internally influenced variables that will be used are size, geography, employee behavior, population demographics, and mission statement. External variables to be analyzed are history and political influence” (p. 532). When comparing both provinces, Ontario’s diversity management practices are much more developed with measurement tools and delineated goals and paths to them (McGrandle, 2017). In Ontario, legislation related to quotas do not work. The province learned the solution to diversity management was ensuring respect for everyone, not only minorities.

Despite the number of differences between Ontario and PEI, there were similarities. Both provinces administered their diversity management policy through a similar structure, they had diversity management mission statements, and they understood that diversity of individuals improved the public sector (McGrandle, 2017). McGrandle (2017) stated, “What this analysis reveals is that diversity management practices in Ontario and PEI differ greatly and have had varying levels of success in achieving an inclusive workforce” (p. 534). The paper recommended that future research of diversity management continue using the framework of contingency theory. McGrandle added, “Further studies using surveys or interviews could obtain more in-depth, quantifiable information, as well as establish more specific variables with which to compare cases” (p. 534).

The same year, P. Williams et al. (2017) completed a paper that presented a contingency theory framework and set of research propositions for customer relationship management (CRM). The contingency theory framework suggested that successful

adoption of CRM was contingent on five contextual factors. The factors acknowledged in the paper were: "customer selection process, channel governance, transaction costs, power distribution in marketing channels, and dynamic capabilities" (P. Williams et al., 2017, p. 454).

Much of the research related to successful implementation of CRM has identified a list of success factors and essential steps in the implementation process. P. Williams et al. (2017) stated, "Despite all the advice on how to implement CRM, the failures rates for FRM efforts remain perniciously high" (p. 454). Early organizational contingency theorists began to move away from the traditional management approaches of "one best way" to manage and structure organizations (p. 455). The theorists of contingency theory began to contend that the best structure was contingent upon environmental-structure-performance relationships. Williams stated, "The primary environmental factors that drew early attention were uncertainty, complexity, and competition. … The performance outcomes were typically efficiency, effectiveness and adaptiveness" (pp. 455-456).

Ziethaml et al. (1988) suggested that contingency theory was relevant to theory development and research in making strategy. Although few studies had used contingency theory approach to examine CRM, there was no framework unifying the approaches (P. Williams et al., 2017). The paper provided five key factors using the framework of contingency theory to determine the success/failure of CRM efforts. The first key and perhaps most significant factor was customer selection. Within this factor, the primary criteria tended to be revenue or profitability. P. Williams et al. (2017) stated, "Whether based on total revenue or profitability, the Pareto principle suggests that the 10-

20% of customers who generate the majority of revenue should be the target of CRM efforts" (p. 458).

Customer relationship orientation was a contributing factor that described customers' desire for a close, collaborative relationship with suppliers (P. Williams et al., 2017). For instance, Boeing Corporation's supply chain practices provided a good illustration of relationship orientation. Boeing Corporation outsourced most of the supply chain to provide value-added production initiatives. Boeing Corporation decided to work with fewer suppliers and improve relationship orientation among the chosen suppliers. This approach increased production and profitability for the company. The study presented the following proposition: "CRM is more appropriate for customers who are valuable and who want a closer relationship with the specific supplier" (P. Williams et al., 2017, p. 460).

The second factor was channel governance within an organization. Contracts and relational norms guided channel governance. P. Williams et al. (2017) stated, "If structured, more formal contracts exist between channel members, and these contracts do not explicitly address relationship marketing issues" (p. 462). The roles and expectations specified in a contract may act as a constraint to deepen information sharing and strengthen the CRM. The paper proposed that interfirm relationships governed by flexible contracts are more appropriate for CRM (P. Williams et al., 2017).

Supply chains played an integral part in the development of channel governance. P. Williams et al. (2017) stated, "Apple is clearly the leader in their supply chain, dictating in detail the behavior of all supplies. Over 80% (657) of Apple's suppliers are located in 16 clusters in Asia" (p. 465). Apple controlled the supply chain and generated

discounts on manufacturing and transportation costs. Organizations faced balancing human capital and physical resources. This included balancing human resources of experience, skills, knowledge, and teams along with organizational structures, culture, processes, control systems, brand, reputation, and financial resources (Barney, 1991; Eisenhardt & Martin, 2000). The fluidity of balancing resources led to the concept of dynamic capabilities.

Innovation emerged as a dominant issue in businesses to help balance corporate culture and strategy, processes, inputs, outcomes, products, and services (Rubera & Kirca, 2012). Many innovative suppliers tend to be specialized with deep knowledge on a specific subject matter. These innovative suppliers tend to be specialized to the customer (P. Williams et al., 2017). The paper provided context that many CRM scholars focused on the supplier's perspective. The proposed contingency theoretical framework sought to link variables within the adoption of CRM within organizations. The conceptual contingency theoretical framework and propositions can be used as a template for future research. P. Williams et al. (2017) stated, "Linking the strategic context of the supplier and the customer to CRM adoption require empirical validation" (p. 469).

Scientific Management Theory

The philosophy of efficiency arose from Fredrick Winslow Taylor, an American inventor and engineer. Taylor developed a theory called the scientific management theory (SMT). Taylor (1903) developed the *Shop Management* handbook for those interested in managing industrial enterprises and producing goods. Within the *Shop Management* handbook, Taylor argued that employees should clearly define daily tasks. He stated,

> Another and perhaps equally great advantage of assigning a daily task as against ordinary piece work lies in the fact that the success of good workman or the failure of a poor one is thereby daily and prominently called to the attention of the management. (pp. 69-70).

Taylor (1903) argued that organizations should consider standardized conditions and appliances. Standardization assists in accomplishing the daily tasks with certainty. Taylor stated, "It is useless to assign a task unless at the same time adequate measures are taken to enforce its accomplishment" (p. 70). Taylor (1911) recommended the following two principles in an organization: (a) high pay for success and (b) loss in case of failure. Both principles provide incentives and a large bonus for the successful performance of the task (Taylor, 1911).

Taylor (1911) recommended that organizations replace the rule of thumb or habits of accomplishing tasks using scientific management:

> Under scientific management, on the other hand, it becomes the duty and also the pleasure of those who are engages in the management not only to develop laws to replace rule of thumb, but also to teach impartially all of the workmen who are under them the quickest ways of working. (p. 54)

Taylor (1911) also pointed out that changes should slowly occur while verifying that all employees understand the new process. Taylor stated, "Until this single man has been thoroughly convinced that a great gain has come to him from the new method, no further change should be made" (pp. 69-70). Organizations should maintain consistent collaboration between the managers and employees.

Another take away from Taylor (1911) was that planning and training are invaluable techniques within an organization: “The man in the planning room, whose specialty under scientific management is planning ahead, invariably finds that the work can be done better and more economically by a subdivision of the labor” (p. 23). Both the managers and employees invest in training and development “so that he can do the highest class of work for which his natural abilities fit him” (p. 11).

Taylor developed the SMT “partly in response to a motivational problem, which at the time was called soldiering—the attempt among workers to do the least amount of work in the longest amount of time” (“Scientific Management,” 2009, p. 1). Myrick (2012) stated, “While Fredrick Taylor may not have purposefully set out to influence the course of Public Administration, the strive for alternative systematic management approaches to address foreman specific difficulties spilled over from the shop/production environment to the office environment” (p. 11).

The scientific management method was also the foundation of many of the principles implemented within lean construction. Staats and Upton (2011) stated, “By using the scientific method and having whoever caused an error fix it where and when it occurred, a knowledge organization can build a problem-solving engine that drives continual improvement” (p. 1). Lean construction focused on process improvements and analysis of data. The lean construction theory explored time and waste in motion and within organizations. According to LSU Online (2020), “Properly applying lean construction principles can significantly reduce or eliminate waiting and transport times. By reducing process waste, a construction firm can make processes more efficient and boost employee productivity, thus improving profits” (p. 1).

C. B. Thompson (1914) published a study that began with an exploration of the foundation of scientific management. Thompson stated, "Scientific management is not a theory to be applied to practice, but that it is first and primarily a practice out of which, many years after its beginning, a theory has developed" (p. 513). The primary finding of scientific management was the inability to attain a standard performance without standardized methods and equipment. After 20 years of experience, Frederick Taylor (2011) submitted his famous works *Shop Management* and *The Principles of Scientific Management*. Taylor developed four elements: (a) the development of a true science, (b) the scientific selection of the workman, (c) his scientific education and development, and (d) intimate friendly cooperation between the management and the men.

C. B. Thompson (1914) provided a brief exploration of the SMT within railroad transportation systems. The study pointed out differences in scientific management between manufacturing and railroads. For example, there were variances in activities and the nature of outputs. There were significant differences with the public, government, and labor union relations between manufacturing and railroads (C. B. Thompson, 1914). The study determined that railroad transportation systems installed scientific methods during construction. Thompson's (1914) study demonstrated the potential to implement scientific management methods within the public transit sector. The study unveiled that successful construction scientific managers cooperate with labor unions (Thompson, 1914). If an organization wishes to implement a scientific management approach, the organization must be prepared to commit time, money, and resources.

Two years later, C. B. Thompson (1916) published the "Relation of Scientific Management to Labor." He stated, "Scientific management in its best manifestations

may be distinguished from other types of management in that it proceeds on industrial principles which may be defined as generalized rules of conduct based on law" (p. 312). SMT recognizes important industrial concepts. The industrial concepts include maximizing output, lowering costs, raising wages, equitable distribution, and reducing unemployment (Thompson, 1916).

C. B. Thompson (1916) explored the relationship between labor unions and SMT. The study declared certain historic advantages in trade unionism, working conditions improvements, and the maintenance and raising of wages. Labor organizations were necessary for developing positive impacts in management. He stated, "Wherever positive management prevails, basic wages are maintained as a matter of expediency, and are raised by the extent of the bonus" (p. 331). Scientific management experts agreed paying employees the minimum wage helped accomplish the goal of the organization. If an organization wished to complete a project on time, the organization continued paying their employees a fair salary.

An organization that standardized conditions, payment of higher wages, and fair treatment of employees minimized the potential of labor union strikes (C. B. Thompson, 1916). Scientific management cannot be recognized as an industrial panacea. Thompson (1916) argued that organizations should incorporate positive management rather than SMT.

Positive management clarified the issues between labor and capital, reduced the number of possible disputes, and increased the possibility of arbitration (C. B. Thompson, 1916). C. B. Thompson (2016) stated, "Positive management goes further and increases

output by the mastery of the natural laws involved and by increasing human skill and control" (p. 344). The study recommends organizations consider positive management.

In 1922, Donham published the "Essential Groundwork for A Broad Executive Theory." Donham stated, "Within each industry competent leaders study their management problems constantly and each manager creates many precedents and practices which are the basis, consciously or unconsciously, of his own decisions" (p. 2). The study argued that industries should take the time to develop standards for executive decisions. Most executives had a lack of information and understanding of how other executives solve similar issues (Donham, 1922). The study provided examples of a few standard systems in accounting. The standardization of executive decisions has not taken place within the railroads and public utility sectors (Donham, 1922).

Donham's (1922) study revealed that technical development within the engineering industry failed to spread from one company to another. The study argued that a scientific methods approach was a good fit for comparative tests of business efficiency and an understanding of business theory. Donham stated, "Much of the material referred to which is published by private and governmental agencies needs further study and classification" (p. 2). Gathering sample data on executive decision-making processes was valuable. The researcher recorded the data, properly arranged the facts into series and relationships, and developed generalizations using the recorded facts (Donham, 1922). Scientific methods assisted with the understanding of executive decisions in the public transit sector.

Grambsch (1959) published a study that argued a considerable amount of empirical investigation was needed when dealing with organizations. In the study,

Mason Haire, a prominent psychologist and organization theorist, indicated a shortcoming in empirical data within organizations. Haire found little evidence of systematic collection of data about organizations (Grambsch, 1959).

Grambsch (1959) argued that Frederick Taylor and other founding groups of scientific management stopped too soon in their research about organizations. He stated, "We recognize now that further investigation, even in Taylor's time, might have come up with entirely different results" (p. 77). The study explored the options professional fields had to learn from the experience of Taylor. For example, in the field of medicine, empirical data was used to read and observe a body of principles and generalizations instead of individual cases (Grambsch, 1959).

The claim made by Grambsch (1959) was that professionals developed and tested a body of knowledge and generalizations similar to medicine. Grambsch stated, "As a next step it is important that we continue to work on the diagnostic skills needed for successful management" (p. 79). The basic philosophy of Taylor and scientific management was exploring the skill and decision-making processes within organizations. The study determined that scientific management was the foundation of empirical exploration within organizations and decision-making processes.

Hickey (1960) completed a publication that explored whether engineers could use the scientific method. According to the Hickey (1960), "A system is an assemblage of objects united by some form of regular interaction or interdependence, which collectively contributes toward an important and complex function" (p. 73). Engineers tend to allow systems to mature over time as innovations and techniques develop. Hickey stated, "The engineer may, in fact, adapt some elements of a natural process to his purpose, speeding

it up or eliminating undesirable collateral effects as required" (p. 74). Engineers use SMT as a foundation to help evaluate a system design.

Hickey (1960) claimed that systems should be evaluated by the merits and not solely on expert opinions. To ensure a strong prediction of system performance, the operators controlled the system (Hickey, 1960). In the sections where they encountered potential problems, the same operators should be involved. The study also established that the most effective evaluations occur in the field and not in a laboratory setting. Operators routinely experience motivations and stress. Before any changes or exceptions expedite the system, decision makers understand the logical sequence to satisfy system requirements (Hickey, 1960).

Sjoholt (2001) further analyzed SMT in the construction industry. The study described how industrial management, which included SMT, originated in the 1900s and was eventually adopted within the construction industry in 1950. Sjoholt (2001) concluded that the construction industry was more than ever dependent on using all the knowledge when positively involving individuals to adopt and implement new instruments. The construction industry accessed the knowledge available about principles of SMT from previous decades.

In 2007, Darmody (2007) published a study focused on Taylor and Gantt. According to Darmody, Frederick Taylor also worked with Henry L. Gantt to study and develop the scientific management method. Both Taylor and Gantt were mechanical engineers who studied theory, but both believed in integrating experience with data while developing the concept of scientific management (Darmody, 2007). The basic information reporting of Gantt's charts served as the foundation of PERT charts and

CPM schedules that were commonly used within the construction industry. Gantt charts, PERT charts, and CPM schedules were the most common tools used to monitor schedules in construction. Taylor and Gantt laid the foundation for modern society within the construction industry (Darmody, 2007). The study revealed that Taylor and Gantt's ideas impacted the methodology and tools in the construction industry.

In 2010, Rutgers and van der Meer published a study focused on providing a historical perspective on the concept of efficiency. Rutgers and van der Meer (2010) argued that efficiency originated in Aristotelian ideas about casualty and acquired a broad, substantive meaning of moving force. The study stated that efficiency comprehensively embodies the core value of public administrators (Rutgers & van der Meer, 2010). Efficiency allows public administrators to become operative agents who can produce the desired values. Public administrators seek out efficiencies at both the project and organizational levels.

In 2012, Myrick (2012) published a study with the initial aim to investigate the extent to which Frederick Taylor influenced public administration. The study stated that Taylor influenced public administration through the SMT and principles of Taylorism (Myrick, 2012). The publication revealed that Morris Cooke approached the analysis of work by purposely differentiating public and private goals. Myrick (2012) analyzed "the relationships or significance between diversity, representation, and performance among teachers, administrators, and students, while segmenting variables heterogeneously by Black, Latino, White, Asian and Indian races" (p.16). The study tested the impact of diversity on organizational performance using the statistical technique of multiple regression. Myrick (2012) concluded that Morris Cooke preceded Woodrow Wilson as

the ultimate proponent and perhaps the founding father of public administration. Cooke assisted in developing a link between scientific management and public administration.

Manzoor (2014) published an article focused on efficiency as defined in public administration over the years. The study predicted the meaning of efficiency and the role in the future within public administration. According to Manzoor, running governments efficiently within the new dynamics required a balance of information and communications technologies and human resource development (Denhardt, 1999). Manzoor (2014) argued that efficiency will become apparent if the organization balances information sharing, communications with internal and external stakeholders, and continual development of the staff.

Public Transportation Construction Schedules

P. P. Kumar (2005) published a journal focusing on the effective use of Gantt charts in large-scale projects. According to Kumar, one of the most complex challenges confronted by project managers is controlling cost and project schedule overruns. A project requires a well-organized planning and cost control system. Kumar emphasized that keeping a project on schedule and within the budgeted cost requires an emphasis on the technical, organizational, monitoring, measuring, and assessing skills of a project manager. Kumar stated, "The Gantt Chart can be considered to be the perfect tool to manage a project of any size and magnitude" (p. 21). The author recommended that project managers of large-scale projects including public transit projects, should consider integrating Gantt charts.

Singh (2010) completed a study based on 894 projects from 17 infrastructure sectors within India. The goal of the study was to "attempt to answer certain important

questions on time and cost overruns in public-funded infrastructure projects" (Singh, 2010, p. 43). Delays and cost overruns typically had significant impacts from an economic and political perspective (Singh, 2010). The study compared delays and cost overruns in the percentage of time and budget to each project. Singh stated, "The magnitudes of cost overruns seem to have come down over the years" (p. 45).

Estimating the cost and schedule of infrastructure projects can be complicated: "For example, during the construction phase of a road project, an unexpectedly poor quality of soil may necessitate changes in the engineering, the design and the quality of bitumen required" (Singh, 2010, p. 47). Large infrastructure projects took the time to plan, develop estimates and provide a thorough initial contract. Singh (2010) added, "If project planning is sloppy, the greater the project size and its complexity, the higher will be the proportion of project works that gets left out of the initial contract, and the larger will be the cost overruns" (p. 47).

Infrastructure projects required constant collaboration between parties. Infrastructure projects faced the consequences of organizational failures (Singh, 2010). Singh (2010) stated, "For example, project implementation, shifting of power lines, water lines, sewer lines, cutting of trees, environmental clearances and other such activities are performed by different departments" (p. 49). The study demonstrated that economic and political influences play a role in infrastructure projects. Infrastructure projects were typically executed in a state that had better transport, power, and telecommunication infrastructure in place (Singh, 2010).

Singh (2010) uncovered six primary findings from the analysis. First, over the previous 3 decades, there had been proof of learning-by-doing among government

officials involved in project planning and implementation (Singh, 2010). The second finding was that policy measures should promptly approve contracts and implementation of infrastructure projects. Infrastructure projects depended on the support of bureaucratic forces. Singh (2010) stated, "The third and fourth findings, along with the analysis show that due to imperfect techniques and contractual incompleteness some delays and cost overruns are inevitable" (p. 52).

The fifth finding was that organizational failures impact the project implementation process and the schedule of infrastructure projects. Singh (2010) stated, "It is widely known that contract management during the construction phase is very important if delays are to be avoided" (p. 52). The final finding was that performance of infrastructure projects in wealthier states was not necessarily better when compared to the rest of the country in India. The study uncovered that there are still issues with cost overruns and schedules across the country. Singh (2010) recommended that sector-specific research occur focused on delays and cost overruns within infrastructure projects.

Elkind (2014) developed a study at the University of California, Los Angeles exploring some of the reasons behind planning and construction delays within the public transit sector in California. The study researched the escalating costs for major public transit projects, including rail and BRT systems. According to Elkind (2014), further innovation was necessary to decrease planning and construction timelines and costs. The study determined that "Federal and State leaders should offer incentives to local governments to implement more bus-only lanes on existing Right-of-Way" (Elkind, 2014, p. 8). The recommendation provided by Elkind (2014) mitigated potential

environmental and ROW risks. If BRT projects in United States minimize the need to acquire ROW, this reduces risks during the construction of BRT systems.

Aubry and Brunet (2016) completed a study focused on advancing scientific knowledge about organizational design while facing the management of multiple projects. Not surprisingly, administering projects was a common issue that many public transit agencies faced. The study "took place within a national government, where it had a unique opportunity to provide some input for reflective practitioners" (Aubry & Brunet, 2016, p. 111). Aubry and Brunet (2016) integrated the following variables within the study: (a) factors of project management performance, (b) portfolio, (c) methodologies, (d) organizational learning, (e) collaboration and communication, and (f) special tasks.

The researchers implemented an empirical approach while analyzing the data. Because of higher costs and longer duration, a different project management framework for engineering and construction was warranted. Project managers within the public transit sector are typically engaged the least compared to other public sectors (Aubry & Brunet, 2016). Successful project managers of BRT projects should be prepared for modifications to anticipate the changing construction environment.

The following year, the Committee on Environment and Public Works in the U.S. Senate completed a public hearing regarding Infrastructure Project Streamline and Efficiency. The goal of the public hearing was to share best practices and find ways to achieve faster, better, and cheaper results on large public infrastructure projects (*Infrastructure Project Streamlining and Efficiency* hearing, 2017). The public hearing provided a lot of relevant and valuable information on the delivery of federal highway and public transit systems throughout the country. In the hearing, John Porcari, President

of U.S. Advisory Services for WSP Parsons Brinckerhoff, stated that many of the issues that hold up large infrastructure projects are not legislative. For a public transportation and transit project to be completed on time, the project should have passionate advocates from external and internal stakeholders (*Infrastructure Project Streamlining and Efficiency* hearing, 2017). These advocates are elected officials from the region and project professionals. Second, the primary responsibility for delivering large infrastructure projects lies within each state and not the federal government. For example, many of the responsibilities are delegated to the state of California (*Infrastructure Project Streamlining and Efficiency* hearing, 2017). This permits public transportation and transit projects to save time throughout the planning, environmental, and construction phases.

Yamaura and Muench (2018) published an article that focused on the impacts of mobile technology in public transportation projects. The study focused on exploring how technology improves efficiency when completing field inspections of public transportation infrastructure projects. In general, project inspectors spend nearly half their shift out on the field, collecting inspection information. During the remaining portion of their shift, field inspectors reference plans and specifications and develop field inspection paperwork (Yamaura & Muench, 2018). The article investigated how a cloud-based mobile technology application improved field inspection productivity and inspection workflow processes. The technology was "piloted within the Washington, Minnesota, and Texas State Department of Transportation on 31 projects over a 3-month time span" (Yamaura & Muench, 2018, p. 55).

Yamaura and Stephen (2018) uncovered the fact that project construction inspectors using mobile technology significantly increased their productivity. The increase in productivity included collecting large quantities of data, consistency among the reports, improved inspector daily reports, provided data security and searchability and allowed multiple users to view the same information (Yamaura & Muench, 2018). The field inspector technology improved communication during construction and limited the number of claims in the field. The study recommended that future public transportation projects integrate the field inspector technology during construction.

Public Transportation Construction Budgets

Jarzab et al. (2002) published an article focused on observing and exploring the characteristics and current applications of BRT projects. The observations provided a comparison between BRT and Light Rail systems (Jarzab et al., 2002). In general, BRT projects can be completed using various phases or contracts. Splitting the project into multiple phases provides the BRT system flexibility during construction and flexibility once the system enters revenue service.

Public officials view BRT system flexibility as a drawback. The permanent features of LRT systems and rail ROW development can be an irreversible public commitment to public transit. A rigid LRT system infrastructure attracts private sector investment that supports community development goals and objectives (Buckley & Miller, 2000). The article also uncovered that BRT project sponsors developed strategic marketable campaigns for the public. Marketing improves public support of BRT projects and increases the ridership numbers once the project is operational (Jarzab et al., 2002). The article concluded that BRT systems are a low-cost alternative compared to

LRT. BRT systems provided flexibility in designs, alternatives, and the ability to obtain speed, reliability, comfort, and safety.

The FTA (2003) participated in a testimony focused on BRT systems before the Committee on Banking, Housing, and Urban Affairs U.S. Senate. The testimony provided updates on federal support for BRT systems and an overview of factors affecting the selection of BRT as an option. The report uncovered evidence that per-mile capital costs of BRT varied depending on the type of system (*Federal Transit Administration: Bus Rapid Transit Offers Communities a Flexible Mass Transit Option*, 2003). On average, the per-mile cost for a BRT project was $13.5 million for a designated busway system, $9 million for a high-occupancy vehicle lane system, and $680,000 on city streets. Meanwhile, Light Rail projects, on average, cost $34.8 million per mile constructed. Because of the advantages of not building extra rail infrastructure, BRT projects typically cost less than other mass transit alternatives. BRT projects have a higher probability of completing the construction phase under budget because of lower risks and costs. Transit agency officials have indicated that rail systems typically dictate a city being world-class. As more BRT projects are developed throughout the country, there is a better understanding of how construction and operations impact a city.

Collins and Rowe (2005) completed a case study that focused on project controls and management strategies to address the risk inherent within the public transit sector. The case study explored four Valley Transportation Authority (VTA) LRT projects between 1999 and 2005. Public transit projects had a much larger magnitude. The magnitude presented a challenge in obtaining and managing multiple funding sources necessary to build a public transit project. The variables applied by Collins and Rowe

(2005) within the case study are (a) utility relocations, (b) unforeseen conditions, (c) unfavorable regulatory decisions, (d) systems/bulk procurement, (e) real estate, (f) design and management, and (f) project contingency. The case study revealed three principle lessons learned during the construction of LRT projects.

First, VTA confirmed continual "Community Outreach takes the heat off the project team and allows design and construction professionals to concentrate on delivering the project successfully" (Collins & Rowe, 2005, p. 15.5). Community outreach permitted the project manager and staff to deliver a public transit project on time and under budget during construction. Community outreach ensured the agency gained public approval on current and future public transit projects. Second, VTA strengthened utility relocation procedures on upcoming public transit projects to reduce inefficiencies. VTA developed long-term relationships with local utility companies and had a dedicated utility staff. The agency strategically hired many former utility company employees who understood the utility relocation process (Collins & Rowe, 2005).

The last lesson learned was acceptable project management practices and tools mitigated many of these challenges while building sufficient contingency into baseline budgets. Collins and Rowe (2005) concluded that project management professionals in the public transit sector prioritized the following factors during construction: (a) management of diverse funding streams, (b) acquisition of ROW parcels, (c) relocation of utilities, and (d) construction of sizeable civil infrastructure systems. The project manager ensured that private and public stakeholders were satisfied while building public transit projects. Collins and Rowe determined that successful completion of construction within the public transit sector depends on project managers well versed

in public funding, ROW acquisitions, utility relocations, public outreach, and building sizeable civil infrastructure systems.

Swope (2006) published an article focused on Los Angeles Metro's launch of new BRT buses for the Los Angeles Metro BRT Orange line. The BRT system expected a ridership of 6,000 passengers per day. Fortunately, the ridership numbers exceeded expectations with roughly 16,000 passengers per day (Swope, 2006). According to Swope, the principal objective when planning a BRT project is providing an attractive and reliable public transit system that appeals to riders and incorporated transit and pedestrian development plans.

The Los Angeles Metro BRT Orange Line total cost was $330 million, which was approximately $24 million per mile to build. This budget was much lower when compared to subway systems or surface-street light rail systems. On average, these large infrastructure public transit systems cost $258 million and $44 million per mile to construct. The cost-effective BRT system connects the transportation network and nearby shopping malls, hospitals, universities, and other critical facilities for the public. The cost-effective Los Angeles Metro BRT Orange Line provides a flexible and reliable public transit system that connects the multimodal transportation network and provides riders access to critical facilities.

The following year, Sheng (2017) explored the fundamental theories of mega infrastructure construction projects in China. In the study, Sheng explained why mega infrastructure construction cost overrun risks occur. Sheng stated that cost overrun risk in general construction is part of mega infrastructure construction. In general, mega construction projects have high costs and complexities. The study defined a mega

infrastructure construction overrun as a regular cost overrun plus complexity cost overrun (Sheng, 2017). Today, the most common type of mega infrastructure construction is public transportation projects throughout the world.

Sheng (2017) stated that one of the significant differences between general and mega infrastructure construction is the primary investor. The government is a typical investor in mega infrastructure construction projects. But the government does not generally play a role in general construction projects. The government has an ultimate say in decisions and a final say in proceeding with mega infrastructure construction projects. For example, numerous BRT projects within the United States acquire funds from the FTA. These funds are provided to sponsors through discretionary grants by FTA. Project sponsors become familiar with the capital investment planning, environmental, project development, engineering, and construction laws imposed by the U.S. federal government. Sheng (2017) stated the goal was to build a thinking mode for mega-infrastructure construction cost overrun and risk overrun. The thinking mode clarified that complexities and cost overruns in these projects are both standard and accidental.

In 2018, Fernandez completed a study focused on exploring the causes of cost overruns in transportation infrastructure projects in the United States. The study implemented an empirical model to estimate the following relationships: (a) the variables of overrun costs, (b) the length of the project, and (c) whether a project was considered a public-private partnership (Fernandez, 2018). The study compared 48 completed transportation projects throughout the United States. The linear probability model (LPM)

uncovered that additional construction seasons for public transportation projects increase the cost overruns by 7.3% per season.

Additionally, the logit regressions of the study supported the longer an infrastructure transportation project was in construction, cost overruns occur regularly (Fernandez, 2018). There was an insufficient number of public-private partnerships acquired for the study to determine the relationship between the project implementation length and cost overruns. The study suggested that FHWA and state department of transportation's (DOT's) continue seeking innovative solutions to reduce the length of time during construction. Lastly, the study determined that if the length of time during construction shortens, this reduces cost overruns of infrastructure transportation projects within the United States.

CHAPTER 3: METHODOLOGY

The methodology chapter begins with a restatement of the purpose of the study and the research questions. Afterward, the chapter provides a rationale for the research design, population, sample, and instrumentation. These sections demonstrate the implementation of a comparative multiple case study research that explored the organizational structure, conflict resolution efforts, decision-making procedures, bureaucratic forces, stakeholder forces, and scientific management efforts within the construction phase of BRT projects in the United States. The comparative multiple case study research explored the positive and negative impacts contingency and SMT themes had on the construction budget and schedule of BRT projects within the United States. Also, within the sample section of the chapter, methodological assumptions and limitations and ethical procedures to protect human subjects are discussed. The two following sections of the methodology chapter are data collection and data analysis. The researcher integrated a qualitative approach to collect and analyze the data gathered through open-ended interviews with participants. The researcher used the responses from participants to clarify the predetermined themes. The themes provided a better understanding of how the BRT projects are on time and under budget. The methodology chapter ends with a summary of the procedures and materials.

Purpose Statement

The study focused on contingency theory and SMT during the construction phase of bus rapid transit (BRT) projects within the United States. Public transit improves the health and economic stance of millions of residents throughout the United States while simultaneously improving the environment. Major public transit projects deal with

unexpected inefficiencies and delays. Singh (2010) stated, "Compared to other sectors, projects in road, railways, urban-development sectors, as well as those in civil aviation, shipping and ports, and power sectors have experienced much longer delays and significantly high-cost overruns" (p. 51). Unexpected inefficiencies and delays have increased scrutiny and oversight from the federal government, states, counties and cities as well as the public throughout the United States. This study explored how organizational structure, conflict resolution efforts, decision-making procedures, bureaucratic forces, stakeholder forces, and scientific management themes permit BRT projects to be constructed on time and under budget within the United States.

Within the literature review, Fiedler (1966), Evans (1970), Heller (1973), and Greenwood et al. (1975) explored the importance and impacts of the organizational structure. In addition, Paget-Seekins (2016), Grandori (1984), and Elgharbawy and Abdul-Kadel (2013) reviewed how strategic conflict resolution efforts played a role during the implementation of a project. Fiedler (1966) and Heller (1973) presented the impacts of decision-making procedures within an organization and a project. Gupta et al. (1994) and Singh (2010) explored how bureaucratic forces can affect an organization. The TSP deployment study (Anderson et al., 2020), Manzoor (2014), the *Infrastructure Project Streamlining and Efficiency* hearing (2017), Collins and Rowe (2005), Zahra and Newey (2009), and Yao et al. (2019) explored stakeholder forces. Lastly, Taylor (1903, 1911), C. B. Thompson (1914), Donham (1922), Hickey (1960), Sjoholt (2001), Darmody (2007), Singh (2010), and Elkind (2014) explored the scientific management themes. The scientific management themes focused on how standardization, innovation, and quality control improved efficiency within an organization and a project.

The purpose/objective of this qualitative study was to research and develop a comparative multiple case study of eight BRT projects within the United States. This study expanded the understanding of how BRT projects were built on time and under budget within the United States. The problem statement of the research is to explore and validate six predetermined contingency and SMT themes that provide perceptions of completion on time and under budget during the construction of BRT projects within the United States. The research focused on efficiency during construction of BRT projects. This study defined efficiency as delivering BRT projects on time and under budget, while maintaining quality. The eight BRT projects selected within the multiple case study approach were completed with the design, planning, and construction phases and were operational.

The specific aim of this study was to explore the predetermined contingency themes that allow BRT projects to be built on time and under budget during construction within the United States. This study explored the use of contingency theory and SMT during the construction of BRT projects within the United States.

Multiple Case Study Methodology

Leonard-Barton (1990) published a paper that used a multiple case study methodology to investigate the process of transferring new technologies to their users. She combined the methodology of a longitudinal case study of a single site and a multiple case study design. Leonard-Barton stated, "The methodology draws on or is related to the work of numerous other researchers who have discussed both the hazards and the richness of qualitative data-gathering methods (e.g. Miles and Huberman 1984, Van Maanen 1988)" (p. 248).

A case study explores the history of a past or current event by obtaining information from multiple sources of evidence (Leonard-Barton, 1990). Facts relevant to the stream of events describing the phenomenon are valuable in a case study. A case study is a research methodology that slices vertically through an organization by obtaining data from multiple levels and perspectives (Leonard-Barton, 1990). Various case studies strengthen the external validity of the research. A multiple case study approach should "either (a) predicts similar results (a literal replication), or (b) produce contrary results but for predictable reasons (a theoretical replication)" (Yin, 1984, pp. 48-49). If a study expands the samples of cases and generated multiple sources of evidence, this supports the validity.

Leonard-Barton (1990) declared that interviews are a valuable tool when gathering information from multiple case studies. Leonard-Barton stated, "The necessary interviewing skills might be compared with those of an investigative reporter" (p. 263). The researcher has a tolerance of ambiguity as the data are analyzed. A multiple case study design adds complexities in managing data, and the methodology provides external validity to a doctoral thesis. Leonard-Barton added, "Moreover, this methodology can require that the researcher spend almost as much time and effort on setting organizational expectations and on fostering and maintaining his/her relationship with the organization as the actual data-gathering" (p. 263). Leonard-Barton suggested that a multiple case study approach and acquiring various sources of data strengthen the validity.

The same year, Visser (1990) presented a study that used a case study approach to research the effectiveness of a motivational intervention in an instructor-facilitated learning context. The research focused on contemporary events in a real-life context

where no control existed over behavioral events. According to Yin (1984), using similar circumstances in a case study approach is the appropriate research methodology. Case study designs have options to be single case versus multiple cases and holistic versus embedded (Visser, 1990). Visser stated, "The data collected in the framework of the study under consideration were looked upon within the embedded multiple-case perspective, which encompasses both the previous study and the case under consideration" (p. 6).

Visser (1990) used multiple data sources to minimize biases and strengthen the validity of the study. The data sources included open-ended anonymous questionnaires, open-ended discussions, recording of observations by the researcher, and audio recordings. Pattern-matching (Yin, 1984) comparisons were made during the collection of data. Visser (1990) completed approximately 100 hr of audio recording and two bookshelf lengths of written documentation and field notes during the study. An embedded multiple case study approach provided a better understanding of contributions made from motivational message strategy. Visser (1990) selected a case study approach because the methodology revealed the dynamics of the process.

Later, McDonnell et al. (2001) published a study that explored the experience of the researchers in conducting multiple case studies in the context of a policy-orientated research project on a fixed time scale. Case studies provided a benefit to guide data collection and analysis (Yin, 1994). The study explored three general hospitals in an urban setting. The hospitals selected for the study varied in size, management strategies and pay, and rewards systems (McDonnell et al., 2001). This approach permitted the study to generate a cross-site comparison of the three hospitals. McDonnell et al. (2001)

stated, “Sampling criteria therefore included the selection of cases that would allow cross-case and cross-site comparisons in relation to the issues in the conceptual framework” (p. 385). The case study approach provided flexibility to the research design and the collection of data.

The following data collection strategies were included in McDonnell et al.’s (2001) study: (a) semistructured interviews with audio recordings, (b) nonparticipant observation of meetings, (c) review of job descriptions and relevant documents, and (d) short questionnaires. The researchers uncovered the multiple case study approach to be challenging but rewarding. McDonnell et al. (2001) stated, “The richness of the data obtained through the adoption of multiple perspectives is, without doubt, the strength of this method” (p. 389). Researchers took the time to strategically plan a multiple-case study approach while understanding the flexibility to deal with unexpected changes. Lastly, researchers planned how to present the findings from the study (McDonnell et al., 2001).

In 2004, Hopwood published an article that focused on researching students’ conceptions. The study used a qualitative framework within a multiple-method case design. Hopwood (2004) stated, “While the framework may be termed phenomenological, the data-collection techniques may equally be viewed as ethnographic, and analytic processes were custom-designed, borrowing from elements of grounded theory” (p. 348). He developed matrices that displayed three substantive areas and response formats. The matrices allowed the study to produce three methods to triangulate data (Hopwood, 2004).

The first task presented participants the opportunity to draw a poster that depicted what they thought "geography" was. The poster provided the researcher with data consisting of illustrations, individual words, lists, and sentences (Hopwood, 2004). Afterward, participants were given a questionnaire from rating scales to open responses producing structured prose (Oppenheim, 1992). The third task involved semistructured interviews that developed a range of data. Hopwood (2004) stated, "Most of the data proved useful, especially when students engaged in a more conversational style giving freer, longer responses" (p. 349).

As the study progressed, the analytical procedures were adapted. The adaptation was used because qualitative methods of analysis lack standardization (Miles & Huberman, 1994). Powerful insights of studies have the potential to emerge if qualitative methods are adjusted. Hopwood (2004) stated, "While the variety of formats served their purpose well, difficulties were encountered in analysis and, in particular, attempts in triangulation" (p. 351). The powerful aspect of the case study design is the semistructured interviews. A study increases reliability and validity if researchers consider integrating a multiple-method design in their case studies. The most valuable lesson when working under this framework is developing specific research questions that are meaningful to the context of the study (Hopwood, 2004).

Moreover, Zahra and Newey (2009) explored the impacts of organization science at Oxford. The study focused on answering the following question: "How can researchers intersect theories across academic fields and/or disciplines for maximum impact?" (Zahra & Newey, 2009, p. 1059). The study proposed that theory building can impact five domains: theories, fields, disciplines, research communities, and key external

stakeholders (Zahra & Newey, 2009). Researchers typically build theories at the intersection of fields or disciplines. Additionally, researchers borrow concepts from one discipline and intersect the theory with another field. According to Zahra and Newey (2009), researchers borrow concepts/theories and extend or transform a theory in a particular discipline.

Theory building at the intersection plays a vital role in understanding complex organizational phenomena. Zahra and Newey (2009) stated, "In addition, without theoretical integration, problems within fields, and disciplines remain intractable and the discipline of organization studies stagnates" (p. 1061). Developing, borrowing, or extending a theoretical framework and theory create an understanding of organizations within a discipline.

Researchers working at intersections develop theories using three generic modes of theory. The first mode entails researchers borrowing and replicating theories. Zahra and Newey (2009) stated, "Researchers have used this mode extensively in as diverse fields as international business, manufacturing strategy, and strategic human resource management" (p. 1067). Borrowing and replicating theories have the potential to replicate future studies. The second mode is borrowing and extending theories to spark research at intersections.

Using the second mode, a researcher explores strategies and operations management within the role of manufacturing. The study offers a broader and richer view that enables strategic moves that redefine the firm's value chain and alter the dynamics of competition (S. Brown et al., 2007). Political, scientific norms, and knowledge of structures are frequent impediments when theories are borrowed and

extended. Another drawback is the violation of boundary conditions of theories if a researcher forces the adaptation within the study.

The third mode is known as transforming the core. Researchers develop new theories at the intersection and transfer the theories to the parent field/discipline (Zahra & Newey, 2009). The newly developed theory can be used to examine a phenomenon. Zahra and Newey (2009) stated, "Original theories could also be developed by building on clinical research conducted in the field/discipline and then the findings are debated across fields/disciplines" (p. 1069). The third mode has the power to map out new research domains in disciplines. Researchers seek to borrow, extend, and develop new theories at intersections within organizational sciences. According to Zahra and Newey, "Waves of creative synthesis, empirical inquiry and revolutionary theorizing can highlight the contributions of organization sciences" (p. 1073).

The same year, the University of Oregon's Community Planning Workshop (2009) published the final report exploring five BRT systems throughout the United States. The study used a comparative multiple-case design to understand BRT systems and how public transit agencies implement BRT systems. The study explored BRT systems in Ohio, Oregon, Hawaii, Missouri, and Pennsylvania. According to the Community Planning Workshop, "The systems were chosen as a result of the availability of information on the internet and whether the system was currently in operation" (p. 2).

Phone interviews with agency officials supplemented the data collection process. The study revealed several key findings within the multiple case study methodology. First, public transit agencies tended to give up certain BRT features because of political or financial restrictions (Community Planning Workshop, 2009). The second key finding

was the impact of public perception of BRT systems when public transit agencies compromised on BRT features. According to the Community Planning Workshop (2009), "Without all the components of BRT are often just viewed as additional buses and the public do not perceive any added benefit of BRT technology" (p. 6).

The third key finding was the unfamiliarity with BRT systems by the public within the United States. The public viewed BRT systems as an inferior alternative compared to LRT systems within corridors. Public transit agencies considered presenting BRT systems as part of the overall transportation system. According to the Community Planning Workshop (2009), "In Cleveland, for example, BRT was implemented because it was appropriate for the corridor and it connects well to the rest of the transit services in the city" (p. 7).

FTA required before and after studies for projects within the New Starts program. If a BRT project qualified under the New Starts program, they completed evaluations of the systems before construction and once the system entered revenue services. Most of the evaluations came from BRT rider surveys and public outreach efforts.

Several of the BRT systems within the multiple case study revealed increased ridership numbers, time savings, and increased customer satisfaction (Community Planning Workshop, 2009). The last key finding uncovered that public participation during the planning phase had the potential to create controversy. Extensive public outreach and education campaigns were effective. The multiple case study revealed public participation led to compromise over components of BRT (Community Planning Workshop, 2009). The comparative multiple case study design presented the findings

through illustrations and genuine relationships. This simple and effective design permitted the researchers to present the information to the public.

Two years later, Okhuysen and Bonardi (2011) published an article that explored the challenges of regularly combining lenses to further the public's understanding. The exploration was similar to a multiple case study methodology in which a discipline occurs through various lenses. Okhuysen and Bonardi stated, "As a practical field, management deserves attention from a multiple-lens perspective because the phenomena within it can often be explained using different theoretical approaches" (p. 6). The field of management in private and public sectors explore the use of a multiple-lens approach.

Using multiple perspectives to examine organizations and disciplines allows researchers to critique the world and practice of management (Currie et al., 2010). The article revealed that multiple-lens perspectives can help bridge silos within and across disciplines (Okhuysen & Bonardi, 2011). A multiple-lens approach helps bridge silos within and across organizations. Organizational silos assume different forms (Bento et al., 2020) and pose a threat to internal and external efficiency. The most common combination using multiple perspectives is when theories share compatible underlying assumptions and address a similar phenomenon (Okhuysen & Bonardi, 2011). This researcher's multiple case study design focused on exploring BRT projects within the United States followed a similar approach. Okhuysen and Bonardi (2011) stated, "We have a formidable opportunity in front of us to contribute to our field by taking down walls and building bridges between perspectives" (p. 10).

The subsequent year, the Africa Transport Policy Programme completed a multiple case study documenting lessons learned of BRT systems within five developing

cities (A. Kumar et al., 2012). The multiple case study explored the political setting, institutions and governance, public involvement, service, operations, management, and planning of BRT systems (A. Kumar et al., 2012). The study developed an extensive review of the literature, interviews with stakeholders, and an analysis. A. Kumar et al. (2012) stated, "Almost all cities in the developing world are dealing with rapid urbanization and the need for improvements in standard of living" (p. 3). Investments and development of BRT systems in developing cities attempted to provide efficient and effective public transport services.

The multiple case study revealed that the construction of BRT projects was faster if support from political leaders existed within the developing cities. A. Kumar et al. (2012) stated, "These advocates were complemented by a solid transport organization with superior administrative and technical skills and public transport experiences" (p. 3). All five BRT case studies revealed that early development and implementation of a communications strategy with stakeholders and the public were fundamental. The five cities, Lagos, Johannesburg, Jakarta, Ahmedabad, and Delhi dealt with various hurdles during the development of the BRT systems.

The first hurdle was that BRT systems are a new concept for the public in developing cities. The second hurdle, public transit generally had a poor image compared to private transit. The third hurdle, developing cities were known to have informal and unregulated private operators who ran the public transit systems (A. Kumar et al., 2012). The last hurdle, public transit was known to have safety, security, and quality issues within the developing cities. Political support and communications strategies were crucial to the development of BRT systems.

The multiple case study revealed that BRT systems in developing cities used existing buses, facilities, and infrastructure within the adapted transitways. The public transit agencies maintained and operated the BRT system without extensive and unique specialized training. A. Kumar et al. (2012) stated, "In all the cities, such infrastructure and facilities as stations and terminals were financed by government" (p. 16).

The BRT systems improved the public transit system in all five developing cities. A. Kumar et al. (2012) stated, "Their techniques varied, with each city adapting to deliver something of value within the respective political, institutional, operating, physical, and financial constraints" (p. 19). The multiple case study design revealed that BRT systems are attractive, cost-effective, and flexible. There was no single design that permitted developing cities to operate and maintain BRT systems efficiently.

Three years later, a comparative case study focused on three BRT projects supported by the Inter-American Development Bank (IBD, 2015). The comparative multiple case study explored BRT projects from the following South American cities: Lima, Cali, and Montevideo. According to IBD (2015), "These projects typically aim to increase overall mobility while also reducing negative externalities such as traffic accidents and emissions of local and global pollutants" (Abstract). The objective of the study was to identify lessons learned from BRT projects to inform future operations. The study implemented a mixed-methods design to identify factors affecting the success, challenges, and barriers in implementing BRT projects.

The BRT projects met the following criteria within the study: (a) The BRT project received disbursement of 75% or more of their funds, (b) The BRT project was already in revenue service, and (c) The BRT project received approval within the past 10 years

(IBD, 2015). The three BRT systems explored included alignments that passed through or reached low-income neighborhoods within the city. There were limited data demonstrating how poor neighborhoods benefit from the BRT systems. According to IBD (2015), "To the extent that the poor realized travel time savings from using the system, the projects also had the potential to indirectly reduce poverty by increasing their access to markets, services, and jobs" (p. 17).

Local technical capacity and fragmented local institutional structures resulted in BRT design and implementation issues. The issues included dealing with "construction challenges and cost over-runs, weak technical and institutional capacity, delays in infrastructure that compromised service quality and efficiency, political cycles, and political economy issues" (IBD, 2015, p. 22). The case studies revealed rising construction costs and high turnover of management and engineering staff within the BRT projects. According to IBD (2015), "Cost over-runs also sometimes resulted from requests by municipalities for additional infrastructure that enhanced the projects" (p. 23). Despite the cost over-runs, the BRT systems were still significantly cheaper than a rail-based mass transit option.

The BRT projects explored provided greater mobility, reduced travel times, and lowered emissions in two of the three BRT cases explored. Also, the comparative multiple case study revealed that BRT corridors should be selected based upon three criteria: (a) high public transit demand, (b) ability to connect major activity centers to support the demand, and (c) existing or predicted near-term levels of congestion (IBD, 2015). The study recommended further research to integrate other innovative public transit solutions to existing or future BRT systems.

The Multidisciplinary Digital Publishing Institute published a study focused on measuring the performance of public transit systems by integrating multiple stakeholders and the exogenous operations environment (Yao et al., 2019). The study revealed that service effectiveness had a positive correlation with production efficiency. The findings demonstrated that public transit rail systems tend perform better than conventional bus systems (Yao et al., 2019).

Public transit generally involved three groups of stakeholders: (a) national and local governments that provide investment and financial support, (b) bus operators, and (c) ridership. Therefore, the study developed a measurement framework that integrates local authority, bus operators, passengers, uncontrollable environment factors, and the externality of public transit (Yao et al., 2019). The study utilized annual data from eleven cities in China from 2009 through 2016. Moreover, the study categorized the cities into three decision-making units: (a) supercity, (b) megacity, and (c) large city. A super city had a population equal to or more than 10 million. A megacity was between 5 million and 10 million residents. A large city was between 1 million and 5 million residents. Yao et al. (2019) stated, "From the overall perspective, super cities tended to perform better than mega cities, and mega cities tended to perform better than large cities" (p. 11).

The findings demonstrated that super cities efficiency production was lower than large cities and megacities. The results suggested that a city with a larger population generates more public transit trips. The number of the public transit trips had the potential to impact the service effectiveness of the system. The study found that exogenous environment impacted the performance measurement of the public transit

system (Yao et al., 2019). The last main finding from the case study was the shortage of investments from local governments and public transit agencies.

Yao et al. (2019) experienced some limitations regarding the availability of high-quality data. The investigation included eleven cities without the integration of a multilens design. For example, the researchers did not examine the public transit agencies in each city, and there were no interviews completed with public transit officials.

Open Ended Interviews

R. H. Turner (1949) explored the migration to a medium-sized city by using the open-ended interview research methodology. The study focused the research within Kalamazoo, Michigan, a medium-sized city with a population of 54,097. Previous research related to the determination of attitudes and motives related to migration lacked a methodology adequately described in most instances (R. H. Turner, 1949). The researcher chose to collect data using an open-ended interview approach. The research methodology used 200 participants, 21 years of age and over, who moved into the municipality of Kalamazoo from a distance of at least 25 miles between July 1, 1946 and January 31, 1947 (R. H. Turner, 1949).

R. H. Turner (1949) stated, "The questionnaire consisted of 55 items and a number of neutral probes which were used in the event that more information was needed to complete the answer to any one question" (p. 231). Because of the number of questions, each interview took approximately 1 to 2 hrs to complete. Each interviewer was trained on properly using open-ended interview techniques. The open-ended

research technique provided the researchers an in-depth understanding of the opinions and attitudes related to migration.

The open-ended research technique revealed approximately 29 variables of opinions and attitudes related to migration. The study demonstrated the potential of the breadth of information and in-depth knowledge a researcher can gain using open-ended interviews. Because of the broad range of variables and motivations among participants, R. H. Turner (1949) compiled the relationship into several major categories.

The categories included economic or job considerations, influences of friends and relatives, and conditions related to improvements in living. R. H. Turner (1949) stated,

> Though the economic factor was the most important one for all groups studied, persons at the lower socio-economic levels often gave reasons for moving that involved economic or job considerations while those at the upper socio-economic levels more often mentioned non-economic factors such as the influence of friends or relatives and factors making for goodness of living. (pp. 229-249)

Most participants with higher education and higher socioeconomic levels remained in their previous locations. Participants migrated for personal factors rather than economic or job-related reasons. The open-ended research technique provided an in-depth and comprehensive understanding of why individuals moved to Kalamazoo, Michigan.

Subsequently, the Survey Research Center at the University of Michigan completed a study that was financed by the Office of Naval Research (Kahn, 1953). The study focused on a comparison of two methods of collecting data for social research. Kahn (1953) stated, “The aim of the research was to test the relative effectiveness of the intensive, open-ended interview, and the fixed-alternative, written questionnaire” (p. 1).

The sample size of the study was 206 employees within a large manufacturer of tractors and earth-moving equipment. During the study, the questionnaires, and interviews compared similar individuals and personal characteristics (Kahn, 1953).

Five hypotheses were explored and tested by the researcher during the study. The last hypothesis tested in the study was "The ability to predict criterion scores from a given item will be greater for the questionnaire than for the interview responses" (Kahn, 1953, p. 4). The researcher found that questionnaire responses proved to be a better predictor compared to open-ended interviews.

The data uncovered three findings. The first finding was that questionnaires and open-ended interviews appeared to be impacted by the participant's perception of the data-collecting situation. The expectations set forth during the study impacted the participants. Kahn (1953) stated, "Specifically, the importance of respondent perception of threat has been suggested as a determinant of content and extent of communication in the data-collection situation" (p. 5).

The second finding was the importance of anonymity to participants. Participants expressed concerns that work situations might become sensitive or hostile (Kahn, 1953). The third finding was that there appeared to be a systematic response pattern that reflected an unwillingness to communicate with the researcher. Individuals believed that if they participated in the study, there would be adverse effects on their jobs. The data-collecting situation was itself unrewarding to the participants (Kahn, 1953). The study revealed the importance of setting up clear expectations and providing anonymity with participants during the data-collection process.

Ulrich and Trumbo (1965) from Kansas State University published a study that explored the accuracy of information obtained during interviews. Ulrich and Trumbo conducted the study within the Minnesota State Employment Service office. The researchers explored the accuracy of job applicant reports, duration of employment, and job duties. Ulrich and Trumbo (1965) stated, "These investigators compared data on these areas obtained in interviews with data obtained from previous employers" (p. 108). The study demonstrated that interviews generally meant that candidates remained on the job much longer.

Afterward, Vaughn and Reynolds investigated the reliability of reports of age, education, and socioeconomic level (Ulrich & Trumbo, 1965). Vaughn and Reynolds interviewed several hundred individuals in two midwestern cities. Four months later, the researchers interviewed the same individuals. The results of the study revealed that the reliability of interview data was highly dependent on external circumstances. Ulrich and Trumbo (1965) stated, "Alternative explanations of differences in reliability should be evaluated before social desirability is accepted as the sole explanation" (p. 109). Motives and circumstances had the potential to influence the accuracy of information obtained through open-ended interviews.

The study recommended incorporating three features within the interview research approach. The first recommendation was interviews included greater standardization using a semistructured technique. The second recommendation was additional sources of data supplemented interviews. Data allowed researchers to verify the information uncovered within the interview process. The third recommendation was interviews focused on narrowing the scope. Interviews were successful in analytical and

model-building studies and exploration of decision-making processes, empathy, and interpersonal communications (Ulrich & Trumbo, 1965).

Two years later, Wu (1967) published a study focused on finding ways to compare the measurements of quantitative data and the information uncovered in interviews. The researcher attempted to measure a series of 48 recorded interviews within a rehabilitation setting in the New York metropolitan area (Wu, 1967). Wu (1967) stated, "The primary purpose of the interviews was to collect data about the subjects" attitudes toward their disability" (p. 79). The researcher used a semistructured interview format. The semistructured interview provided the interviewer the flexibility to use open-ended questions and define a degree of structure for comparable data collection.

The researcher recorded all the interviews and verbal interactions with the participants. Wu (1967) stated, "In order to obtain the respondent's co-operation for a study, a good client-worker relationship is essential and must be established prior to the re-corded interview" (p. 82). The researcher spent the beginning and ending sections of the interview reviewing the purpose of the study, providing recording instructions, and confirming the participant's reactions to the questions. Wu added, "It is interesting to point out that the interviewer spoke only 546 words in the longest interview, while the mean number of words he spoke was 572" (p. 82). The length of the interview was dependent on the degree of involvement from the participants.

Wu (1967) argued there were four ways to measure the validity of data collected from interviews. First, researchers compared the participants' responses with factual outside reports or objective evidence from a third party. Second, future behavior prediction was based on participants' statements regarding their plans and expectations

(Wu, 1967). Third, consistency of statements regarded similar underlying attitudes. Fourth, correlating the data were gathered from interviews and the information was placed in genuine relationships.

The reliability of an interview depended on the validity of the data. Wu (1967) stated, "Like the reliability of many measuring instruments when there is a lack of standards for comparison, it is difficult to determine to what degree or extent the research interview is qualitatively and quantitatively satisfactory or unsatisfactory" (p. 86). The questions formulated in the interview should narrow the scope of the study and provide predetermined areas of inquiry. Once the interviews are recorded and transcribed, independent judges can be used to rate the measurements. The study provided techniques to uncover information and measure quantitative data from interviews.

Mandel (1974) published a study that focused on selecting and phrasing questions in interviews. Mandel (1974) stated, "Typically, the goal of an interview is to secure relevant and accurate information for the interviewer from the interviewee" (p. 17). The study recommended that interviewers devote time during the selection of questions. The questions within the interview focused on assisting the researcher in securing the type of information they were looking for (Mandel, 1974). The interviewer determined the subject along with an outline.

According to Mandel (1974), semistructured interview questions typically use planned questions. A semistructured interview format allowed a researcher to reveal data and insights on a particular topic. Mandel stated, "The questions are open-ended and do not force the interviewee into a limited verbal response" (p. 20). Meanwhile, structured interviews constrained the subject area. The structured interview technique provided

high reliability of data analysis, but at the same time, this approach limited the amount of information gathered (Mandel, 1974). This study considered both formats and determined which technique to use in this study.

Mandel (1974) then reviewed two strategies interviewers can use to structure their questions. First, the funnel strategy was when the interview begins with free associated questions and moves to structured questions (Mandel, 1974). This technique provided the interviewer the ability to discover new information within a study. Mandel (1974) stated, "The funnel method starts with less constrained questions and gradually moves to more constrained questions in order to pin down desired information from the interviewee" (p. 21). The second strategy was the inverted funnel technique. This technique begins with open-ended questions and ends with more specific closed-ended questions. Researchers used this technique to establish a cause-to-effect relationship and determined whether the responses were consistent with attitudes, feelings, and beliefs (Mandel, 1974). Once the interviewer had selected the technique and types of questions, the study presented three factors that influenced the phrasing of questions.

The first factor was making sure appropriate language was selected in each question (Mandel, 1974). The interviewer made sure the language was not vague or inappropriate. The second factor when phrasing questions was the reduction of threat. Mandel (1974) stated, "When respondents feel that an interviewer's questions threaten their psychological security, moral or religious beliefs, or right of privacy, the tendency is for the respondent to terminate an interview" (p. 22). The third factor was making sure the questions were relevant to the topic. Interviewees typically responded fully to questions that seemed relevant to the topic under discussion (Mandel, 1974). The

interviewer determined the type of information needed in the study, phrased the questions appropriately, and provided an outlet for participants to respond honestly.

Rutherford (1978) published a study sponsored through the National Institution of Education. The study focused on interviews as a research tool in change research in schools and universities. Rutherford stated, "Interviews in the change process are not intended to identify individual's problems, as are counseling interviews" (p. 6). Interviews identified how the individuals were doing and their plans. The research conducted more than 3,500 personal interviews and demonstrated the value of the personal interview as a research tool. The study provided four reasons why personal interviews are powerful in change management.

The first reason was that individuals are the main reason processes change. Rutherford (1978) stated, "Secondly, the flexibility of the interview makes it possible to obtain both breadth and depth of information" (p. 7). The third reason was that interviewers can adjust the format to focus on a particular theme. The fourth reason was that interviews are a personal technique (Rutherford, 1978). The study demonstrated that reasonable reliability and validity occur if in-person interviews used a focused approach.

In 1988, Isacofano et al. assessed the newly established, county-wide, timed transfer bus system within Pierce Transit in Tacoma, Washington. They stated, "The timed transfer system responded to the need for people to travel between suburban locations throughout the county" (p. 76). The researchers selected to use an open-ended interview methodology to conduct the study. Thirty-five staff members from the executive, management, and supervisory positions were interviewed (Isacofano et al., 1988).

The open-ended interview approach provided valuable information relevant to the entire system and the new timed transfer concept. Isacofano et al. (1988) stated, "Although they generally expressed positive support, in many cases they echoed the drivers' concerns about changes that inconvenienced veteran riders" (p. 83). The researchers interviewed all six members of the Board of Commissions from Pierce Transit. The board member responses paralleled the constituents, which demonstrated an overwhelmingly positive view of the transfer concept. According to Isacofano et al., "They were concerned about the long-term impacts of their decisions and felt a strong sense of responsibility to make decisions that would bear the test of time" (p. 83).

The open-ended interview approach revealed two primary dimensions, political and social. Many open-ended survey questions provided participants the opportunity to give more details (Isacofano et al., 1988). As the study progressed, more and more of the managers became involved. Many of the managers began to request a copy of the responses and immediately corrected the issues. Isacofano et al. (1988) stated, "There was a continual striving to make the system work better—reflecting the strong service orientation of the staff" (p. 84). The open-ended interview approach provided an in-depth analysis of the new timed transfer concept and a good understanding of where the public transit agency stood. The research approach uncovered additional issues that were not necessarily related to the original project scope.

The Transportation Research Board published a multiple case study focused on the success of public transit systems in the 1990s (Yoh et al., 2003). During the economic boom of the late 1990s, public transit ridership increased nationwide. Yoh et al. (2003) stated, "To examine agencies that were especially successful at increasing

patronage during the late 1990s, in-depth, open-ended interviews were conducted with managers from 12 agencies that substantially increased ridership between 1995 and 1999" (p. 111). The study began by reviewing previous studies that adopted methodological approaches focused on factors influencing public transit ridership. Many previous case studies explored ridership numbers within the United States on fixed-route services between 1994–1995 and 1998–1999 (Yoh et al., 2003).

The researchers completed the open-ended interviews over the phone and focused on identifying factors that influenced the ridership within each public transit agency. Yoh et al. (2003) stated, "Agency representatives were asked to (*a*) generally describe their service setting, and (*b*) discuss why they believed their agencies experienced the high levels of ridership growth" (p. 111). During the interview, researchers used probing questions to seek possible factors within ridership. The researchers looked for service quality improvements, fare policy changes, changes in the agency's planning process, increased marketing research, and media relations initiatives (Yoh et al., 2003).

The open-ended interview methodology revealed two general patterns of responses by the participants. The first pattern was that respondents were not reluctant to attribute ridership increases to external factors (Yoh et al., 2003). External factors included economic and population growth. The second noticeable pattern was participants focused on a few motives for ridership rather than a set of complex reasons. For example, the representatives of Caltrain from the Bay Area argued that ridership increased because of route changes within their service. Caltrain representatives revealed there were changes in Silicon Valley because of the dot-com era. The dot-com era contributed to unprecedented growth and traffic in the region. These factors assisted in

propelling ridership numbers of commuters aboard its commuter rail service (Yoh et al., 2003).

Open-ended interviews also revealed that managers from the public transit agencies did not contribute good management ridership growth. Open-ended interviews provided researchers a successful methodology to holistically understand why ridership numbers increased. The study uncovered the following factors leading to the increase of public transit ridership: (a) consistent community outreach, (b) cooperation with employers in the region, (c) cooperation with local universities, and (d) economic and population growth (Yoh et al., 2003).

Two years later, the Transportation Research Board examined the contracting practices of public transit agencies within California (Iseki et al., 2005). The study was completed using a multiple case study approach and explored 13 California public transit agencies. The preferred research methodology used was open-ended interviews. Open-ended interviews with public transit agencies of various sizes and blends of contract practices occurred. Iseki et al. (2005) stated, "Some have readily adopted contracting to provide all services, while others have used different strategies, such as part-time labor and varying wage scales, to enhance their cost-efficiency" (p. 82).

Before this study, most of the research focused on public transit contracting was conducted in the 1980s and early 1990s. The previous qualitative studies argued that public transit agencies are influenced by economic, political, social, and institutional conditions during contracting strategies (Iseki et al., 2005). The research methodology implemented in the study was open-ended phone interviews during the spring of 2004. The interviews were conducted with management-level or higher personnel at 13

California public transit agencies to determine their level of contracting (Iseki et al., 2005). The study limited the scope to agencies in California to control the variation in economic, political, and institutional conditions.

Many participants perceived the decision to contract as a management choice. The decision to contract was not made by the governing board of the agency (Iseki et al., 2005). Iseki et al. (2005) stated, "They all believed that the suggestion of contracting could come from operational staff" (p. 83). The open-ended interview methodology revealed several factors agencies considered during the decision-making process of contracts. The first factor was that public transit agencies generally provided all services in-house and contracted out only a portion of services to improve cost-efficiency. According to Iseki et al. (2005), "Transit agencies that partially contract do so primarily for two reasons: to increase cost-efficiency for specific lines and to try out new service" (p. 86).

The second factor was that several of the newer public transit agencies had decided to contract all services to avoid labor issues. These transit agencies also decided to fully contract out their services to include a continuation of the previous service administered by the agency (Iseki et al., 2005). The third factor revealed from the open-ended interviews with the transit managers was that political environments play a role in contracting out fixed-route services. For instance, the San Francisco Muni agency mentioned that a decision about contracting involved Muni's board, city officials, and policymakers because of the prolabor political environment in San Francisco (Iseki et al., 2005).

The fourth factor in the study was that transit agencies may consider contracting out work if the union and political representatives understood economic concerns. According to Los Angeles Metro, "Contracting at the heavily unionized agency became a realistic option for some lines that were so cost-ineffective that it became clear that they were going to be cut" (Iseki et al., 2005, p. 88). The last factor revealed was that most of the agencies interviewed were unionized. The only public transit agencies that did not have unions were the younger full-contracting agencies.

Public transit agencies addressed concerns from labor unions as they strategize contracting decisions to improve cost-efficiency. Iseki et al. (2005) stated, "It is important that an agency maintains a good relationship with the union without using privatization measures as a threat" (pp. 89-90). The open-ended interview research methodology revealed that agencies implement contracting to improve cost-efficiency within the organization. The research methodology also provided future research recommendations relevant to contracting initiatives within public transit agencies. The future research included a further examination of how labor agreements influenced contracting decisions. There needs to be a better understanding of labor union influences from the political environment or other factors (Iseki et al., 2005). The study revealed that open-ended interviews provide in-depth analysis and future research of labor union agreements was recommended within the public transit sector.

In 2010, D. W. Turner developed a study that explored how to complete an in-depth qualitative interview. Turner stated, "One of the most popular areas of interest in qualitative research design is that of the interview protocol. Interviews provide in-depth information about participants' experiences and viewpoints of a particular topic" (p. 754).

According to the study, three common qualitative interview design formats exist: (a) informal conversational, (b) general guide approach, and (c) standardized open ended.

The informal conversational approach is generally a spontaneous set of questions using a natural interaction (D. W. Turner, 2010). Individuals considered this style beneficial because of the flexibility, but many researchers viewed this approach as unstable or unreliable because of the inconsistency of interview questions. The general guide interview approach is more structured while also providing some flexibility. The general guide interview approach allows the researcher to develop a rapport with each participant while also providing the flexibility to ask follow-up or probing questions. The questions in the interview are structured, but the researcher can explore a more personal approach with each participant (D. W. Turner, 2010).

The last qualitative interview format is a standardized open-ended structure. This interview format integrated identical open-ended questions. D. W. Turner (2010) stated, "This reduces researcher biases within the study, particularly when the interviewing process involves many participants" (p. 756). A qualitative investigation using interviews remains a popular methodology. During the interview, researchers remain impartial and consider the following recommendations: (a) Verify recording the interview, (b) Ask one question at a time during the interview, (c) Provide transition points between topics, and (d) Continue to be in control of the structured and probing questions (D. W. Turner, 2010).

In 2013, Kash explored the effects of open-ended and closed questions when researching the attitudes of public transit users. Many scholars have debated using open-ended or closed questions in interviews. Kash (2013) stated, "But as the potential of

mixing research methods is increasingly recognized, it becomes apparent that there are benefits to combining both question types" (p. 51). Open- and closed-ended questions provided different results even though the same participants answered the questions (Kash, 2013). According to the study, researchers used closed-ended questions to standardize the process and provide an approach when interviewing large groups. Open-ended questions provided a "much more direct window into what people are thinking and provide researchers with an opportunity to learn the unexpected" (Kash, 2013, p. 51).

The study explored rider attitudes within the public transit system in Arequipa, Peru peak hours (Kash, 2013). Arequipa is the second-largest city in Peru with a dense population. Kash (2013) used brief interviews as the preferred methodology within the study. The interviews took place at high-traffic transit stops during the afternoon and evening peak hours (Kash, 2013). The researcher used a semistructured interview format with each participant. The first question asked was "What are the two problems you see with public transportation in Arequipa?" (Kash, 2013, p. 52). Kash used a closed-ended question asking the participants to prioritize six potential goals for public transportation reform in Arequipa.

The responses from the open-ended question of the interview demonstrated that riders were primarily concerned with the current state of buses, congestion, travel times, and treatment of bus staff. Kash (2013) stated, "Although experiential concerns were most prevalent in response to open-ended questioning, social concerns dominated responses to the ranking task" (p. 54). Pollution was the most important goal for public transportation reform in Arequipa. There was an apparent contradiction between the responses from participants when using open-ended questions and closed-ended

questions in the interview. The study questioned, “Why were there such different responses on the same topic using open-ended and closed-ended questions”?

Kash (2013) stated, “In the case of the open question in this survey, it is thought that one of the strongest factors influencing accessibility is interview location” (p. 56). Many of the participants during the time of the interview were experiencing congestion in old buses. During the closed-ended questions, participants considered various goals for public transportation reform in Arequipa. This task asked participants to evaluate preset factors rather than providing participants the ability to state their concerns. The closed-ended question style of questions systematically shaped participant responses in different directions (Kash, 2013).

The study demonstrated that researchers should carefully consider standardizing closed-ended questions while also including open-ended questions during interviews. Open-ended questions generated a complete picture. Closed-ended questions strengthened the results of the study. Kash (2013) stated, “It is suggested that open and closed questions can be successfully combined to capitalize on the strengths and compensate for the limitations of each question type” (p. 58).

Creswell and Creswell (2018) studied the various qualitative, quantitative, and mixed methods approach for a study. The study revealed that there are four basic types of collection procedures in qualitative research (Creswell & Creswell, 2018). Interviews are one of the procedures in a qualitative study. Interviews involve a few unstructured and open-ended questions with the intention to provide views from participants (Creswell & Creswell, 2018). A researcher may choose one-on-one interviews, focus group interviews, or email interviews.

There are three distinct advantages if a researcher selects open-ended interviews as the preferred data collection procedure. The first advantage of open-ended interviews is the usefulness when participants cannot be directly observed (Creswell & Creswell, 2018). A researcher would be unable to develop observations during the construction of BRT projects if the projects explored were already in operations. The second advantage of open-ended interviews is that participants provide historical information not found in documents or public records. Open-ended interviews provide the first-hand experience of events.

The third advantage of open-ended interviews is the procedure allows a researcher control over the line of questioning (Creswell & Creswell, 2018). The study highlighted the importance of establishing an interview protocol. An open-ended interview protocol includes the following sections: (a) introduction, (b) opening question, (c) content questions, (d) probing questions, and (e) closing instructions. Probing questions allow a researcher to expand the duration of the interview and net useful information (Creswell & Creswell, 2018).

Toward the end of the open-ended interview, a researcher uses the following final probing questions: “Who should I contact next to learn more?” (Creswell & Creswell, 2018, p. 267) and “Is there any further information that you would like to share that we have not covered?” (Creswell & Creswell, 2018, p. 267). The probing question technique permits the researcher to expand the participant pool and gain additional information. Open-ended interviews provide an in-depth analysis within a case study design and are the preferred data collection procedure for qualitative studies.

Recently, a BRT case study focused on the arrival of the system in Barranquilla, Colombia (Palacios et al., 2020). The case study explored the travel experience for residents and whether the experience had changed since the deployment of the new BRT system in 2010. The researchers recruited participants from 15 locations and conducted dozens of semistructured interviews using open-ended questions (Palacios et al., 2020). The study used a qualitative methods approach that focused on the illuminating travel experience.

The BRT system connected multiple districts in Barranquilla with other municipalities in the metropolitan area. To evaluate the efficiency from the perspective of the riders, the researchers conducted 65 interviews. The interviews were conducted in Spanish and recorded with the consent of the participants. Moreover, the researchers were interested in an in-depth understanding of user experiences (Palacios et al., 2020). After transcribing and analyzing the interviews, the researchers were able to identify five themes.

The first theme unveiled was network changes and navigability concerns expressed by the participants. The BRT system eliminated many direct routes provided by the conventional licensed buses (Palacios et al., 2020). The new BRT system increased the number of transfers, added a complex route labeling system, and increased confusion among riders. The second theme was the concern of comfort and safety because of overcrowding in the BRT system. Palacios et al. (2020) stated, "Overcrowding was a concern for various reasons, including safety, ability to board at rush hour, and the ability to take a seat" (p. 135).

The third theme revealed by the open-ended interviews was the affordability of the BRT system compared to the preexisting transit alternatives. Palacios et al. (2020) stated, "By paying only for one fare, they can reach their destination if they can stay on the BRT system" (p. 136). The fourth theme focused on private motorization and traffic congestion in Barranquilla. The open-ended interviews revealed that individuals who owned vehicles preferred riding the BRT system downtown to avoid parking fees. Regardless, most of the participants aspired to own an automobile in the future because of the symbol of social status (Palacios et al., 2020).

And the last theme was the use of taxis, shared taxis, and moto-taxis in Barranquilla. Many participants revealed that they prefer to use these modes in their neighborhoods because of the flexibility and availability. Palacios et al. (2020 stated, "Interestingly, one interviewee said that the proliferation of collective taxes was associated with the elimination of conventional bus routes after BRT implementation" (p. 137). The open-ended interview research methodology for the BRT case study provided an in-depth analysis of the system. According to Palacios et al., "Many of these findings are consistent with several studies of BRT in developing-world cities that show that BRT tends to benefit primarily middle-income residents over disadvantaged populations" (pp. 137-138).

The semistructured and open-ended interview approach provided a holistic understanding of the ridership experience. The interviews identified many of the same issues found in the review of the literature regarding virtues and issues of BRT systems. The open-ended interviews provided the researchers with new and unforeseen issues related to the BRT system. The issues uncovered provided valuable information to BRT

planners and future development of the public transit system in Barranquilla. The study demonstrated that using open-ended interviews and a qualitative study approach potentially expands and deepens the public's understanding of BRT systems.

Research Questions

This study implemented the following seven research questions:

1. What organizational structure was used during the construction of the BRT projects?
2. What strategic conflict resolution efforts were used during the construction of the BRT projects?
3. What decision-making procedures were used during the construction of the BRT projects?
4. What bureaucratic forces permitted the construction of the BRT projects to be completed on time?
5. What stakeholder forces permitted the construction of the BRT projects to be completed under budget?
6. What scientific management efforts permitted the construction of the BRT project to be completed on time?
7. What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Research Design

The research design for this study was a semistructured, open-ended interview combined with OSINT. The research design explored eight BRT projects within the United States. The researcher explored the following six predetermined contingency

theory and SMT themes throughout the comparative multiple case study analysis: (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures, (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts. The semistructured, open-ended interview research design permitted this study to focus on contingency theory and SMT.

Population

The population of the research identified and analyzed data from eight BRT projects within the United States. The researcher analyzed official public records relevant to the eight BRT projects selected in this study. The public records and databases included (a) construction progress reports, (b) project schedule reports, (c) public forum meeting notes, and (d) budget reports. Most of the data gathered for this study were through an open-ended interview research design. The qualitative research design included open-ended interviews with participants using live video technology. Collecting data through multiple methods and sources allowed the researcher to test the validity of the information provided by the participants.

The participant population size for each BRT project was dependent on the availability and willingness of individuals. There was a limited number of individuals who had direct knowledge of the construction budget and schedule of BRT projects. Once the researcher began communicating with potential candidates, additional participants were confirmed. The researcher interviewed approximately one to two participants per BRT project in this study. The researcher reached out to 22 BRT projects across the United States and sought out potential participants. The potential participants included public transit agencies, federal agencies, project management consultant

agencies, construction contractors, city employees, and MPO employees. This study received confirmation from eight BRT projects within the United States to join this comparative multiple case study. The researcher completed nine open-ended video interviews with participants for this study. The participants directly worked on the eight BRT projects selected within this study.

Participants selected within this study had direct knowledge of the eight BRT projects construction budget and schedule. Potential job titles from the participants were (a) deputy director, (b) deputy executive officer, (c) director of construction management, (d) senior engineering manager, (e) senior consultant director, (f) program manager, (g) project manager, (h) project engineer, (i) director of communications, and (j) construction manager.

The information provided by participants was cross-referenced using the technique of OSINT. The data gathered using OSINT included public records and peer review articles relevant to the eight selected BRT projects. Investigators and researchers often select OSINT as a method to validate against other sources (Akhgar et al., 2016). OSINT is an application that law enforcement and security agencies use to understand conflict and insecurity (Akhgar et al., 2016). Gillham (2005) stated, "Interview data have to be taken as valid in their own right: they add something different to other data. We need to think not so much in terms of triangulation or cross-checking as of the complementary role of different kinds of data" (p. 165). Open-source data and interviews have the potential to qualify and interpret findings from other data sources (Gillham, 2005).

As data are collected by the researcher, an affinity diagram tool helps develop genuine relationships. The affinity diagram of the open-ended interviews can be found within the appendix of this study. The affinity diagram helps researchers group and link their collective thoughts into a clear and understandable structure (Kawakita, 1982). An affinity diagram is a standard tool that assists researchers to organize a substantial number of ideas and considerable data by sorting the information into genuine relationships and groups. Takai and Ishii (2010) stated,

> The affinity diagram procedure starts by placing the first customer need on a white sheet of paper. The second customer need is placed near the first need if it is similar to the first need and placed apart if otherwise. This procedure continues until all of the needs are placed on the sheet of paper. (p. 102)

The researcher used the affinity diagram tool to reveal themes that provided the perception of completion on time and under budget during the construction of BRT projects within the United States. More information about the affinity diagram tool is found within the data collection and data analysis sections of the methodology chapter.

Sampling

There were many designs within the mixed methods field. According to Creswell and Creswell (2018), the three most common designs within the mixed methods field and the social and health sciences today are (a) convergent, (b) explanatory sequential, and (c) exploratory sequential. The preferred design in this study was a qualitative convergent methodology. Creswell and Creswell (2018) stated, “In this design, the investigator typically collects both forms of data at roughly the same time and then integrates the information in the interpretation of the overall results” (p. 15). The

researcher explored the results from the open-ended interviews while reviewing open-source data from eight BRT projects.

The eight BRT projects selected for this study provided the researcher with ample data to validate contingency theory and SMT. The nine open-ended interviews completed by the researcher allowed this study to reach a point when qualitative data was robust. The researcher used a purposeful sampling technique within the qualitative research. Palinkas et al. (2015) stated, "Purposeful sampling is a technique widely used in qualitative research for the identification and selection of information-rich bases for the most effective use of limited resources (Patton, 2002)" (p. 533). The researcher used a theory-based strategy when implementing the purposeful sampling technique. The theory-based strategy permitted the researcher to explore and validate contingency theory and SMT constructs (Palinkas et al., 2015).

The convergent mixed method also states that the researcher merges quantitative and qualitative data to provide a comprehensive analysis (Creswell & Creswell, 2018). This study implemented a qualitative open-ended interview approach. The qualitative evaluation included exploring and comparing the construction budgets and schedules from the eight BRT projects.

The researcher completed a qualitative technique that gathered information using in-person video interviews and publicly available data at roughly the same time. In-person video interviews presented participants the ability to provide in-depth responses. J. Green and Thorogood (2004) stated, "The interviewee's responses determine the kinds of information produced about those topics, and the relative importance of each of them" (p. 80).

Most of the qualitative samples came from the information gathered through open-ended video interviews. Salazar (1990) stated, “The interviewer is the critical point of failure in survey research (Bradburn, 1981). A review of research using interviewing methods indicated that some of the problems of bias are even greater than many investigators assume” (p. 569). The researcher took the time to plan and prepare for the interviews and sampling process. Salazar (1990) stated, “The difference between a successful and non-successful interview will depend not so much on the skill of the interviewer as it will on the interviewer’s attitude” (p. 570).

To reduce biases, Enelow and Swisher (1986) suggested an interviewer avoid emotionally loaded words, use open-ended questions, and be mindful of the timing of questions and responses. Most importantly, the interviewer must be aware of any potential biases during the interview and sampling process. The researcher remained open-minded and minimized stereotypes or biases as data were collected and interpreted within the qualitative convergent approach. God has provided us love and self-control by graciously giving us his Holy Spirit. This spirit allows us to be fearless in troubled times, open-minded, and help minimize stereotypes as 2 Timothy 1:7 states, “For God gave us a spirit not of fear but of power and love and self-control” (ESV, n.d.).

The study was described to all participants before the interview. The description provided to the participants included (a) background of the problem, (b) problem statement, and (c) purpose statement. The participants’ names remained anonymous by removing any identifiable information. All the participants’ identifiable information was safeguarded appropriately and destroyed throughout the development of the study.

As a Christian scholar, this study spread the Lord's Word and reminded us that God oversaw my journey. This study continued improving America's public transportation systems by enhancing our citizens' mobility, accessibility, and economic well-being. The research and development of this study helped share best practices for future BRT projects. As stated in the Bible, "Practice these things, immerse yourself in them, so that all may see your progress" (ESV, n.d., 1 Timothy 4:15). The study assisted public transit agencies and local governments find ways to complete BRT projects on time and under budget.

Lastly, according to Philippians 2:3, "Do nothing out of selfish ambition or vain conceit. Rather, in humility value others above yourselves" (ESV, n.d.). The sampling of independent variables within the comparative multiple case study approach provided an efficient and legitimate process. Maintaining integrity, humility, and an understanding of potential biases throughout the sampling and data analysis procedures was important to this study. The researcher implemented the principles of integrity, legitimacy, and humility throughout the sampling procedures.

Instrumentation

The primary instrumentation implemented during this study was individual live video interviews with participants using preset open-ended questions. The researcher provided a video conference format for each potential participant. The live video interviews used Zoom software. To improve security, the participants received a personal meeting identification code and password code. The researcher enabled the participants to enter the room once they entered the waiting room.

The researcher insisted that participants complete open-ended interviews using Zoom video software. A live video format was preferred because this would develop a more natural conversation during the open-ended interviews. Video interviews allowed the researcher to see facial expressions and have a more in-depth experience with the participants. Video interviews avoided missing some of the nonverbal communication (Iacono et al., 2016).

The researcher completed the open-ended interviews using virtual video software because of the current COVID-19 travel restrictions within the United States. The researcher resides in the Washington DC region, and most of the potential participants live outside the Washington DC region. According to Centers for Disease Control and Prevention (CDC, 2020), "Travel increases your chances of getting and spreading COVID-19. ... Airports, bus stations, train stations, and rest stops are all places travelers can be exposed to the virus in the air and on surfaces" (p. 2). To help reduce the spread of COVID-19, the researcher used virtual video software to complete the open-ended interviews. God taught us that physical and spiritual health must both be prosperous during the difficult times of the COVID-19 global pandemic. He said, "Beloved, I pray that all may go well with you and that you may be in good health, as it goes well with your soul" (ESV, n.d., 3 John 1:2).

An online chat or email design was not used during the open-ended interviews. Using an online chat or email interview format avoids unwanted noises. There are several disadvantages when using online chat or email design. First, an online chat or email interview format makes it difficult for the researcher to verify the identity of the

participants. Second, there are a lack of social cues between the researcher and participants. Pease and Pease (2006) stated,

> Albert Mehrabian, a pioneer researcher of body language in the 1950's, found that the total impact of a message is about 7 percent verbal (words only) and 38 percent vocal (including tone of voice, inflection, and other sounds) and 55 percent nonverbal. (p. 1)

The third disadvantage of using an online chat or email interview format was the increase of probability for more miscommunication and misunderstanding. Fosslien and Duffy (2020) stated, "Most digital miscommunication happens because we don't have access to the non-verbal cues, including tone of voice, body language, and facial expressions, that give us valuable emotional context when we're discussing in person" (p. 4). Lastly, the fourth disadvantage is a significant time delay between the questions and responses. Extended time between questions and answers creates more room for scope creep.

For consistency, the researcher used the same preset open-ended interview questions. After the preset open-ended interview questions, the researcher provided participants additional time to add relevant information. The participants understood the video interviews were recorded, professionally transcribed, and added in this study. Each interview lasted approximately 45 min. The length of time of each interview depended on how much information each participant provided.

Focus group interviews were not part of the instrumentation process. Generally, focus groups are suited for qualitative research by providing a platform to participants (Arthur, 2012). Arthur (2012) stated, "Focus groups can be used as a method in their own right but are often used to complement other methods" (p. 186). There are three

disadvantages and difficulties posed by group interviews. The first disadvantage is group interviews can be hard to control and difficult to maintain focus. The second disadvantage is many of the potential participants had demanding and conflicting schedules. The third disadvantage is the potential for problems with confidentiality (Arthur, 2012). Setting up group interviews with participants is difficult to complete. The group interview methodology presents challenges in planning, logistics, and maintaining a focus of the study.

Individual live video interviews provided each participant the ability to offer their professional opinion. The live video interviews minimized the potential for stereotypes or biases between the researcher and candidate. Moreover, individual live video interviews provided participants a process that had no interruptions or disagreements. Live interviews permitted the potential participants to share their thoughts freely with no judgments.

Lastly, individual live video interviews allowed the researcher to complete an in-depth and comprehensive qualitative study. Open-ended questions provided the researcher in-depth information. The data collection section demonstrated more details of the open-ended interview questions. Individual live video interviews assisted in the exploration of efficiencies, lessons learned, contingency theory, and SMT during the construction of BRT projects. The instrumentation of live video interviews helped uncover why the BRT projects selected were constructed on time and under budget within the United States.

Data Collection

The data were collected using open-ended interviews with participants. All the participants were directly involved with the eight BRT projects selected in this study. The open-ended interviews included public transit agency employees, consultant project managers, and city employees. The interviews of the study took place over 4 months. Each interview was recorded and transcribed within 24 hrs using an automatic transcription software tool. The transcription software tool selected for this study was Otter ai. The software tool has the capability of transcribing video and audio recordings to text in minutes.

The researcher used the Delphi method, which sought to reduce pressures for conformity. Conformity can be completed through several rounds of questionnaires, and the responses were aggregated and shared after each round (Twin, 2021). The Delphi method was developed by RAND in the 1950s for market research and sales forecasting. According to Howe School of Technology Management (2022), "It provides a sound and well researched theoretical framework for the consolidation of expert opinions" (p. 1). Jorm (2015) stated, "The Delphi method is used because of the lack of other research evidence on the topic. Panel members are being asked to draw on their professional or personal experience" (p. 893). The researcher reviewed the transcription of the video interviews provided by the software tool and made corrections to the text if needed.

During the implementation of the Delphi method, the facilitator gathered responses from the members of the group (Jorm, 2015). The researcher emailed a copy of the transcription to each participant and confirmed that each participant received the transcript. Each participant had the opportunity to review the transcript and offer

additional comments. Jorm (2015) stated, “The members of the group are able to revise their responses to the questionnaire after receiving the feedback” (p. 889). Many of the participants provided feedback to the researcher after reviewing the transcripts.

The feedback from the participants cleared up information that focused on the eight selected BRT project scopes and construction processes. The researcher used the feedback provided by the participants to ensure accuracy of the qualitative data within this study. Several of the participants also provided the researcher construction documents and links to peer-reviewed articles that verified qualitative and quantitative data of the eight selected BRT projects. The researcher did not incorporate the technical reports and documents provided by the participants to protect the anonymity of the agencies involved with the eight selected BRT projects and the participants’ personal identifiable information.

The Delphi method reduced the amount of time it took for the researcher and participants to reach a consensus. Fish and Busby (2005) stated, “A good example of the utility of the Delphi method occurred in the early 1980s. Structural and strategic family therapies, two of the most popular approaches at the time, lacked both conceptual and practical clarity” (p. 241). A consensus was built from a panel of expert structural and strategic therapists to assess the similarities and differences between the two approaches (Fish & Busby, 2005). The Delphi method assisted the researcher to move forward in developing an understanding of the qualitative data. If the participant wished to provide further comments, a follow-up video conference or phone call was offered by the researcher. None of the participants in this study requested a follow-up conversation with the researcher.

The interviews used a semistructured questionnaire approach similar to what was implemented by Warcup (2015). Warcup (2015) stated, "Because of the semi-structured interview approach selected by the researcher, it was unnecessary to ask every single question on the interview question sheet as long as the respondent covered each question in their responses" (p. 46). The semistructured questionnaire permitted the researcher to explore and validate the research questions of this study. The semistructured questionnaire used by the researcher during this study is as follows:

Opening:

1. My name is Santiago Cruz-Roveda and I am currently a Doctor of Public Administration student with California Baptist University. I wanted to thank you for your time as we complete this interview. Please remember the interview is being recorded.
2. As a reminder the study is exploring what themes provide perception of completion on time and under budget during construction of Bus Rapid Transit (BRT) projects within the United States.

(Transition: The interview should take approximately 45 minutes. We will begin the interview by asking some general questions about the participant and the BRT projects.)

Body:

1. Please introduce yourself and your relationship with the BRT project?
2. What is the BRT project scope and description?

(Transition: We will now transition and focus on the organizational structure during construction.)

Theme 1: Organizational Structure

3. Please describe the organizational structure during construction of the BRT project?
4. In your perception, what impacts did the organizational structure play in permitting the BRT project to be completed on time?
5. In your perception, what impacts did the organizational structure play in permitting the BRT project to be completed under budget?
6. In your perception, did the organizational structure impact the progress of the BRT project during construction?

(Transition: We will now transition the interview to strategic conflict resolution efforts.)

Theme 2: Conflict Resolution

7. What conflict resolution efforts were used during construction of the BRT project?
8. In you perception, what impacts did conflict resolution efforts play in permitting the BRT project to be completed on time?
9. In your perception, what impacts did conflict resolution efforts play in permitting the BRT project to be completed under budget?
10. In your perception, did conflict resolution efforts impact the progress of the BRT project during construction?

(*Transition: We will now transition the interview to the third section, decision making.*)

Theme 3: Decision Making

11. What decision-making procedures were used during the construction of the BRT project?
12. In you perception, what impacts did decision-making procedures play in permitting the BRT project to be completed on time?

13. In your perception, what impacts did decision-making procedures play in permitting the BRT project to be completed under budget?
14. In your perception, did decision-making procedures impact the progress of the BRT project during construction?

(Transition: We will now transition the interview to the fourth section, Bureaucratic and stakeholder forces.)

Theme 4: Bureaucratic and Stakeholder Forces

15. In your perception, did bureaucratic forces impact the progress of the BRT project during construction?
16. In your perception, did stakeholder forces impact the progress of the BRT project during construction?

(Transition: We will now transition the interview to the last section, Scientific management efforts.)

Theme 5: Scientific Management Efforts

17. What standardization efforts where used during the construction of the BRT project?
18. In your perception, did any of the standardization efforts impact the progress of the BRT project during construction?
19. What quality control efforts where used during the construction of the BRT project?
20. In your perception, did any of the quality control efforts impact the progress of the BRT project during construction?

(Transition: This has been a pleasure finding out more about your professional experiences, information about the BRT project, and construction practices. Let me briefly summarize by reminding you the interview has been recorded.)

Closing:

1. As a reminder the study is exploring what themes provide perception of completion on time and under budget during construction of Bus Rapid Transit (BRT) projects within the United States.
2. Is there anything else you think would be helpful for the study?
3. Once again thank you for your time. The interview will be transcribed, and a text copy of the interview will be emailed within 24 hours. If you have any additional questions or would like to add anything do not hesitate to contact me. Lastly, if you are interested in providing additional information, we can set up a brief follow-up video conference call or phone call.

Throughout the semistructured interview, the researcher asked follow-up questions, probing questions, and interpretation questions. For example, the researcher asked each participant the following questions: (a) Could you say more about that? (b) What did you mean? (c) What did you do? (d) What does this remind you of? (e) What impact did this have on the project?

The responses from the participants were cross-referenced with public records and publicly available peer review articles. The researcher also used the Delphi method to validate the responses from the participants. Lastly, an affinity diagram helped develop genuine relationships with the data from the open-ended interviews. The genuine relationships focused on the following six predetermined contingency theory and SMT themes: (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts. The themes improved the understanding of how BRT projects were

completed on time and under budget within the United States. The next section of this chapter explains how the affinity diagram assisted with data analysis. The researcher completed open-ended, live video interviews with participants and used a qualitative approach to collect data for this study.

Data Analysis

The researcher completed three steps when analyzing and scoring information. The first step included recording the nine open-ended interviews and professionally transcribing the responses provided by participants. After transcribing the open-ended interviews, the researcher used the Delphi method and OSINT to cross-reference the qualitative data and increase the validity of the responses of this study. After the researcher integrated the Delphi method and OSINT, the responses were transferred to an online utility text analyzer operating software system.

In the second step of the data analysis, the researcher used the online utility text analyzer operating software system to find the most used words or phrases in the responses. Kuckartz (2014) stated, "In qualitative text analysis, the categories stay connected to the data throughout the entire analysis process, and it is often quite useful to refer back to the original text" (p. 45). After the text analyzer found frequently used words and phrases, the researcher looked for themes within the information provided. In qualitative text analysis, different passages within the open-ended interviews demonstrated information relevant to a theme that was then marked accordingly (Kuckartz, 2014). The text analyzer function allowed the researcher to develop common themes. The researcher arranged the data with the most utilized responses using the

online utility text analyzer operating software system. The online utility text analyzer operating system most utilized responses can be found in Table 2 within this study.

In the third step, the researcher developed an affinity diagram. The affinity diagram of the nine completed open-ended interviews can be found in the appendix of this study. Responses were analyzed and categorized by the researcher to develop and validate natural themes. The affinity diagram presented the optimal number of relationships by developing a spreadsheet that contained the themes and frequency (Davis, 2019). The spreadsheet sorted the themes according to descending order of frequency (Davis, 2019). The commonalities uncovered by the online utility text analyzer operating software system assisted the researcher in categorizing the response themes. The focus of this study was validating the predetermined contingency theory and SMT themes that provided the perception of constructing BRT projects on time and under a budget within the United States. During the data analysis, the affinity diagram developed by the researcher did not uncover additional contingency theory or SMT themes. The researcher had the potential to uncover new themes relevant to common hindrances. The developed affinity diagram did not uncover new themes relevant to common hindrances.

This study implemented a qualitative research design to collect and analyze the information gathered from the nine open-ended video interviews. The researcher highlighted the most common responses and began to validate the predetermined contingency and SMT themes using an online text analyzer operating software system. The researcher validated and illustrated the predetermined contingency theory and SMT themes by developing an affinity diagram.

Limitations

The limitations of the study were characteristics that set parameters on the interpretation of the results. The first limitation of the data was the narrow focus on budget and schedule within the capital construction phase of BRT projects. This study and research questions did not focus on the following project phases: (a) planning, (b) ROW, (c) environmental, (d) design, and (e) maintenance/operations. This study did not provide an in-depth analysis of the predetermined contingency theory and SMT themes outside the construction phase of BRT projects within the United States.

The second limitation was the small number of participants interviewed within this study. As data collection and analysis progressed, the researcher validated the participants' connections with the eight BRT projects explored. The researcher looked for participants who had first-hand knowledge of the construction phase within the eight BRT projects explored in this study. The researcher was able to find nine credible participants who were available and willing to participate in this study. The researcher was only able to interview one to two participants with first-hand knowledge of the construction budget and schedule for each BRT project.

The third limitation of the data were hidden biases or stereotypes. The researcher was a well-versed practitioner within the public transportation and public transit sector at a national level. The researcher worked as a transportation engineer with the California Department of Transportation from 2005 to 2019. From 2020 to present, the researcher worked as a general engineer and transportation industry analyst with the U.S. Department of Transportation in Washington, DC. The researcher was a practitioner and oversight project manager of major public transit, public transportation, and railroad

projects throughout the country. The researcher had worked as an oversight project manager and lead project manager of BRT, LRT, freight railroad, commuter railroad, and high-speed rail projects throughout the United States. One of the researcher's recent job duties was assisting project sponsors to complete their risk workshops. According to the FTA's Oversight Procedure 40c,

> The reliability of the Sponsor's project scope, cost estimate, and schedule over the course of the project life is extremely important, not only for the success of the individual project, but also for the professional credibility of the transit industry including FTA. (FTA, 2015c, p. 1)

The researcher's practitioner role within the national public transit and public transportation sector strengthened the validity of this study. The researcher was able to provide a national practitioner's perspective to this study. Because of the current practitioner role, the researcher acknowledged that hidden biases and stereotypes were potential limitations within this study.

The fourth and final limitation was the possibility of self-selection bias because of certain agencies being reluctant to participate in this study. Several agencies were hesitant to participate in this study because they had issues delivering their BRT projects on time and under budget during construction within the United States. The data analysis of this study would be more enriching with additional BRT projects that were behind schedule and over budget. The agencies did not participate in this study because of organizational bureaucratic forces and public perception from the media. In the end, this study explored and validated six predetermined contingency and SMT themes that led to constructing BRT projects on time and under budget within the United States.

Summary

In summary, the most appropriate design for this study was a comparative multiple case study approach of eight BRT projects and completing a qualitative open-ended interview with nine participants. The population size depended on the availability and willingness of potential participants. The participants included (a) public transit agency employees, (b) consultant project managers, and (c) city employees. Information was collected using the OSINT framework. The information gathered included historical data, peer review articles, social-media feeds, and publicly available records. The information was then cross-referenced with the qualitative data gathered from open-ended interviews. The qualitative interview approach provided the researcher an in-depth and comprehensive study of how BRT projects are built on time and under budget within the United States. The predetermined contingency theory and SMT themes were validated and categorized from the responses by the researcher using an online utility text analyzer operating software system and the development of an affinity diagram.

Throughout the methodology, participant names and their respective agencies remained anonymous. The researcher removed all names and any identifiable information from participants within this study. This procedure safeguarded the exploration, data analysis, and development of this study.

CHAPTER 4: RESEARCH, DATA COLLECTION, AND FINDINGS

This study focused on efficiency during the construction phase of BRT projects within the United States. Public transit is one of the most robust and comprehensive systems in the nation. Public transit improves the health and economic stance of millions of residents throughout the United States while improving the environment. Major public transit projects deal with unexpected inefficiencies and delays during construction. Unexpected inefficiencies and delays have increased scrutiny and oversight from the federal government, states, counties and cities throughout the United States as well as the public. This study explored how organizational structure, conflict resolution efforts, decision-making procedures, bureaucratic forces, stakeholder forces, and scientific management themes permit BRT projects to be constructed on time and under budget within the United States.

The purpose/objective of this qualitative study was to research and develop a comparative multiple case study of eight BRT projects within the United States. This study explored and validated six predetermined contingency theory and SMT themes during the construction phase within the United States. The problem statement of the research is explore and validate six predetermined contingency and SMT themes that provide perceptions of completion on time and under budget during the construction of BRT projects within the United States. The research focused on efficiency during construction of BRT projects. This study defined efficiency as delivering BRT projects on time and under budget while maintaining quality. The eight BRT projects selected within this multiple case study were completed with the planning, design, and construction phases and were operational.

The specific aim of this qualitative study was to explore and validate contingency theory and SMT themes that provide the perception of completion on time and under budget during the construction of BRT projects within the United States. The dissertation explored efficiencies using the OSINT framework, live video open-ended interviews, and the Delphi method. The researcher sought to develop a relationship between the construction of BRT projects, contingency theory, and SMT.

The eight projects selected for this study completed their planning initiation documents; environmental documents; ROW acquisition documents; and plans, schedule, and estimate package. This study identified and analyzed eight projects that completed their risk and contingency review and were operational.

Research Questions

The study implemented the following seven research questions:

1. What organizational structure was used during the construction of the BRT projects?
2. What strategic conflict resolution efforts were used during the construction of the BRT projects?
3. What decision-making procedures were used during the construction of the BRT projects?
4. What bureaucratic forces permitted the construction of the BRT projects to be completed on time?
5. What stakeholder forces permitted the construction of the BRT projects to be completed under budget?

6. What scientific management efforts permitted the construction of the BRT project to be completed on time?
7. What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Synopsis of Interviews

Participant 1

Participant 1 (P1) was working as a vice president of a construction management division within their organization that had participated in various BRT projects during the conceptual planning, design, and construction phases. According to P1, a BRT was a bus that rapidly moved from point A to point B. If one were to drive from point A to B, most people would not take a regular bus ride because it takes time. A regular bus stops between two to three times in a mile. A regular bus decelerates, stops, drops off passengers, picks up passengers, and then once again accelerates. Once again, a regular bus travels for a certain distance, decelerates, stops, accelerates, and repeats the same cycle.

The first feature of a BRT system is the reduction of the number of stops within the corridor. A BRT system typically has one stop every mile within the corridor. Depending on the physical limitations or circumstances, the distances between the stations can be shortened or extended more than one mile. In certain instances, BRT systems have exclusive paths and bus only lanes assigned, which reduces time loss. The exclusive lanes may be limited in the corridor because of intensive acquisitions of real estate. A BRT system incorporates traffic signal priority (TSP), which is similar to

emergency vehicle preemption. TSP systems allow a bus in mixed traffic to jump ahead at signal intersections.

According to P1, the station design similarities to a rail system is another feature that allows a bus to become rapid within a BRT system. The rail station design makes the experience very convenient for the rider. A rider could purchase the tickets at the bus station or at the platform. The BRT station design has level boarding features, which means the platform is in line with the steps of the bus. Elderly individuals, individuals with strollers, or individuals with disabilities can get on and off the bus rapidly. These features make the bus travel faster and the BRT system distinct from the regular bus service.

Depending on the physical limitations or circumstances, sometimes the distances between the stations can be shortened or extended more than one mile. For example, the bus-only lane limits a portion of the corridor. A BRT system uses special buses with multiple doors on both sides of the bus. The special buses have a distinguishable look, color, and logo. In some cases, the bus stations are in the median. When a BRT system uses stations in the median, the driver-side doors open. In other cases, the opposite side doors open. BRT systems use 40-foot buses or 60-foot buses. This BRT project uses 60-foot articulated buses, which refers to a bus that uses an articulated joint. The articulated joint is a flexible joint that resembles an accordion bellow to facilitate sharp corners on narrow streets.

According to P1, an organizational structure would vary from company to company. The organization in charge of this BRT project was a bus operator who did not have a separate Project Management Department. To comply with funding requirements,

the organization formed an integrated project management office (IPMO). The IPMO's core responsibility was to manage the design and construction of this BRT project. The organizational structure during construction included a project director who reported to the chief executive officer (CEO) of the organization. The organizational structure also had a design manager who coordinated with the design consultant and the construction manager. A construction manager worked with the consultant management team. The organizational structure focused on safety, which was important during the construction of this BRT project. A quality assurance manager was included in the organizational structure. Lastly, the organizational structure had a schedule and cost manager who was responsible for schedule, cost control, and compliance.

According to P1, three key organizational structure entities impacted the execution of a BRT project. The first entity was the design consultant. The design consultant provided services during the environmental phase, the clearance to conceptual design phase, and the preliminary design to final design phase. This BRT project hired an experienced design consultant who worked on similar BRT projects. The second entity of the organizational structure was the construction management consultant. The construction management consultant team included quality assurance inspectors and safety inspectors. The safety inspectors documented daily progress that addressed construction issues and further actions related to labor compliance, material suppliers, schedulers, and cost control.

The third entity of the organizational structure was the contractor. The contractor team included (a) construction manager, (b) superintendent, (c) trades team, (d) safety team, (e) quality control team, and (f) others. Typically, the lowest bidder was awarded

the construction contract. According to P1, this project ensured the lowest bidder was responsive and responsible per contract requirements.

To ensure the best use of public funds and managing the three entities, this BRT project created an overseeing organization. The IPMO acted as the overseeing organization for this BRT project. The IPMO oversaw the three entities and assisted in implementation of the scope of work, budget, and schedule of the consultants and contractors. The IPMO ensured work was proceeding using the approved scope, schedule, and budget. The IPMO provided updates and reports to the funding agencies and stakeholders of this BRT project. The IPMO impacted this project and made sure this BRT project was completed on time and under budget.

According to P1, during construction the design manager worked closely with the design consultant. For example, if changes occurred while finalizing the design or during construction, the design manager acted as the conduit between the design consultant, the IPMO, the company, and the funding agencies. The public organization notified funding agencies, construction consultants, and contractors if design changes occurred. During construction, many unforeseen situations required actions to be taken on the fly. These immediate actions had a direct impact on cost and schedule. The construction manager worked closely with the construction management consultant. Most of the issues were resolved in the field without impacting the design, cost, and schedule. If issues were not resolved in the field, they moved up the ladder. Ultimately, the decision made sometimes involved finances, scheduling, and other elements.

According to P1, there were three aspects to conflict resolution during construction. The first aspect of conflict resolution was the fact the IPMO team was on

top of situations daily. Daily oversight provided the IPMO team advanced notice of potential issues and permitted the construction team to act proactively. The IPMO team assisted in anticipating potential problems during construction. The IPMO team constantly reviewed the ongoing construction activities and the following week's activities. Daily review of construction activities permitted the IPMO team to resolve and mitigate issues when uncovered.

The second aspect of conflict resolution was developing partnering sessions with the contractor at the beginning of this BRT project. The partnering sessions typically included the owner, the contracting team, consultants, and occasionally key stakeholders. The partnering sessions occurred on a quarterly or biyearly basis. The partnering sessions permitted the parties to share their issues and exchange ideas. The focus of the partnering sessions was how to make this BRT project have a win-win situation for both parties. The partnering sessions did not air out dirty laundry. Instead, the sessions focused on positive feedback to improve tasks and responsibilities for the benefit of this BRT project.

The third aspect of conflict resolution was the dispute resolution board (DRB). The DRB allowed the contractor and owner to identify experts in the industry and appoint them as independent reviewers after a dispute occurred. The contractor and owner approved two individuals, and the third individual of the DRB acted as the tiebreaker. The third individual was known as the chairman. Every quarter the DRB members met with the contractor and owner to review the issues and progress of this BRT project. The quarterly meetings provided historical knowledge of this BRT project to the DRB members before a conflict. If there was an issue, the DRB committee was involved. The

DRB completed a study, documented their findings, and confirmed whether the contractor was asking for reasonable and fair compensation. Ultimately, the owner needed to agree to the request and ensure the dispute was not part of the original scope. The standardized conflict resolution procedures contributed to this BRT project being completed on time and under budget. If the right team was involved daily, most BRT projects were constructed on time and under budget.

According to P1, there were decisions made daily during the construction of this BRT project. Issues varied in nature and the construction team had full knowledge and the ability to provide guidance to the involved parties. An experienced construction manager and design manager were key members in most decisions during the construction phase. For example, if the contractor came up with an innovative change to save costs, the engineering manager, design manager, and construction manager evaluated the change. After the preliminary review was complete, the change was forwarded to the design consultant. The design consultant was recognized as the engineer of record (EOR). The EOR was responsible for design changes to the original design. The EOR provided concurrence on the proposed change. If the proposed change required a design change, the EOR changed the plans. In the field, the construction manager or contractor could not make the change because ultimately the EOR was responsible for the change.

According to P1, there were situations on the spot when decisions were mandated. For example, the design plan showed a pipeline going to the left of a particular location. But in the field, the inspectors realized this change was off by three feet. Moving the pipeline three feet to the left could be considered a minor change if there were no

significant impacts associated with the change. The field inspector, construction manager, and design consultant confirmed the minor change. According to P1, the EOR may not be involved in the minor change process. Minor changes avoided the long-drawn-out formal change order process. Regardless, minor changes were marked out in the plans with a red pen to assist with future as-built drawings. At the end of the construction phase, many of the design sheets had redlines indicating minor changes. After the construction phase, the redline changes were formalized in AutoCAD, showing the final as-built condition. This BRT project implemented the formal change order process and the minor change process to manage the design and construction decisions.

According to P1, the change order process impacted the scope, cost, and time during the construction phase of this BRT project. The change order process started with the contractor submitting a request for information (RFI). The field inspector, construction manager, and design manager completed a preliminary review of the RFI. The RFI formalized and legitimized the documentation of the change order process. The contractor was required to provide the cost and schedule impacts and backup documentation. Once the preliminary reviewers approved the RFI, the change order transferred to the cost control department. Depending on the cost impact, the change would go through several layers of approval. The higher the cost impact, the more signatures were required. If the change order was significant, the CEO and financing agencies would be involved in the change order process.

The contractor was not authorized to construct the change until the change order was officially approved. If the contractor decided to perform the work in the field before the change order process was approved, the work performed would be at the contractor's

own risk. If the contractor completed the work and the change order process was not approved, the contractor would pay the cost. According to P1, the change order process cause the most bottlenecks for public agencies. The change order process was complicated and time consuming because of the many layers of approval. The bigger the public organization, the more steps within the change order process.

The smaller the public organization, the less experience the agency had in managing the change order process. According to P1, if the public organization was small and inexperienced, training focused on the change order process was required for everyone in the organization. The IPMO formalized procedures of the change order process for the public organization. Regardless, the change order process was the main bottleneck during construction. The formal change order process held up the schedule during construction. During the change order process, the contractor sat still and created workarounds. The workarounds helped make up time during construction. Without workarounds, the change order process delays accumulated, and the construction schedule began to slip. The golden rule in construction is time equals money.

According to P1, the public organization and owner maintained an excellent working relationship with the contractor. The objectives and mindsets were different for the public organization and contractor. The contractor performed the work to make a profit, and the public organization completed the project for the benefit of the public. Both parties found a fiduciary responsibility to spend the approved public funds wisely. If an adversarial relationship between both parties formed, this derailed the cost and schedule of this BRT project.

According to P1, bureaucratic and stakeholder forces impacted the progress of this BRT project in various aspects. The first aspect, every citizen was a stakeholder, and the public had the right to know what was occurring during construction. The public had the right to express their opinion and demand certain features. BRT projects generally were constructed along a corridor that connected various cities. The community influenced the approved location of this BRT corridor. BRT projects conducted several public meeting sessions that presented the concept of this project. The public meetings provided the opportunity for the public to offer comments. Rules, regulations, or field constraints complicated the implementation of some of the requests by the public. Regardless, handling public comments was mandated because the public would use the BRT system.

According to P1, this BRT project dealt with the contentious real estate acquisition process during the planning and design phase. The design of this BRT project sometimes required street widening. For example, a property owner had an issue because the footprint of this BRT project reduced a portion of their property. The real estate acquisition had a formal procedure that provided due compensation to the impacted party. In many cases, the acquisition of property became a contentions process during the construction of this BRT project. For example, if the property owner or impacted business did not agree with the due compensation, this moved to the procedure to condemnation.

Condemnation was when the government gave the authority for a public project to acquire property with due compensation. The condemnation process took 6 months to a year to complete. If this BRT project did not have the ROW or the construction

easements in place, the contractor could not work in that area. When the contractor did not perform work, this added time and cost. During construction, this BRT project also impacted driveways, lane access, utilities, and traffic signals. Detours were created during construction, affecting the traffic within the corridor. Underground utilities were also moved during the construction of this BRT project. Moving underground utilities indicated that utility power, water, or gas had to be temporarily disconnected from the neighboring community. Advanced notice to the community and additional public meetings occurred if utility power, water, or gas was disconnected.

According to P1, there were three bureaucratic elements in this BRT project. The first bureaucratic element was the public organization constructing this BRT project acquired permission from the city traffic department, utility companies, and other permitting stakeholders. This BRT project was one of many projects the permitting stakeholders reviewed and approved. The second bureaucratic element was the public organization's board of directors approved this BRT project scope and cost. The third bureaucratic element was cities hosting this BRT project played a role in the approval process. The public organization building this BRT project ensured the cities agreed with progress issues during construction. Many times, cities requested additional work within the umbrella of this BRT project. The extra work was known as betterments, which were likely to impact cost and schedule.

For example, if this BRT project was a building curbside on the east side of the road, the city requested adding new curbside on the west side of the road. Because the contractor and equipment were already present in the field, the betterment requested for new curbside made sense. Similarly, if this BRT project upgraded one of the corners of

an intersection, the city requested modifications on all four corners. The betterments were typically not part of the approved scope of work for the contractor. According to P1, betterments approval was a balancing act. Depending on the cost, schedule, and approval process required, this BRT project considered adding the betterments.

Approving betterments was a common problem during the construction of this BRT project. A city had the potential to impact the scope of work of this BRT project through betterment requests. Developing provisions for betterments was complex because of the uncertainty of the city. Also, the city public works department approved this BRT project plans. The city was the responsible party. This BRT project was not able to begin construction until the city approved the plans. According to P1, this BRT project commonly coordinated with the city's public works department. The corridors of this BRT project were mainly within the city's public ROW.

The construction of this BRT project had the potential to impact stakeholders. If this BRT project was blocking a driveway, this had the potential to impact the property owner's business. The center lane within an existing corridor was referred to as a fifth lane or suicide lane. The fifth lane within the existing corridor was used as a left turn into a strip mall or shopping center. During construction, this BRT project removed the fifth lane and replaced the lane with a new BRT median station. The construction of a BRT median station included a landscape barricade that prevented the public from making a left turn. For example, if a resident accessed a McDonald's for years by turning left at the suicide lane, the resident would no longer be able to access the restaurant. The new BRT median station forced the resident to drive past the McDonald's and look for an intersection where they can legally make a U-turn. Because of the barricade, the resident

preferred to go to another fast-food restaurant on the right side of the road. Therefore, McDonald's raised an issue because the restaurant potentially lost a customer because of the newly built BRT median station.

According to P1, removing access to businesses or homes was the most common issue during the construction phase of BRT projects. Noise levels, vehicle and construction equipment movements, and heavy equipment movements were all safety concerns during construction. Safety had the potential for major stakeholders' impacts during construction. Stakeholders had the right to provide safety issues or comments to the public organization and contractor. The safety concerns were addressed satisfactorily and taken seriously. Safety was reviewed and addressed throughout the life of the construction phase. Having a good public relations officer and communications team was key to the success of this BRT project during construction. The public relations officer had to be constantly informed during construction so there were no surprises.

According P1, the owner, consultant, and contractor had a qualified team to ensure this BRT project was built on time and under budget. This BRT project had to ensure the team was qualified and technically sound across the board. As far as the contractor, generally the lowest bidder won the project. Before awarding the contract, the public organization ensured the contractor was responsive and responsible during the bid process. In summary, having a qualified team was key to constructing this BRT project on time and under budget.

Participant 2

Participant 2 (P2) worked as an executive director of planning and engineering within their public transit agency. Within the public transit agency, this BRT team was

one of the four departments P2 oversaw. This BRT project had been progressing for more than a decade within the public transit agency. Most of the investment study for this BRT project had occurred approximately 20 years previously. The organization identified three corridors intended to improve service reliability and provide service to riders. The preferred corridor selected for the study demonstrated a high transit dependency for the population. The initial BRT corridor included three cities. The environmental process and planning phase took almost 10 years to complete because of the involvement of numerous agencies. After the environmental process, one of the initial cities dropped out of this BRT project. This BRT project shortened from the original 14.5-mile corridor to approximately 9.5-miles.

During the planning and approval process, the remaining two cities imposed a lot of conditions. This BRT project was adapted and shortened because of the restrictions imposed by the cities. This project executed three bid packages. The first bid package focused on reviewing advanced utility conflicts in the station platforms. This BRT project constructed 46 raised platforms for level boarding. The first bid package permitted this BRT team to evaluate whether the 46 platform locations had any water, sewer, or other utility conflicts.

This BRT project constructed bus-only lanes in 80% of the corridor. A traffic lane was eliminated in the corridor because of the addition of the bus-only lane and station platforms. This BRT project impacted public parking along the corridor. As part of the environmental mitigation process, this transit agency developed parking improvements along the corridor. The second bid package focused on purchasing additional land to build surface parking lots. The second bid package also improved

parallel roads to this BRT corridor. According to P2, parallel road improvements enhanced traffic circulations and mitigated the impacts of surface parking lots.

The third bid package was considered the major capital construction of this BRT project. The third bid package focused on the construction of the 9.5-miles of this BRT corridor. This BRT project included 46 raised platforms that make up 34 stations along the corridor. Some stations had two platforms. The first platform was in the northbound direction, and the second platform was in the southbound direction. According to P2, each station was approximately 1/3 miles away from the other because of community input. This BRT project constructed new curb to curb paving and upgraded over 515 curb ramps along this corridor. This corridor had 110 existing traffic signals. This BRT project installed 35 new traffic signals within the corridor to slow the traffic and improve crossing conditions. This BRT project constructed and improved over 200 new pedestrian crossings within the corridor to improve pedestrian safety.

The newly built raised platforms included vending machines. Riders used the regional Card readers, a fare riding machine that automatically accounted for discounts and transfers. Card readers permitted riders to pay on the platform while waiting for the bus to roll in. This BRT payment system mimicked a fare payment system of an LRT project. Riders paid before entering the transit vehicle. There were no payment machines or systems located on the BRT buses. This BRT project also integrated TSP into the design of the system.

This BRT system was operating buses within the corridor at approximately 10-min headways. This BRT system intended to reach 7-min headways. According to P2, within 1 to 2 years, this BRT system would be operating 24/7. Starting at 6 a.m. and

ending at 7 p.m., this BRT system had 10-min headways. Starting at 7 p.m. and ending at midnight, this BRT system had 15-min headways. And starting at midnight and ending at 6 a.m., this BRT system had 1-hr headways. To operate this BRT system 24 hrs a day, the transit agency would acquire 27 60-foot special BRT buses.

According to P2, special BRT buses were necessary because of the locations of the raised station platforms within this corridor. The special buses had five doors on both sides of the vehicle. Within the downtown area, the BRT buses used the curbside stations. Throughout the remainder of this corridor, the BRT buses used in the center of the road stations. The special BRT buses included bridge plates. If necessary, the bridge plates were deployed to fill in the gap between the platform and bus. A bridge plate permitted a rider to roll into the bus with their stroller or wheelchair. According to P2, the transit agency was operating 20 BRT buses in the peak periods. As COVID diminished and physical distance requirements decreased, the transit agency expected the ridership to come back. This BRT project was a $232 Million Program for the public transit agency.

According to P2, the organizational structure during construction was a challenge for the public transit agency. Early on, the public transit agency decided to build this BRT project. The public transit agency created a BRT Department that oversaw the day-to-day operations of this BRT project during construction. This BRT department included a BRT director. The BRT director led the design and construction efforts of the three bid packages. A small team of two project managers and an administrative assistant supported the BRT director. According to P2, the organizational structure was a public transit agency-wide effort that included support from legal, procurement, IT, operations,

planning, and project controls. The public transit agency identified additional subject matter experts (SMEs) from the various areas to assist in delivering this BRT project.

The public transit agency also brought in a consultant construction management team to act as an extension of this BRT Department. The consultant construction management team included a resident engineer, assistant construction manager, inspector, and traffic controller. The public transit agency developed an internal BRT Department that oversaw daily activities. Additional SMEs within the public transit agency and a consultant construction management team completed daily field inspections, augmenting this BRT Department.

According to P2, the organizational structure played a vital role in permitting the project to be completed on time and under budget. After looking back during the construction phase of this BRT project, P2 suggested not having SMEs from each department. SMEs had limited time to assist with this BRT project because they had other priorities and a full-time job. The SMEs considered this BRT project a "special project." A special project was generally not part of the SME job duties. This BRT Department waited many times for SME support because of the special project classification.

The public transit agency decided early on not to hire additional staff that focused on this BRT project. Because of the limited resources within the public transit agency, when this BRT Department asked for support, this took a long time to occur. The organizational structure impacted the delivery of this BRT project during construction. This BRT project was one of the largest major capital projects the public transit agency had undertaken. The public transit agency was pulling resources from teams that had

never done this type of job in the past. Even legal was unfamiliar with the major conflicts involved with the contracts or the complexities. According to P2, everybody within the public transit agency was learning on the job. The learning curve was one of the primary reasons there were delays in the decision-making process during construction.

According to P2, the organizational structure impacted the progress during construction. During construction, many memorandum of understanding (MOU) and utility agreements needed to be modified. Many change orders occurred during construction. Change order happened because the field conditions were completely different from the as-built conditions. This BRT corridor had been neglected by the cities for a long time with no improvements for approximately 80 years. According to P2, the as-builts were very old and could not be trusted. Not trusting the archaic as-builts was one of the lessons learned during the construction phase of this BRT project. This BRT project uncovered many different field conditions. During construction, the utility companies and cities were not aware that their lines existed at locations.

According to P2, when uncovering unknown utilities, this BRT project developed a change order. The change order process went through the entire organization to get approval. The general manager was the only individual who could approve a change order. Waiting for the general manager impacted the schedule and cost of this BRT project. According to P2, the $232 million BRT project had to wait for the general manager to approve a $20,000 change order. While the change order was approved, the general contractor counted the number of hours and days of the delay. The change order process impacted this BRT project budget and schedule.

This BRT project tried to streamline the change order process and examined ways to shorten the process. According to P2, this BRT project should have thought through the change order process more and adopted changes with the board. Given the high priority of this BRT project, improving the change order process would be an easy way to impact daily activities and progress during construction.

This BRT project had strong conflict resolution efforts during construction because of the institution of partnering sessions. The public transit agency instituted a partnering class by which an outside third-party mediator was brought into the sessions. The public transit agency and general contractor agreed to cost-share by paying half of the cost for a third-party mediator to complete partnering sessions. The partnering sessions between the public transit agency and general contractor helped resolve many issues. This BRT project still had disputes to mitigate on the contract side of the house, but partnering still occurred. Partnering allowed the public transit agency and general contractor to continue negotiating and not head directly to court. This BRT project took advantage of partnering starting from the design phase.

The unique nature of the public transit agency was that it does not own the real estate within this BRT corridor. This BRT project was within the city real estate. The BRT buses ran on the city real estate, meaning that the cities issued permits. The cities imposed many conditions on the public transit agency, but unfortunately, the cities did not come to the table or partnering with the public transit agency. According to P2, the public transit agency decided to host a mediation and partnering session with the stakeholders to permit this BRT project to begin construction. The partnering sessions allowed everyone to come together and move forward in the right direction. The public

transit agency used the specifications and examples provided by the state department of transportation (DOT) and applied them to this BRT project. Partnering sessions impacted the conflict resolution efforts for this BRT project.

According to P2, conflict resolution and partnering efforts had a huge impact on this BRT project being completed on time and under budget. Conflict resolution and partnering efforts with multiple cities, the general contractor, and the public transit agency permitted this BRT to start construction. Once this BRT project entered the construction phase, the general contractor was unable to immediately acquire the necessary permits to start construction. At the beginning of the construction phase, the general contractor had to wait close to 8 months from the notice to proceed to have the first shovel on the ground. For 8 months the general contractor, cities, and the transit agency entered an intense partnering effort. The cities imposed additional permitting conditions on the general contractor. This BRT corridor was close to 10 miles long with many street blocks impacted during construction.

According to P2, before this BRT project went out to bid, the cities agreed to allow the general contractor to build 10-block sections at a time. Before this BRT project began construction, the cities decided not to permit the general contractor to work in 10-block sections. Instead, the city restricted the general contractor to work in certain corners of the 10-block sections. This was an issue because the public transit agency did not bid or stage construction with the permitting restrictions. According to P2, the city permitting restrictions doubled the timeframe to build this BRT project. The permits restricted the general contractor to work on 10 corners instead of 10-block sections.

The general contractor began working on the permitted corners. Because of the inaccuracy of old as-builts, every time the general contractor began digging a corner, utility conflicts were uncovered. The general contractor closed the corner and waited for the utility company to come in and fix the issue. Because of utility conflicts, the general contractor and public transit agency asked the cities for additional permits that allowed the construction of 10 more corners. Once 20 locations opened in this BRT corridor, the community and businesses began to get frustrated. Because of holes opening in this BRT corridor, the business driveways were affected. Conflict resolution and partnering efforts impacted the permitting process, utility conflicts, and community/business disturbances during the construction of this BRT project.

According to P2, this BRT project should have implemented a single point of decision making. The public transit agency ran and administered the construction of this BRT project. The contractual obligation between the public transit agency and general contractor slowed down the city's and external stakeholders' decision-making process. The public transit agency made decisions because of the contractual obligations between the public transit agency and the general contractor. Meanwhile, the cities and external stakeholders were not mandated to make decisions because they had no contractual obligations in this BRT project. The decision-making process impacted the construction schedule and budget of this BRT project.

In certain instances, the public transit agency made decisions by themselves to advance the construction of this BRT project. Decisions occurred without final input from the cities or external stakeholders. The decisions permitted construction to progress within this BRT corridor. According to P2, this BRT project should have developed a

unified decision-making procedure with the cities and external stakeholders. The city's and external stakeholders should had sat down together with the BRT director. The individuals representing the city and stakeholders should have been authorized to make a decision. Unfortunately, a unified decision-making meeting did not occur during construction.

During construction, the BRT director sent out a separate request to each city and external stakeholder for a decision. The issue and proposed solution circulated within the city's and external partner's staff. The public transit agency provided a solution and requested concurrence of the proposed decision from the external partners. The decision-making process took a long time to complete, impacting the construction schedule and budget. According to P2, the decision-making process did not function well during the construction of this BRT project.

Because of the lack of a unified decision-making process, the public transit agency decided to make its own decisions 2 years into the construction phase of this BRT project. The agency's decisions abided by the contract language, specifications, laws, and regulations of the permitting agencies. The public transit agency began making most of the decisions and informed the cities and external stakeholders of the outcomes. For example, the public transit agency and designer mitigated a utility conflict in the field. Afterward, the decision was conveyed to the cities and external stakeholders, which allowed construction to be on time and under budget.

According to P2, the designated representatives from the cities and external stakeholders would come to the construction meeting to listen and take notes regarding the latest developments of this BRT project. During construction meetings, the

designated representative would not concur with the proposed solution presented. Instead, the representative took the information back to their organization and circulated the information for further feedback. The construction decision-making process for this BRT project took weeks to finalize.

According to P2, bureaucratic forces impacted the progress of this BRT project. During the design phase, the public transit agency experienced bureaucratic forces from the cities. The agency's intent and goal was to run reliable buses that were frequent and provided additional amenities for riders. Most of the riders were residents of the cities within this BRT corridor. The political and council members from the cities took the original intent of this BRT project and expanded the scope. The cities used this BRT project to improve the 80-year neglected corridor. Because the public transit agency was building a project that ran BRT buses, the cities asked the public transit agency to improve the infrastructure for the entire corridor. The public transit agency agreed with the requests of the council members to improve the city infrastructure.

The infrastructure improvements included upgrading approximately 800 curb ramps to meet the Americans With Disabilities Act (ADA) regulations. This BRT project also included curb to curb paving and lighting improvements for the entire corridor. The public transit agency agreed to include city improvements and instituted these additions into the scope of this BRT project. Because of restrictions of this BRT project footprint, there was no real estate acquisition within the corridor. The only real estate acquisition was the surface parking lots that helped mitigate parking issues. According to P2, the impacts for the public during construction were the presence of construction crews in front of businesses, pavement operations, and the construction of sidewalks.

The council members requested the public transit agency establish a business impact mitigation fund that helped distribute money to various impacted businesses along the corridor. Many businesses within the corridor were considered mom-and-pop shops. The public transit agency agreed to establish a business impact mitigation fund. The demand to create the business impact mitigation fund came from stakeholders along the corridor. The stakeholders requested mitigation funds to assist with financial business impacts because of the construction of this BRT project. According to P2, the city also potentially impacted businesses along the corridor when they paved and upgraded the city infrastructure. Because of grant regulations, the business impact mitigation fund was separate. The public transit agency raised funds with the assistance of partnering and mediation efforts. The business impact mitigation fund had no strings or regulations attached, providing the cities flexibility to spend the funds any way they wanted. Bureaucratic and stakeholder forces developed the business impact mitigation fund.

The public transit agency's board was directly elected. Most of the public transit agencies in the nation belong to a city or a county, and their board members were appointed council members. The public transit agency was unique because it did not own real estate. The public transit agency created a Policy Advisory Committee consisting of three transit board members, two council members from each city, and the state DOT. According to P2, the Policy Advisory Committee started imposing more improvements on the public transit agency's BRT project. The Policy Advisory Committee began requesting to fund additional improvements along the corridor, and they got away from the initiative to construct a BRT system. The Policy Advisory Committee passed a resolution restricting the funds to this project. The public transit agencies board stated

they would not spend additional funds on the general fund for this BRT project. The Policy Advisory Committee became another bureaucratic and stakeholder layer that impacted the cost and schedule during construction.

The council members impacted the construction sequence of this BRT project. The 10-block sections proposed for construction were among the council member's district maps. For example, a council member stopped construction within their district for the next 10 months until other districts completed certain criteria within this BRT corridor. Council members influenced the proposed construction of this BRT project. The council members stopped the city from issuing construction permits within their districts. According to P2, the council members impacted the construction budget and schedule of this BRT project. The council members' actions demonstrated there was no real buy-in from the bureaucratic leaders.

According to P2, stakeholders also impacted the construction progress of this BRT project. One of the stakeholders along the corridor influenced this BRT project during the planning and design phases by requesting two additional stations. The public transit agency ended up adding the two stations as part of this BRT project. Stakeholders demanded money because of obstructions caused by construction activities. According to P2, this BRT project addressed stakeholders' demands during construction creatively. One of the stakeholders even conducted a mock scenario showing how a bus-only lane impacted the residents and businesses. The stakeholder illustrated what would happen if this BRT project came along and converted one of the lanes to a bus-only lane. The stakeholders' mock scenario tried to demonstrate traffic impacts from a bus-only lane within this BRT corridor. The public transit agency had to deal with the mock scenario

during construction. According to P2, after construction the BRT buses entered the operations phase and the traffic impacts presented by the stakeholder were no longer valid.

According to P2, this BRT project did not implement a comprehensive standardization effort during construction. The public transit agency did not standardize specifications. This BRT project was on the state highway system and the local street systems. The cities had their construction specifications, and the state highway system had its construction specifications. According to P2, the general contractor was compensated separately for constructing sidewalks on the state highway and the local city street system. The field inspectors had to deal with different construction specifications and measurements. This BRT project should have standardized the construction specifications along the corridor.

Many conflicts occurred in the field because of utilities being shallower than the as-builts. For example, once an excavation started, utilities were found six inches deep, but the as-builts showed the utilities were 30 inches deep. Some of the electrical utility pipes uncovered were old and no longer manufactured. According to P2, the public transit agency brought in a designer to develop alternate preapproved design solutions for existing conflicts. The public transit agency prepared design alternatives, showing the most common conflict scenarios. Developing preapproved design alternatives assisted the project when the construction team dealt with a similar utility conflict scenario in the field. The preapproved design alternative options provided the general contractor a quick solution.

According to P2, this BRT project created a TIGER team that completed advanced exploratory potholing work. The TIGER team completed the work before the general contractor arrived in a particular location. The public transit agency convinced the cities to issue a permit to execute exploratory potholing. The potholing team opened larger sections than the average potholes to investigate underneath each intersection. This innovative solution helped speed up the conflict resolution process during construction. This BRT project instituted rub rails on the side of the platforms to help the drivers approach the raised stations. During training, the drivers were hesitant to approach the raised platform stations. The bridge plates would not close the gap between the BRT buses and the raised platforms. Rub rails permitted the BRT bus drivers to rub along the raised platform stations. This BRT system also instituted a stripe on the road that assisted drivers. The stripe provided BRT bus drivers a visual cue to see how close they were to the raised platform stations. This BRT project instituted bridge plates, rub rails, and new stripes to assist the BRT driver's approach the raised platform stations.

According to P2, this BRT project assigned a quality control manager during construction. The general manager received independent reports from the quality control manager. The quality control manager provided an independent review during the construction phase. The quality control manager also worked very closely with the funding agencies and acted as a grantee point of contact. The quality control manager also handled the noncompliance reports (NCR) during construction. The NCRs focused on issues that were related to structure, painting, paving, and other elements within this BRT project. According to P2, the quality control manager did not impact the progress during construction.

During construction, the quality control manager discovered two elements that caused delays. The first quality control delay was due to welding issues related to the canopies of the raised platforms. The canopies were sent back to the manufacturer. The installation of the canopies was considered the last element in the general contractor's schedule. The second quality control delay was due to paving. After certain portions of paving, the general contractor did not complete certain elements correctly. The general contractor had to come back at the end of the project and fix the issues related to paving on their own time.

According to P2, this BRT project prepared a lessons learned document at the end of construction. The first lesson was a public transit agency should identify stakeholders early in the process. Identifying and collaborating with stakeholders early is critical to completing a BRT project on time and under budget. The stakeholders should be addressed early on during the planning and design phases. New stakeholders should not come up during the construction phase of a BRT project. If a stakeholder was uncovered late in the process, the public transit agency should negotiate and mitigate new demands during construction. The second lesson was understanding who decided what, which played a role in the decision-making process. According to P2, the planning and design phases were cheap compared to the construction phase. Public transit agencies should make as many decisions as possible and understand the roles and responsibilities before a project started construction.

The third lesson was properly staffing a BRT project during construction. The public transit agency should have a robust organizational structure to run a BRT project. The fourth lesson was working with the sponsor of the same scale of the project. This

BRT project experienced little to no ownership from the cities. The fifth lesson was that the environmental and planning team should not ensure promises early in the process without input from the design and construction teams. Ensuring promises early in the process has the potential to add another layer and additional costs during the construction phase of a BRT project. The sixth lesson was ensuring there was a political will to move the project forward during construction. The political will would ensure and assist the public transit agency to acquire the necessary permits on time. During construction, the political will would make sure the cities and stakeholders made appropriate decisions promptly. The political will has the potential to impact a BRT project schedule and budget during construction.

Participant 3

Participant 3 (P3) was a director of communications who came on board in early 2015. In 2015, this BRT project was moving into a 30% design phase. P3's role was to facilitate public engagement and internal communication logistics required with this BRT project. P3 also managed a public outreach specialist who specifically came on board for this BRT project. The public outreach specialist went door to door and spoke with businesses and destinations along this BRT project route. The public outreach specialist also connected with riders.

This BRT project was the first and only BRT system within the public transit agency's service area. This BRT project was the pioneer system for the public transit agency. This BRT project operated with dedicated bus-only lanes in the middle of the corridor within the route. According to P3, there was a lot of trepidation and uncertainty regarding buses operating in the middle of the street or dedicated lanes adjacent to the

curbside. If the dedicated bus-only lane were installed adjacent to the curbside, this potentially would remove parking or confuse right-turning vehicles and bicyclists.

This BRT project installed new signal heads, new BRT bus stations, and new BRT buses. This BRT route was a 7.6 miles long corridor that operated in two jurisdictions. This BRT project connected to an overall redesign of the long-overdue local fixed-route bus network. The new local fixed-route bus network and this BRT system provided additional routes throughout the region. The public transit agency added Saturday and night services as part of the services delivered.

According to P3, the public and current riders expressed the need for the local bus service to be faster, more frequent, and more reliable like the BRT. The public transit agency simultaneously worked on this new BRT project and redesigned the local fixed bus service. The public transit agency launched the new BRT system and the redesigned fixed-route local bus network on the same day. The public transit agency noticed an increase in ridership up until the global COVID-19 pandemic began. According to P3, the public transit agency was excited about its growth. Because of the success of this BRT project and the bus network redesign, the public transit agency was able to expand service farther into both jurisdictions. In March 2020, the public transit agency expanded the fixed local bus service into the second jurisdiction. This date was around the same time the local region began experiencing impacts because of the global COVID-19 pandemic.

The ridership levels decreased on bus routes because of the global COVID-19 pandemic. According to P3, the public transit agency noticed a decrease in ridership levels within the Express bus routes and BRT system. One of the primary ridership

populations served by this BRT system was a local university with two campus locations along the corridor. For the entire 2020 school year and into early 2021, the university was primarily virtual. The local university supported maximum telework for its faculty, staff, and student population. The public transit agency lost a significant number of riders. Riders regularly used this BRT system to go back and forth between the two campus locations.

According to P3, the local university paid the public transit agency annually to support zero fare for their entire faculty, staff, and students. The university was back in fall 2021, the public transit agency witnessed an increase in the BRT ridership levels. The ridership levels were back to prepandemic levels across the rest of the local fixed bus routes.

According to P3, the organizational structure evolved over the life of the project. The public transit agency was the lead project manager during the preliminary engineering phase and up until 30% design. The public transit agency hired a contracting engineering firm to assist with preliminary engineering. The engineering firm worked with the public transit agency to develop the preliminary engineering package through 30% design. As this BRT project worked through the end of 30% design, the state DOT stepped in with more technical support. The state DOT was also one of the funding partners of this BRT project. The state DOT transitioned as the project management lead of the project moving forward.

During the preliminary engineering to 30% design phase, the public transit agency worked under an older construction mindset of design-bid-build. As this BRT project exited the preliminary design phase, the contracting engineering firm forecasted the

schedule and budget through completion. The public transit agency and contracting engineering firm identified that switching the organizational structure to design-build would be the most efficient path for controlling the costs and schedule. The public transit agency was fortunate that the state DOT was an industry leader in managing design-build projects within the United States.

The state DOT had primarily managed bridge, bike path, and roadway design-build projects. The state DOT had not worked on a BRT design-build project. According to P3, the experience of the state DOT in design-build assisted this BRT project in handling the logistics, costs, and schedule during construction. During the transition from 30% to 60% design, the state DOT became the lead project management agency. The organizational structure shifted to a team effort moving forward. The group worked together, and each group understood its responsibilities and obligations moving forward.

According to P3, permitting was an important aspect within the construction schedule. Representatives from the local jurisdictions would routinely meet with the state DOT team and the design-build contractor. The routine meetings and open communication between the parties allowed this BRT project to continue moving forward on time. According to P3, this BRT project was finished on time and within budget using the design-build organizational structure managed by the state DOT. The public transit agency was the grant recipient of this BRT system and was considered the project owner. The public transit agency operated the BRT system. According to P3, the public transit agency was thankful to take advantage of the state DOT's project management and organizational structure expertise in design-build.

According to P3, the design-build process helped with logistics, coordination, and technical support. The public transit agency went from having their staff trying to facilitate this BRT project, manage engineers, and handle all the jurisdictional coordination to having the full support of the state DOT. This BRT corridor also served the state employees, a local university, and jurisdictions within the route. According to P3, without the technical expertise from the state DOT, this BRT project would have taken longer.

According to P3, regular BRT project scheduled meetings and check-ins with the various project teams, representatives from each locality, and funding partners who assisted with conflict resolution efforts among the project partners. P3 led the public information officer (PIO) biweekly team meetings during the construction phase of this BRT project. The PIO meeting switched to weekly when this BRT project needed to meet frequently with the project partners. The biweekly PIO meetings assisted in maintaining coordination and easing the conflict resolution efforts with project partners.

During the PIO biweekly meetings, the permitting team, engineers, and contractors joined the call if a utility conflict needed resolution. The PIO meetings permitted the project teams to come together and work through utility conflict issues during construction. According to P3, the construction side of the house also met weekly to resolve conflicts during the construction phase of this BRT project. All the responsible parties showed up to the construction meetings, talked through any construction conflicts, reviewed the look-ahead schedule for the next 2 to 3 weeks, and focused on the upcoming deliverables.

One of the biggest problems was that this BRT project was built in an old city, creating utility issues that needed resolution. During construction, an existing communication fiber line crumbled as it was exposed. A new fiber-optic replaced the old communication fiber line, which impacted the schedule. This BRT project finished on time, but the utility conflicts were a key hurdle during construction. The fiber-optic utility conflict solution included renting fiber-optic lines from existing telecommunications providers and installing new fiber optic within the city and the state DOT's ROW.

This BRT project developed creative solutions to resolve conflicts during construction. According to P3, the bottom line was this BRT project required constant communication during construction. Within the newly built corridor, there was a low-elevated portion of the roadway known to be the low part of the city. The low-elevated section of the BRT corridor was not quite halfway through the route. The low-elevated portion was prone to flooding. When the corridor received climate change-induced flash flooding or tropical systems, this overwhelmed the old infrastructure and caused flooding. There was a massive drain that ran underneath one of the BRT stations at the low-elevated portion. The utility and drainage system at this location was a big issue that needed resolution.

The BRT station located at the low-elevated segment of the corridor could not move. The project partners worked together on modifying the underground design of the BRT station. The BRT station had a sizeable drainage system underneath the station platform. A manhole was installed at the BRT station platform to access and maintain the drainage system. According to P3, installing the manhole and redesigning the utilities

and drainage system at the low-elevated BRT station was an example of continually communicating with project partners and solving issues. This BRT project maintained constant communication with the project partners by regularly scheduled meetings. The regularly scheduled meetings allowed the project partners to meet and resolve issues during construction, which impacted the schedule.

According to P3, from a public and ridership standpoint the heaviest labor was getting through the final approval votes in 2015 and early 2016. The public was not always fully attuned during the planning process with public transportation projects like this BRT project. According to P3, the public had the potential to oppose projects during the 11th hour. According to P3, the 11th hour was when the board of directors completed the final votes to approve the project and when the project secured the funding grants.

P3 listened to concerns, answered questions, and coordinated in developing creative solutions with the engineers and project team that would move this BRT project. This BRT project was in a car-centric community, and there were no congestion problems. Within the city, an individual could get around most places within 15 min. Residents were accustomed to quickly getting to their destination within 15 min, parking in front for free, and coming right back out. This ease of finding parking was the culture within the city. This BRT project proposed to take away parking spaces for new bus stations, the dedicated bus only lanes, dedicated left turn lanes, and to widen the medium for pedestrian refuge.

According to P3, regardless of the design alternative, residents did not understand the trade-off. Residents focused on their own experience and did not look at the bigger picture. This BRT project team realized the importance of listening seriously to the

concerns of the business owners. Many of the businesses within the corridor relied on 10-min parking zones that allowed clients to make quick purchases. The businesses also expressed the importance of loading zones for deliveries. If the business did not have alley access, they relied on front street parking or loading zones. Parking was one of the biggest challenges faced in this BRT project.

This BRT project worked closely with the traffic engineers to assess the parking inventory to determine which parking stalls were used or not used within the corridor. The traffic engineers made recommendations for underutilized parking spaces by remarking them as loading zones specific to businesses. One of the most creative solutions developed was the city's changing the direction of a one-way street to permit more on-street parking for an impacted business. The business was going to lose its on-street parking. The city reversed the direction of the one-way street, opening street parking. The business ended up with additional on-street parking because of the creative solution.

This BRT project also experienced pedestrian safety concerns within the corridor. According to P3, even though the speed limit decreased from 35 mph to 25 mph within parts of the route, most drivers did not obey the speed limit. This BRT project team had safety fears about pedestrians going into the middle of the street to catch the bus. This BRT project also ran into issues related to increasing new pedestrian ADA-accessible crosswalks throughout the corridor. This BRT project widened the median and built a new pedestrian refuge. According to P3, this BRT system needed to design using ADA standards and human behavior.

This BRT project also had concerns with bus and bike connections. The BRT stations connected with bike-share stations, enhancing bike capacity within the system. The bike-share stations deployed around the same time as the construction phase of this BRT project. Instead of using the traditional two bike storage rack, the new BRT buses implemented a three-bike storage rack. This BRT project operated 40-foot buses. In the future, 60-foot articulated buses could provide additional onboard bike storage facilities. The 60-foot articulated buses would allow riders to carry their bikes inside the bus. The public transit agency was looking to purchase 60-foot articulated buses.

In talking with bicyclists, the BRT project team wanted to ensure they loaded their bikes onto the new bike racks in front of the buses. The cyclist could use a ramp to walk their bike down to the street level from the elevated 15-inch station platform. The cyclists were not awkwardly trying to pull the bike rack lever down and lift their bikes from the station platform. The ramp design allowed cyclists to walk their bikes down to the street level after the bus stopped at the station platform. After placing the bicycle on the bike rack, the cyclists walked back up the ramp to get on the bus.

According to P3, humans tended to exert the least amount of effort and took shortcuts by not using the designed ramp even if the ramp was 10-feet away. Pedestrians went down the wrong way, leapfrogged out of the station, and landed in the middle of an unprotected pedestrian crosswalk. The bicycle ramps were a pedestrian safety concern in this BRT system. Riders walked through landscaping, jumped barriers, and took a more difficult path so they could shorten the distance. According to P3, this BRT system was looking for a safe and operational solution to the cyclist's ramp at the stations.

According to P3, safety was always the top deciding factor during the decision-making procedures. The BRT project team asked themselves: Is the decision safe from all perspectives? Does the decision provide a safe design? Does the decision provide a safe line of sight? Does the decision provide safe mobility? The overarching decision-making factor was whether the decision was safe for this BRT system and the public. This BRT project team also asked themselves whether the decision was practical and operational for the rider and operator. This BRT system was fortunate to build a training platform before the system began operations.

Before opening, the BRT bus operators had a year to practice lining up and docking against the rubber rail at a station platform. While the BRT bus operators trained, two issues came about. The first issue was that the team learned they needed to extend the rubber rail at the station platforms. Extending the rubber rails provided the BRT operators additional time to touch and align with the station platforms. The second issue was that the BRT system installed architectural, red brick walls that went up to the pedestrian ramps from both sides. The red brick walls stopped at the platforms where the 40-feet BRT buses docked. The operator potentially hit the walls if the BRT bus was not docked perfectly at the station platform.

This BRT system experienced minor damages to the buses because of the red brick walls. According to P3, these were human operators who docked the buses throughout their shift repeatedly. Human operators have the potential of not docking the BRT buses perfectly. The BRT operators docked the buses without the assistance of sensors at the station platforms. This BRT project team wanted to modify the wall design or shave it back. Unfortunately, by this point, the design-build process was already

underway. The project team was unable to complete a change order in time without impacting the schedule. Uncovering the issues of the wall design during the training phase was one of the lessons learned.

This BRT project team decided to continue building the wall design per contract specification. The solution proposed was modifying the platform station during operations. As the damage occurred, this BRT system altered the station by scaling the wall back during the repairs. According to P3, this BRT system has resolved the red brick wall conflict since opening in 2018. This BRT project team developed beautiful concepts and ideas. If the alternative presented was over budget, the alternative was not selected.

According to P3, operational impacts were another factor during the decision-making process of this BRT project. The operational impact tied into the leading factor of safety. Listening to public feedback, riders and businesses along the corridor played a role in the decision-making process. This BRT project had a better operating system because of public feedback and the operators' training program.

According to P3, bureaucratic forces impacted the progress of this BRT project during construction. In the preliminary engineering stages of this BRT project before the project entered the conceptual schedule stage, the targeted opening date was 2017. This BRT project opened in June of 2018. During the preliminary engineering stages, the governor publicly announced a 2017 opening date. According to the political messaging at the state level, the governor's office wanted to stick to the October 2017 date for a period. Behind closed doors, this BRT project team knew the actual design-build

schedule. The design-build contract was through June of 2018. According to P3, this BRT project was completed on time using the contractual timeline.

There were incentives to the contractor, which allowed them to earn more if they finished early. The financial incentive pushed the contractor to complete the project by the governor's opening date of October 2017. There were no financial penalties in the contract if they did not hit the October 2017 opening date. The only contractual consequence was if the contractor did not meet the contractual opening date of June 2018. The contractor completed this BRT project on time and endured no financial penalties. According to P3, the schedule was a double-edged sword. The PIO office publicly announced an October 2017 opening date, but the contractual opening date was June 2018.

This BRT project was fortunate to receive support, political weight, and technical expertise on the state level. For example, when the project was going through the final city council votes, the governor sent the state secretary of transportation to the city council public meeting. The state secretary of transportation attended the city council meeting, which provided political weight and commitment to this BRT project. Because of the support at the city, county, and state levels, this BRT project acquired a Transportation Investment Generating Economic Recovery (TIGER) grant from the U.S. Department of Transportation (n.d.). The public transit agency was grateful to receive political and technical support when needed.

According to P3, stakeholder forces impacted this BRT project during construction. There were several communities and business organizations that helped facilitate some of that public communication. Similarly, stakeholder forces assisted with

political maneuvering during construction. The stakeholder forces included grassroots writer entities and nonprofit entities that assisted the public transit agency. The stakeholder forces provided letters of support, showed up to public meetings, typed up editorial pages, and generated excitement for this BRT project.

Lastly, this BRT project standardized communication efforts throughout construction. P3 advocates for frequent updates from the contractor. The PIO office began with an unrealistic wish. The communications office wanted to receive real-time and on-the-ground updates of the construction progress. Before this BRT project, P3 had never worked on a large public transportation construction project and did not realize that daily updates were unrealistic.

The standardized communications compromise was the weekly look-ahead schedules. Every Friday, the PIO office received an updated weekly look-ahead schedule along with a recap of the progress made that week. The look-ahead provided details of the activities expected for the following week along with a 2-week forecast. The PIO office updated this information on the designated project website page and disseminated the information to the subscriber list every Friday. The standardized communication effort was known as the standardized weekly Friday blast.

The Friday blast disseminated information across social media platforms. The PIO office also created maps using basic paint snip technology showing the impacted areas and the type of work. At the beginning of construction when the work occurred in a few pocket areas, the visualization helped people understand. As this BRT project got closer to the end, construction work occurred everywhere within the corridor. The

contractor and BRT construction team were racing to finish the project on time. The standardized weekly Friday blast efforts assisted this BRT project.

The PIO office also standardized the quarterly public information meetings. This BRT project continued to hold quarterly public information meetings even after the project was fully approved and the plans were not changing anymore. The standardized quarterly public information meeting was an opportunity for the construction team to meet with the public and answer questions. This quarterly meeting provided an opportunity for business owners or residents who had specific concerns to have face-to-face time and have their issues resolved.

According to P3, in the beginning, there was a low to moderate attendance and interest in the quarterly public information meetings. As this BRT project kept progressing in construction, there was minimal interest in the quarterly public information meetings because the team handled the communication flow well. The quarterly information updates were just a formality, but maintaining the standardized updates was important. The standardized quarterly public information meetings provided open access to the public in case an unexpected issue arose in this BRT project.

According to P3, there were also standardized efforts in the design efforts of this BRT project. This BRT project experienced roadway slope challenges because the crown of the road varied along the route. The roadway slope challenges led to some minor modifications in the BRT station design. Overall, the BRT station designs were similar. The BRT stations used the same materials, the same glass, and visually looked the same. The only difference at the BRT stations was the name on the totem. Similarly, the procured buses were identical for the BRT system.

According to P3, the public transit agency was not collecting fares because of the COVID-19 pandemic. Since March 2020, the public transit agency had not collected payments. Before the pandemic, this BRT system collected payments using standardized vending machines available at every station. This BRT system updated the fare collection technology quite a bit. This BRT system opened some of the passes a bit more by providing unlimited use passes. The public transit agency also began using mobile pass payments for rides. Standardizing the BRT station design, vending machine technology, and buses simplified the procurement process. According to P3, design standardization allowed the same construction crew to work at various BRT stations along the corridor. Design-build provided a lot of flexibility to this BRT project during construction.

According to P3, the public aspect was important during the design phase to have the architectural language of the BRT stations feel like the city. The BRT station design along the corridor included red brick, steel, glass, and cedar. The BRT station design was not modular or modern. A highly skilled workforce built the BRT stations. The glass panels installed at the BRT stations were custom-made every time. It took a long time to procure the specific materials and pieces because of the customization. Looking back at the importance of the architectural language, P3 would not change the design of the BRT stations.

According to P3, the design-build team had their internal quality control process during the construction phase of this BRT project. The construction BRT team constantly cross-checked each other. The state DOT project management team also constantly cross-checked behind the design-build team. This BRT project included a

partner checklist that was used as an acceptance document. The partner checklist required every SME to review the information and check off their respective area of expertise. The partner checklist provided quality control and ensured each item met contract expectations. Multiple quality control levels happened in this BRT project, from the contractor, state DOT, and SMEs from the localities and partners.

The public transit agency also self-certified this BRT project and completed internal checklists to ensure quality control. The public transit agency completed the self-certification process to document before starting service legally and safely. The design-build construction quality control checklist and public transit agency's operational quality control checklist were completed concurrently. This BRT project completed multiple emergency and safety simulation exercises. The last simulation exercise focused on a worst-case scenario that included the emergency responders from the local jurisdictions. The simulation exercise included shutting down the corridor at night to minimize the impact on the residents. According to P3, the last simulation was fascinating to experience. The simulation exercises ensured the public transit agency knew what to do in case the worst-case scenario occurs.

According to P3, quality control was difficult to accomplish with communications. When the communications office received the look-ahead schedule, the office could not correct the construction project manager. The PIO office's responsibility was to update the information on the public website and inform all stakeholders. The content had to be accurate and close to what was provided by the construction team. The communications team reached out to the construction team to answer and resolve a public inquiry as quickly as possible.

According to P3, other BRT systems across the country that were opening or would soon be opening visited the public transit agency. The public transit agency informed visitors that communication, clear expectations of timing, and coordination between the various project partners were important. If a BRT project focused on communications, expectations, and coordination, this permitted a BRT project to be completed on time and under budget.

Participant 4

Participant 4 (P4) acted as a BRT project manager for a public transit agency. P4 assisted the public transit agency in constructing, opening, and operating this BRT project. This BRT project was a six-mile-long corridor with 34 stations that connected a regional mall and the downtown of a city. This BRT ran in a Southwest to Northeast direction. Most of the residents along this BRT corridor were low-income and minorities.

The west end of this BRT corridor reconstructed a big plaza and a station. The east end of this BRT corridor relocated and rebuilt a mall transit center. Three construction contracts were part of this BRT project: (a) BRT stations and corridor; (b) mall transit center; and (c) modernizing, expanding, and remodeling the public transit maintenance facility.

According to P4, an appointed board of directors ran the public transit agency. The executive general manager or chief executive officer was under the board of directors. The various department directors reported directly to the public transit agency's chief executive officer. P4 worked within the Development and Public Affairs Department and acted as the BRT manager. P4 had one other employee working within

this BRT team, primarily for public information purposes. The rest of this BRT team worked as contractors for the public transit agency. According to P4, the executive team received regular progress reports, and the board of directors received occasional progress presentations. When a contract was needed, P4 and the procurement officer led the process within the public transit agency. This BRT project had 12 different contracts from the planning through construction phases.

According to P4, the appointed board of directors was part of different member entities. The board of directors was subject to politics like other boards across the United States. This board experienced a political tug of war between this BRT project and another more controversial public transportation project. The politicians against the controversial public transportation project joined the public transit agency's board of directors. This BRT project experienced a political and technical process as the project progressed through several hurdles early on. A BRT project technical process encompassed design, construction, and operations.

According to P4, the most significant hurdle was acquiring funding commitments from the public transit agency's board of directors to move this BRT project into construction. P4 acknowledged the board of director's political hurdle was difficult to avoid. Usually, appointed or elected officials developed the direction or strategic plans for public transit agencies. Another issue this BRT project faced was P4 being the only registered professional engineer (PE) at the public transit agency. In some cases, P4 completed additional engineering work on their own because of the PE registration. The public transit agency did not have an engineering department to support this work.

According to P4, there was engineering work and time priority pressures to move this BRT project forward on time. This project was considered the first BRT system in the local region. This public transit agency could not coordinate or ask another agency nearby for assistance. P4 reached out to public transit agencies outside the state that built BRT projects. According to P4, having the ability to speak with other public transit agencies that had experience building BRT projects was a big help moving forward.

Many of the other public transit agencies were at least 3 hr away. The long distance made it difficult for P4 to travel often and meet other public transit agencies. According to P4, other public transit agencies have larger internal project management or engineering teams. This BRT project would benefit from additional internal public transit agency technical support. Employees from this public transit agency reviewed the design, program, and operational plans. Many of the public transit agency employee's regular priorities focused on operating the bus system. According to P4, it was challenging to have employees review BRT plans because of conflicting priorities.

According to P4, the organizational structure impacted the progress of this BRT project during construction. Before this BRT project, P4 had professional experience creating strategic and resource management plans. P4's professional experience assisted this BRT project in overcoming the organizational structure impacts. Using P4's professional experience, this BRT project determined who to bring on board and help the project. The public transit agency ended up hiring consultants to assist with this BRT project. The challenge was ensuring the public transit agency had enough time to procure the consultant parties.

According to P4, the procurement process of bringing consultants on board took time. The procurement process included request for proposal (RFP), bidding out the work, RFI, selecting the consultant, and developing a contract with the consultant. According to P4, this BRT project experienced time pressures because of the consultant procurement process. The consultant procurement process did not delay this BRT project. Numerous steps were completed behind the scenes, ensuring no impact on the schedule. This BRT project procured the necessary consultant support to build the project.

According to P4, this BRT project implemented a multipronged conflict resolution approach. The first prong was a project and program management approach. This BRT project ensured the involvement of a broad cross-section of the community during the initial planning phase. The conflict resolution decisions during planning included the placement of stations and lanes along this BRT corridor.

The community involvement developed a locally preferred alternative decision. P4 ensured the correct people in the community were present at the table during the design phase. The community's input and involvement led to studying 23 different alternatives for this BRT project. This BRT project selected the final alternative presented. The conflict resolution process ensured the preferred BRT design alternative included community input. This BRT project permitted the community the opportunity to provide their insights and express their differences of opinions. The conflict resolution process allowed this BRT project to understand the community's point of view.

P4 trained to strategize using a systematic development of informed consent. According to P4, systematically informed consent was not gaining consensus or having

the majority onboard on a decision. Community members left the room feeling as if they had the opportunity to express their opinions and weigh in. Systematically informed consent allowed community members to understand the public transit agency's decision during the development of this BRT project.

This BRT project experienced political conflicts because of appointed and elected officials wanting to try and stop this project. The appointed and elected officials expressed concerns because this BRT project connected to another controversial public transportation project. This BRT project worked behind the scenes to ensure the public transit agency board members were still behind the project. The public transit agency board member's approvals permitted this BRT project to proceed on time and under budget. This BRT project navigated through the political conflict resolution process, which included gaining the support of board members in 3- to 4-hr meetings.

This BRT project experienced utility design conflicts and complexities. Numerous utility design issues arose during construction, creating cost overruns. This BRT project included a healthy contingency in the construction budget. Most of the contingency was used because of the numerous design conflicts. This BRT project developed a risk management process that continually reviewed design and construction conflicts. The conflicts potentially impacted the construction budget and schedule. The risk management process focused on the critical path items to avoid cost overruns and schedule impacts.

According to P4, this BRT project faced numerous issues impacting the time and budget of the project. The public transit agency wanted to open this BRT project within the federal grant period of performance timeline. The federal grant period of

performance ended in May 2017. If this BRT project opened after the period of performance timeline; this violated the grant agreement and impacted the ability of the public transit agency to acquire future federal funds. The public transit agency decided to open this BRT project in January 2017, placing this BRT project 3 months ahead of the grant agreement timeline.

According to P4, this BRT project experienced weather-related issues during construction. This BRT project was creative and relied on contractor experience during cold and rainy conditions. During construction, this BRT project uncovered design issues. The design issues included asbestos pipes in the public transit agency's facility. The asbestos pipes were not shown or identified in the design plans. This BRT project had to decide whether the system could open without completing all the items on time. According to P4, this BRT project identified most of the critical items before opening. This BRT project decided to postpone the noncritical items and completed them after the opening date.

Another lesson learned during the construction phase of this BRT project was learning to pour concrete in cold climate conditions. The region's top concrete contractor implemented a specialized way to pour concrete in a cold environment. The concrete contractor confirmed they knew how to deal with cold conditions out in the field. The majority of the transit center was built in approximately 3 to 4 weeks during December. This work included pouring concrete for bus stations and a plaza. According to P4, the concrete pouring occurred in 20- to-25-degree weather and in some cases concrete pouring occurred when it was snowing outside. P4 understood that contractors had more experience than people sometimes give them credit for. This BRT project permitted the

concrete contractors professional experience to help overcome a construction conflict. A partnership effort between this BRT staff and concrete contractors was crucial to the success of this BRT project.

According to P4, a risk management plan can deal with identified conflicts early on. This BRT project maintained consistent progress of conflicts and used the risk management plan to resolve issues. The risk management plan ensured this BRT project met the designated timelines. If a resolution was not documented, this BRT project found a way to put it back on schedule.

According to P4, the decision-making procedure during construction involved grant funding politics, project partner coordination, and stakeholder interaction. This BRT project procured an experienced construction management firm to help manage all three construction contracts. This BRT project also had a bus procurement contract that experienced other issues not related to construction. The buses arrived approximately 6 months before this BRT project was ready for them. The public transit agency did not have a location to store the buses because the maintenance facility was incomplete.

This BRT project worked with the construction management firm to monitor resources and the risk management plan. The construction management firm managed construction inspections and contractors. When conflicts occurred, the construction management resolved the issues in the field and assisted with change orders. This BRT project experienced numerous change orders. Many of the change orders did not involve decision makers at the executive levels. The public transit agency developed construction policies that permitted the construction management firm to resolve change orders.

P4 ensured decisions progressed in the change order process. The public transit agency had an independent review of the change order requests. This BRT project tracked the design change orders and design issues during construction. A total of $400,000 in cost overruns occurred because of design errors. This BRT project ended up filing a claim against the designer. According to P4, this BRT project settled the design claim after the construction phase and once the system entered operations.

According to P4, this BRT project was built 3 months ahead of schedule and under budget. This BRT project expended $52.8 million of the $53.4 million allocated budget. This BRT project was built $600,000 under budget. According to P4, this BRT project was under budget because of the continual implementation of the risk management plan. This BRT project only approved contractor justified change orders. If the contractor built an item incorrectly, the contractor rebuilt the item.

According to P4, one of the most complicated items built was close to two hundred ADA wheelchair ramps at intersections. Constructing precise ADA slopes and design standards was difficult. The contractor built the ADA ramps to specification on several occasions. The city acquired the ADA infrastructure and signal intersections. The city ensured they inherited ramps and intersections that met ADA standards. The city ended up rejecting several of the constructed ADA ramps. The contractor had to come back out and reconstruct the wheelchair ramps to meet the required specifications and standards. According to P4, the contractor did not build the items using the approved design drawings or ADA specifications. The contractor claimed thousands of dollars in change orders. The public transit agency ordered the contractor to rebuild the items on their own time and money.

According to P4, the decision-making process in this BRT project helped maintain the schedule and budget. Without the decision-making process, this BRT project may not have met the period of performance deadline imposed by the federal grant. According to P4, setting up the decision-making procedures early on and maintaining the process allowed this BRT project to be built on time and under budget

This BRT project experienced internal bureaucracy within the public transit agency. According to P4, the internal bureaucracy hindered the progress of the project. The public transit agency organizational structure was not ready or set up for a project this size. This BRT system is three times larger compared to the biggest project built by the public transit agency. The public transit agency organizational structure operated and maintained 140 buses, bus shelters, and bus stops.

According to P4, part of that internal bureaucracy was understanding the expectations for this BRT project. Once the public transit agency began to understand the expectations of this project, they asked for additional work within the scope of this BRT project. In most cases, the extra work was not relevant to this BRT project. According to P4, internal bureaucracy permitted this BRT project to complete a mall transit center.

Because of expansions at the mall and changes in the parking lot, riders began using the mall transit center. The public transit agency had to compete with parked cars at the mall. The public transit agency for years unsuccessfully relocated the mall transit center to avoid parking issues. P4 championed the effort of building a mall transit center as part of this BRT project. Once the mall transit center entered the scope of this BRT project, legal bureaucracy took effect. Legal bureaucracy ended up delaying the process.

The public transit agency understood where they wanted to relocate the mall transit center.

The mall was under multiple ownerships during the life of this BRT project. The public transit agency had to change negotiations with mall management companies. Within the mall, a retail company ended up going bankrupt and went into a holding company. This BRT project had to deal with lawyers from Australia and California. Eventually, the law firm that took over the negotiations and representation of the retail company was on the East Coast. This BRT project understood and navigated through the legal bureaucracy system. There was no playbook that provided guidance in navigating the legal bureaucracy of a BRT project.

The public transit agency spent a lot of money navigating the legal system. According to P4, the public transit agency retained a law firm and spent approximately $300,000 or $400,000 in legal fees trying to navigate the legal system and agreements. This BRT project was also hampered by trying to figure out a way around Buy America. According to P4, Buy America required a project to have 70% to 100% iron, steel, technology, and buses manufactured and assembled in the United States. This BRT project could not find security cameras and other technological elements that were compliant with Buy America. Most of the manufactured security cameras came from Asia.

The public transit agency had to pull out the federal funds and self-fund the items that were not compliant with Buy America. This BRT project went through the Buy America waiver process with FTA. The Buy America waiver process took anywhere from a year to a year and a half to complete. The lengthy time to acquire a Buy America

waiver hampered this BRT project. Instead of having the federal grant cover these expenses, the public transit agency self-funded the security cameras and a few other items.

According to P4, for the most part, this BRT project had a good relationship with stakeholders. P4 was available to meet or talk on the phone with all stakeholders, even stakeholders that opposed the project. According to P4, transparency throughout the process was vital, and meeting with stakeholders was not an issue. The stakeholder forces positively impacted the progress of the project during construction in some instances. For example, this BRT project built a station at the location of a new merchandise retailer. The new bus station and improvements around the station overlapped with work required by the merchandise retailer.

This BRT project built the improvements for the merchandise retailer. This decision enabled the merchandise retailer to pay 50 cents on the dollar for the improvements. The public transit agency used the funds provided by the merchandise retailer to match the federal and state funds for the station. The stakeholder relationship with the merchandise retailer permitted the transit agency to save money and benefit from this BRT project.

According to P4, this BRT project used standard specifications and special provisions during construction. This BRT project experienced an issue with windscreens. The public transit agency wanted the windscreens to be impact-resistant, but the material specified was not impact-resistant. The contractor had to procure new impact-resistant materials from the vendor for the windscreens. The standard specifications were unclear, creating the windscreen material change order to impact and scratch-resistant material. A

change order altered the windscreen material to polycarbonate. According to P4, the windscreen change order was not a design error.

This BRT project underwent adverse weather events during construction. The weather was challenging to identify in the construction specifications. According to P4, this BRT project used warm water in the chemical reaction to mix concrete in 20-degree weather. The contractors used innovative ways to mix concrete in adverse conditions. There were cold climate standards and performance measures available in the construction industry and other states. This BRT project did not include standard specifications that pertained to adverse weather conditions. In turn, this BRT project used nonstandard specifications and scientific methods to resolve the adverse weather conditions.

According to P4, this BRT project attempted to use standard specifications where possible. A lot of the items in this BRT project were architectural, creating difficulties for standardization. Architectural items had a different set of specifications compared to the specifications found in American Public Works. Architectural specifications were measured differently and were lump-sum payments. According to P4, American Public Works specifications were bid items and paid by quantities. This BRT project had to work through differences in both systems. The contractors assigned to this BRT project were accustomed to American Public Works, but the work was architectural. The architects spent more time in the field than anticipated to support the construction team.

According to P4, there were quality control measures in place. This BRT project had several mandated plans from the federal grant. This BRT project completed a project management plan, quality control plan, and a change management plan. This BRT

project developed, continually reviewed, and updated the plans. The project addressed many changes. According to P4, sticking to the basis of the quality control plans was a priority. The quality control plans assisted in managing changes and completing this BRT project on time and under budget. Establishing and prioritizing a quality control plan minimized the impacts of design errors and change orders during construction.

According to P4, there was a lot of research and reports available that share lessons learned within the public transportation industry. The issue was that many of the documents were not easily accessible or widely publicized. Before a public transit agency starts a big project like this BRT project, the agency needs to take the time to review some of the lessons learned. Future projects should incorporate the lessons learned into their change management, quality control, and project management plans. According to P4, incorporating the lessons learned early on was critical to the success of a project. P4's philosophy was to plan to have errors and issues. If a BRT project planned in advance, the project team dealt with the issues as they arose. Not taking the time to plan was a plan for failure.

Participant 5

Participant 5 (P5) was a director of planning at a public transit agency. P5 was also the project manager for this BRT project. P5 had been working with the public transit agency for 20 years in a planning capacity. P5 had a master's degree and an undergraduate degree in urban sociology. P5 education focused on how cities influence residents and what makes a city work. Formal education provided the foundation for a professional career in city-building and public transit. P5 was involved with various local steering committees. The local community of this BRT system was very close.

According to P5, coordination with stakeholders helped make this BRT project successful.

For the past 20 years, the corridor of this BRT project was a fixed bus route. The bus route service ran approximately 13 miles east to west, connecting the downtown of a city and a local town. The town was home to an NCAA division II university. The university had approximately 27,000 students. This BRT corridor ran through some neighborhoods as it exited downtown. Before connecting to the university, the last six or seven miles of the corridor were rural and agricultural.

As university enrollment continued to grow over the past 20 years, the university decided to build a downtown footprint. More daily commuters were going back and forth in the 13-mile corridor. Twenty years ago, the fixed bus route service had about 1-hr headways. In 2013, the fixed bus route service was running approximately 6-min headways. The public transit agency was operating 14 fixed buses daily within the corridor. According to P5, the fixed bus route service peaked at approximately 12,000 riders daily.

To help maximize capacity and efficiency in the corridor, the public transit agency began to think about BRT systems. According to P5, this was the impetus to start planning a BRT project in the 13-mile corridor. Aside from a conveyor belt, a BRT system potentially increases the frequency and effectiveness of headways. The public agency began to plan for the next mode beyond a fixed bus route service, a BRT system. According to P5, the public transit agency began planning this BRT project in August 2013.

This BRT project entered service in August of 2020. According to P5, the seven-year roller coaster ride included bureaucracies, stakeholders, and different personalities. The COVID-19 global pandemic impacted this BRT system. The ridership numbers of this BRT corridor were not at the planned operational levels. According to P5, this BRT corridor was one of the best recovering routes in the entire system. The public transit agency was seeing the promise of the BRT system recovering from the pandemic.

This BRT project developed a project management plan (PMP), a sanctioned document by FTA. According to P5, projects that receive FTA funds must have a PMP. The PMP outlined the organizational structure of this BRT project. The PMP included an organizational chart that visually identified all positions of this BRT project. This BRT project identified the internal roles within the public transit agency. This BRT project had a project manager, deputy project manager, financial manager, operational manager, safety manager, and training manager. This BRT project included a full array of fully defined interdepartmental members who influenced the project. On the engineering side, this BRT project contracted a project controls consultant. The project controls consultant oversaw the finances and accounting.

A project manager oversight consultant (PMOC) was part of the organizational structure of this BRT project. According to P5, a PMOC was a requirement by FTA to help oversee the engineering process and ensure the project followed federal regulations. According to P5, prior to construction this BRT project and corridor had to complete the National Environmental Policy Act (NEPA) process (U.S. Department of Transportation, 2020b). The environmental process included baseline assessments and a comprehensive

process that needed to be documented. After the planning, environmental, and design phases were completed, this BRT project entered construction.

The public transit agency opted for a unique project delivery method, construction manager at risk (CMAR). This BRT project hired a construction firm that was responsible for subcontracting all the work. According to P5, CMAR was more expensive. The CMAR delivery method reduced the administrative burden for the public transit agency during construction. This BRT had 30 to 50 subcontractors during construction. According to P5, the organizational structure of the public transit agency did not have the capacity internally to administer a BRT project. For example, the planning department within the public transit agency only included three staff members. The organizational structure of this BRT project had a legal team who worked on license agreements, construction easements, and real estate acquisition. This BRT project sent monthly construction reports to FTA. The monthly reports identified the status of the contracts along with budget and scheduled updates during construction.

This BRT project was featured in a magazine article. According to P5, everybody on this BRT project team had a great rapport with each other. This BRT project team was very organized, and all the team members knew what they were doing. The organization permitted the team to understand the sequential timeline of activities. This BRT team completed weekly phone call meetings that allowed all parties to check in. According to P5, the weekly phone meetings felt like overkill at times. Hindsight being 2020, constant communication led to success. Everyone on this BRT team regardless of their roles knew what they were doing.

For example, a team member in accounting understood what the legal team was working on. Nine times out of ten, activities were interdependent. The one time an activity combined multiple parties, efficiency improved because of communication. Weekly phone meetings and constant check-ins proved to be helpful. This BRT project was efficient because the team understood the activities of each party. According to P5, each spoke of the wheel met in the middle and continued moving forward. In addition, this BRT project had a technical advisory committee throughout the planning, design, and engineering phases. Each advisory committee encompassed approximately 20 to 30 community members. The community members in the advisory committee were stakeholders and not directly engaged with this BRT project.

According to P5, as this BRT project developed the scope of the design, the advisory committee member's involvement was instrumental. The advisory committee members minimized scope creep as the project progressed through the phases. This BRT project permitted the community to review, provide feedback, and influence the outcome. For example, P5 walked across the street at one of the BRT station platforms and spoke with a florist shop owner. P5 asked the florist shop owner what they wanted to see in landscaping at this new BRT station. The florist shop was across the street from the zoo entrance and new BRT station. The florist shop had a clear sight of the zoo entrance, trees, new landscaping, and a new metal glass BRT station structure. According to P5, this BRT project determined that courteousness with the community played an important role. This BRT project team took the time to consider input from the community, permitting the community to buy in.

According to P5, the organizational structure impacted the progress of construction. This BRT project had many stages during construction, including internal documentation and FTA reviews. The construction stages were checkpoints along the way. According to P5, this BRT project had a tight-knit group of people who were adamantly aware of the project. This BRT would not have been successful without the awareness from all parties.

Before receiving a federal grant, this BRT project was assigned a PMOC by FTA. The PMOC reviewed all the documents, ensuring boxes were checked and the public transit agency was ready to receive the federal grant. This BRT project had a $72 million budget, with 80% of the budget paid by a federal grant and 20% covered by a state DOT Capital Investment Grant (CIG). The CMAR developed a construction schedule. The CMAR requested a 25% contingency buffer within the construction schedule. According to P5, this BRT project was $10 million under budget and on time. Even with a pandemic around the corner, this BRT project was under budget and on time.

This BRT experienced a few delays in the supply chain because of the pandemic. Some of the ancillary fare collection equipment and real-time arrival signs arrived late because of supply chain issues. Regardless, this BRT project began revenue operations on time and was built $10 million under budget. During the construction of this BRT project, there were two statewide mandatory shutdowns because of the pandemic. This BRT project was deemed essential and was permitted to continue working. According to P5, the mandatory statewide shutdowns impacted this BRT project and caused a couple of months delay. This BRT team had a robust construction organizational structure that

included identifiable roles and responsibilities. The organizational structure allowed the project to progress through the pandemic.

According to P5, this BRT project underwent conflict resolution efforts during the development of third-party agreements. Third-party agreements were known as inner local agreements for BRT projects. This BRT project impacted many jurisdictions during construction. This BRT project dealt with real estate issues and inner local agreements with the city, town, state DOT, and NCAA Division II university. Inner local agreements were legal agreements between jurisdictions. The legal agreements outlined construction expectations and the responsibilities of each jurisdiction and public transit agency once this BRT system entered revenue service. For example, the legal agreement declared which jurisdiction was responsible for maintaining the landscaping, buses, BRT stations, and snow removal.

According to P5, this BRT project had an advisory committee. The advisory committee was composed of high-level officials that came to the table to come up with a resolution for a dispute. The advisory committee was one of the formalities written into the agreements. According to P5, this BRT project used a technical advisory committee several times during construction. The technical advisory committee was composed of technical staff from the jurisdictions and the public transit agency.

According to P5, this BRT project ran in mixed traffic, and the existing congestion within the corridor did not warrant dedicated bus-only lanes. The first couple of miles of this BRT corridor included a traditional business district. The business district had parallel street parking on each side of the street. According to P5, this BRT project confronted design questions of how the project dealt with parallel parking. For

example, did the BRT project design remove several parking spaces and build to the curb? Or did the BRT project design extend the curb out for more of a pedestrian realm? If the curb extended out, the BRT bus stayed in the travel lane instead of pulling out of the travel lane. Would vehicles have a through lane or park behind the bus when they stopped at a BRT station?

According to P5, there were different points of view and a spectrum of perceptions during a BRT design decision. The traffic engineers acted like plumbers, seeing traffic flow through the corridor. Other members wanted to focus more on placemaking and planning. If this BRT project extended the curb, this permitted more room for pedestrian facilities. If the curb extended, this allowed for more space for people to congregate between the BRT station and buildings.

This BRT system had low dwell times at the stations because of precision docking by the buses. The precision docking allowed the bus to pull up and quickly permit passengers on and off like a subway or train. According to P5, the straw that broke the camel's back was the business district facing the removal of parking. This BRT project removed 11 parking spaces to allow the 60-foot articulated buses to come in and dock at the platform as opposed to only removing three parking spaces if the preferred design brought the curb out to the travel way. The preferred alternative was extending the curbs to the travel way, providing additional room for pedestrians, and minimizing parking impacts within the business district. Parking issues were an example of a conflict resolution effort that impacted this BRT project.

According to P5, this BRT project built a significant station underneath a highway overpass. Underneath the highway, a typical empty concrete area existed where no

pedestrian ever wanted to be. This BRT project added stylish design elements and lighting at the station underneath the highway. The stylistic elements permitted the lighting at the station to change at night, change with a season, or match a special event in the city. The public transit agency saw this station as a blank canvas and took the opportunity to design something unique for this BRT system.

During the design process, there was a duality of perceptions in ideas. According to P5, the maintenance department never wanted to see any trees because leaves fall on the streets and sidewalks. Similarly, individuals were against placing grass because of the maintenance and mowing requirements. On the other side of the coin, trees and lawns improved the aesthetics of the BRT corridor. According to P5, many of the disputes within this BRT project were design themes.

According to P5, did a BRT project prioritize the scale and speed of the corridor? Or did the BRT project humanize the rider experience? This BRT system opted to prioritize placemaking and slowing down the traffic. Slowing down the traffic allowed the corridor to focus more on the rider experience of the BRT. According to P5, humanizing the rider experience was part of the roller coaster ride as this BRT project reached the final design. This BRT project considered design alternatives and understood the time limits to the final design and the bidding process. According to P5, there were a few instances when the public transit agency CEO got on the phone with another executive. Some of the decisions needed to be made by the executive staff, but nothing rose to a formal legal issue.

According to P5, everyone was on board to move this BRT project forward. The public transit agency understood that a fixed bus route and 6-min headways were not

sustainable. Nobody disagreed that the public transit agency and community needed a BRT system. According to P5, dealing with different personalities was like playing a chess game. There were assertive staff engineers who were technical and adamant that a decision needed to be a certain way. Once the team understood each other, the tone softened between the parties, and tensions eased. BRT team members went out for coffee and strengthened their soft skills. According to P5, the conflict resolution effort created headaches but did not impact the schedule and budget of this BRT project.

This BRT project implemented the CMAR project delivery method, allowing the contractor to absorb the risks. The project delivery method minimized the risks absorbed by the public transit agency. The public transit agency was able to take a backseat in many of the decision-making procedures once this BRT project began construction. The contractor understood their schedule and budget, and it was up to them to build the project on time and under budget. This BRT project developed a PMP. The PMP was part of the contractual obligation, and the plan identified a material testing consultant. The material testing consultant ensured the concrete and material were up to code during construction.

This BRT project had weekly construction meetings with the owner, architect, and contractor. The weekly construction meetings were standard in the industry. The meetings included all parties and reviews of the previous week's work and upcoming items. During the weekly meetings, this BRT team informed the parties of the construction activities. According to P5, the engineering field inspectors were part of the construction meetings. Including the engineering field inspectors in the weekly meeting allowed this BRT project to be on the same page during construction. The engineering

field inspectors measured all the items and ensured this BRT project was built in accordance with the design specifications.

According to P5, at the end of construction, the contractor completed a punch list. The punch list included the BRT station platforms, stylized items underneath the highway overpass, stainless-steel bolts, landscaping items, and much more. While completing the punch list, field inspectors noticed several rose bushes by the zoo went missing. No legal action occurred. This BRT project replaced the rose bushes before revenue service began.

According to P5, this BRT project incorporated cosmetic branding at each station. The stations used an architectural aluminum skeleton structure with cantilevered glass. The rooflines and features of the BRT stations came from another state, but some cuts were wrong. The superfluid cuts of the station did not fit like a jigsaw puzzle. This BRT project team had to decide to send the material back for $100,000 or try and resolve the issue out in the field. According to P5, there were a few construction glitches, nothing major that impacted the schedule. Soft skills were crucial in resolving construction glitches. According to P5, as the saying goes, we are mistakes, and we make people.

According to P5, the PMP outlined the decision-making procedures. The decision-making procedures included the CMAR project delivery method, weekly construction meetings, and organized documentation. The parties involved with this BRT project were not surprised when an item was built a certain way because of constant communication. The design of this BRT project displayed the contractual items throughout the corridor. According to P5, the design team worked with the engineering consultants to draw out a render of this BRT station platform from a street view. The

BRT design team went out in the middle of the street and photographed the locations of the BRT station platforms. The BRT design team drew 3d computer renderings of the BRT station platforms.

According to P5, the BRT design team completed an augmented reality CAD version of the BRT stations. The BRT team went to a conference room and wore virtual reality masks. The virtual reality face masks provided a full-scale rendering of the BRT stations. According to P5, when the BRT team walked around the conference room with virtual reality masks, they saw the platform design renderings. The technological renderings were used as a checkpoint and supported the BRT team understanding of the design. According to P5, this BRT project did a great job with communications. P5 desired that additional communication efforts happened throughout the BRT project. Communication helped remove mechanical processes and ensured the BRT team progressed the project to the finish line. P5 preferred communication through cell phone calls and in-person meetings rather than office calls or emails.

According to P5, this BRT project did not experience bureaucratic forces during construction. Most of the bureaucracy occurred during the planning and design phases. This BRT project completed public outreach efforts during the planning and early design phases. At times, the city and public works staff did not want to place a BRT station in a particular location. Public outreach efforts with the business district impacted the placement of the BRT stations. The design alternative of this BRT project did not occur through unilateral decisions. Public outreach efforts influenced the design of this BRT project.

During the planning phase, the advisory committee determined the roadmap of getting design buy-in for this BRT project. The community and public transit agency understood and trusted the process. According to P5, a thorough process minimized bureaucratic issues and problems. Most bureaucratic forces occurred while developing and executing the inner local agreements. This BRT project ensured local jurisdictions agreed with the design and maintenance features. P5 identified public outreach as one of the biggest successes of this BRT project.

According to P5, this BRT project was architecturally appealing, the operations ran well, and the public resonated with the system. Community involvement throughout the process permitted the public to feel ownership. This BRT project had many open houses providing numerous opportunities for input from the community. According to P5, when a project gets early buy-in, this simplifies the process. The community became excited about this BRT project, and the public could not wait for the project to be completed. This BRT project began celebrating once the public transit agency received the federal grant and began construction. Toward the end of design, this BRT team, bureaucrats, dignitaries, city staff, jurisdictions, and the public understood the renderings. The community understood this BRT project and the expectations during construction.

According to P5, scientific management efforts occurred during construction. The PMP and monthly reports were examples of standardization efforts during construction. The CMAR project delivery method was an advantage to the public transit agency because of the organization. The contractor developed weekly reports of the construction elements. According to P5, the contractor reviewed safety incidents, roadblocks, the status of items, and supply chain issues weekly. During construction, the

cost of steel went up. The rise in steel prices impacted this BRT project because of the installation of station stainless-steel structures. The contractor had standardized protocols to identify and resolve issues during construction.

Standardization efforts impacted the progress of construction. According to P5, the overarching theme was the amount of communication within an organizational structure. BRT projects should communicate more often than required. If a BRT project believes they need to put in x hours for public outreach, they should double the outreach. If a BRT project believes they need biweekly coordination meetings, the coordination meetings should be weekly. P5 believed that standardizing communication processes and strengthening soft skills led to a successful project. A successful recipe of a BRT project included soft skills and understanding how to interact with individuals. According to P5, BRT projects experienced traditional public administration aspects, standardized communication, and soft skills. The team leading this BRT project understood public administration and soft skills.

This BRT project used various quality control efforts during construction. According to P5, the public transit agency submitted a Quality Acceptance/Quality Control (QA/QC) manual as part of the federal funding requirements. The assigned PMOC reviewed the QA/QC manual that identified the quality control elements. This BRT project contracted out a material testing firm to test the materials. The material testing firm used scientific tests verifying the materials were within the approved tolerances and under the specifications. The PMOC, QA/QC manual, material testing firm, and engineers crossed each other at different angles. The teams were able to cross-check each other and standardized the processes within construction. According to P5,

FTA had resources online demonstrating how to maintain the documents. This BRT project was part of the small starts program with FTA.

According to P5, this BRT project benefited from quality control efforts. This BRT project accounted for quality control processes and resolution of issues within the 25% schedule contingency. During the punch list process, if the field inspector found an item that did not meet the specifications, the item was replaced using the schedule contingency. According to P5, the schedule contingency allowed this BRT project to be fully prepared. This was like an astronaut having a contingency plan available inside a spaceship in case something critical issue arose. According to P5, when the contractor started digging the first hole, there was nothing more that could be done but sit there and monitor the activities. This BRT project was able to standardize the communication and quality control processes before construction began. The standardization efforts prior to construction permitted this project to be built smoothly.

According to P5, two themes permitted this BRT project to be constructed on time and under budget. The first theme was significant public outreach, and the second theme was embracing the standardization process. Public outreach included the public, external partners, jurisdictions, and business districts. During the planning and design phases, this BRT project embraced the standardized controls set in place by FTA. The standardization controls were in place to reduce glitches and allowed this BRT project to run smoothly.

Participant 6

Participant 6 (P6) was a deputy director for a public transportation authority. The public transportation authority had a BRT program with multiple projects. P6 was the

deputy director responsible for the design and construction of this BRT project. The engineering work and construction administration included a team under the responsibility of P6. This BRT project was approximately a 2.5-mile transition from a local bus corridor to a BRT corridor. A portion of the alignment included an exclusive busway in the median and improvements to platforms station areas.

This BRT project included improvements to the CCTV system, real-time information, and accessibility. According to P6, this BRT project wanted to include onboarding with ticket card readers. Late in this BRT project, the removal of ticket card readers occurred. The public transportation authority wanted this project to be like a light rail on wheels. This BRT project turned out to be something in between. This BRT project included shared lanes for approximately half the corridor and 1.5 miles of exclusive bus lanes. This BRT project had a total of 11 stations and was part of the most significant bus line. This BRT project provided transit improvements from a downtown area to the busiest transit center in the area. The connection between the transit center and downtown was the first step toward a light rail transit (LRT) system. This BRT project was the potential first step in the direction of a light rail system. This BRT project was the first step in that direction.

According to P6, this BRT project goes back to the early 2000s. At first, this project was a single-car light rail system. BRT was gaining steam in Latin American and Europe. At the time, there were only a couple of BRT projects in the United States. This project realized the impacts of light rail compared to a BRT system. The public transportation authority completed an evaluation and learned that a BRT system provided ridership demands that were less expensive and less impactful. According to P6, the

policy side of the house had an emotional reaction to BRT because they thought the system was a weaker improvement and investment. This BRT team stated the platform length, roadway, and alignment were like the light rail system. According to P6, the BRT system was considered the first step toward a light rail system.

According to P6, this BRT project had the same organizational structure from engineering through construction. The public transportation authority was a public agency that was not a city or county. The public transportation authority was responsible for public transportation and public transit, which included overseeing transportation congestion. According to P6, the agency had a board of directors. The board of directors included county and city elected officials. The elected official were mayors and council members from the cities and counties.

This BRT project also included a set of standing committees focused on administration and finance. According to P6, there were standing committees for system safety, transportation operations, and capital project delivery. All the items presented to the board had to go through a standing committee. This BRT project also benefited from a policy advisory board. The policy advisory board was a subset of existing and former board members interested in the success of this BRT project. According to P6, this BRT project provided several improvements within the county. The policy advisory board included county representatives and city council members. The policy advisory board drove policy direction by understanding the community and transit requirements. P6 worked as a staff member of an engineering and construction team for a division responsible for project delivery. P6 attended a monthly board of directors meeting.

According to P6, this BRT team worked closely with the board of directors, standing committees, and policy advisory board.

According to P6, this BRT project was behind schedule and over budget. Publicly available grand jury reviews and audit information showed that city representatives wore multiple hats during the construction of this BRT project. City representatives made decisions with the best intentions for their districts and not for the transit value. The responsibilities for city officials during the construction of this BRT project were blurry. According to P6, when board members advocated for a project, this pushed the project forward. This BRT project witnessed board member decisions in the interest of their constituent and not the transit agency. The decisions made by the policy advisory board were about the community's reaction to this BRT project and not the transit value. The city representatives were elected officials appointed to the board of directors. According to P6, the city officials found it difficult to separate their constituent responses and the transit values.

According to P6, this BRT project experienced an organizational structure with city council members that had perceived conflict of interest. The city council members pulled in different directions. Individuals with a perceived conflict of interest could be informed or have their decisions influenced in contrast to transit values. This BRT project included an organizational structure with city council members that looked out for the residents. At times the decisions made by the city council members were in the best interest of transit. According to P6, the perceived conflict of interests within this BRT project were a unique dynamic.

This BRT project began when funding was available early on. This BRT project was a capital project that included local and federal funding. According to P6, after 2008, funding this BRT project was more challenging because of the economic downturn. Policymakers prioritized funding decisions, and the board of directors committed to this project. This BRT project had support through the design, engineering, and construction phases. According to P6, the organizational structure was fine, but individual perspectives did not help. If perspectives were part of the organizational structure, the organizational structure impacted this BRT project.

According to P6, residential and commercial properties felt impacts during the construction of this BRT project. This BRT project was in a downtown environment that had a lot of connections. This BRT project was not a freeway or highway job. This BRT project was in front of homes and businesses. Because of the location, this caused impacts to lane reductions, turn movement reductions, and elimination of street parking. The elimination of street parking was the most impactful sticking point for the community. According to P6, the policy advisory board was responsive to the public needs without an equal appreciation for the transit value. The policy advisory board did not recognize the transit value in the same light as the residential impacts.

The policy advisory board responded to two community complaints during construction. The policy advisory board response during construction created challenges for this BRT project. According to P6, if the policy advisory board focused on public transit, the decisions would be less impactful to this BRT project. This BRT project redesigned parking and added left-turn lanes impacting the corridor. The design changes slowed down this BRT corridor and created transit value conflicts. According to P6,

public complaints, impacts to the community, and the city council members' perceived conflict of interests affected this BRT project.

This BRT experienced two levels of conflict resolution efforts. The first level was having a conflict resolution with the contractor. According to P6, the contractor had a contract resolution process. This BRT project went through a conflict resolution process with the contractor like other projects in the industry. The public transportation authority directed the work in the field. If the contractor identified an issue, the contractor submitted a change notice request. The contractor requested a change in scope, budget, or schedule. This BRT project negotiated and resolved conflicts at the staff level where possible.

According to P6, if the contractor was not performing, bonding companies were notified. This BRT project called the bonding company several times to elevate the issues to management. This BRT project had regular meetings between the president of the contractor firm and the public transportation authority deputy director. The contractor's president or deputy director were usually not involved in the day-to-day business operations during construction. This BRT project completed construction dispute resolution efforts at the highest level of the organizations. The construction dispute resolution effort was mitigated by notifying the bonding company a couple of times.

According to P6, the contractor's disputes extended the feedback from policymakers, business owners, residents, and city staff. The feedback provided reactions to the construction impacts. The dispute resolution effort focused on the public transportation authority dealing independently with the interests of the parties and the

contractor's performance issues. The public transportation authority communicated with the stakeholders throughout the process. The stakeholders wanted scope changes because of the construction impacts. According to P6, after internal analysis and audits, there were three reasons for community conflicts.

The first community conflict was traffic impacts because of construction. Even if the contractor built the project per the specifications, the public continued to complain. Residents experienced traffic impacts during construction. The second community conflict was no construction in an area. This BRT project experienced a situation where the contractor began working in a section and moved elsewhere within this corridor. The community started complaining because they noticed the contractor shifted the work away from their area. According to P6, community members began complaining because this BRT project was not completing the work in their area.

The third community conflict was members not agreeing with the construction activities and procedures. This BRT project had community members complaining about the construction staging and how the contractor completed the work. Community members complained about the way this BRT project blocked driveways, the construction work windows during the day, traffic control procedures, the length of the contract staging area, and traffic control changes that allowed access to the worksite. This BRT project experienced the three community conflicts reasons described by P6.

According to P6, dispute resolution had responsible parties in the field. The responsible parties included a resident engineer who worked with the contractor and an engineer who worked with the city and stakeholders. The responsible participants took information down while negotiating among the stakeholders. The responsible

participants decided when issues got critical. According to P6, some decisions reached the policy advisory board for this BRT project. This BRT project met every other month with the policy advisory board and presented items to the group. The policy advisory board included five city and county representative members. The policy advisory board received the same complaints from the stakeholders. According to P6, this BRT project was "built by complaint."

This BRT project built an item, a complaint was received, and the project readjusted the design or construction procedures to minimize the complaint. The readjustments added additional costs and time to the contract. According to P6, most of the dispute resolution efforts occurred at the staff level daily. The staff understood most of the issues and resolved them in the field. The president of the contractor and deputy director of the public transportation authority were involved if the staff was not able to resolve an issue.

According to P6, conflict resolution efforts impacted the progress of construction. This BRT project struggled with public contracting. Projects incurred liquidated damages if contractor delays occurred because of their responsibility. For example, the contract of this BRT project instructed the contractor to build platforms in front of properties. This BRT contract stated the contractor had 1 week to restore the new sidewalk. The contract also stated the contractor should provide a temporary walkway during construction. According to P6, the contract requirements were obvious, but there were no consequences if the contractor did not deliver.

The public transportation authority got upset and wished the contractor met the contract guidelines. Unfortunately, the contract provided no consequences for the

contractor if they did not deliver. According to P6, this BRT contract provided no additional compensation for completing the work faster. And there was no loss of money if the contractor did not finish on time. The only recourse left was to go to a bonding company and state that the contractor was not delivering the work. This made the contractor enter into default status. According to P6, going to the bonding company does not work well. Within 30 working days, the contractor completed the work and replaced the sidewalks. Finding ways to accomplish the dispute resolution efforts using contractual tools could be helpful.

According to P6, this BRT project told the contractor they were supposed to be done with items in a timeframe. Once the timeframe expired, this BRT project told the contractor they had another contractor on standby to come in and complete the work. This BRT project told the contractor they were going to impose special retentions, deducting payments to the contractor. The special retentions got the attention of the contractor. The special retentions technique did not expedite the completion of the sidewalks in front of the property owners. According to P6, a more objective dispute resolution process would be helpful.

On the subjective side, good partnering was helpful. Within P6's 32 years in public transportation, a community relations officer was used to identify the perceptions and impacts to the community. The contractor's foreman did not care about traffic or where the backhoe was parked. But someone who cared about community outreach focused on traffic impacts and where the contractor's equipment was parked. The community relations officer provided the contractor and the project manager a different perspective. Having a qualified community relations officer improved the project

because they provided community concerns. According to P6, partnering helped BRT projects, but partnering involves the motivation to cooperate. This BRT project did not incorporate partnering efforts within the contract. According to P6, the contractor was there to perform a job and get paid using fair compensation. If there were a way to achieve a partnering attitude, this would have helped this BRT project. In other projects where P6 was involved, partnering efforts improved the project. Partnering in a public contract that used a low bid approach can be a challenge.

According to P6, during design the decisions made were impacted by the environmental process, permitting requirements, and scope coordination efforts with the policy advisory board. During construction of this BRT project, some changes occurred because of community complaints. According to P6, some of the decisions explored whether this BRT project built the entire scope because of the community impacts. For example, this BRT project built a median exclusive busway, eliminating left turn lanes at several locations. Removing left turn lanes improved transit and reduced the number of traffic management conflicts. During construction, property owners cared a lot about the left turn lanes because this provided access. The decisions to eliminate left turns were elevated to the city council offices. The city council offices influenced and encouraged the city staff to work with the property owners to mitigate the complaints.

According to P6, the approach was mitigating complaints and not evaluating the decisions. This BRT project experienced the decision-making process at different levels, depending on the complexity. Daily field-level decisions about traffic control, hours of operations, and dealing with property owners or businesses occurred. Some of the decisions went all the way up to the policy advisory board. This BRT project

experienced decision impacts during construction. According to P6, the audit occurred because the contractor experienced challenges in the field. When the contractor hit a utility conflict, the contractor was not prepared to work around the utility conflicts. Over time, there were a lot of delays, and no activities occurred in the field. The community complained and stated this BRT project impacted businesses and the residents' livelihood. Residents could not tolerate business impacts for a month or more. Businesses were dependent on constant income. The board of directors created a business assistance program, not required by law or the contract.

The business assistance program enforced this BRT project to pay businesses for loss of business when this project was not occurring. According to P6, a public contract was created to improve the benefits of the public, not to pay business impacts. The contractor spent approximately 3 months not working on this BRT project. This BRT project settled the contractor out and removed them. The public transportation authority ended up working with other contractors and subcontractors, managed the work, and finished the project without the original contractor. This BRT project paid approximately $5 million to businesses. While this BRT project was at a standstill, all the actions and formal public process was made by the board of directors. The board of directors recognized that typically a project would not work for 3 months while a new contractor came onboard. To finish the work, this BRT project settled with the prime contractor.

According to P6, this BRT project did not acquire a contractor who understood the environment and helped minimize community impacts. This BRT project had meetings with the city regularly. After one of the standardized city coordination meetings, the public transportation authority project manager asked P6 a rhetorical

question. When did we promise there would be no impacts for construction? According to P6, this BRT project experienced a mentality that minimizing construction impacts meant there would be no community impacts. There is a certain level of expectation that needs to be understood with construction. According to P6, BRT projects must communicate honestly and clearly with the community.

For example, this BRT project removed on-street parking in front of an apartment complex. The apartment complex began complaining and told the project team that removing on-street was not an option. The public transportation authority stated they tried to keep the on-street parking, but there was no available space. This BRT project prioritized the impacts, and on-street parking was the least impactful. This BRT project held a public meeting on site in front of the apartment complex. At the public meeting, a large-scale set of drawings was present. City representatives and the apartment complex association attended the public meeting. This BRT project team presented the situation in general terms and the prioritization of impacts.

The large-scale set of drawings were placed on the table, allowing everyone to walk through the impacts. This BRT project team asked whether the buildings should be taken down. Everyone agreed to not take down the buildings. Then this BRT project team asked whether they should widen or keep the sidewalks in front of the property. Everyone agreed to keep the sidewalks at 10 feet wide. This BRT project team then asked whether they should keep the on-street parking, the two lanes, and the left turn lane. Everyone agreed to keep the on-street parking, two lanes, and left-turn lane. This BRT project team then told the public that the corridor needed 27 feet for the bus.

According to P6, the public transportation authority went to the bus yards and the analysis confirmed that BRT buses need a minimum width of 27 feet.

This BRT project team then asked the public whether the building, sidewalk, on-street parking, and two lanes from the neighbors across the street needed to be removed. Everyone agreed not to remove the building, sidewalk, on-street parking, and two lanes. After the analysis was completed, this showed the public there was not enough room to keep all the items within the corridor. The public was asked, what do should we keep and remove from the corridor? This BRT project team went through the decision-making process multiple times during the public meeting. In the end, the obvious choice was removing on-street parking. According to P6, after the public meeting, a couple of the ladies who were the most ardent complainers gave this BRT project team a hug because they understood why on-street parking needed to be removed.

According to P6, this BRT project found a way to help the public understand decisions. Without understanding, the public viewed decisions as persecutions, the public did not care, and the public did not attempt to resolve impacts. When this BRT project took the time to review the decision-making process with the public, this cleared up a lot of miscommunications and mitigated complaints. One of the best practices for this BRT project was good communication and honesty. According to P6, this BRT needed to show the public actions and not just words. If this BRT project did not share the decisions with the public early on, there were potential consequences during construction.

According to P6, the stakeholder forces influenced the bureaucratic forces. Had the bureaucratic perspective already been shaped, the bureaucratic forces would not have

influenced this BRT project as much. For example, policy individuals told this BRT project team that a tire shop driveway was impacted. This BRT project team met with the property owner, talked about the hours of operations, and developed a plan that was the least impactful for the business. According to P6, if the policymakers understood the construction activities more they would not have been as influenced by stakeholder forces. This BRT project experienced bureaucratic forces impact because of stakeholder forces. As the project progressed, the transit values were being watered down because of the bureaucratic forces.

According to P6, the public transportation authority wanted to make a statement with this BRT project. Within the organizational structure, each division had a different perspective about this BRT project. The construction personnel reacted differently compared to the planning side of the house within the organization. The decision made by the planners and designers needed to be built in construction for this BRT project. When this BRT project was being built, the community complaints were not intended to go to the planners or designers; the complaints went to the construction staff in the field. According to P6, the planner's mentality was to make a statement with this BRT project. Phenomenal improvements have higher cost and schedule implications for the project in the long run. The planners were not part of the conflict resolution efforts during construction, only the engineers and construction personnel. Another lesson learned for this BRT project was having a balance of constructability and planning perspectives. Having a balanced perspective provided early benefits to this BRT project. According to P6, planning to have this BRT project be grand or phenomenal ended up costing the project more during construction.

According to P6, this BRT project was good at establishing a standardized construction administration protocol. The public transportation authority treated all the capital construction projects as a program and the agency completed multimillion-dollar projects. Completing multiple large public transportation projects forced the agency to be thorough with construction management. The public transportation authority was aware of cost controls, schedule controls, and change management. The construction management efforts were standardized and structured during the construction of this BRT project. This BRT project was able to understand the consequences decisions and how they impacted delays and cost. The delays and cost overruns were not a surprise to the public transportation authority. This BRT project anticipated the cost overrun and scheduled delays. According to P6, this BRT project was good at cost, schedule, and budget management.

This BRT project understood where the funds were coming from and how to administer the funds. According to P6, having standardized construction management efforts prevented this BRT project from being over budget or behind schedule. The construction management team were able to control the budget and schedule because they controlled the decisions. Unfortunately, many of the impactful decisions for this BRT project came from outside sources. The bureaucratic and stakeholder forces directed this BRT team to make changes. According to P6, this BRT project had a difficult time controlling the bleed of the scope, cost, and schedule. This BRT project did not have a lack of standardization or controls; the bureaucratic and stakeholder environment created high-level construction risks. This BRT project experienced problems during construction because (a) the BRT corridor was built in an old area with unknown utilities,

(b) businesses could not tolerate downtime, (c) phenomenal improvements were made in front of community properties, (d) there were large-scale traffic impacts, and (d) the settlement with the contractor created several months delay.

According to P6, quality control did not impact the process during the construction of this BRT project. Interface integration impacted the progress of this BRT project. According to P6, quality control was part of interface integration. This BRT project had very complex bus shelters within the corridor. The large-scale bus shelters were a special design that was unique to this BRT project. The bus shelters and stations were all custom-made for this BRT project. According to P6, the integration between the prime contractor and several subcontractors was a challenge during the construction of this BRT project. Quality control included inspections, expectations, and testing of materials. The issue this BRT project experienced was the confusion of responsibilities between the prime contractor and subcontractors during the interface integration phase. The public transportation authority ended up assisting the prime contractor with the interface integration efforts and building of the large-scale bus shelters.

According to P6, the lesson learned was needing a contractor who understood the complexity of interface integration or eliminating the complexity in the design. BRT projects should find a way to simplify the design. When a BRT project is planning or engineering the design, they understand the complexities during construction. According to P6, design integration should be included within the quality control component. Design integration ensures that electrical, safety, security, architectural, structural, and operations combine to make a design that is easy to build. The design integration quality control is a good check to have in future BRT projects.

According to P6, BRT projects understand that construction is the natural conclusion of developments during the engineering phase. The engineering and design phase of BRT projects is more important than the construction phase. If a BRT project does not take the time to reflect on the design, additional construction conflicts could occur. The planners and designers need to be made aware that someone built the design. BRT projects should ask the following two questions: (a) How does the design simplify construction? and (b) How does the project balance the stakeholders' long-term value and short-term inconvenience during construction? According to P6, engineers are taught to design the best system. The best design at times is not the perfect design. The perfect design appreciates and balances all the influences.

According to P6, there were three takeaways that allowed this BRT project to be on time and under budget. The first takeaway was understanding the balance when decisions were made and incorporating the balance early on during the design phase. The second takeaway was that project teams communicated the balance to bureaucratic and stakeholder forces. The bureaucratic and stakeholder forces recognized the balance and understood why decisions were made early on. The third takeaway was recognizing that changes should be avoided during construction unless there were safety issues. BRT projects understood the balance early. Bureaucratic and stakeholder forces should be allowed to bend without breaking. This BRT team set the stage early on and informed decision makers that changes during construction impacted the project.

Participant 7

Participant 7 (P7) was the assistant director for a city. During the construction phase of this BRT project, P7 worked in a different capacity within the city. This BRT

project was completed and launched into service in 2018. During the construction phase of this BRT project, P7 oversaw change management and change orders. This BRT project was built in approximately a 15-mile corridor within the city. This BRT project ran east to west and north to south, like an L-shape. This BRT project provided 15-min service during nonpeak hours and 10-min service during peak hours.

This BRT project included 52 stations, ticket vending machines for short fare collection, BRT station shelters, amenities, real-time display boards, TSP at the intersections, new buses, and the installation of an intricate network to support telecommunications. This BRT project installed a lot of fiber lines and software updates to improve the network and connect the system. This BRT project required all hands on deck from the city. According to P7, big projects such as this BRT project were a bit more complex than meets the eye. The city, like many other agencies across the country, realized the complexities during the development of this BRT project.

According to P7, the organizational structure evolved over time for this BRT project. The city department dedicated more resources and adapted to ensure this BRT project was completed on time and met the dedicated launch date. During construction, the city's project manager was the single point of contact, and there was a counterpart quality control specialist. The quality control specialist left partway through this BRT project. According to P7, the project manager was the wrong person for the project and created problems. This BRT project was too complicated for the project manager. The city shifted additional resources to this BRT project to assist with the management of the job.

The assistant director of the city stepped in and took control of this BRT project. The assistant director ensured decisions were made and this BRT project continued progressing. According to P7, this BRT project did not have contingency remaining at the end of construction. Toward the end of the construction phase, the organizational structure included the assistant director from the city, the project manager from the city, construction managers, a full-time engineering team, and a full-time administration team. The administration team assisted with managing the funding and communications. This BRT project also brought in an outside consultant who acted as an owner's representative halfway through this BRT project. The city realized they needed support and additional resources to stay on track. The consultant assisted the city to deal with finances and the interface with the project management oversight (PMO) committee.

The hired consultant provided oversight of additional consultants assigned to this BRT project. According to P7, the construction management team included a project management team that was not utilized well. The project management team did not serve the needs of this BRT project the way they were intended from the beginning. The quality control engineering team also hired a consultant toward the end of this BRT project to assist the city with testing requirements and lab results. The remainder of the organizational structure for this BRT project was all in house within the city.

According to P7, involvement of decision makers during construction was important. Having decision makers involved allowed decisions to be made on the spot. The project manager could not make decisions on the spot. According to P7, a team that was unable to make decisions created a lack of confidence for everybody involved in the

project. Bringing the decision makers from the department helped prioritize tasks to completion in certain elements of this BRT project.

The construction decisions for this BRT project involved changes to structures, infrastructure to accommodate new technology, and department onboarding policies. According to P7, having decision makers involved in the process permitted this BRT project to continue moving forward. For example, P7 was a decision maker within the change management process. P7 reviewed and approved change orders during the construction phase of this BRT project.

According to P7, this BRT project experienced conflicts in change management. The vendors completed extra work, and they requested compensation. This BRT project completed a conflict resolution effort to figure out what was reasonable for appropriate scope changes and additional compensation. This BRT project team sat down with the vendors and negotiated on the scope of work and cost changes. The vendor changes were forecasted, and if there were unforeseen costs, this BRT project team dealt with them on the spot. While negotiations occurred for scope changes, the change management team provided the vendors the authority to proceed with the work using a not-to-exceed value. According to P7, allowing the contractor to proceed with work is called force-account or time and materials. Force-account work permitted this BRT project to mitigate conflicts and allowed the work to proceed.

According to P7, this BRT project was able to resolve conflict resolutions quickly. Resolving conflicts quickly minimized construction delays. There were a few change orders that were sorted out at the end of this BRT project, a typical construction practice. According to P7, managing conflict resolutions against grant compliance

requirements was challenging. The change management department of the city had different views to the regulations imposed by the grant. This BRT project was able to resolve the grant interpretations for procurements.

According to P7, when this BRT project began breaking ground in construction, the weather began to rain nonstop. The job sites of this BRT project were flooded, and the schedule contingency was used. The decision makers helped keep the schedule on time. According to P7, working through change management was a challenge. Effective communication and setting expectations with the contractor improved change management. According to P7, the prime contractor of this BRT project worked with the public agency.

According to P7, this BRT project experienced budget conflicts. When this BRT project went out to bid, the contractor bids were 30% higher. At first, the contractor bids were outside the construction budget, and the city was not able to afford this BRT project. The city completed a value engineering exercise with the lowest bid contractor, focusing on the scope of work and grant regulations. The value engineering exercise allowed this BRT project to reduce construction costs. During the value engineering exercise, this BRT project reviewed all the line items. This BRT project team developed alternative materials, alternative methods, and a reduction in the scope of work. This BRT project team ensured the decisions made during the value engineering exercise allowed the project to stay in compliance with grant regulations.

According to P7, this BRT project presented the contract bid award and change order that lowered the construction cost millions of dollars to the city council. The value engineering exercise permitted this BRT project to be built. According to P7, this BRT

project used up most of the contingency during construction and was approximately $2 million under budget. The city was able to control the scope of work and change orders during construction. According to P7, the city still had money available. The available funds were spent on various additional BRT items. Change order costs were approximately 7% of this BRT project cost. According to P7, if the change order project costs were below 10%, this was fantastic. The conflict resolution efforts impacted this BRT project in a positive manner by moving the project forward.

Having decision makers in the room permitted this BRT project to be completed on time and under budget. Most of the change orders decisions were executed by P7. If the decision was a major change to this BRT project, P7 had to coordinate with the assistant director or management team to complete the change order process. If the management team approved the change order, P7 negotiated with the construction manager and contractor on the schedule, scope of work, and budget changes. In the end, the change order process was approved by P7.

According to P7, bureaucratic forces did not impact the progress of this BRT project. The main bureaucratic force was the city council receiving complaints about business impacts during construction. This BRT project received complaints about lane closures and construction activities in the field. The city council and community debated whether this BRT project was necessary or a waste of taxpayer money. The community expressed concerns that the money should be diverted elsewhere within the city. This BRT project was approved by the board of directors and built. Once the project was approved by the board of directors, there was no turning back. According to P7, this BRT project completed a 10- to 15-year planning process. The original scope of work

included bus-only lanes. Bus-only lanes were not received well by the city council and were removed from the scope of work. The removal of the bus-only lanes delayed the project and created additional engineering work during the design phase. According to P7, the environmental process of this BRT project had the largest bureaucratic impact.

According to P7, not having the ability to verify off-board fare collection impacted this BRT project. This BRT project set up a system by which riders used an off-board fare system before boarding buses. Riders could board the BRT buses through the front door or rear doors. During the revenue service phase, this BRT project was the "free bus." The free bus service issue was impacted because of the ticket vending machines not working. Riders were not purchasing tickets, and they were using the BRT buses for free. There was no ticket enforcement on the buses, so riders used the BRT system for free. The city decided to put fare boxes on the BRT buses, which permitted payment validation through an onboard fare system. According to P7, off-board fare collection did not work for this BRT project because the city was never allowed to enforce fare collection. Not permitting fare collections was a bureaucratic force imposed by the city council. The city council did not approve sworn officers to verify tickets on the BRT buses.

The city did not have transit police available because the police worked for a city government. A public transportation authority or public transit agency had transit police available. This BRT project did not have transit enforcement available. The city council voted not to have sworn officers verify $1.25 tickets and enforce small fines for unpaid bus fares. The city council preferred to have paid sworn officers out on the streets to address crimes. What was the greater good, having sworn officers enforce a $1.25 bus

fare or having sworn officers deal with impactful crimes on the streets? According to P7, there were dedicated police officers for this BRT system. For the police officers to check fare collections, changes to the city government code were required. The city council did not approve or consider the changes to the code.

According to P7, stakeholder forces did not impact this BRT project during construction. The ticket vending machines were delivered late. The city was not at fault for the late delivery of the vending machines. The ticket vending machine vendor was unable to meet the required delivery date. Once delivered, this BRT project experienced problems with the ticket vending machines during the revenue service phase. According to P7, the only notable stakeholder force was the public complaints because of construction impacts.

According to P7, this BRT project completed monthly and quarterly meetings with external stakeholders. This BRT project also completed weekly meetings with the PMO team and weekly internal meetings with the city staff. According to P7, this BRT project completed weekly construction meetings that helped the project stay on track. The quarterly external stakeholders meeting provided a progress report along with updates on funding and procurement challenges. This BRT project had standardized procurement processes in place. The procurement and change order process used construction industry standards. Standardized processes were in place to have contracts approved by the city council. According to P7, there were no revolutionary standardization efforts. This BRT project team ensured communication and tracking of deliverables occurred while the project progressed through construction. According to P7, this BRT project benefited from the standardization efforts during construction.

This BRT project included quality control efforts during construction. The quality control efforts included a QA/QC plan. According to P7, this BRT project had a person dedicated to quality control from the beginning. The quality control specialist left this project. There was no market for a quality control specialist in the region. Filling the technical specialist role was complicated. The city shifted internal resources to fill in the gap of the quality control role. According to P7, the city's internal sources improved process and file management quality assurance. The city focused on improving processes. The construction manager oversaw the quality control aspects for this BRT project. This BRT project incorporated testing labs to ensure the items met specification requirements. The city's internal technology department was heavily involved in verifying specification standards. According to P7, the traffic signal team completed quality control processes to ensure the new technology added to the signals worked properly and was safe for the public.

According to P7, the predefined quality control plan impacted the progress of this BRT project. Not every capital project required a quality control plan. Because of the intricacies and moving parts, this BRT project required a quality control plan. The quality control plan ensured the processes met safety and quality compliance criteria. This BRT project completed a quality system that was on time and under budget. According to P7, there was one area that fell short in quality control. The ticket vending machines did not pass the quality control tests before they shipped. The vendor could not get the ticket vending machines to work at the factory. Eventually, the vendor was able to get the ticket vending machines to work.

At the time, only one other agency within the United States implemented the same ticket vending machines. The other agency experienced similar problems with the ticket vending machines. According to P7, the new technical parts of the ticket vending machines were not reliable. This BRT project spent over a year completing the conflict resolution process with the ticket vending machine vendor. This BRT project separated the general contractor from the ticket vending machine contract. Separating the general contractor from the ticket vending machine contract saved this BRT project millions of dollars.

According to P7, BRT projects developed standardized process plans, communication plans, public interface plans, and quality assurance control plans. The project had to follow the approved plans. BRT projects had to develop PMPs because of their complicated nature. PMPs permitted the team to create an educated scope, cost, and schedule. According to P7, the project schedule was one of the valuable components of this BRT project. Agencies had to figure out how to deliver BRT projects to the customer. How does a BRT project handle customer relation and maintain a risk register? According to P7, this BRT project learned how to use most of the project management tools during the delivery of this project. The city had never taken on such a complicated public transportation project in the past. A small-town bus system planned, designed, and built this BRT project, and the complexity opened the city's eyes.

Participant 8

Participant 8 (P8) was the chief customer officer and chief operating officer for a public transit agency. During the construction of this BRT project, P8 was the vice president of bus operations. P8 worked on the operations phase and revenue readiness

process. The revenue readiness process included the delivery of new BRT buses, the system testing, and ensuring the BRT buses were out on the road. According to P8, the operations and testing seemed to occur during the cold months.

This BRT project scope included a north and south route. The first BRT route was a 21-mile corridor, and the second BRT route shared a three-mile section of downtown. This BRT project built 77 stations between the two routes. This BRT project started with 40 buses and the operations progressed to 55 buses. This BRT project procured 22 60-foot articulated buses and 18 40-foot buses. According to P8, this BRT project included branded stations and buses.

According to P8, the organizational structure for this BRT project included a cross-functional team. Nearly every department within the public transit agency was involved in the design, construction, and implementation of this BRT system. The departments ensured the BRT buses were operationally ready with the proper equipment for the system. On the operational side, the department verified the service schedule and the training of the BRT bus drivers. The organizational structure also included a construction management team. The construction management team included internal project managers who supported the design and construction teams.

The organizational structure included a general contractor and consulting staff who oversaw the contractor's work in the field. This BRT project also had a valuable technology component. The valuable technology component included designing and implementing TSP systems while collaborating with the city. According to P8, most of the intersections on the BRT routes installed TSP. The TSP system held a green light longer, permitting the BRT bus to pass through the intersection. In the downtown areas

of the BRT routes, this BRT project built dedicated transit lanes for the buses instead of using TSP systems. The dedicated transit lanes provided the buses with priority over automobiles.

According to P8, this BRT project used a portion of the grant to develop a mobile fare application. This BRT project was one of the first agencies in the United States to develop a mobile fare application. At the time, the public transit agency was the first in the United States to deal with a mobile application by which people could purchase off-board tickets. This BRT project implemented predictable arrival times at the stations. The stations included a dynamic message sign that provided the arrival time of the next BRT bus. The organizational structure of this BRT project also had a safety department. The safety department ensured the construction and operations worked well for this BRT project. The organizational structure of this BRT project included a planning department. The planning department focused on the preconstruction design and developed a schedule and integration with the rest of the bus system. The bus system integration included transfers and joint bus routes.

According to P8, this BRT project experienced organizational structure impacts. As part of the grant approval process, interviews occurred with the entire BRT team and executive staff to determine qualifications and experience. The interviews ensured the public transit agency had the appropriate qualified and experienced staff to implement this BRT project. The interviews ensured this BRT project was a priority within the organization. At the time, this BRT project was a very high-profile project and a priority for the public transit agency.

According to P8, all the management within the public transit agency focused on this BRT project. This BRT team was cross-functional within the entire organization, which led to success. This BRT project planned to implement the system as a new service, not necessarily a construction project. According to P8, all the departments within the public transit agency collaborated on this BRT project. The one challenge this BRT project experienced was the environmental permitting process. This BRT project partnered with the city and had dedicated inspection and construction staff available all the time. According to P8, partnering efforts with the city helped complete the project on time.

According to P8, every department within the public transit agency assisted in developing the budget for this BRT project. The engineers developed and reviewed the estimates with every department. For example, the engineers asked the operations department to confirm the number of purchased buses and the amount of equipment required. This BRT project developed accurate estimates early. According to P8, this BRT project worked within the city's ROW and streets. Because of the unknown underground risks within the city ROW, this BRT project implemented unit-based pricing. The unit-based pricing approach permitted the public transit agency to share the risks with the contractors. The conventional cost estimate approach had contractors accepting the risk and inflating bids to cover unknown cost overruns. According to P8, if the contractor hit an unknown risk during construction, the public transit agency helped cover the cost. Using the conventional cost estimate approach, contractors inflated their dollar amount to cover unknown risks.

According to P8, this BRT project team developed a collaborative environment. There were a lot of team meetings at which individuals brought up issues and worked them out. According to P8, within the public transit agency, there were minimal conflicts. There were more conflicts with external partners like permitting issues with the city. For example, during construction, this BRT project closed lanes because of operations. According to P8, one morning the traffic was backed up into downtown. The city called the public transit agency and notified the agency they needed to get out there immediately. This BRT project team went out in the field and ensured the traffic cleared that morning. According to P8, during construction, this BRT project experienced daily conflicts and resolutions. This BRT project team developed a conflict resolution effort routine.

According to P8, a risk register was a valuable tool for this BRT project that allowed the team to understand what could go wrong and the mitigation steps. This BRT project worked through all the issues before the start of construction. Mitigating potential impacts identified in the risk register played a key role. According to P8, this BRT project partnered and cooperated with the city during construction. The virtue of having the team and stakeholders aware of the risks mitigated schedule and budget impacts. According to P8, everybody understood their role and responsibility, and all parties had a vested interest in completing tasks on time. This BRT team understood how tasks interrelated within the process. If a team player did not meet a deadline, they understood the impact downstream.

According to P8, this BRT project encountered unknowns when they began digging. This BRT project team expected to uncover unknowns. There are old areas of

the city. When the contractor began digging, unexpected pipes and utilities were uncovered. There were a few cases when the city was asked to make quick decisions. For example, when the contractor encountered an unexpected water line, this BRT project quickly worked with the city to figure out how to relocate the water line. According to P8, the relocation of unknown pipes and utilities slowed down the process during construction. This BRT project was fortunate the city provided flexibility during construction.

If this BRT project hit a roadblock in a location, the contractor closed-up the location and moved on until a solution was found. Moving from location to location created conflicts between this BRT project and the city. At times this BRT project had to wait until a decision was made by the city. The time for the decision to be made can be seen as a bureaucratic force, holding up the process during construction. According to P8, the city's bureaucratic force impacted locations within the corridor, but because of the flexibility of the city, the bureaucratic force did not impact the schedule.

According to P8, this BRT project incorporated a very collaborative environment. This BRT team understood each team member's decisions and the authority at each level. This BRT team recognized when a decision was made, the decision would impact the outcome of the project. According to P8, this BRT team knew when to elevate decisions. There was no predetermined decision-making tree; this BRT team understood the decision-making authority of each department. The steering committee for this BRT project was made up of executives. On a monthly basis, this BRT project team briefed the steering committee and asked the steering committee for help in making any decisions. According to P8, this BRT project made decisions on a frequent basis. If

needed, this BRT project escalated issues outside the steering committee meeting and briefed the committee on the results during the meeting.

According to P8, having access to the steering committee and providing standardized updates impacted the decision-making procedures. This BRT project had a focused scope, schedule, and budget, creating a positive outcome. According to P8, many decisions did not impact the scope, schedule, or budget. The decisions influenced the quality of the service or the operations of this BRT system.

According to P8, this BRT project was well organized and experienced minimal bureaucratic internal forces during construction. This BRT project experienced internal and external stakeholder forces. The primary external stakeholders were the city, the Department of Transportation, utility agencies, and the watershed protection agency. The watershed protection agency forcefully regulated stormwater runoff. According to P8, the watershed agency required this BRT project to place a bus platform island in the city street. This BRT project built a tunnel underneath the island to provide a stormwater bypass around the station. This BRT project had to develop this expensive solution during construction.

According to P8, the tunnel bypass was a temporary solution; the city planned to dig a hole and replace the system with a stormwater structure. According to P8, the stormwater bypass was in place for about 6 months before the city dug and replaced the system with new infrastructure. The stormwater bureaucratic decision added cost to this BRT project. According to P8, this BRT project was built under budget, but bureaucratic decisions added costs and delays.

This BRT project experienced internal and external stakeholder forces, including the city. According to P8, external stakeholders assisted in building this BRT project. This project was the first attempt to construct BRT only lanes. The city supported the effort to build BRT only lanes. The public transit agency showed the city that buses ran every 5 min or less within the BRT only lanes. According to P8, buses ran more frequently within the BRT lanes. Building BRT only lanes were a risk and received public resistance. The city stood up with the public transit agency and showed the positive aspects of BRT lanes. According to P8, having a good partnership with the city was beneficial. This BRT project experienced difficulties coordinating with some of the individual utility agencies. The public transit agency understood the perspective of the utility companies. According to P8, the stakeholder benefits from external partners far outweighed the negative impacts of stakeholder forces.

This BRT project utilized the Project Management Institute (PMI) methodology. According to P8, this BRT project spawned a more robust public transit agency-wide project management system. This BRT project focused on all the core concepts and values of PMI. According to P8, PMI concepts included managing scope, schedule, budget, risk, and establishing a communication plan. The public transit agency had a culture that had become disciplined in project management and became more widespread. According to P8, during construction, the change implementation strategy implemented a unit price contracting approach. This BRT project used unit price contracting rather than the traditional turnkey fixed price methodology. The unit price contracting approach permitted the public transit agency to share the risk with the contractor. This approach minimized the overinflation of prices and project risks.

This BRT project incorporated a quality management plan that established the quality assurance and quality control efforts. The quality control efforts were undertaken by the entire project. This included quality control efforts within construction, buses, or operations. This BRT project incorporated quality strategies and guidance within the various disciplines. For example, the design plans completed quality and constructability reviews. According to P8, within construction, the construction field staff monitored the activities and resolved issues in real time.

According to P8, a standard project management methodology was valuable to this BRT project. The most important aspect was the collaborative cross-functional matrix team environment. All the various parties understood their roles and responsibilities. The various departments within this BRT project owned their part and were interested in delivering the system on time and under budget.

Participant 9

Participant 9 (P9) was the vice president of facilities and construction at a public transit agency. P9 was the project manager for both BRT routes for this system. This BRT project was built in 2014. P9 managed a cross-functional team that designed and built this BRT project. According to P9, this BRT project had the first buses to push out a Computer-Aided Dispatch/Automatic Vehicle Location (CAD/AVL) system. The public transit agency had been in the design configuration and implementation phase of the CAD/AVL system for a while.

According to P9, the paratransit service was the first system to implement the CAD/AVL system. This BRT project provided the right time to implement and launch the CAD/AVL system on buses. This BRT project provided the first set of buses that

went live with the CAD/AVL system. Implementing the CAD/AVL system on the BRT buses was a big deal. According to P9, this BRT system incorporated the first buses to have onboard fare validation equipment that scanned a mobile application. The public transit agency launched the fare mobile application the year before this BRT project began revenue service. The public transit agency was able to use fare scanning equipment for the mobile applications at the front and rear doors of the BRT buses. The fare mobile application system was available throughout the entire transit network. Implementing CAD/AVL and the fare mobile applications was a lot of work behind the scenes. According to P9, this BRT project provided the launching point for customer technology tools.

According to P9, the coordination with the swim lanes within the public transit agency made this project successful. This BRT project delivered a public service by building stations, purchasing vehicles, and training operators. According to P9, all the portions within the public transit agency had skin in the game. The different swim lanes were part of the project management process. For example, P9 asked what steps were needed to operate the bus service. P9 began planning the operations of this BRT system two years before construction began. The public transit agency understood there was no point in building additional stations if the project did not train enough operators.

According to P9, coordination of the swim lanes from beginning to end helped this BRT project. This BRT project completed a transition of phases early from planning to architecture and engineering. This BRT project incorporated vehicle engineering to help build the new buses. According to P9, this BRT project eventually transitioned to an

operations and service delivery exercise, morphing over time. The various departments within the public transit agency understood their role from the beginning.

According to P9, all the departments within the public transit agency got along, and there were no disagreements. The standard project management tools and risk register were helpful. This BRT project was able to identify and gain knowledge from potential risks. For example, during the analysis of the risk register, operator training was identified as a risk. According to P9, defining roles and responsibilities and writing a charter was valuable. The project charter allowed this BRT team to confirm the scope. The project charter answered the following questions: What is this BRT project doing? What is this BRT project not doing? Defined roles, responsibilities, and the scope of work assisted in conflict mitigations. This BRT project team understood each other's roles. According to P9, this BRT team did not wait for a department to complete a role or responsibility.

According to P9, there was a 99% likelihood that a BRT project was in the same corridor of an existing bus system. The public transit agency already had a local bus service in the corridor. The agency asked themselves whether the corridor warranted a BRT system. The public transit agency asked themselves whether they wanted to construct and build BRT infrastructure improvements or just improve bus service. According to P9, this BRT project underwent construction impacts. This BRT project managed the existing service around the construction operations of this new system.

According to P9, collaboration and coordination with the existing service were valuable to this BRT project. This BRT project considered the operational service impacts early. During construction, the operations team was ready to pick up riders

around the corner. The cross-functional collaboration mitigated issues during the construction of this BRT project. According to P9, this BRT project designated leads to the different swim lanes, which included the steering committee. The leads of each swim lane met regularly as a project team. On a regular basis, this BRT project had structured agendas and a clear schedule. According to P9, this BRT project completed biweekly meetings for 2 years. The meetings were more frequent toward the end of construction, which allowed the team to understand the final steps to completion. The structured meetings permitted this BRT team to understand when issues needed to be elevated to the steering committee level.

This BRT team understood when the steering committee needed to achieve consensus on a decision, had the steering committee break a tie, or informed the steering committee of a decision. Taking this approach permitted decisions to be made on the spot for this BRT project. According to P9, this BRT project had regular drumbeat check-ins with the steering committee. Even if there were no problem to solve or decision to made, the regular meetings with the steering committee kept them informed. The executive team was able to see the system from a political landscape, providing a different lens compared to the staff level. According to P9, even if there were no issues, this BRT project provided updates to the steering committee to ensure collaboration.

According to P9, this BRT project was reliant on federal funding. This BRT project did not launch the project until executing the federal grant, which minimized financial risk. Completing the federal grant process was a learning curve for this BRT project team. The federal grant process added an extra layer of bureaucratic levels. According to P9, additional bureaucracy occurred when a project acquired millions of

dollars of grants. The bureaucratic forces ensured oversight of federal taxpayer funds. According to P9, most government employees were good at understanding and completing projects with bureaucracy. This BRT project provided a learning experience to the public transit agency and improved the relationship with external bureaucratic forces. According to P9, large public transportation projects within the United States often experience various federal bureaucratic layers.

According to P9, this BRT project had regular processes that combined the public transit agency and vehicle manufacturer staff being on-site. The public transit agency contracted with a third party and sent somebody to the factory every other week. Having a third-party present ensured the vehicles met standards. This BRT project trained operators for the services through third-party contractors. According to P9, this BRT project contracted companies to hire the operators and mechanics. The public transit agency invested in training the operators on the new BRT system.

This BRT project heavily invested in training the operators and ensured the public transit agency delivered a good product on time to the community. According to P9, the effectiveness of operations was valuable to the public transit agency and this BRT project. This BRT project completed oversight and took the time to review the quality of the products. According to P9, the oversight and quality assurance did not impede the progress of this BRT project. Standardization oversight and quality assurance was the reason this BRT project was successful.

This BRT project completed 4- to 5-hr simulations of the proposed schedule. This BRT project put all the buses on the street and ran the systems for a month before launching. The simulation provided valuable lessons to this BRT project. For example,

the simulation uncovered various constraints within the new CAD/AVL system. According to P9, this BRT project was able to recover quickly. The riders did not notice the CAD/AVL system issues uncovered during the simulation. According to P9, the quality control oversight was not an impediment. The quality control oversight was a reason for the success of this BRT project.

According to P9, collaboration, ownership, and communication were valuable components of this BRT project. The entire organization was vested in the success of this BRT project. According to P9, many public transit agencies understood the most valuable aspect was the next piece of the system implementation. This BRT project ensured it had buy-in and support from top to bottom within the organization. When there was buy-in and a vested interest this improved the outcome of this BRT project.

Data Analysis

The researcher began the research process with a thorough review of literature on BRT projects, contingency theory, SMT, and public transportation construction schedules and budgets. The researcher uncovered and validated the public transportation construction schedules and budgets of the eight selected BRT projects through OSINT and information gathered from the open-ended interviews. The participants provided the researcher various technical reports and documents showing the construction schedules and budgets of the eight selected BRT projects. The researcher did not incorporate the technical reports and documents provided by the participants to protect the anonymity of the agencies involved with the BRT projects and the participants personal identifiable information. As described in the interview protocol and script, the participants involved in this study understood that any reference to their responses contributing to the study

would be coded and any identifiable information would be removed from this study. Next, the researcher prepared a summary of each open-ended interview and incorporated the synopsis of the interviews within this chapter. The synopsis of the interviews provided the researcher a preliminary indication of potential themes. The researcher transcribed the synopsis of the interviews into an online utility text analyzer operating software system. The online utility text analyzer operating software system allowed the researcher to find the most frequent phrases and frequencies of words. Once the text analyzer was initiated, the researcher began developing a robust understanding of the data and the emergent themes within the participant responses.

From the text analyzer frequency query, the researcher was able to identify keywords and phrases used during the interview process. The most utilized words were (a) BRT, (b) construction, (c) public, (d) design, (e) process, (f) team, (g) corridor, and (h) contractor. The most utilized two-word phrases were (a) BRT project, (b) the design, (c) the corridor, (d) the contractor, (e) organization structure, and (f) quality control. The most utilized three-word phrases were (a) this BRT project, (b) public transit agency, (c) change order process, (d) the organizational structure, (e) the general contractor, and (f) the decision making. The most utilized four-word phrases were (a) the public transit agency, (b) the change order process, (c) on time and under budget, and (d) the decision-making process.

Table 2, “Online Utility Text Analyzer Operating System Most Utilized Responses,” provides a summary of the most frequently used words and phrases from the open-ended interviews.

Table 2

Online Utility Text Analyzer Operating System Most Utilized Responses

Single-word	Two-word phrases	Three-word phrases	Four-word phrases
BRT	BRT project	This BRT project	The public transit agency
Construction	The design	Public transit agency	The change order process
Public	The corridor	Change order process	On time and under budget
Design	The contractor	The organizational structure	The decision-making process
Process	Organization structure	The general contractor	
Team	Quality control	The decision making	
Corridor			
Contractor			

Table 2 revealed that the design, the BRT corridor, the general contractor, the organizational structure, quality control, the change order process, and the decision-making process impacted the eight selected BRT projects from being on time and under budget during construction. The text analyzer revealed that the design phase, organizational structure, quality control, change order processes, and decision-making processes were emergent themes that impacted the construction schedule and budget.

Themes

The researcher used semistructured interviews that explored and validated six predetermined contingency and SMT themes that provided perceptions of completion on

time and under budget during the construction of BRT projects within the United States. The perceived degree to which contingency theory and SMT impacted the construction of BRT projects varied among the participants, but all agreed that the theories had a significant impact. The six predetermined contingency theory and SMT themes validated were (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts.

Summary

According to P1, a BRT project must have a qualified and technically sound team to ensure the project was built on time and under budget. Once the contractor won the award, the public transit agency verified whether the contractor was responsive and responsible. According to P2, a BRT project identified stakeholders early in the process and understood the roles and responsibilities of each party in the decision-making process. P2 agreed that a public transit agency must have a robust organizational structure and the technical capacity to build a BRT project.

The environmental, planning and design phases impacted the construction of a BRT project. The construction team was part of the early phases and ensured the decisions made were constructible and minimized additional costs. According to P2, a BRT project must have the political support to be built on time and under budget. According to P3, communications, clear expectations of timing, and coordination between the various project partners were critical to a BRT project. Clear and constant communications, expectations, and coordination between partners permitted a BRT project to be completed on time and under budget.

According to P4, a public transit agency needed to take the time to review lessons learned, research, and reports of previously built BRT projects. BRT projects should incorporate the lessons learned into their change management, quality control, and PMPs to manage the schedule and budget. According to P5, significant public outreach and embracing the standardization process permitted a BRT project to be built on time and under budget.

According to P6, there were three takeaways that allowed a BRT project to be on time and under budget. The first takeaway was understanding the balance when decisions were made and incorporating the balance early on during the design phase. The second takeaway was that project teams must communicate the balance to bureaucratic and stakeholder forces. The bureaucratic and stakeholder forces must recognize the balance and understand why decisions were made early on. The third takeaway was recognizing that changes should be avoided during construction unless there were safety issues. BRT projects understood the balance between the bureaucratic and stakeholder forces early in the process.

According to P7, BRT projects developed standardized process plans, communication plans, public interface plans, and quality assurance control plans. BRT projects also developed PMPs because of their complicated nature. PMPs permitted the team to create an educated scope, cost, and schedule. According to P7, the team learned to use project management tools that permitted a BRT project to be built on time and under budget.

According to P8, a standard project management methodology was valuable when completing a BRT project on time and under budget. The various teams of a BRT project

owned their part and had a vested interest in delivering the system on time and under budget. According to P9, collaboration, ownership, and communication were valuable elements that permitted a BRT project to be built on time and under budget. Successful BRT projects ensured they had buy-in and support from top to bottom within the organizational structure.

CHAPTER 5: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This study focused on efficiency during the construction phase of BRT projects within the United States. Public transit is one of the most robust and comprehensive systems in the United States. Public transit improves the health and economic stance of millions of residents throughout the United States while simultaneously improving the environment. Major public transit projects deal with unexpected inefficiencies and delays during construction. Unexpected inefficiencies and delays have increased scrutiny and oversight from the federal government, states, counties, and cities throughout the United States as well as the public. This study explored how organizational structure, conflict resolution efforts, decision-making procedures, bureaucratic forces, stakeholder forces, and scientific management themes permit BRT projects to be constructed on time and under budget within the United States.

The purpose/objective of this qualitative study was to research and develop a comparative multiple case study of eight BRT projects within the United States. This study explored and validated six predetermined contingency theory and SMT themes during the construction phase within the United States. The problem statement of the research was: Explore and validate six predetermined contingency and SMT themes that provide perceptions of completion on time and under budget during the construction of BRT projects within the United States? The research focused on efficiency during construction of BRT projects. This study defined efficiency as delivering BRT projects on time and under budget while maintaining quality. The eight BRT projects selected within the multiple case study approach were completed with the planning, design, and construction phases and were operational.

The specific aim of this qualitative study was exploring and validating six predetermined contingency and SMT themes that provided the perception of completion on time and under budget during the construction of BRT projects within the United States. The study explored efficiencies using open-ended interviews and OSINT. The researcher developed a relationship between the construction of BRT projects, contingency theory, and SMT.

The projects selected for this study completed their planning initiation documents; environmental documents; ROW acquisition documents; and plans, schedule, and estimate package. This study identified and analyzed projects that had completed their risk and contingency review. Federal grants were not allocated to the project grantee until the risk and contingency review was completed. This study did not focus on the planning, design, and environmental phases of eight BRT projects. But if common hindrances were identified during construction, this study pointed them out. Identifying common hurdles in the construction phase minimized biases and stereotypes throughout the analysis.

Research Questions

The study implemented the following seven research questions:

1. What organizational structure was used during the construction of the BRT projects?
2. What strategic conflict resolution efforts were used during the construction of the BRT projects?
3. What decision-making procedures were used during the construction of the BRT projects?

4. What bureaucratic forces permitted the construction of the BRT projects to be completed on time?
5. What stakeholder forces permitted the construction of the BRT projects to be completed under budget?
6. What scientific management efforts permitted the construction of the BRT project to be completed on time?
7. What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Chapter 5 includes a summary of the results based on the research questions for the study. Virtual open-ended interviews were conducted with nine participants from local government agencies and public transit agencies throughout the United States. An analysis of the data collected demonstrated and validated six predetermined contingency and SMT themes. The six predetermined contingency theory and SMT themes validated were (a) organizational structure, (b) strategic conflict resolution efforts, (c) decision-making procedures, (d) bureaucratic forces, (e) stakeholder forces, and (f) scientific management efforts.

Major Findings

The researcher completed over 400 min of virtual open-ended interviews with nine participants across the United States. The virtual open-ended interviews provided abundant data to reach the major findings presented in this section. Each participant and interview revealed unique takeaways that permitted a BRT project to be built on time and under budget. The major findings revealed that the six predetermined contingency and SMT themes impacted the schedule and budget of BRT projects within the United States.

This study revealed that BRT projects that were built on time and under budget had a robust organizational structure and hired a qualified and technically sound team. Successful BRT projects ensured they had buy-in and support from top to bottom within the organizational structure. Successful BRT projects identified stakeholders early in the process and understood the roles and responsibilities of each party in the decision-making process. Clear and constant communications, expectations, and coordination between partners permitted a BRT project to be completed on time and under budget.

This study revealed that bureaucracy potentially impacted the schedule and budget of BRT projects within the United States. The bureaucratic process impacted decisions made by the appointed board of directors, local jurisdictions, the public, and stakeholders. A BRT project that was built on time and under budget had political support. This study revealed that bureaucracy impacted the political, internal organizational structure, legal, and agreement process. Successful BRT projects learned to balance technical capacity, public outreach, stakeholder and partner expectations, and bureaucracy to complete the project on time and under budget.

This study revealed that a public agency needed to take the time to review lessons learned, research, and reports of previously built BRT projects. Successful BRT projects incorporated significant public outreach and embraced the standardization process. BRT project leaders understood the balance of decisions and communicated the balance to bureaucratic and stakeholder forces. The bureaucratic and stakeholder forces recognized the balance and understood why decisions were made early on.

This study revealed that successful BRT projects developed a project management methodology that incorporated a project management plan because of their complicated

nature. Project management plans permitted the team to create and maintain the scope, cost, and schedule. The BRT team learned to use project management tools to complete the project on time and under budget. This study revealed that various leaders within a BRT project owned their part and had a vested interest in delivering the system on time and under budget.

Additional Findings

This study did not uncover a new contingency or SMT theme during the construction phase of BRT projects within the United States. There were two additional findings in this study. The first additional finding revealed that decisions during planning and design impacted the construction schedule and budget. The participants in this study validated that public outreach, coordination with external stakeholders, and coordination with local jurisdictions early on were key to the success of a BRT project within the United States. Researchers should consider exploring and validating the six predetermined contingency and SMT themes during the planning and design phases of BRT projects within the United States.

The second additional finding revealed that utility, business, and parking conflicts are common high-level risks and impacts to the construction budget and schedule. Successful BRT projects considered mitigating utility, business, and parking conflicts through standardization and innovative conflict resolution efforts. The researcher recommends that high-level risks should be further analyzed using continency and SMT themes to improve the efficiency of BRT projects within the United States.

Conclusions

The conclusions of the seven research questions were as follows.

1. What organizational structure was used during the construction of the BRT projects?

The first theme, organizational structure, impacted the progress of the eight selected BRT projects during construction. Public transit agency organizational structures focused on public outreach, communications, safety, and operations. According to the participants, the public transit agencies did not have an existing organizational structure to build a BRT project. There were only a few staff members appointed within each public transit agency to work on BRT projects. The public transit agencies' internal conflicting priorities created challenges to review plans. The eight selected BRT projects hired consultants who assisted with managing the work during construction.

The eight selected BRT projects had a BRT director or lead project manager within the public transit agency and city. The BRT director or lead project manager reported to the CEO or president of the public transit agency and the mayor of the city. The appointed board of directors ran the public transit agencies and not the CEO or president. The public transit agencies that appointed board of directors impacted the BRT project politically, which created internal bureaucratic challenges. The public transit agency bureaucratic challenges impacted the organizational structure.

The eight selected BRT projects used a design-bid-build, design-build, or CMAR project delivery approach during construction. Further discussion of the organizational structure and project delivery methods is in the recommendation for future research section in Chapter 5. To comply with funding and organizational structure deficiencies, one of the selected BRT projects formed an IPMO. The IPMO's core responsibility was

to manage the design and construction of the BRT project. This study revealed that an organizational structure must be technically sound to complete a BRT project on time and under budget. This study revealed that successful BRT projects had a technical staff that included designated individuals from the public transit agencies, cities, design consultant agencies, construction management consultant agencies, and an experienced prime contractor.

2. What strategic conflict resolution efforts were used during the construction of the BRT projects?

Strategic conflict resolution efforts, the second theme, impacted the progress of the eight selected BRT projects during construction. The eight selected BRT projects continually monitored conflicts during construction. Partnering sessions occurred between the owner, contractor, and stakeholders. The partnering sessions assisted in resolving permitting issues, parking issues, utility conflicts, and community issues during construction. Several of the BRT projects explored in this study used the DRB to review claims during construction and developed unconscious bias resolutions for the parties. This study revealed that successful BRT projects resolved conflicts during construction through constant communication, community involvement, listening to the concerns of all parties, and developing informed consent.

A comprehensive conflict resolution and risk management process facilitated the administration of the construction schedule and budget of the eight selected BRT projects. Several of the explored BRT projects used risk management to review construction conflicts. This study revealed that not understanding potential conflicts impacted the construction schedule and budget. The risk management process focused

on the critical path and high-level risk items to avoid cost overruns and schedule impacts. This study revealed that BRT projects were on time and under budget during construction if the projects implemented a strategic conflict resolution effort and risk management process.

3. What decision-making procedures were used during the construction of the BRT projects?

Decision-making procedures, the third theme, impacted the construction schedule and budget of the eight selected BRT projects from this study. Decisions were taken daily during construction. During a formal construction change order decision-making process, the general manager, construction manager, EOR, and contractor were the players in involved. Construction change orders were generally lengthy because the process went through the entire organization to get approval. Some of the BRT projects in this study were able to streamline minor changes in the field. This study revealed that the construction change order process implemented improvements to ensure a BRT project was on time and under budget.

Public transit agencies provided the public and stakeholders time to review and comment on decisions. This study revealed that successful BRT projects provided a clear deadline for a decision during construction. To ensure a BRT project was on time and under budget, a single point or unified decision-making process among the stakeholders occurred. This study revealed that successful BRT projects had decision makers present when construction coordination meetings occurred. Having the decision makers present at the construction coordination meetings improved the efficiency of the eight selected BRT projects throughout the United States.

4. What bureaucratic forces permitted the construction of the BRT projects to be completed on time?

Bureaucratic forces, the fourth theme, impacted the schedule of the eight selected BRT projects and permitted the construction phase to be on time. This study uncovered that BRT projects within the United States experienced bureaucratic forces in the planning, design, and construction phases. Most of the bureaucracy occurred during the planning and design phases, which impacted the construction phase. This study revealed that eight selected BRT projects experienced bureaucratic forces in the following four manners: (a) political, (b) internal organizational structure, (c) legal, and (d) during the development of inner local agreements.

The BRT projects in this study were completed on time if bureaucratic weight and political commitment were on the forefront. Bureaucratic weight and political commitment permitted a BRT project to move forward during construction. Bureaucratic leaders ensured BRT projects within the United States acquired the necessary permits on time. Internal bureaucracy impacted the scope, cost, and schedule of the BRT projects within this study. This study revealed that BRT projects navigated internal bureaucratic forces within public transit agencies and city governments to complete the construction phase on time. Internal bureaucracy included organizational structure impediments and buy-in from the appointed board of directors. The scope and cost were approved and governed by the public transit agencies' appointed board of directors. The study revealed that the public transit agencies' appointed board of directors ensured BRT projects progressed into construction with an approved scope and cost, which impacted the schedule.

Legal bureaucracy assisted several of the BRT projects in this study to acquire permits and agreements on time. This study revealed that successful BRT projects within the United States had an experienced legal team to navigate the legal system while developing inner local agreements. BRT projects developed agreements with jurisdictions, utility companies, and other permitting agencies. This study revealed that permitting agencies of BRT projects asked for betterments, additional work that impacted the schedule. Political, internal, and legal bureaucracy allowed the BRT projects within this study to be on time.

5. What stakeholder forces permitted the construction of the BRT projects to be completed under budget?

Stakeholder forces, the fifth theme, permitted the eight selected BRT projects to be under budget during construction. This study revealed that common stakeholder forces for BRT projects within the United States were (a) businesses, (b) residential properties, (c) merchandise retailers, (d) the local community, (e) permitting agencies, and (f) local jurisdictions. Finding parking within the BRT corridor was part of the city culture. Removing access to existing driveways and parking was a common issue during the construction of the eight selected BRT projects. Receiving buy-in early for a solution to stakeholder parking and access to the properties permitted BRT projects to be under budget.

This study revealed that improvements were made adjacent to or in front of merchandise retailers during the construction of BRT projects. Building a stakeholder relationship with merchandise retailers permitted BRT projects to save money and be under budget. The stakeholder relationship with the community was valuable.

Community involvement throughout the process allowed the public to feel ownership. Successful BRT projects incorporated open houses, which provided numerous opportunities for input from the community. This study revealed the usefulness when BRT projects focused on receiving early buy-in from the public. If the community was excited about the BRT system, this impacted the construction budget.

This study revealed that BRT projects minimized permit and jurisdiction restrictions during construction to ensure that construction was under budget. Permit and jurisdiction restrictions specified constraints in work areas and construction time windows, which impacted stage construction. Successful BRT projects included permitting and local jurisdictions as part of planning, design, and risk management. Before construction, identifying and collaborating with stakeholders was critical for the eight selected BRT projects to be under budget. If a stakeholder was uncovered late in the process, BRT projects negotiated and mitigated new demands during construction.

6. What scientific management efforts permitted the construction of the BRT project to be completed on time?

Scientific management efforts, the sixth theme, impacted the schedule of the eight BRT projects explored. This study revealed that BRT projects that implemented standardized construction specifications, standardized communications, and innovative utility conflict resolutions were on time. When BRT projects did not implement a comprehensive effort to standardize specifications; this complicated the constructability and measurements of items during construction. This study uncovered that BRT projects that standardized specifications minimized errors in the field. Standardized specifications simplified the process for the contractor, construction project managers, and field

inspectors. This study revealed that successful BRT projects had local jurisdictions along with stakeholders who agreed on standardized specifications during planning and design. Once there was the buy-in for a standardized approach, the specifications were part of the construction bid package.

Standardized communication efforts included weekly construction meetings, quarterly public information meetings, and constant coordination meetings with jurisdictions, stakeholders, and the appointed board of directors. Standardized construction meetings allowed the eight BRT projects to monitor the construction schedule, progress, and risks. This study revealed that weekly construction coordination meetings allowed the BRT project teams to understand the status of construction items and issues. The weekly construction coordination meetings permitted the BRT project teams to come up with solutions on time. The researcher confirmed that standardized public information meetings provided more opportunities for the BRT construction team to meet with the public and answer questions. Standardized public information meetings allowed face-to-face time with the BRT project team, business owners, and residents with concerns.

This study revealed that BRT projects implemented innovative utility conflict resolution efforts to mitigate construction delays. Utility design conflicts and complexities were some of the main reasons BRT projects experienced construction delays and cost overruns. Rather than using the budget contingency to cover cost overruns, this study uncovered that BRT projects developed a risk management process. The risk management process continually reviewed design and construction conflicts. The risk management process permitted BRT projects within the United States to deal

with utility conflicts early on and ensured the projects met the appropriate deadlines. The utility conflict were placed back on the schedule if there was no solution uncovered.

This study revealed that an innovative solution used to mitigate utility conflicts was completing advanced exploratory potholing. Before the general contractor arrived at a section within the corridor, one of the explored BRT project managers convinced local jurisdictions to issue permits to execute exploratory potholing. Exploratory potholing allowed the BRT project to open large areas and investigate underneath each intersection. The researcher confirmed that innovative solutions to utility conflicts sped up the resolution process and impacted the construction schedule. Innovative solutions during construction provided a higher probability for BRT projects to be on time within the United States.

7. What scientific management efforts permitted the construction of the BRT project to be completed under budget?

Scientific management efforts, the sixth theme, impacted the budget of the eight BRT projects explored. This study revealed that BRT projects implemented a comprehensive quality control plan and standardized utility coordination effort to be under the construction budget. The quality control plan included a quality control manager who provided an independent review during construction. The independent review ensured items met contract specifications. A comprehensive quality control plan allowed the construction team to cross-check each other during the construction of the explored BRT projects of this study. Multiple quality control levels occurred during the construction of BRT projects within the United States.

The quality control plan included a standardized partner checklist. The standardized partner checklist required subject matter experts (SMEs) from the public transit agency and jurisdictions to review items and information before hand-off. A comprehensive quality control plan ensured BRT projects within the United States built a system that was legal and safe. This study revealed that safety was a priority for the public transit agencies, cities, stakeholders, and the public during construction. A comprehensive quality control plan allowed BRT projects to address safety concerns during construction. Successful BRT projects included quality control and quality assurance within their organizational structure. This study uncovered that quality control and quality assurance ensured BRT projects were compliant, safe, and under budget.

BRT projects typically modified utility agreements during construction. Many utility companies and local jurisdictions were not aware of the locations or conditions of underground lines. A common issue that BRT projects dealt with was waiting for utility companies to fix a conflict. This study revealed that successful BRT projects developed a standardized coordination meeting with the utility companies during planning, design, and construction. Developing a standardized utility coordination effort reduced the time to resolve an issue and reduced cost overruns. Developing and implementing standardized utility coordination strengthened the soft skills and trust between the BRT project team and utility companies. This study uncovered that BRT projects within the United States focused and embraced standardized utility coordination efforts to be under the construction budget.

Implications for Action

This study explored and validated six predetermined contingency and SMT themes during the construction of BRT projects within the United States. This study also provided some insights into validating contingency and SMT themes during the planning and design phases of BRT projects. This study revealed that BRT projects that were on time and under budget during construction were hands-on during the project development process. The project development process included the planning, environmental, design, construction, operation, and maintenance phases. The researcher uncovered that a successful BRT project within the United States had continual feedback among the phases—the more feedback, the fewer impacts to the construction schedule and budget. To help mitigate construction schedule and budget impacts, God reminded us we should be open to counsel and instructions from ministers, the Wisdom of God, and the scriptures. Proverbs 19:20 says, "Listen to advice and accept instruction, that you may gain wisdom in the future" (ESV, n.d.). A successful BRT project learned from past experiences, spent time planning, continually collaborated with the public and stakeholders, and had the appropriate level of project management and technical expertise.

BRT projects within the United States were still in the early maturity state compared to other countries. This study recommends that public transit agencies, cities, consultants, and contractors within the United States come together. Lessons learned and experiences must be shared and easily accessible among the parties. Creating a foundation among the public transit agencies, cities, consultants, and contractors will improve the BRT project's civil work experience, planning, design, quality control,

system integration, reliability of services, and safety. The Lord reminded us of the importance of building a solid foundation:

> Everyone who comes to me and hears my words and does them, I will show you what he is like: he is like a man building a house, who dug deep and laid the foundation on the rock. And when a floor arose, the stream broke against the house and could not shake it, because it has been well built. (ESV, n.d., Luke 6:47-48)

This study revealed that the United States had built BRT systems on time and under budget during construction. This study also determined that there was still room for growth within the U.S. BRT industry.

Recommendations for Further Research

The researcher establishes five recommendations for further research. Based on this study, the recommendations will expand the analysis of contingency theory, SMT, and bureaucracies within the public transportation sector of the United States. The first recommendation is to explore and validate whether contingency theory and SMT themes provide perceptions of completion on time and under budget during the construction of railroad, heavy rail, and LRT projects within the United States. Future researchers should consider expanding the foundation of this study to explore railroad, heavy rail, and LRT projects throughout the United States.

The second recommendation is to explore and validate whether contingency theory and SMT themes provide the perceptions of completion on time and under budget of the construction change order and utility conflict resolution process for public transportation projects within the United States. This study revealed that the change

order process and utility conflicts were common issues within the public transportation sector in the United States. Future researchers should consider narrowing the scope to explore the change order process and utility conflict resolution effort of highway, heavy rail, railroad, bus, BRT, and LRT projects within the United States.

The third recommendation is to explore and validate whether contingency theory and SMT themes provide the perceptions of completing construction on time and under budget using the design-build, design-bid-build, and other innovative project delivery methods within the United States public transportation sector. This recommendation opens the door to explore and contrast various project delivery methods within the United States public transportation sector. This recommendation provides future researchers the opportunity to determine whether a project delivery method impacts the construction budget and schedule.

The fourth recommendation is to explore and validate whether contingency theory and SMT themes provide perceptions of completing construction on time and under budget during the COVID-19 global pandemic within the United States public transportation sector. This study uncovered that the global pandemic did not impact the budget and schedule for one of the selected BRT projects. This recommendation will allow future researchers to explore and understand the impacts a global pandemic has within the public transportation construction industry in the United States. Did contingency theory and SMT themes provide the perception that public transportation projects in the United States are on time and under budget during a global pandemic? Future researchers should consider expanding the scope of the fourth recommendation to various countries.

This study confirmed that bureaucracy impacted the political, internal organizational structure, legal, and agreement process of BRT projects within the United States. The fifth recommendation is to explore and analyze organizational structure bureaucratic forces and external bureaucratic forces impacting the operating budget of public transit agencies. The fifth recommendation explores and validates contingency themes that provide the perception of public transit agencies operating under budget. This recommendation allows future researchers the opportunity to explore operating budget impacts imposed by appointed public transit agency board of directors, organizational structure bureaucracies, and other external bureaucratic forces.

Concluding Remarks and Reflections

If we continue working on our faith, Christ continues providing us wisdom: "If any of you lacks wisdom, let him ask God, who gives generously to all without reproach, and it will be given to him" (ESV, n.d., James 1:5). The researcher gained valuable lessons on developing an appropriate scope for this study. At first, the researcher designed this study to explore and analyze BRT projects within California. During the development of this study, the researcher realized the scope needed to expand to explore and analyze BRT projects throughout the United States.

Expanding this study to BRT projects throughout the United States provided the researcher robust qualitative data to explore and validate the six predetermined contingency theory and SMT themes and the seven research questions. This study revealed that BRT projects should ensure that the scope and footprint are locked in early on within BRT projects to limit the impacts during the construction phase of BRT projects within the United States. As a researcher, expanding the scope of this study was

counterintuitive to the procedures taken by public transportation and public transit practitioners throughout the United States.

Although the researcher completed the data analysis of this study, the IPMO approach was part of the organizational structure. The IPMO approach permitted BRT projects to be on time and under budget within the United States. The IPMO approach was a key takeaway for the researcher who currently works as public transportation practitioner. Today, the researcher works as a project manager on mega public transportation projects throughout the United States. The mega public transportation projects cost billions of dollars to deliver to the traveling public and taxpayers. As a public transportation practitioner, the researcher integrated the IPMO approach within the organizational structure. The IPMO approach allowed the mega public transportation projects to deliver one consensus message from the top-down, improve decision-making procedures, and eliminate silos within the organizational structure.

This study revealed that BRT projects throughout the United States are dynamic and complicated. The researcher determined three challenges for future BRT projects. The first challenge is the lack of technical expertise within agency organizational structures during the construction of BRT projects. BRT projects need to continue looking for ways to continue filling in the technical capacity void while they construct projects throughout the United States.

The second challenge is the lack of public administration practitioners and public information officers (PIOs) throughout the United States who have experience dealing with bureaucratic and stakeholder forces during the delivery of BRT projects. Future BRT projects within the United States need to continue filling in the public administrator

practitioner and PIO voids. Experienced public administration practitioners will allow future BRT projects to have early buy-in from stakeholders and the public from the beginning of the project. And experienced PIOs will allow future BRT projects to provide timely and accurate information to key stakeholders and the public.

The third challenge is finding ways to share the experiences and lessons learned with the broader BRT community within the United States. Agencies outside the U.S. Department of Transportation need to provide an outlet or mechanism that widely distributes and shares qualitative data of BRT projects. This study revealed a gap and inconsistent approach in sharing lessons learned between agencies that construct BRT projects within the United States.

Future researchers may consider exploring and validating predetermined contingency theory and SMT theory themes that provide the perception that public transit agencies have appropriate operating budgets within the United States. The researcher learned that approximately 30% of the BRT projects within the United States selected for this study agreed to participate. Future researchers may also consider expanding the foundation of this study to explore and validate predetermined contingency theory and SMT themes that provide the perception that BRT projects were built on time and under budget throughout the world. BRT projects are growing in popularity within the United States and globally. Communities seek solutions that provide efficient public transit systems for their residents. In many cases, after communities completed the planning phase, BRT systems were the preferred alternative.

During the development of this study, the researcher noticed a lack of public administration doctorate studies analyzing BRT projects. This study helps to bridge the

gap of public administration doctorate studies focusing on BRT projects and the public transit sector within the United States. Future public administration researchers should continue developing studies on why and how public transportation projects were completed on time and under budget. Researchers should explore and validate public administration themes that provide the perception that heavy rail, railroad, LRT, bus, metro, and highway projects were completed on time and under budget within the United States.

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APPENDIX—Open-Ended Interview Affinity Diagram

Open-Ended Interview Affinity Diagram (Part 1)			
Organizational Structure	**Strategic Conflict Resolution Efforts**	**Decision-Making Procedures**	**Bureaucratic Forces**
Public outreach was part of the organizational structure during construction	BRT projects within the United States continuously monitored conflicts during construction	Decisions were taken daily during the construction phase of BRT projects within the United States	BRT projects within the United States experienced bureaucratic forces during planning, design, and construction phases
Many public transit agencies within the United States do not have an existing organizational structure to build BRT projects	Partnering sessions occurred between the owner, contractor, and stakeholders	The formal construction change order process included the general manager, construction manager, EOR, and contractor	Most of the bureaucracy occurred during planning and design, which impacted construction of BRT projects within the United States
Public transit agencies hired consultants to help fill technical capacity voids during the construction of BRT projects	Permitting, parking, utilities, and community issues were the main construction conflicts encountered by BRT projects within the United States	The change order process was cumbersome, but some of the studied BRT projects were able to streamline the process by reducing approvals	BRT projects experienced bureaucratic forces in a political, internal, and legal approach and during the development of inner local agreements
Public transit agencies reported to a CEO and Board of Directors	BRT projects used DRB to review and resolve construction claims	BRT projects within the United States provided the public and stakeholders time to review and comment on impactful decisions	BRT projects within the United States that were successful had bureaucratic and political leader support
BRT projects used DB, DBD, and CMAR project delivery methods	Comprehensive conflict resolution and risk management processes were beneficial in BRT projects	A single-point or unified decision-making process among the stakeholders improved the decision-making process	Internal bureaucracy impacted the approval process of construction schedules and budgets by the public transit agencies appointed Board of Directors

IPMO helped bridge the offices and improve communications	Risk management processes focused on the critical path and high-level risk items during construction of BRT projects	Decision-makers were present at the continuous construction coordination meetings to improve efficiency	Legal bureaucracy impacted BRT projects during the permitting and agreement process
-	-	-	Successful BRT projects within the United States had an experienced legal team to help navigate inner local agreements

Open-Ended Interview Affinity Diagram (Part 2)		
Stakeholder Forces	**SMT Efforts on Time**	**SMT Efforts Under Budget**
Common stakeholder forces for BRT projects included businesses, residential, properties, retailers, permitting agencies, and local jurisdictions	A comprehensive standardization effort improved the constructability and measurements of items of BRT projects within the United States	A comprehensive quality control plan impacted the construction schedule and budget of BRT projects within the United States
Parking within the designated BRT corridors was part of the city culture within the United States and parking was a common issue during construction	Successful BRT projects within the United States ensured standardized specifications buy-in from local jurisdictions and stakeholders	BRT projects within the United States included a quality control plan that incorporated a standardized partner checklist
Getting early buy-in from stakeholder permitting agencies impacted the construction budget and schedule of BRT projects within the United States	Standardized communication efforts included weekly construction meetings, quarterly public information meetings, and constant stakeholder meetings	A comprehensive quality control plan allowed BRT projects to address construction compliance, safety, and legal concerns
Building a stakeholder relationship with the community was valuable for BRT project teams within the United States	Standardized public information meetings improved collaboration with business owners and residents during construction of BRT projects	Successful BRT projects developed a standardized coordination meeting with the utility companies during planning, design, and construction phases
Successful BRT projects minimized permit and jurisdiction restrictions and conflicts during construction	Successful BRT projects within the United States developed risk management processes to deal with utility conflicts early on	Standardized practices strengthen soft skills and improved trust between partners during the construction of BRT projects within the United States
Uncovering a stakeholder late in the project delivery process impacted the construction schedule and budget	Advanced exploratory potholing was used by BRT projects to validate and mitigate construction utility conflicts	-