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## **A Systematic Literature Review of Project Management Tools and Their Impact on Project Management Effectiveness**

Michelle Newton  
*Purdue University*

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**A SYSTEMATIC LITERATURE REVIEW OF PROJECT MANAGEMENT  
TOOLS AND THEIR IMPACT ON PROJECT MANAGEMENT  
EFFECTIVENESS.**

by

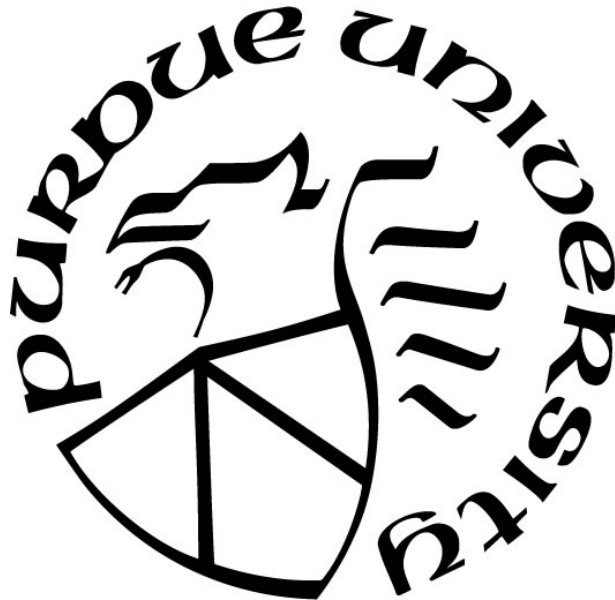
**Michelle Newton**

**A Thesis**

*Submitted to the Faculty of Purdue University*

*In Partial Fulfillment of the Requirements for the degree of*

**Master of Science**



Department of Technology Leadership & Innovation

West Lafayette, Indiana

May 2018

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To my mother, husband, and the William's family for their unwavering support.

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## ABSTRACT

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Title: : A Systematic Literature Review of Project Management Tools and Their Impact on Project Management Effectiveness.

Committee Chair: Dr. Michael Dyrenfurth and Dr. Mitchell L. Springer

This thesis was conducted to examine project effectiveness and the best methodologies to use for managing projects as supported by the literature. Project effectiveness depends on multiple dimensions and has many situational issues that demand flexibility in method selection and utilization. Three of the most important dimensions explored in this study included: organizational structures, cost and schedule management typologies and leadership styles. A systematic literature review was utilized to collect data on the most common project management methods found to be effective according to the current literature. As projects are complex and vary greatly it was concluded from the literature that project management effectiveness cannot be measured by a single metric. An outline of methods and tools that may best be utilized based on project type and needs was created to better understand potential applications for each method and tool.



## **CHAPTER 1. THE PROBLEM**

### 1.1 Introduction

As project based outcomes have become the standard mode of operation within most organizations, the effective utilization of projects is necessary to stay competitive (Northouse, 2013). While there have been advancements in technology as well as a focus on leadership in understanding effective use of teams, there are still misunderstood elements related to the implementation of project management tools and effective project management. This chapter provides a context for examining the literature on project management tools and explains the necessity of such research within the scope of project management effectiveness. The chapter sections include the statement of the problem, the significance of the study, research questions, as well as the limitations, delimitations, assumptions, and definitions.

### 1.2 Statement of the Problem

As more companies move from a function based structure to a project based structure, the need for effective project management models is vital (Thiry, 2007; Ouye, 2011). Determining the effectiveness of a project is a multi-layered and complex endeavor. There is a trend of questioning the validity of project management theories and models as well as their effectiveness, as seen in works by Koskela and Howell (2002), and Mir and Pinnington (2014). A systematic literature review was conducted to explore which project management tools and methods are most effective. From this research, a determination of which tools are most effective in the management of a project enabled a call for future research.

### 1.3 Significance of the Problem

Wald and Hanisch (2011) developed a framework to aid in the understanding of project management challenges in modern organizations by demonstrating the interdependence of design, context, and goal. This thesis examined these major aspects determined by Wald and Hanisch to determine which methods within each aspect are more effective in the management of a project. A better understanding of these concepts is expected to aid in the development of future research within the field of project management.

### 1.4 Research Questions

1. Which types of organizational design models most readily support project management?
2. Which cost and schedule models most readily support project management?
3. Which leadership characteristics and methodologies most readily support project management?

### 1.5 Assumptions

This thesis assumes there are methods used within project management that contribute to their effectiveness. An assumption may also be made that there are methods used within project management that work more effectively than other methods.

### 1.6 Delimitations

To narrow the scope of this project the following project management topics will not be included in this research:

- agile project management
- the extent of project management software used to improve efficiency
- quality management
- project risk management tools such as PERT

- Monte Carlo simulation
- project portfolio management (PPM).

The focus of this research study is on the effectiveness of the management of the project, not the success of the product completed during a project.

### 1.7 Limitations

The limitations of this systematic literature review include:

- The research and categorization of all articles and books were solely selected and executed by the author.
- The exclusion of other leadership styles including but not limited to: servant leader, authenticity leadership, team leadership, and contingency theory.
- The exclusion of project management theories and methods including but not limited to agile management,
- The exclusion of statistical analysis.

### 1.8 Definitions

Project Management Effectiveness: The degree of which a specific set of requirements are achieved, or the ability to meet objectives (Wideman, 2002; Hyväri, Project management effectiveness in different organizational conditions, 2006; Sundqvist, Blacklund & Chronéer, 2014).

Project Success: “measured by the product and project, quality, timeliness, budget compliance and degree of customer satisfaction” (Project Management Institute, 2013, p. 8).

Project Management: “the person assigned by the performing organization to lead the team that is responsible for achieving the project objectives” (Project Management Institute, 2013, p. 555).

Leadership: “a process whereby an individual influences a group of individuals to achieve a common goal” (Northouse, 2013, p.5).

Organizational Structure: “The formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization” (Lunenburg, 2012, pg.1).

## CHAPTER 2. LITERATURE REVIEW

The purpose of this literature review was to examine the research conducted within the field of project management to identify the most successful tool and methods for managing them. This will add to the body of project management knowledge and be useful for developing suggestions for areas of further research. The focus of this research study is on the effectiveness of project management, not the success of a product completed during a project. Some other topics that will not be covered within the scope of this literature review include:

- agile project management
- the extent of project management software used to improve efficiency
- project risk management tools such as PERT
- Monte Carlo simulation
- project portfolio management (PPM).

A deeper understanding of the literature will aid in the definition of effectiveness, project success, and the role of a project management. These definitions and concepts will be used throughout the following research to answer the follow questions: Which types of organizational design models most readily support project management? Are there cost models which readily support project management? Which leadership characteristics and methodologies most readily support project management? The materials available through the Purdue library were utilized, with the narrowed criterion of work created from 2010- present, peer-reviewed, and content that contains the full text. The results from these searches had to fall within these six criteria: availability within databases and journals, containing the full article, be peer-reviewed within the leading project management journals, and contain relevant information about project management effectiveness tools as it pertained to: organizational structures, cost and schedule management, and or leadership skills. Search terms used included: project management

effectiveness, project success, project manager, leadership style, systematic literature review, project process, organizational structure, functional model, matrix model, project scheduling and costing methods, cost control, critical path, critical chain, leadership in project management, emotional intelligence, and transformational leadership.

The materials reviewed included books, case studies, and journal articles. The databases used to search for research materials included: Elsevier ScienceDirect, ProQuest, Wiley Online Library, Elsevier ScienceDirect, Wiley Online Library, Sage and Springer, South Western, Oxford, Emerald Insight, IEEE, HBRPress, Canterbury, Pergamon, JSTOR and Springer. The framework for the systematic literature review used in this research employed seven steps “1) Identify the research question(s); 2) Define inclusion and exclusion criteria; 3) Search for studies; 4) Select studies for inclusion based on pre-defined criteria; 5) Extract data from included studies; 6) Evaluate the risk of bias of included studies; 7) Present results and assess the quality of evidence” (Creswell, 2009; Cornell University, 2016, p.1).

Each of the research questions required an analysis of their individual topics, from their origin through their evolution, and to the current practices and research findings. The three major topics of research included: organizational structures used within project management, cost management models used within project management, and leadership methodologies used within project management. Yang, Huang, and Wu (2001), outlined the importance of these three topics and the impact on project management effectiveness. The purpose of this literature review was to address the uncertainty of the effectiveness of project management tools which has come into question (Koskela, L., & Howell, G., 2002; Mir & Pinnington, 2014). A systematic review of the literature delineated details allowing a deep understanding of each topic. This provided

the groundwork for answering the research questions, drawing conclusions and making recommendations for future research.

## 2.1 Project Management

Project management is an intricate process that is carried out by a project facilitator also known as the project manager. The Project Management Body of Knowledge, PMBOK, defined a project manager as “the person assigned by the performing organization to lead the team that is responsible for achieving the project objectives” (Project Management Institute, 2013, p. 555). The PMBOK is a guide book that provides managers with guidelines, rules, and characteristics for working on projects. The PMBOK stated that to have an effectively managed project a project manager must have technical, interpersonal, and conceptual skills that aid them in the assessment of different situations to make informed decisions. Joslin and Müller (2015), also found that the greatest link to project success comes from a project manager’s ability to tailor project management methodology to solve problems.

According to the PMBOK (2013) and Westland (2006), there are four major processes to a project: initiating, planning, executing, and closing, which differs from Kerzner’s (2013) processes: conceptual, planning, testing, implementation, and closure. The slight variations exist because there is no one way to complete a project, and depending on which company or industry one is examining, there will be discrepancies. These processes create what is known as the project lifecycle. Figure 1 shows these processes through the lifecycle of a project. The amount of time, money, and resources allotted to each of these processes depends on the complexity of the project and the time constraints. “Project success originally consisted of the triple constraint concept, known as the iron triangle, which consisted of time, scope, and cost” (Joslin & Müller, 2015, p.1378). Today the definition and the understanding of project success has evolved to

include measurement models that are capable of being tailored to different types of projects as well as different aspects of project success (Joslin & Müller, 2015; Pinto & Slevin, 1988; Shenhar et al., 2002; Hoegl & Gemünden, 2001; Turner & Müller, 2006). Cooke-Davies (2002) differentiated project success from project management success as the outputs from the project as opposed to the analysis of internal efficiencies relating to cost, time, and quality (Joslin & Müller, 2015). “The success of a project is measured by the product and project, quality, timeliness, budget compliance and degree of customer satisfaction (Project Management Institute, 2013, p. 8). For this research study, success or project management effectiveness will be measured solely by budget, time, and performance towards a measurable predetermined objective, metric or known standard.

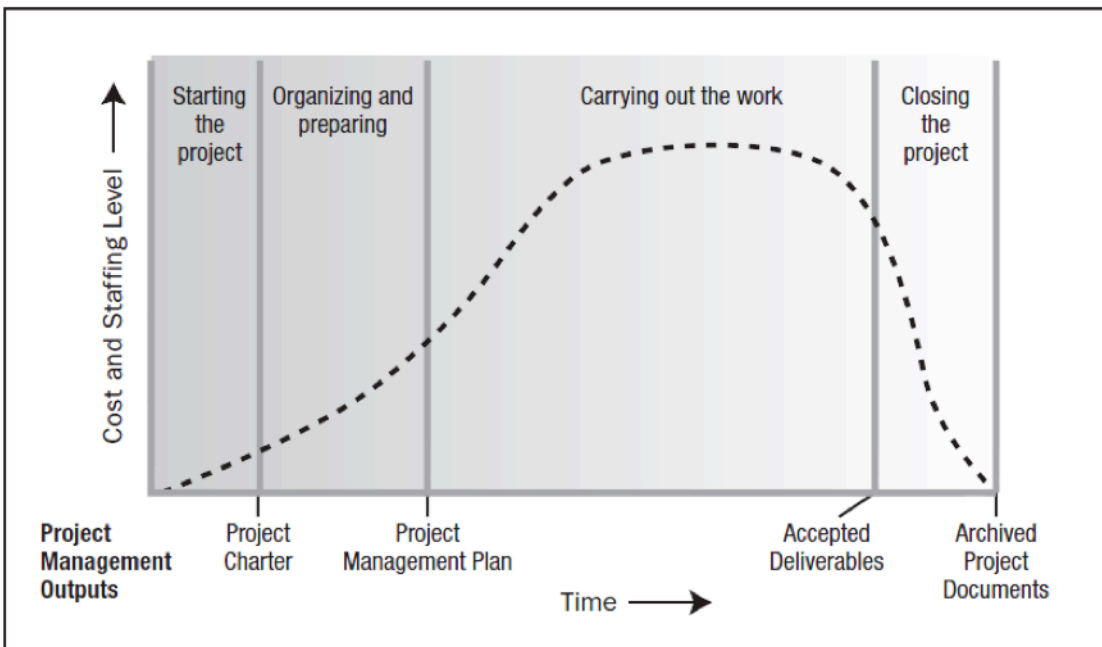


Figure 1. Lifecycle of a Project (Project Management Institute, 2013, p. 39)

Before any work can begin in a project the project manager must first develop the work breakdown structure to outline the deliverables and define the scope within a project. “A work breakdown structure (WBS) is created with the goal of providing the basis for: the responsibility



matrix, network scheduling, costing, risk analysis, organizational structure, coordination of objectives, and control (Project Management Institute, 2013, p. 541). To provide a visual of a lifecycle of a project, Figure 1 divides the outputs while depicting the cost and staffing levels throughout the various stages of a project (Project Management Institute, 2013). A WBS outlines the total scope of work and provides objectives that the team will carry out to create the required deliverables (Project Management Institute, 2013). Within a WBS are the work packages, which the Project Management Institute (2013) described as, “work defined at the lowest level of the work breakdown structure for which cost and duration can be estimated and managed” (Project Management Institute, 2013, p.567).

Key performance indicators (KPIs) are metrics that evaluate the operational, tactical, and strategic activities that are critical for the success of the organization, whether that be individual performance or the organization as a whole (Kerzner, 2013). Traditionally KPIs consisted of solely of time and cost metrics, today a typical project manager may include the following KPIs:

- “Percent of work packages adhering to the schedule.
- Percent of work packages adhering to the budget.
- Number of assigned resources versus planned resources.
- Percent of actual versus planned baselines completed to date.
- Percent of actual versus planned best practices used.
- Project complexity factor.
- Time to achieve factors.
- Customer satisfaction ratings.
- Number of critical assumptions made.
- Percent of critical assumptions that have changed.
- Number of cost revisions.
- Number of schedule revisions.
- Number of scope change review meetings.
- Number of critical constraints.
- Percent of work packages with a critical risk designation.
- Net operating margins.
- Grade levels of assigned resources versus planned resources.”  
(Kerzner, 2013, p.801)

Pinnington and Mir (2013) found, in a study examining project management performance and project effectiveness variables, that KPIs directly impact project teams and project efficiency when organizations develop and manage KPIs through a formal management system. KPIs are synonymous with performance metrics, and will be used interchangeably throughout this review.

## 2.2 Organizational Structures

Within any organization there are several distinct “specialists” that represent specific fields, like finance, manufacturing, and engineering. Determining how these distinct fields will work together to complete projects is the basis behind the development of organizational design models. Organizational design models work to place the right team members into the right groups to improve efficiency. These structures are comprised of three major factors: authority, responsibility, and accountability.

“Authority is defined as the power granted to individuals. Responsibility is the obligation incurred by individuals in their roles in the formal organization to effectively perform assignments. Accountability is being answerable for the satisfactory completion of a specific assignment.” (Kerzner, 2013, p.113).

The weight of these factors can be understood through this equation:  $\text{accountability} = \text{authority} + \text{responsibility}$  (Kerzner, 2013). “It is the extent how responsibility and authority are given to either of the managers that largely shapes the organization” (Petro & Gardiner, 2015, p. 1720). For organizations to keep up with changing demands and trends, they typically must reorganize their structure. When an organization undergoes restructuring each factor must be developed and defined so everyone has a clear understanding of their role within their team

(Kerzner, 2013). As each factor is a working component within each division, department, and section within the organizational models, having clear definitions is vital within each organizational model. The organizational models that were examined included: traditional, product, matrix, and project management.

### 2.2.1 Functional (Traditional) Model

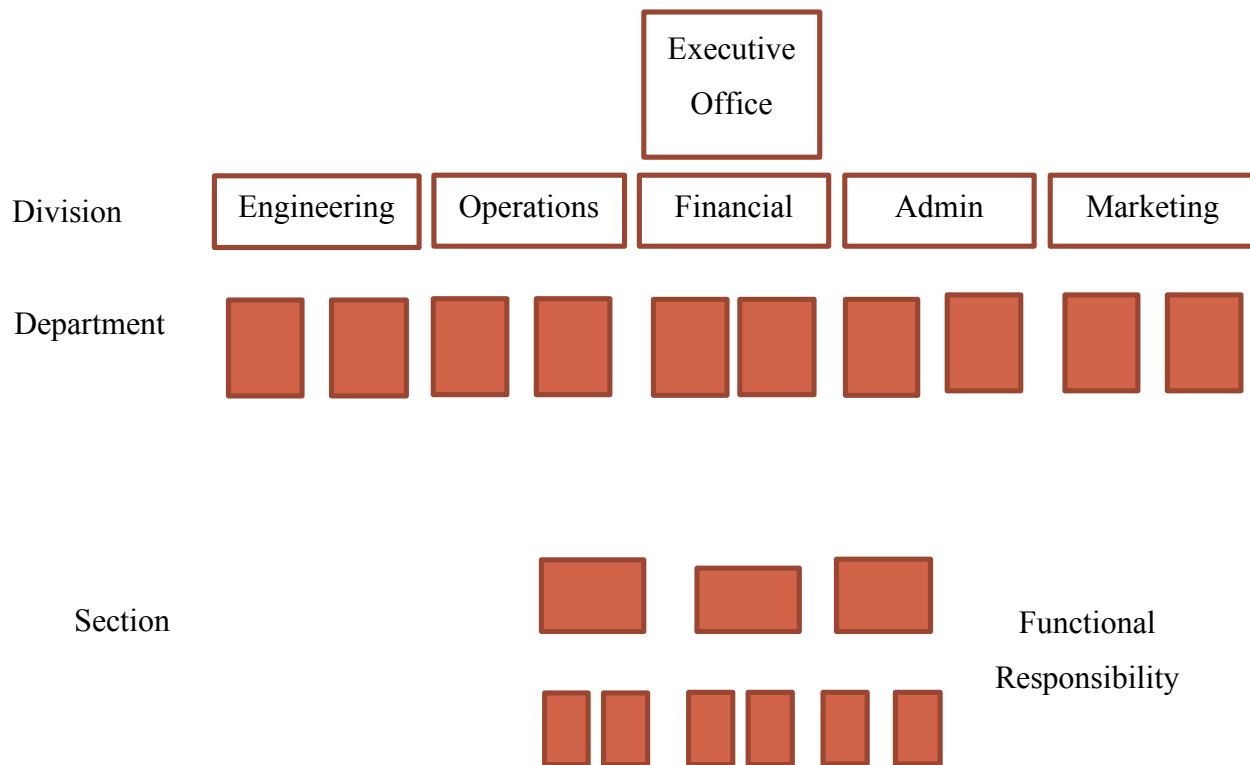


Figure 2. Functional Model (Springer, 2013, p. 196)

The functional model, also known as the traditional model, is an organizational structure that divides organizational units into common specialists (Springer, 2016). An example of the functional model is depicted in Figure 2. Communication channels within the functional model are easier as each person reports to only one individual (Kerzner, 2013). While direct

communication is efficient, it can lead to the largest bottleneck within the functional model. Because of its propensity for bottlenecks, the functional model requires long lead times. Hyväri (2006) found that the functional model was not the most efficient due to the competitive nature of the global markets and needs for faster outcome. In the same study Hyväri (2006) found that as the need for faster outcomes has increased, companies that follow the functional model find themselves forming additional project teams to keep up with demand. Kerzner (2013) explained how the rapid technological advances have caused stakeholders to increase their demands, thus making the use of one or two product lines an outdated practice. In addition to the functional model's long lead times, a lack of central authority and individual responsibility, top-level executives are required to get involved on a daily-basis. There is also no customer focal point; all customer issues fall to upper-management who then must divide each complex issue to the respective function managers. This can result in excess time for customers to receive assistance.

### 2.2.2 Product Model

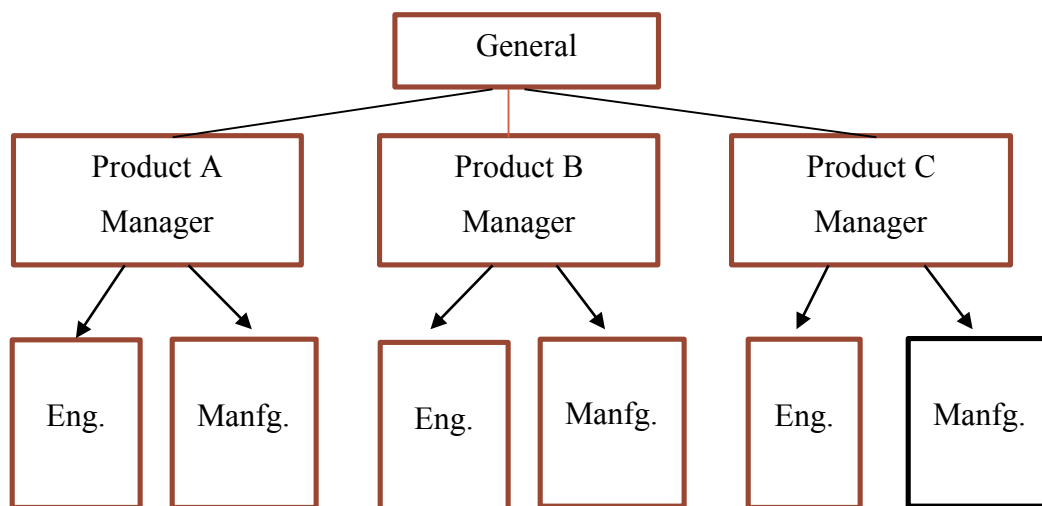


Figure 3. Product Model (Springer, 2013, p. 197)

The product organizational model divides specific product or brand lines amongst distinct operating units. In Figure 3, it is apparent how the authority is given directly to the product managers from the general manager. This allows the product manager to contain the line of authority, thus enabling stronger communication, faster response times, and overall smoother projects.

### 2.2.3 Matrix Model

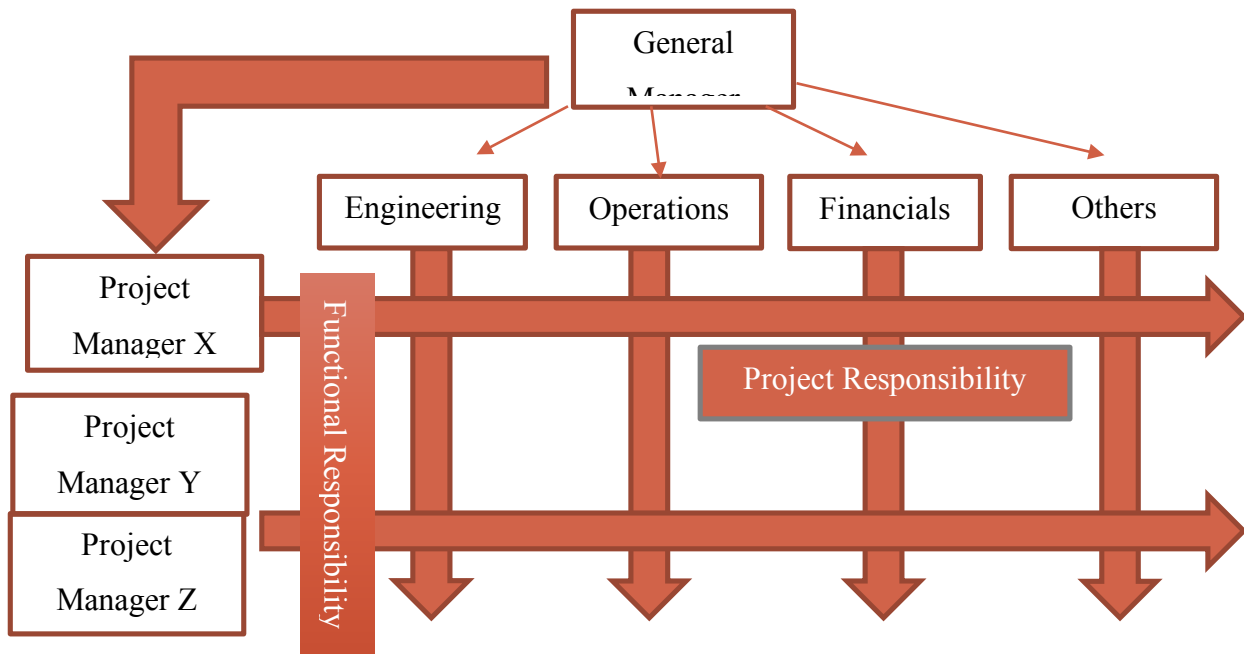


Figure 4. Matrix Model (Springer, 2013, p.199)

The Matrix model is the combination of the advantages of the functional and product models. Each project manager receives their authority directly from the general manager. Within this model, the project manager holds all the authority as well as the accountability for the project success. Within each functional unit there is a project manager whose responsibility is to “maintain technical excellence” (Kerzner, 2013, pg. 127). This means ensuring that a unified technical base is updated regularly and that all information is available every project. “The matrix model enables efficient use of production resources, effective interdisciplinary task

integration, and effective project control” (Kerzner, 2013, p. 128). The matrix model is a collaborative function where project management is a coordinative function. The matrix model aims to keep every team member informed, as well as get all the members of the project working together as a cohesive team. This is also applied to the project and function managers, as they share the responsibility and authority throughout the entirety of the product. One of the biggest issues project and functional managers face is negotiating which group will oversee certain components of the project at hand. Lechler and Dvir (2010) found weaknesses in the matrix approach, specifically when it came to determining where the authority sat with different managers, calling into question the validity of the intended organizational structure. Mckenna (2006) asserted that while authority was given to them by the organization, personality and leadership style were mostly likely to impact individuals’ abilities to hold on it said authority. The matrix model’s weakest link stems from where the authority is given. Organization and clear communication are key to the matrix model to ensure the general manager has the necessary amount of time to coordinate activities between project managers (Kerzner, 2013).

The most recent evolution of project management organization structures is the project management model. It stems from the matrix model with the addition of a director of project management as shown in Figure 5. This model is intended for larger companies that handle a higher frequency of projects. The addition of the director of project management enables the general manager to attend to other needs within the company and multiple channels of communications as there is one individual overseeing several projects ensuring uniformity. This model also increases the consistency of customer relations. Hyväri (2006), found that project matrix and project team-based organizations were most effective, and even though the subjects of the study were satisfied with the project management tools available to them, they have found

there is a need for multi-project management tools. While this model may not be suitable for all project managers it can aid larger companies in the management of their projects effectiveness.

#### 2.2.4 Project Management Model

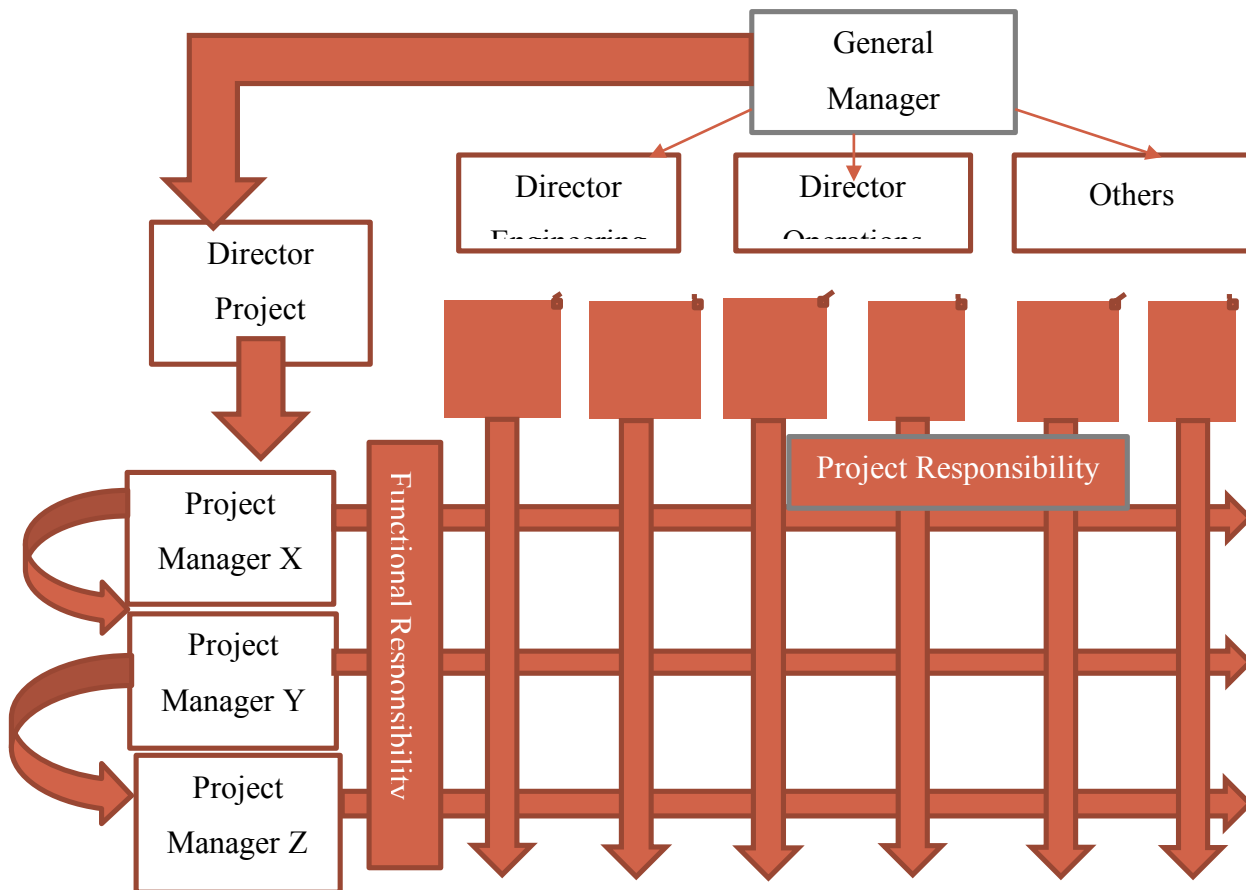


Figure 5. Project Management Model (Kerzner, 2013, p. 133)

These models are not a one-size-fits-all configuration. Projects are temporary team or group tasks to complete the work in a specified amount of time with a certain amount of resources. Every project is unique and requires varying amounts of research and development, as well as management oversight. These organization models are meant to be guideposts to enable organizations to be as stringent or collaborative as the projects require. “Important management issues that should be addressed at the beginning of any project include: product strategy, goals,

project milestones, a powerful project leader, and the initiation of cross-functional team” (Jassawalla & Sashittal, 2000; Rauniar & Rawski, 2012, p, 947). Understanding the relationship between the strategic goals of the business and the needs of the market is the easiest way for the management team to be effective (Rauniar & Rawski, 2012). The biggest differences between these organizational structures pertains to the authority and communication, as it is management’s roles to interact with the different divisional groups and ensure transparency.

### 2.3 Cost Management Models

The examination of the organizational structure helps to build the understanding of relationship between communication and authority throughout a project. Through cost and schedule management, the focus is on how projects stay within budget and time constraints. Specifically, the methodologies to be examined included: earned value management, earned schedule, the theory of constraints, and critical path (Vanhoucke, 2014). These are the cost and scheduling management models that are frequently used in projects that lend themselves to the effectiveness of project management.

#### 2.3.1 Earned Value Management

“Earned Value Management (EVM) is a methodology used to measure and communicate the real physical progress of a project and to integrate time, cost and scope into a single project management and control system” (Vanhoucke, 2014, p. 17). EVM brings together scope, cost and schedule and enables project managers to detect budget and time issues. (Pajares & López-Paredes, 2011). According to Vanhoucke (2014), the metrics within the EVM that allow project performance to be monitored are: Planned Value (PV) Actual Cost (AC) Earned Value (EV).



- “Planned Value: The cumulative increase in the value of the project over time as a direct result of the baseline schedule cost values of project activities.
- Actual Cost: The cumulative increase in real activity costs summed up at the project level to know the actual spending at a given moment in time.
- Earned Value: The cumulative increase of the value of the work done at a certain moment in time by connecting the physical percentage completion with the expected baseline project value” (Vanhoucke, 2014, p. 18,20).

These performance metrics allow project managers the ability to review the progress of a project during review periods and enable them to forecast the remaining time and cost of their projects (Vanhoucke, 2014). With the ability to review and recalculate cost and scheduling for projects, project managers can identify and resolve issues early, and with minimal impact to the team (Kerzner, 2013). EVM enables project managers to detect issues as they are starting and make small incremental changes, opposed to large costly reworks.

Variance within the scope of this project is defined as: “any schedule, technical performance, or cost deviation from the specific plan” (Kerzner, 2013, p.754). Cost variance (CV) and schedule variance (SV) are the two major variances that project managers calculate to determine whether a project is over budget or schedule. These variance values are calculated using the EVM metrics:  $CV = EV - AC$ , and  $SV = EV - PV$  (Vanhoucke, 2014). A negative outcome for CV indicates that a project is over-budget, and a negative SV indicates the project is behind schedule (Kerzner, 2013). To calculate performance efficiency as a percentage of EV, project managers calculate cost performance index(CPI), and schedule performance index(SPI). The equations for CPI and SPI are as follows:  $CPI = EV/AC$  and  $SPI = EV/PV$ . While these metrics are frequently

used, they have been found to be unreliable. As EV and PV are not calculated with real costs, and their calculation measures the time difference between planned work versus work completed. The values used to represent the difference is monetary. These values can cause confusion which can lead to miscalculations. Another issue is the differences in time, PV pertains to planned value at a specific moment in time, where EV looks at the value of the work completed at a moment in time. The biggest issue concerns the time performance variables SV and SPI. As SV is expressed as a monetary value, instead of a unit of time.

### 2.3.2 Earned Schedule

The development of the Earned Schedule (ES) was due to the need for a more reliable way of calculating schedules during a project. ES provides project managers with an update of where the project is at that moment in time, opposed to where they should have been according to the baseline schedule which was what EV was providing. ES also ensures that the correct time performance is calculated during the life of a project. While the standard duration estimate is a variation of ES, one of the major issues with ES is that it is based on a linear cumulative plane and the earned value cost curves (Warburton & Cioffi, 2016), as most project cost curves are presented as S-shaped. The ES has been accused of lacking empirical evidence and is another example of how project management is narrow and implicit (Koskel & Howell, 2002; Warburton & Cioffi, 2016). Through a comparison study of EVM and ES duration estimation Warburton & Cioffi, 2016, could establish that the current theory of duration estimation using ES is linear, and that the ES-based duration formula could also be used for nonlinear profiles.

Lipke (2012, p. 11), found that “as projects nearing the end would appear to have an on-time project schedule even when the project was late, this was due to the decreased deviation

between PV and EV causing the  $SV=0$  and  $SPI=1$ ". The development of ES was meant to reduce this error and improve schedule analysis, as well as to determine the time at which the EV increase should have occurred (Lipke, 2012). To calculate ES the following equation is used:  $ES = t + [EV - PV_t / PV_t + \Delta t - PV_t] \Delta t$ . Where ES is the earned schedule, EV is the earned value at the actual time (AT) and  $PV_t$  is the planned value at time instance t. ES is not intended to replace EV but to simply enhance and increase effectiveness.

"As the ES method is the time earned at AT for the work done expressed in a time unit and used to measure the time performance" (Vanhoucke, 2014, pg 38), SPI and SV are also calculated using the new method, thus  $SV(t)$  is now calculated  $SV(t) = ES - AT$ , and  $SPI(t) = ES/AT$  (Vanhoucke, 2014). The main advantage of the  $SV(t)$  and  $SPI(t)$  are their ability to generate the correct time performance from project start until finish (Vanhoucke, 2014). As mentioned earlier, SPI has shortcomings when calculating the accurate schedule performance, the  $SPI(t)$  does not have this misleading trend and is therefore more reliable.

### 2.3.3 Critical Path

The critical path method is network analysis that provides project managers with the following information:

- "Interdependencies of activities,
- Project completion time
- Impact of late starts
- Impact of early starts
- Trade-offs between resources and time
- What-if exercises
- Cost of crash programs
- Slippages in planning/ performance
- Evaluation of performance" (Kerzner, 2013)

“The critical path method, discovered in 1957 by M.R. Walker and J.E. Kelly, is described as networks that consist of: events, activities, durations, effort, and the critical path” (Alharkan, 2005). Events indicate when activities start and stops and each activity signifies the work to be accomplished. The duration represents the amount of time each activity requires, the effort is the amount of work performed during a duration, and the critical path is the longest path through the network and determines the length of the project (Kerzner, 2013). The critical path is a valuable tool for project managers to allocate and schedule resources used throughout the project. The use of slack enables project managers to maximize resource utilization and reduce overall project cost through the elimination of wasted time. Slack is the difference between the latest allowable date and the earliest expected date (Kerzner, 2013). Slack time=  $Tl - Te$ , where  $Tl$  is the earliest time an event can take place, and  $Te$  is the latest time an event can take place without adding complexity to the project (Kerzner, 2013).

#### 2.3.4 Critical Chain

The critical chain derived from the methodology called the theory of constraints, Dr. Eliyahu M. Goldratt is credited with the creation and development of both methodologies (Kerzner, 2013, p. 639). Kerzner (2013) outlined Goldratt’s five focus steps to develop the critical chain; these steps are:

1. “Identify the system’s constraints.
  2. Decide how to exploit the constraint.
  3. Subordinate everything else to the above decision.
  4. Elevate the system’s constraints.
  5. If, in a previous step, the system’s constraint has been broken, go back to step 1.”
- (Kerzner, 2013, p. 639)

The basic concept of the critical chain is reflected by interdependent project activities that are completed in the shortest duration of time. This reduces the procrastination that occurs when

people are given a certain amount of time to complete a project. Goldratt referred to this procrastination as “student syndrome” (Ahlemann, Arbi, Kaiser, & Heck, 2013). Because employees could use the work package buffers, they would do so whether it was necessary or not. Critical chain operates on the assumption that resources are limited which is not the assumption in traditional project methods (Zhang, 2016). The critical chain has become a project management standard and norm as the critical chain has proven itself to be effective through numerous empirical studies (Ahlemann, Arbi, Kaiser, & Heck, 2013).

## 2.4 Leadership Styles

“Northouse (2013, p. 5) defined leadership as a process whereby an individual influences a group of individuals to achieve a common goal.” While that definition is clear enough, the execution of leadership skills or even being able to enhance such skills has been debated for decades. Kerzner (2013) outlined the most common elements of leadership as being the person that leads, possesses followers, and influences the environment. The most common dilemma within leadership theory is whether a leader is born or made. While leadership is a complex ideal, action, process, there is no denying its existence and its impact on a project, whether present or absent, is undeniable.

The leadership within the scope of project management is no different than any other leadership focus. There is a leader and they use their skills to motivate their followers to complete a specific task. While there is not one type of leadership style that is deemed most effective, there are styles that perform better within the area of project management (Krahn & Hartment, 2006). The leadership styles to be reviewed are: situational, path-goal, transformational, and emotional intelligence.

### 2.4.1 Situational

The situational leadership style requires that leaders match their leadership style to the competence and commitment levels of their subordinates (Northouse, 2013). The situational approach operates on the assumption that the leader can recognize what the employee competencies are and what their commitment levels are, and then adapt their styles to best suit the employee (Northouse, 2013). The situational approach involves four classifications as seen in Figure 6: directive, coaching, supporting, and delegating (Northouse, 2013). Within each of these classifications there is a description of the necessary supporting and directing behaviors. These descriptions are aligned with the level of competence and commitment level of the employee. These varying levels of development are shown in the development levels of followers.

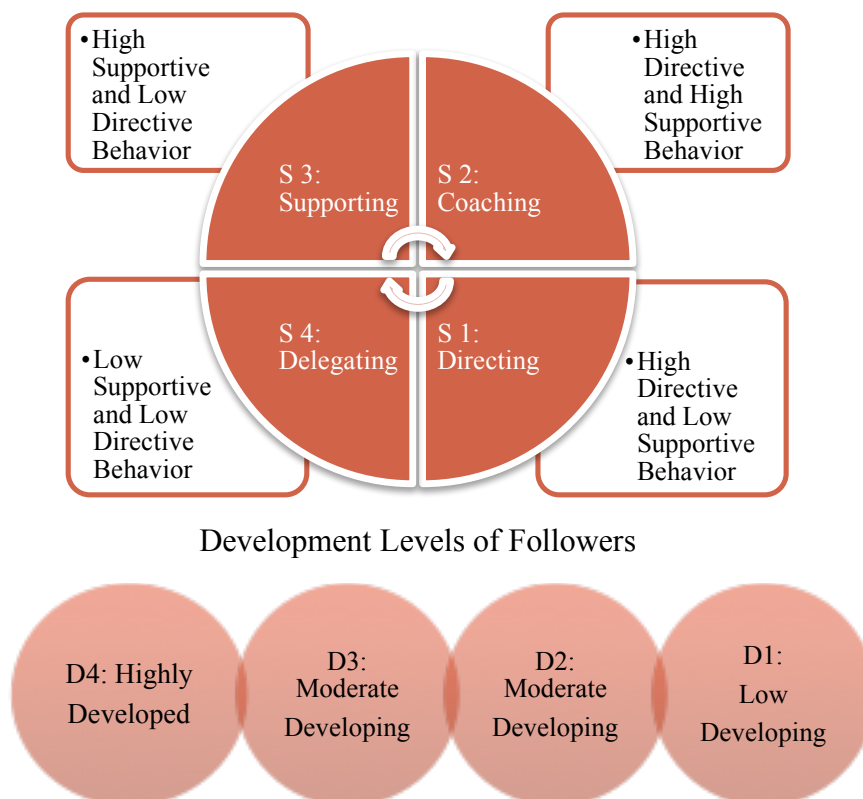


Figure 6. Situational Leadership Model (Northouse, 2013, p.100))

### 2.4.2 Path-Goal Theory

The definition of path-goal theory is “how leaders motivate subordinates to accomplish designated goals” (Northouse, 2013, p. 137). Path-goal is a situational type theory as it relies on the leader’s ability to assess the followers’ needs and determine how to then motivate them to succeed. Path-goal theory stems from expectancy theory, which emphasizes the impact of motivation and communicating the value of work followers produce (Northouse, 2013). This idea is supported by the findings of Pinnington and Mir, (2014), that the greatest impact to the success of a project was the employees’ abilities to relate directly to their project. Path-goal was created out of the understanding of how the level of motivation plays an important role in how and why followers do their work (Northouse, 2013). With the positive outcomes of motivation on project success, project managers could emphasize the use of path-goal to increase their effectiveness.

### 2.4.3 Transformational Leadership

“Transformational leadership is the process whereby a person engages with others and creates a connection that raises the level of motivation and morality in both the leader and the follower” (Northouse, 2013, p. 186). “The theory of transformational leadership assumes that a leader is able to bring about positive changes in followers' values, attitudes, perceptions, and expectations in a permanent organization” (Tyssen, Wald, & Spieth, 2014, p. 368; Bass, 1999; Yuki, 1999). Furthermore, a transformational leader focuses on people and their motivations, beliefs, and behaviors, and provides them with visions that satisfy their needs and desires (Tyssen, Wald, & Spieth, 2014; Lusser & Achua, 2009).

Transformational leaders rely heavily on their charisma and vision to help guide their followers to improve their performance and support their development. Vision has been found to

be the least important tool project managers used, while sensitivity and communication were deemed most important (Müller & Turner, 2007). This may be because as Tyssen et al. (2013) discovered, transformational leadership was found to be beneficial amongst followers within a permanent setting. As projects tend to be temporary in nature, the use of transformational leadership is ineffective because the use of a long-term goal would be unrealistic (Tyssen, Wald, & Spieth, 2013).

#### 2.4.4 Emotional Intelligence

As stated previously, project management is complex and requires project managers to handle the relationships with multiple departments, stakeholders, customers, as well as ensuring all the components that occur during a project are being completed on time and budget. This type of juggling requires a certain type of leadership and understanding of self and awareness of others. Emotional intelligence is “the capacity to be aware of, control, and express one's emotions, and to handle interpersonal relationships judiciously and empathetically” (Goleman, 2011, p. 8). Goleman (2011) outlined the major components of emotional intelligence as: self-awareness, self-regulation, motivation, empathy, and social skills. The basis for this leadership skill lies in the individual's abilities to know themselves as well as effectively perceive the needs of the employees and organization. Emotional intelligence is a skill that takes introspection and understanding of one's self. The motivation of continued growth enables managers to hone their leadership skills through their own advancement of self-awareness. It is through leaders' self-awareness that they can better serve their organizations and followers.

Rezvani, et al. (2016) and Müller and Turners (2007), found there to be a link between a project manager's emotional intelligence and the success of the project. This was predominantly due to the project manager's ability to be enthusiastic and keep employees motivated. Just as



emotional intelligence can aid in the management of a project, the lack of emotional intelligence can be just as impactful. As Thomas and Mengel (2008) discovered, project managers that lacked emotional intelligence struggled to handle the strain that occurs during complex projects which can lead to frustration, stress and low performance.

#### 2.4.5 Summary

As project management effectiveness is not measured by one criterion, the examination of organizational structures, cost and schedule management, and leadership styles were explored to determine if there are tools used within management that aid in a project's effectiveness.

While the three main topics initially seem too varied to build upon each other, throughout this literature review it has become apparent how intertwined these project management components are to one another. The next step will be to conduct a synthesis of project management literature to better understand the methodologies that are used throughout the field of project management.

## CHAPTER 3. METHODOLOGY

### 3.1 Framework

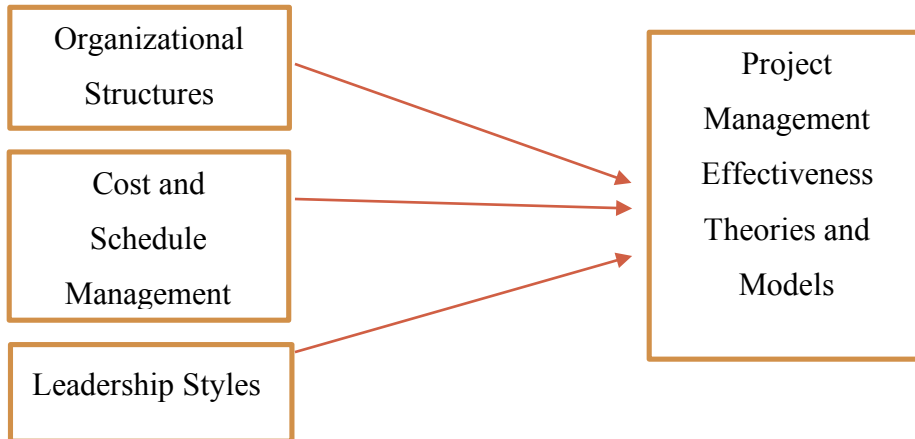


Figure 7. Project Framework

As depicted in Figure 7 the framework of this project is an examination of organization structures, cost and schedule management, and leadership styles to determine if there are project management theories or models that have been found to be more effective in the management of a project than others (Brocke & Lippe, 2015).

### 3.2 Methodology

The purpose of this research study was to review the methods and theories used within project management that best aid in project management effectiveness. The three reviewed areas of research enabled an examination of which methods and theories used within project management have been found to be the most effective. A systematic literature review was conducted to better understand the methods and theories used within organizational design models, cost and schedule management and leadership styles. From this review, an analysis was

conducted to better understand which methodologies and theories were found to be most effective within project management.

The steps used within a systematic literature review are: “1) Identify the research question(s); 2) Define inclusion and exclusion criteria; 3) Search for studies; 4) Select studies for inclusion based on pre-defined criteria; 5) Extract data from included studies; 6) Evaluate the risk of bias of included studies; 7) Present results and assess the quality of evidence” (Creswell, 2009; Cornell University, 2016, p. 1).

### 3.2.1 Research questions

1. Which types of organizational design models most readily support project management?
2. Which cost models readily support project management?
3. Which leadership characteristics and methodologies most readily support project management?

### 3.2.2 Define inclusion and exclusion criteria

The inclusion criteria for this research were based on the relevance of research topics to search criteria. This especially pertained to the differences between success factors versus effectiveness factors, because factors are measured by post project success, and whether the product was successful. This is in opposition to the effectiveness of the management of a project which pertains to the degree to which the manager was successful in aiding team cohesion, reaching project fulfillment, meeting cost and time deadlines, and maintaining communication.

Inclusion criteria included:

Organizational Structures:

Functional

Product

Matrix

Project

Cost and schedule management:

Earned Value Management

Earned Schedule

Critical Path

Critical Chain: Theory of Constraints

Leadership Styles:

Situational

Path-goal

Transformational

Emotional Intelligence

Exclusion criteria were:

- agile project management
- the extent of project management software used to improve efficiency
- project forecasting, quality management
- project risk management tools such as PERT
- Monte Carlo simulation
- project portfolio management (PPM)

### 3.2.3 Search Criteria

This literature reviews examined organizational structures, cost and schedule management, and leadership styles to determine which methods or theories are the most effective within the management of a project. The search terms used to research organizational structures,

cost and schedule management, and leadership styles included: project management effectiveness, project success, project manager, leadership style, systematic literature review, project success, organizational structure, functional model, matrix model, project scheduling and costing methods, cost control, critical path, critical chain, leadership in project management, emotional intelligence, and transformational leadership.

#### 3.2.4 Select studies for inclusion based on pre-defined criteria:

To increase the reliability of the research process, the studies selected for this research had to fit within seven predetermined criteria for them to be included. These seven criteria included: availability within databases and journals, published from 2010 to present day, consisting of the full article, be peer-reviewed within a leading project management journals, and containing relevant information about project management effectiveness tools as it pertained to: organizational structures, cost and schedule management, and or leadership skills. Studies were discovered through searching these electronic databases: Elsevier ScienceDirect, Wiley Online Library, Sage Elsevier ScienceDirect, Wiley Online Library, Sage and Springer, South Western, Oxford, Emerald Insight, IEEE, HBRPress, Canterbury, Pergamon, JSTOR and Springer. The academic journals included were: *The International Journal of Project Management*, *International Journal of Information, Business and Management*, *International Journal of Innovation, Management and Technology*, *International Journal of Production Research*, *Leadership Quarterly*, *European Journal of Work and Organizational Psychology*, *Project Management Journal*, *R&D Management*, and *International Journal of Production Economics*.

#### 3.2.5 Extract data from included studies

The data obtained were categorized by relevant question topic and divided into the following categories: date of search, database, search terms, and results. These results can be

found in Appendices A and B. Appendix A is the resource catalog which details the search terms used, the date of discovery, the database the article or book were found, and the citation.

Appendix B is the classification scheme which details the breakdown of this literature review's research tools. These tools include: general information, time dimension, data analysis, research strategy, data collection, and industry sector. Through the classification of research data, sources, and strategy used during research, future researchers will have the ability to duplicate this research with ease.

### 3.2.6 Evaluate the risk of bias of included studies

The development of each research question brings a certain level of bias because of the researcher own interests. There is also a potential for bias in the researcher's categorizing and choosing all the documents for inclusion in the study. To eliminate this risk and increase the validity of the findings, documents were chosen based on their peer-reviewed journal merit, the thoroughness of the paper or books researched, and articles were chosen based on results rather than how well they followed any preconceived notions of results.

To eliminate this risk, documents were chosen based on their peer-reviewed journal merit, the thoroughness of the paper or books researched, and the articles results not how well they followed any preconceived notions of results.

### 3.2.7 Present results and assess the quality of evidence

The results of this systematic literature review are presented in Appendix 1. A systematic literature review is classified as a level 1 evidence (Wisconsin, 2017), meaning that the research conducted was a systematic review that followed the guidelines set for said review.

In the following chapters an examination of the literature findings resulted in identification of the relative effectiveness of various project management methods as they

pertained to the research questions. Subsequently, the researcher provided recommendations for future research.

### 3.3 Chapter Summary

This thesis was conducted to examine organizational structures, cost and schedule management, and leadership styles. Each research question pertains to different fields within project management that contain their own criteria for what is deemed effective. These criteria were based on the literature and were compared to the defined success criteria: budget, time, and performance. Conclusions subsequently were made based on the various outcomes produced based on organizational structure, cost and schedule management, and leadership style success analysis.

## CHAPTER 4. FINDINGS

This systematic literature review was conducted to analyze which organizational structures, cost and schedule management and leadership skills have been found in the literature as the most effective for use in project management. Organization structures, cost and schedule management, and leadership styles are the vital components within any project. The systematic literature review of these components revealed there were several methods and tools that were found to be effective in the management of projects. These findings are outlined in this chapter.

### 4.1 Organizational Structures

The first portion of research conducted for this literature review was to analyze which types of organizational design models most readily support project management. The four structures that were researched included: functional, product, matrix, and project. Depending on the specific situation, each of these structures serves a unique purpose, and can be used to aid in project effectiveness. Figure 8 outlines which organizational structure is most effective given the specific type of organization.



Organizational Structures	Effective Utilization
Functional	Distinct departments. (I.E. marketing, accounting, engineering, sales, etc.) (Springer, 2016).
Product	Production lines (Springer, 2016).
Matrix	Large multi-divisional organizations where a need for increase easy communication is necessary for dynamic projects (Hatch, 2012).
Project	Contract style projects. Where temporary teams are developed for a specific project (Kerzner, 2013).

Figure 8. Utilization Recommendations Based on Organizational Structures

The functional organizational design model consists of dividing organizational units into common specialties. This model enables professionals within their field to work in their own distinct workplace. The separation of workplaces enables these professionals to work on their own equipment and with the necessary technologies depending on their needs (Springer, 2016). The functional organizational design model is best utilized in companies that remain centralized. To coordinate the specific departments, the development of a management system that elevated all the responsibilities on one figurehead is critical (Society For Human Resource Management, 2015).

The product model consists of divisions within divisions, where one project manager oversees the entire project. This enables strong communication channels with quick reaction times, as the team members are in contact with one center person from start to finish (Kerzner, 2013). The product organizational model is best suited for major product or brand lines (Springer, 2016). As product management is frequently a temporary

For the matrix model to be pertinent four characteristics should be evident, these characteristics are: “projects that are short yet complex, complicated design that is both innovative and produced in a timely manner, development of a product that needs advanced skill that is constantly updated and advanced and a rapidly changing marketplace that requires

different specifications to a product from the beginning of conception to the final deliverable” (Kerzner, 2013, p. 132).

The matrix method was created to combat the complex needs of large organizations. One of the main benefits of the matrix method is the increased communication in projects for multi-divisional organizations (Hatch, 2012). Pakarinen (2016) found that matrix organizational structures enable members of a project to create a coherent vision, and that the ability to communicate with group members in different divisions enabled conflict resolution. Up-to-date information in an ever-changing world is a necessity that that companies of any size cannot afford to miss out on. Hyväri (2016) found that matrix managers ensured resources were available when needed as they were responsible for approving the order of said resources, eliminating the need for an intermediary, and increasing the effectiveness of the project by empowering the manager. The matrix organizational structure eliminates the separation between upper management and lower level employees to increase communication and reduce the mismanagement of projects.

The project model allocates all the power to the project manager, and requires the work to be completed in a systematic timeline (Kerzner, 2013). This requires resources to be focused on one project component at a time, therefore it is best suited for small projects that can afford all resources focused on individual pieces. Two major issues that arise with the project model is the lack of communication and career opportunity. The retention of project members changes with each project and their resource needs (PM4DEV, 2007).

#### 4.2 Cost and Schedule Management

The second portion of research conducted for this literature review was to analyze which cost and schedule models most readily support project management. Figure 9 provides an outline

for which cost and schedule model is most effectively utilized given a situation. The critical chain is the evolution of the critical path, where job tasks are divided to ensure projects are completed in a timely manner. While the critical path contained work buffers, the critical chain focuses on task order and firm scheduling (Ahlemann, Arbi, Kaiser, & Heck, 2013). With the elimination of the time buffer, procrastination scheduling, projects can be completed faster and without the time spent waiting on other components of the project to be completed. Izmailov et al. (2016) concluded that the critical chain method is the most effective approach for project planning.

Cost and Schedule Models	Effective Utilization
Earned Value Management	Primarily used for budget management calculations (Kerzner, 2013).
Earned Schedule	Best used in conjunction with other time and schedule management tools. Aids project manager in forecasting milestones and completion dates (Vanhoucke, 2014, pg 38).
Critical Path	Better used for clearly-defined projects with few stakeholders (Lucidchart Content Team, 2018).
Critical Chain: Theory of Constraints	More flexible modification of critical path method that helps prevent inefficiencies such as task switching or multitasking (Ahlemann, Arbi, Kaiser, & Heck, 2013).

Figure 9. Utilization Recommendations Based on Cost and Schedule Models

The ability to allocate resources to reduce time lags has made the critical chain a vital component for project management. Through aggregated schedules and the elimination of uncertainty time buffers, critical chain projects can be completed faster reducing the overall cost of the project. “Theory can be applied in production, logistics, supply chain, distribution, project management, accounting, research and development, sales and marketing” (Simsit, Günay & Vayvay, 2014, p. 930). As the theory of constraints can be implemented throughout a wide variety of industries, its use and dependability are incredibly useful.

### 4.3 Leadership Styles

The third portion of research conducted for this literature review was to analyze which leadership characteristics and methodologies most readily support project management. The leadership displayed by the project manager has a major impact on the team, and subsequently their ability to be effective. There are dozens of leadership methods, but for this literature review the following were researched: situational, path-goal, transformational, and emotional intelligence. Figure 10 contains details about which leadership styles are more effectively utilized for given project situations.

Leadership Styles and Methodologies	Effective Utilization
Situational	As situational leadership requires leaders to match their leadership style to the competence and commitment levels of their subordinates (Northouse, 2013), situational leadership is best suited for leading teams where the leader has extensive knowledge and experience with each member.
Path-Goal	Best to provide motivation and increase efficiency within the group (Northouse, 2013).
Transformational	Best for permanent positions where a need for a change in vision or culture is necessary (Tyssen, Wald, & Spieth, 2014, p. 368; Bass, 1999; Yuki, 1999).
Emotional Intelligence	Best when used in combination with a leadership style as E.I. requires a certain type of leadership and understanding of self and awareness of others.

Figure 10. Utilization Recommendations Based on Leadership Styles and Methodologies

Path-goal and emotional intelligence are best suited for project management effectiveness. They are best used in concert with each other because emotional intelligence is more of a trait that can enhance a project manager's effectiveness, while path-goal relies on the project manager's ability to determine what best motivates the team members to achieve the preferred outcomes. Mir and Pinnington (2014) found that the greatest impact on the success of a project came from an employee's ability to relate directly to their project. This plays into the effectiveness of the critical path. Through the elimination of time buffers, there is an expectation

that the team will not procrastinate tasks ensuring work is completed at a faster rate. A project manager's ability to effectively communicate the role of the team member to the completion of a task and how that impacts the whole of the project is key.

#### 4.4 Summary

This chapter outlined which organizational structures, cost and schedule management schemes, and leadership styles frequently utilized within project management were found within the literature to be most effective depending on their specific situations. Conclusions and recommendations made based on these findings are made the following chapter.

## CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Summary and Conclusions

A key assumption made for this research was that there are methods used within project management that contribute to their effectiveness. Further assumptions were made that there are methods used within project management that work more effectively than other methods.

Through this systematic literature, it can be concluded that project management effectiveness cannot be measured by a single metric. Because effective project management tools cannot be reduced to a simple prescribed list or set of guidelines, recommendations for the management of a project fall into categories based on specific situations. These categories found to be recommended by the literature were related to the size of the organization, the amount of time the project will take, and utilization of specific industry standards when defining cost and scheduling assignments.

The organizational structure that is found in the literature to be effective in the management of projects with distinct departments is the functional model (Springer, 2016). While the organizational structure that is found to be most effective for the management of projects with production lines is the product organization (Kerzner, 2013). The structure that is found in the literature to be effective in the management of a large and complex project is the matrix model. The matrix organizational structure is a hybrid of the functional and product organizational structures. The main benefit of this fusion stems from the division of power and the increased communication capabilities. Information processing during a project comes with its own set of logistical issues, but with increased information flow a matrix enables resources to be applied quickly opposed to going unnoticed (Horney & O'Shea, 2009). Through this model

individuals are empowered by their ability to be heard enabling ownership of the project by the team opposed to just the project leads.

It is well accepted that project success is heavily dependent on cost and time budgets. As these components make up two of the three sides of the iron triangle, which consisted of time, scope, and cost (Joslin & Müller, 2015), the exploration into the most effective cost and time management tools and models was crucial. The major time and cost management techniques reviewed were: earned value management, earned schedule, critical path, and critical chain: theory of constraints. While these calculations and methods play a role in effective project management. The critical chain: theory of constraints enables project managers to utilize scheduling tools that will reduce their overall costs and ensure they are on schedule (Vorne, 2017).

A leadership style that works best for a specific project, team, and timeframe is not always going to look the same. The path-goal leadership style enables managers to determine how they should lead and motivate their subordinates depending on their needs. As path-goal is a continuation on the situational leadership style, there is an element of “situational” leadership, but with the added focus of motivation, and work setting (Northouse, 2013). Emotional intelligence and path-goal are two separate leadership styles that both benefit from the ability to motivate individuals. Emotional intelligence is a skill that enables an individual to handle their own emotions and motivations while also being empathetic to others. Empathy enables managers to assess the situation and provide feedback that is best suited for the individual subordinate. Path-goal is about utilizing these tools to motivate subordinates to accomplish the task at hand. The motivation factor of both leadership competencies is why they are the most effective in the management of a project.

This research supports the existing empirical work that studied organizational structures, cost and scheduling methods, and leadership styles. This research also fills the gap separating these major components used within the management of a project, and provides evidence from the literature for how functional organizational structures, product organizational structures, matrix organizational structure, the critical chain: theory of constraints, path-goal and emotional intelligence impact the effectiveness of the management of projects. This systematic literature review will add to the body of project management knowledge and may enable further research to be conducted.

## 5.2 Discussions and Future Research Recommendations

A limitation of this review is that the research and categorization of all articles and books were conducted by the author alone. To combat this limitation, a thorough cataloging of research is presented in Appendix 2, which will enable future researcher to test any of the findings. Another limitation is the exclusion of certain project management theories and methods such as PM software or agile management, which are two methods frequently used within project management. It is recommended that future research be conducted on the potential impact that PM software and agile management on effective project management.

Also, the exclusion of leadership styles limited the results on which leadership style is most effective in the management of projects. While the leadership styles that were chosen represents diverse styles of leadership, future research may be conducted to expand on different styles to determine which leadership styles are most effective within different project types and sizes. Another limitation of this literature review is the lack of statistical analysis. Future research could increase the validity of their findings through the development and utilization of a Likert-scale. This research could focus on specific industries' project management, word



associations, or organization structures of large versus small organizations. The narrowed focus of project management would allow researchers to create guidelines and further the recommendations for research.

## APPENDIX A. RESEARCH CATALOG

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	Research Findings
8/20/2017		PM	Project management effectiveness	<ul style="list-style-type: none"> <li>Project management effectiveness definition (Wideman, 2002).</li> </ul>
8/20/2017		PMI	Project management effectiveness	<ul style="list-style-type: none"> <li>Project management effectiveness definition (Hyväri, Project management effectiveness in different organizational conditions, 2006).</li> </ul>
8/20/2017		ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>Questioning the validity of project management theories and models (Koskela &amp; Howell, 2002).</li> </ul>
8/20/2017		ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>Project management effectiveness definition (Sundqvist, Backlund, &amp; Chronéer, 2014).</li> </ul>
8/20/2017	1,2,3	ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>How organizational structures, cost management, and leadership methodologies increase project management effectiveness (yang, Huang, &amp; Wu, 2011).</li> </ul>
8/20/2017	1,2,3	ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>Organizational structures used within project management, cost management models used within project management, and leadership methodologies used within project management (Jassawalla &amp; Sashittal, 2000).</li> </ul>
8/20/2017	3	Sage	Project management effectiveness	<ul style="list-style-type: none"> <li>Balancing the goals of the business with the needs of the market to increase effectiveness in team management (Rauniar &amp; Rawski, 2012).</li> </ul>
8/20/2017		Wiley	Project management effectiveness	<ul style="list-style-type: none"> <li>Five processes used within a project. (Kerzner, 2013)</li> </ul>
8/20/2017	1,2,3	Wiley	Project management effectiveness	<ul style="list-style-type: none"> <li>How project management effectiveness is impacted by organizational structures, cost and schedule management, and leadership styles (Brocke &amp; Lippe, 2015).</li> </ul>
8/20/2017		ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>There is a trend of questioning the validity of project management theories and models as well as their effectiveness. (Koskela &amp; Howell, 2002) (Mir &amp; Pinnington, 2014).</li> </ul>
8/20/2017	1	ScienceDirect	Project management effectiveness	<ul style="list-style-type: none"> <li>KPIs directly impact project teams and project efficiency when organizations develop and manage KPIs through a formal management system (Mir &amp; Pinnington, 2013).</li> </ul>
9/27/2016		PMI	Project success	<ul style="list-style-type: none"> <li>Project success definition. (project management institute, 2013)</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	<ul style="list-style-type: none"> <li>Research Findings</li> </ul>
9/27/2016		ScienceDirect	Project success	<ul style="list-style-type: none"> <li>The success of a project is impacted by an employee's ability to relate to the project. (Pinnington &amp; Mir, 2014)</li> </ul>
9/27/2016	3	ScienceDirect	Project success	<ul style="list-style-type: none"> <li>The greatest link to project success comes from a project manager's ability to tailor. (Joslin &amp; Müller, 2015)</li> </ul>
9/27/2016	1,2,3	ScienceDirect	Project success	<ul style="list-style-type: none"> <li>Today the definition and the understanding of project success has evolved to include measurement models that are capable of being tailored to different types of projects as well as different aspects of project success. (Pinto &amp; Slevin, 1988)</li> </ul>
9/27/2016	3	ScienceDirect	Project success	<ul style="list-style-type: none"> <li>Found there to be a link between a project manager's emotional intelligence and the success of the project. (Müller &amp; Turner, The influence of project managers on project success criteria and project success by type of project, 2007)</li> </ul>
9/27/2016		Pergamon	Project success	<ul style="list-style-type: none"> <li>Differentiated project success from project management success as the outputs from the project. (Cooke-Davies, 2002)</li> </ul>
9/27/2016	3	PMI	Project management	<ul style="list-style-type: none"> <li>"The person assigned by the performing organization to lead the team that is responsible for achieving the project objectives" (Project Management Institute, 2013, p. 555).</li> </ul>
9/27/2016	2	ScienceDirect	Project management	<ul style="list-style-type: none"> <li>Projects heavily depend on their ability to adhere to their cost and time budgets. As these components make up two of the three sides of the iron triangle, which consisted of time, scope, and cost (Joslin &amp; Müller, 2015).</li> </ul>
9/25/2016	3	Sage	Leadership styles	<ul style="list-style-type: none"> <li>"A process whereby an individual influences a group of individuals to achieve a common goal" (Northouse, 2013, p.5).</li> </ul>
9/25/2016	3	Sage	Leadership styles	<ul style="list-style-type: none"> <li>Situational leadership- leaders match their leadership style to the competence and commitment levels of their subordinates (Northouse, 2013).</li> </ul>
9/25/2016	3	Wiley	Leadership styles	<ul style="list-style-type: none"> <li>Outlined the most common elements of leadership as being the person that leads, possesses followers, and the environment (Kerzner, 2013).</li> </ul>
9/10/2016	1	PMI	Project process	<ul style="list-style-type: none"> <li>There are four major processes to a project: initiating, planning, executing, and closing. (Project Management Institute, 2013)</li> </ul>
9/10/2016	1	Wiley	Project process	<ul style="list-style-type: none"> <li>There are five major processes: conceptual, planning, testing, implementation, and closure (Kerzner, 2013).</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	<ul style="list-style-type: none"> <li>Research Findings</li> </ul>
10/05/2016	1	ScienceDirect	Organizational structure	<ul style="list-style-type: none"> <li>It is the extent how responsibility and authority are given to either of the managers that largely shapes the organization” (Petro &amp; Gardiner, 2015, p. 1720).</li> </ul>
10/05/2016	1,3	ScienceDirect	Organizational structure	<ul style="list-style-type: none"> <li>While authority was given to them by the organization, personality and leadership style were mostly likely to impact individuals’ abilities to hold on it said authority. (Mckenna, 2012)</li> </ul>
6/04/2017		Cornell Library Sage	Systematic literature review	<ul style="list-style-type: none"> <li>The steps used within a systematic literature review are: “1) Identify the research question(s); 2) Define inclusion and exclusion criteria; 3) Search for studies; 4) Select studies for inclusion based on pre-defined criteria; 5) Extract data from included studies; 6) Evaluate the risk of bias of included studies; 7) Present results and assess the quality of evidence. (Cornell University, 2016) (Creswell, 2009)</li> </ul>
10/02/2016	1	ScienceDirect	Functional model	<ul style="list-style-type: none"> <li>The functional model was not the most efficient (Hyvräi, 2006).</li> </ul>
10/02/2016	1	Wiley	Functional model	<ul style="list-style-type: none"> <li>The functional model, also known as the traditional model, is an organizational structure that divides organizational units into common specialists (Springer, 2016)</li> </ul>
10/02/2016	1	Book-Wiley	Matrix model	<ul style="list-style-type: none"> <li>“The matrix model enables efficient use of production resources, effective interdisciplinary task integration, and effective project control” (Kerzner, 2013, p. 128).</li> </ul>
10/02/2016	1	Wiley	Matrix model	<ul style="list-style-type: none"> <li>Projects that are short yet complex, complicated design that is both innovative and produced in a timely manner, development of a product that needs advanced skill that is constantly updated and advanced and a rapidly changing marketplace that requires different specifications to a product from the beginning of conception to the final deliverable” (Kerzner, 2013, p. 132).</li> </ul>
10/02/2016	1	Oxford Press	Matrix model	<ul style="list-style-type: none"> <li>One of the main benefits of the matrix method is the increased communication in projects for multi-divisional organizations (Hatch, 2012).</li> </ul>
10/02/2016	1	Emerald Insight	Matrix model	<ul style="list-style-type: none"> <li>Found that matrix organizational structures enable members of a project to create a coherent vision, and that the ability to communicate with group members in different divisions enabled conflict resolution. (Pakarinen, 2016).</li> </ul>
10/02/2016	1	ScienceDirect	Matrix model	<ul style="list-style-type: none"> <li>Matrix managers ensured resources were available when needed as they were responsible for approving the order of said resources, eliminating the need for an intermediary, and increasing the effectiveness of the project by empowering the manager (Hyväri, 2016).</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	Research Findings
10/20/2016	2	Springer	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>Earned Value Management (EVM) is a methodology used to measure and communicate the real physical progress of a project and to integrate time, cost and scope into a single project management and control system" (Vanhoucke, 2014, p. 17).</li> </ul>
10/20/2016	2	Springer	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>"As the ES method is the time earned at AT for the work done expressed in a time unit and used to measure the time performance" (Vanhoucke, 2014, pg 38).</li> </ul>
10/20/2016	2	PMI	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>Lipke (2012, p. 11), found that "as projects nearing the end would appear to have an on-time project schedule even when the project was late, this was due to the decreased deviation between PV and EV causing the SV=0 and SPI=1" (Lipke, 2012, p. 11).</li> </ul>
10/20/2016	2	PMI	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>The development of ES was meant to reduce this error and improve schedule analysis, as well as to determine the time at which the EV increase should have occurred (Lipke, 2012).</li> </ul>
10/20/2016	2	Springer	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>SPI and SV are also calculated using the new method, thus <math>SV(t)</math> is now calculated <math>SV(t) = ES - AT</math>, and <math>SPI(t) = ES/AT</math> (Vanhoucke, 2014).</li> </ul>
10/20/2016	2	Springer	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>The main advantage of the <math>SV(t)</math> and <math>SPI(t)</math> are their ability to generate the correct time performance from project start until finish (Vanhoucke, 2014).</li> </ul>
10/20/2016	2	Springer	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>Cost variance (CV) and schedule variance (SV) are the two major variances that project managers calculate to determine whether a project is over budget or schedule. These variance values are calculated using the EVM metrics: <math>CV = EV - AC</math>, and <math>SV = EV - PV</math> (Vanhoucke, 2014).</li> </ul>
10/20/2016	2	ScienceDirect	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>Through a comparison study of EVM and ES duration estimation Warburton &amp; Cioffi, 2016, could establish that the current theory of duration estimation using ES is linear, and that the ES-based duration formula could also be used for nonlinear profiles (Warburton &amp; Cioffi, 2016).</li> </ul>
10/20/2016	2	PMI	Project scheduling and cost methods	<ul style="list-style-type: none"> <li>ES has been accused of lacking empirical evidence and is another example of how project management is narrow and implicit (Koskel &amp; Howell, 2002; Warburton &amp; Cioffi, 2016).</li> </ul>
10/21/2016	2	ScienceDirect	Cost control	<ul style="list-style-type: none"> <li>EVM brings together scope, cost and schedule and enables project managers to detect budget and time issues (Pajares &amp; López-Paredes, 2011).</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	<ul style="list-style-type: none"> <li>Research Findings</li> </ul>
10/24/2016	2	Book- Wiley	Critical path	<ul style="list-style-type: none"> <li>“Interdependencies of activities,</li> <li>Project completion time</li> <li>Impact of late starts</li> <li>Impact of early starts</li> <li>Trade-offs between resources and time</li> <li>What-if exercises</li> <li>Cost of crash programs</li> <li>Slippages in planning/ performance</li> <li>Evaluation of performance” (Kerzner, 2013)</li> </ul>
10/24/2016	2	Wiley	Critical Path	<ul style="list-style-type: none"> <li>Critical path is the longest path through the network and determines the length of the project (Kerzner, 2013).</li> </ul>
10/24/2016	2	ScienceDirect	Critical chain	<ul style="list-style-type: none"> <li>The critical chain focuses on task order and firm scheduling (Ahlemann, Arbi, Kaiser, &amp; Heck, 2013).</li> </ul>
10/24/2016	2	Wiley	Critical chain	<ul style="list-style-type: none"> <li>The critical chain derived from the methodology called the theory of constraints Dr. Eliyahu M. Goldratt is credited with the creation and development of both methodologies (Kerzner, 2013, p. 639).</li> </ul>
10/24/2016	2	Wiley	Critical chain	<ul style="list-style-type: none"> <li>Kerzner (2013) outline Goldratt’s five focus steps to develop the critical chain, these steps are:</li> <li>“Identify the system’s constraints.</li> <li>Decide how to exploit the constraint.</li> <li>Subordinate everything else to the above decision.</li> <li>Elevate the system’s constraints.</li> <li>If, in a previous step, the system’s constraint has been broken, go back to step 1.”</li> <li>(Kerzner, 2013, p. 639)</li> </ul>
10/24/2016	2	ScienceDirect	Critical chain	<ul style="list-style-type: none"> <li>The critical chain has become a project management standard and norm as the critical chain has proven itself to be effective through numerous empirical studies (Ahlemann, Arbi, Kaiser, &amp; Heck, 2013).</li> </ul>
10/24/2016	2	ScienceDirect	Critical chain	<ul style="list-style-type: none"> <li>Critical chain operates on the assumption that resources are limited which is not the assumption in traditional project methods (Zhang, 2016).</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	<ul style="list-style-type: none"> <li>Research Findings</li> </ul>
10/24/2016	2	ScienceDirect	Critical chain	<ul style="list-style-type: none"> <li>Concluded that the critical chain method is the most effective approach for project planning. (Zhang, 2016), (Izmailov, Korneva, &amp; Kozemiakin, 2016)</li> </ul>
10/01/2016	3	Sage	Leadership in project management	<ul style="list-style-type: none"> <li>“A process whereby an individual influences a group of individuals to achieve a common goal.” (Northouse, 2013, p.5)</li> </ul>
10/01/2016	3	ScienceDirect	Leadership in project management	<ul style="list-style-type: none"> <li>Found that the greatest link to project success comes from a project manager’s ability to tailor project management methodology to solve problems. (Joslin &amp; Müller, 2015)</li> </ul>
09/29/2016	3	HBR Press	Emotional intelligence	<ul style="list-style-type: none"> <li>“The capacity to be aware of, control, and express one’s emotions, and to handle interpersonal relationships judiciously and empathetically” (Goleman, 2011, p. 8).</li> </ul>
09/29/2016	3	HRB Press	Emotional intelligence	<ul style="list-style-type: none"> <li>The major components of emotional intelligence as: self-awareness, self-regulation, motivation, empathy, and social skills. (Goleman, 2011)</li> </ul>
09/29/2016	3	ScienceDirect	Emotional intelligence	<ul style="list-style-type: none"> <li>Found there to be a link between a project manager’s emotional intelligence and the success of the project. (Rezvani, et al. (2016) (Müller &amp; Turners 2007)</li> </ul>
09/29/2016	3	ScienceDirect	Emotional intelligence	<ul style="list-style-type: none"> <li>Project managers that lacked emotional intelligence struggled to handle the strain that occurs during complex projects which can lead to frustration, stress and low performance. (Thomas &amp; Mengel, 2008)</li> </ul>
09/29/2016	3	ScienceDirect	Transformational leadership	<ul style="list-style-type: none"> <li>A transformational leader focuses on people and their motivations, beliefs, and behaviors, and provides them with visions that satisfy their needs and desires. (Lusser &amp; Achua, 2009) (Tyssen, Wald, &amp; Spieth, 2014)</li> </ul>

Date of Search	Research Question [1,2,3]	Data Source	Search Terms	<ul style="list-style-type: none"> <li>Research Findings</li> </ul>
09/29/2016	3	Sage	Transformational Leadership	<ul style="list-style-type: none"> <li>Transformational leadership is the process whereby a person engages with others and creates a connection that raises the level of motivation and morality in both the leader and the follower” (Northouse, 2013, p. 186).</li> </ul>
09/29/2016	3	ScienceDirect	Transformational Leadership	<ul style="list-style-type: none"> <li>“The theory of transformational leadership assumes that a leader is able to bring about positive changes in followers' values, attitudes, perceptions, and expectations in a permanent organization” (Tyssen, Wald, &amp; Spieth, 2014, p. 368; Bass, 1999; Yuki, 1999)</li> </ul>



## APPENDIX B. CLASSIFICATION SCHEME

### General Information

Title  
 Publication year  
 Journal citations -Elsevier ScienceDirect,  
 Wiley Online Library, Sage and Springer  
 Oxford  
 Emerald Insight  
 IEEE  
 HBRPress  
 Canterbury  
 Pergamon  
 JSTOR  
 Author(s)

### Data Analysis

Qualitative  
 Quantitative  
 Mixed-Study

### Research Strategy

Survey research Literature Study Meta-study  
 Single case study Multiple case study Quantitative modelling

### Data Collection

Questionnaire  
 Interview  
 Secondary analysis  
 Experiment  
 Observation  
 Literature review, academic  
 Focus group  
 None specified

### Industry Sector

Small and Medium enterprises  
 Construction  
 Health care  
 Private Sector  
 Education  
 Manufacturing

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