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The final state convergence model

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Abstract

Purpose – The purpose of this paper is to expand project management theory about practice and theory for practice through a new conceptual model developed from the transformational production management, strategic management and complexity bodies of theory.
Design/methodology/approach – This research uses a grounded theory methodology. A preliminary model is developed and tested against two case studies. The model is revised and tested using a purposively selected focus group before being presented in this paper.
Findings – The research indicates that the "final state convergence model" which has been synthesized from the transformational production management, strategic management and complexity theories. The model illuminates the complexities that can exist within the practice of project management.
Research limitations/implications – The final state convergence model provides a novel approach to synthesizing new bodies of theory into traditional project management theory.
Practical implications – The model challenges practitioners to think beyond their current conceptual base of traditional project management methodologies, systems, and processes toward a broader conceptualization of project management.
Originality/value – The research adds to the theory about practice and theory for practice through the development of a new model which not only illuminates the complexities of project management but enriches and extends the understanding of the actual reality of projects and project management practices.

Keywords Complexity, Lived experience, New model

Paper type Research paper

1. Introduction

Project management is a profession that is outgrowing its traditional theoretical foundations (Koskela and Howell, 2008; Winter *et al.*, 2006). Many modern-day project managers are attempting to deal with the challenges of Mega, Wicked and Complex projects (Oehmen *et al.*, 2015; Giezen, 2012; McCall and Burge, 2016) using methods, systems and processes based on theoretical foundations that are over 100 years old and specifically developed to assist factory managers set out production machinery and increase operational efficiency (Taylor, 1911; Usher, 2014).

These challenges have been noticed by project management researchers and practitioners alike as they become increasingly aware of a widening divide developing between project management theory and practice (McKenna and Whitty, 2012; Cooke-Davies *et al.*, 2007; Morris, 2010). In 2006, the Rethinking Project Management Network (the "Network") proposed an agenda for the future of project management research (Winter *et al.*, 2006). One of the main findings of this research was:

> […] that the extant project management body of thought is [not] worthless and should [not] be abandoned, but rather that a new research network was required to enrich and extend the field beyond its current intellectual foundations […] (p. 639).

In an attempt to address this theory-praxis divide project management researchers have begun exploring alternate bodies of theory which might augment the classical theoretical foundations of project management and assist in understanding how projects could be better managed in the modern-era (Walker, 2015; Klein *et al.*, 2015). Our research builds on

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this previous research by exploring three bodies of theory that have been previously been proposed as alternate bodies of theory for developing the discipline of project management. Our goal is to expand project management theory about practice and theory for practice through a new conceptual model.

Similar to the Network's research we began by reviewing transformational production management, which has been proposed as the traditional theoretical foundation of project management (Koskela and Howell, 2008). From there we reviewed two, more recently proposed alternatives; strategic management (Patanakul and Shenhar, 2012; Dvir and Lechler, 2004) and complexity theory (Padalkar and Gopinath, 2016; Cooke-Davies *et al.*, 2007). Our aim was to determine what can be learnt from these bodies of theory that might enrich and extend the field of project management research.

The intention of our paper is not to provide specific support for any one of these particular bodies of theory in relation to project management, instead our paper focuses on addressing one obvious deficiency in relation to all three bodies of theory within the project management construct. The deficiency that although each of these bodies of theory has previously been investigated as theories to augment project management, all three have been addressed as discrete fields of research. Our investigations indicate that no model has been developed to assist researchers and practitioners understand how these theories might be combined within the field of project management.

Using a grounded theory methodology, we developed an initial model based on a review of the extant literature and our experiences as project management practitioners. This model was tested against two case studies and revisions were made to the model. The revised model was then tested by a focus group. The data provided through that focus group was utilized to further refine the model, before being presented in this paper.

Our research culminates in the development of the final state convergence model. This model appears to address a number of the directions that the Network recommended for additional research in project management. First, our model helps explain the "lived-experiences" of project managers. Second, our model is supported by a broader theoretical basis than just the traditional project management body of theory.

2. Research problem

Project management researchers and practitioners are becoming increasingly aware of a widening divide developing between project management theory, the environment in which project managers are required to operate, and the practices and tools adopted to deliver projects (Williams, 1999; Morris, 2010; McKenna and Whitty, 2012; Koskela, 1999; Cooke-Davies *et al.*, 2007).

To investigate this in more detail the UK's Engineering and Physical Sciences Research Council commissioned a research project, The Rethinking Project Management Network (the Network). The goal of this research project was to explore how the discipline of project management could be expanded beyond the traditional conceptual foundations into new areas which could augment and enhance the theory and practice of project management (Winter *et al.*, 2006). The research undertaken by the Network found that there was "[…] a strong need for new thinking to inform and guide practitioners beyond the current conceptual base […]" (p. 640). In response to their findings the Network presented a framework of five directions which they felt the discipline of project management needed to develop in order to meet the challenges of modern projects.

The Network categorized these five directions into three major themes. First, is the need to develop new theory about practice; the second is to develop new theory for practice; the third is the development of theory in practice. (Winter *et al.*, 2006). Our research is positioned within the categories of theory about practice and theory for practice.

2.1 Theory about practice

According to the Network, the focus of any research into the theory about practice should be to assist the project management community to understand the practice of project management (Winter *et al.*, 2006). They recommended research in this category focus on developing "[…] new models and theory which recognize and illuminate the complexity of project management […]" and explore "[…] new ontologies and epistemologies which extend and enrich our understanding of the actual reality of projects and project management practice […]" (p. 643).

Within the theory about practice category, the Network call for new models of project management that move away from the simple, life-cycle-based models that have dominated project management theory, toward models which can embrace and explain the complexity that many project manager's experience. These new models may not immediately produce practical tools or systems for application in the daily management of projects, however, they should cause researchers and practitioners to contemplate projects from different perspectives and paradigms so that the traditional notions about project management can be challenged and redefined (Winter *et al.*, 2006).

In consideration of the new models which could be developed within the theory about practice category, the Network stated that these models will need to emerge from "[…] organized interactions between theory and practice, between academics and practitioners […]" (p. 643). In other words, any new models developed for explaining and understanding the complexities of project management needs to link theory and practice through the actuality of practitioners "lived-experiences" (Cicmil *et al.*, 2006; van der Hoorn, 2015, 2016).

2.2 Theory for practice

According to the Network, the aim of research into theory for practice should be to develop concepts and approaches to project management that have the potential for practical application. In defining the category of theory for practice, the Network call for "[…] new images, concepts, frameworks and approaches to help practitioners actually deal with complexity in the midst of practice […]" (p. 643).

In order to develop new theories for practice, researchers need to create alternative images of project management that not only challenge the traditional, deterministic models but also challenge the assumption that the deterministic model is the actual reality of project management (Svejvig and Andersen, 2015). By challenging these fundamental tenets of project management, researchers can free themselves to re-conceptualize project management. New perspectives and images can help the project management community gain a deeper understanding of what is actually occurring in projects, as well as revealing new practices that may not have been readily apparent when projects were viewed through the lens of classical project management (Morgan *et al.*, 1997; Winter and Szczepanek, 2007).

Within the category of theory for practice, the Network outlined directions they believed project management research should explore further. Our research addresses "Direction 4" which calls for research that moves from the current, narrow understanding of project management with its assumptions of well-defined starting objectives, lineal and sequential processes and rigidly defined project boundaries, toward a broader conceptualization that can incorporate unclear starting objectives, multiple project purposes, and permeable and contestable project boundaries (Winter *et al.*, 2006; Morris, 2002).

3. Literature review

3.1 Rationale for theory selection

Three bodies of theory were purposively selected for review in this paper; these are transformational production management, strategic management and complexity theory.

The purposeful selection of theoretical constructs for examination is not uncommon in a grounded theory methodology. Milliken (2010) notes that grounded theory research often commences with the researcher's own experiences and interpretations of their environment. Furthermore, it is precisely because of these subjective experiences that potential alignment and deviations from existing theoretical constructs are noticed and emergent themes recognized (Milliken, 2010).

We acknowledge that other bodies of theory have been proposed as potential foundations for project management theory. Our research does not discount these bodies of theory, and we propose future research to investigate other theoretical foundations. However, due to the constraints associated with journal article lengths, we had to limit the theories which could be included for review in this paper.

Transformational production management was selected because it has already been proposed as the traditional basis for project management theory (Koskela and Howell, 2008). Many of the processes and tools utilized in modern-day project management have been developed from underpinning theories of transformational production management (Vidal, 2008; McKenna and Whitty, 2012). We felt it was important to consider the traditional theoretical foundations of project management within our research so as not to summarily "abandon" the extant project management body of thought by assuming that the classical theoretical foundations are "worthless" (Winter *et al.*, 2006).

Strategic management was selected because previous research has already identified it as a possible complementary theory to the traditional project management paradigm (Patanakul and Shenhar, 2012; Davies and Hobday, 2005; Killen *et al.*, 2012; Jugdev and Mathur, 2006). Strategic management theory appears to share commonalities with project management. Specifically both practices attempt to provide temporary and unique outcomes (Hitt *et al.*, 2011; Porter, 1980; Project Management Institute (US), 2013); both require the codification of intangible concepts at inception (Schaap, 2012; Mintzberg, 1994; Hart, 1992; Ingason and Jónasson, 2009); both are applied in complex environments characterized by unpredictability and dynamism (Bracker, 1980; Steiner and Miner, 1972; Mintzberg, 1973; Hällgren and Wilson, 2008; Ives, 2005); and the practitioners in both fields approach their subject matter as generalist, rather than specialists (Steiner and Miner, 1972; Williams and Samset, 2010).

Complexity theory was selected primarily because it provided a potential basis for understanding the dynamic environments in which project managers operate (Tsoukas, 1998; Collyer *et al.*, 2010; Collyer and Warren, 2009). Aritua *et al.* (2009) have noted that, traditionally, the practice of project management has been dominated by hard paradigms and reductionist techniques which fail to address the chaotic nature of the project management construct. Researchers such as Cooke-Davies *et al.* (2007), Baccarini (1996) and Pollack (2007) have all identified the benefits that complexity theory might offer to the discipline of project management.

3.2 Transformational production management

Koskela (2000) argues that project management has previously been classified as a subset of production and operations management. More specifically that it has been adapted from the transformational production management body of theory (Koskela and Ballard, 2006; Koskela, 1999).

There does appear to be merit in this perspective as the theoretical foundation of production management can be readily seen in many of the frameworks and methodologies employed by project managers. Project management tools and practices such as the Gantt chart, Work Breakdown Structures and the "Iron Triangle" are based on reductionist techniques that can be traced directly to transformational production management theory (Koskela and Howell, 2002; Vidal, 2008; Starr, 1964; McKenna and Whitty, 2012).

Transformational production management theory is founded upon three key theories. These are Taylorism, Fordism and Shewhart's quality control theories (McKenna and Whitty, 2012, 2013; Koskela and Howell, 2002; Wright, 1993; Williams, 1999). Usher (2014) has suggested that each of these theories is borne from certain assumptions that may not be supported by practitioner's "lived experience."

Taylor's theory of scientific management (Taylorism) is underpinned by assumptions that the sum of the whole (work) can be decomposed into a number of smaller elements (tasks) without losing any value (Starr, 1964); that the production process, once scientifically planned, will not need to be changed by the workers (i.e. the production environment is stable and tasks maintain linearity and sequentiality) (Koskela *et al.*, 2007); that all deviations from the scientifically planned process will produce less than optimal outcomes (Pruijt, 2003); and that workers lack the ability, intellect or creativity to improve on the scientifically planned process (Taylor, 1911).

Braverman (1998) outlines how Fordism was developed from Taylor's theories and carries with it all of Taylor's foundational assumptions. However, Fordism was further developed to incorporate the assumptions that tasks, workers and machinery can be further decomposed to create a single economic unit for the purpose of controlling cost (Williams *et al.*, 1992); and that production efficiency and cost reduction is best served through the application of a "push-system" whereby the preceding production process relentlessly drives inputs into the subsequent processes without any consideration as to whether these downstream processes have the capacity to accept the new work (Naruse, 1991; Braverman, 1998).

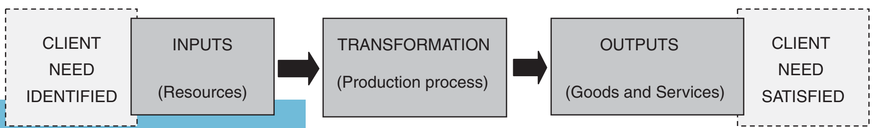
Shewhart's quality theory is based on the assumptions that the production process is highly repetitive which allows for continual adjustment within a strictly controlled environment; that the scientific method of delivery (Taylorism) invariably produces the most efficient method of production (Shewhart, 1931); and that exact quality outcomes can be achieved if enough management oversight is applied during the production process (Boje and Winsor, 1993).

3.2.1 A model of transformational production management. From these three theories (Taylorism, Fordism and Shewhart), a model of transformational production management has evolved. Starr (1964) argues that, regardless of the level of complexity required, production can always be viewed as a basic input-output system.

The transformational model of production management starts with a client's needs. The fulfillment of these needs requires inputs (resources) to undergo some form of transformation. This transformation process modifies these resources into the form desired and then discharges them as outputs which ultimately satisfies the client's original needs. (Starr, 1964). This system is shown in Figure 1.

In reviewing the transformational model of production management, we felt this model appeared to provide a suitable meta-level construct for explaining the practice of project management. However, we also felt that many of the assumptions which have been used to develop this model do not support the practitioner's "lived experience" – specifically, the assumptions regarding linearity and sequentiality of the processes and tasks, and that project management is conducted in a stable delivery environment (Gudienė *et al.*, 2013; Usher, 2013; Hällgren and Wilson, 2008).

Figure 1.
Transformational production management model



3.3 Strategic management theory

Henry Mintzberg (1989) proposed ten schools of thought within the strategic management body of theory. These can be thought of as ranging from purely deliberate to purely incremental theories (Mintzberg, 1989, 1990, 1994; Mintzberg and Waters, 1985; Wiesner and Millett, 2012). For the purpose of this paper we will review only two of these schools of thought, these are the Deliberate (Design) school, and the Emergent (Incremental) school. We elected to address these two schools of thought as they have been recognized as the polar opposites on the strategic management continuum (Neugebauer *et al.*, 2015; Mintzberg and Waters, 1985) and therefore we considered these to encapsulate the entire strategic management body of theory between them.

3.3.1 Deliberate (Design) school. The Deliberate school (Design school) advocates a methodical and analytical approach to strategy development (Acur and Englyst, 2006; Pettigrew, 1992). Strategist adopting the Deliberate school of thought assess their organization's external environment for opportunities and threats, and critically evaluate its internal capabilities for strengths and weaknesses (Andrew, 1987; Fletcher and Harris, 2002; Hitt *et al.*, 2011; Johnson *et al.*, 2011). This assessment allows planners to formulate and codify specific strategies into formalized statements and present them to implementers (Schaap, 2012; Hart, 1992; Mintzberg, 1994).

Deliberate strategies have easily recognizable characteristics. First, they express their ultimate goal as a complete, priori statement of intent before the commencement of the implementation process (Mintzberg, 1987; Wiesner and Millett, 2012). Second, they rely heavily on detailed planning (Söderholm, 2008; Perminova *et al.*, 2008). Finally, they evaluate progress against predetermined performance metrics (van der Hoorn, 2016; Milosevic and Srivannaboon, 2006; Usher and Whitty, 2017).

3.3.2 Emergent school. The Emergent school (Incremental school) postulates that within complex and dynamic environments the concept of adhering to a complete, priori statement of intent is illogical and futile (Quinn, 1978; Neugebauer *et al.*, 2015). The Emergent school advocates that strategies must remain adaptive if they are to meet the challenges that can arise in dynamic environments (Loasby, 1967; Fletcher and Harris, 2002).

The Emergent school argues that the only logical means for coping with a dynamic environment is to let the final outcome be shaped and formed by it (Quinn, 1978; Neugebauer *et al.*, 2015; Garg and Goyal, 2012). The Emergent school postulates that optimal outcomes can only be achieved by allowing the countervailing forces of risk, opportunities, threats and new information to create an unintended order from broad guiding principles (Quinn, 1978; Mintzberg and Waters, 1985; Wiesner and Millett, 2012; Johnson *et al.*, 2011).

3.3.3 Deliberate and Emergent models. The Deliberate and Emergent schools of Strategic Management are two different processes for arriving at a realized strategy (Johnson *et al.*, 2011; Rose and Murphy, 2015). Figure 2 provides a conceptualization of these two schools as originally envisaged by Mintzberg (1994). The fundamental concepts of this original model are still accepted by strategy academics in the modern era, testifying to the efficacy of the original model (Johnson *et al.*, 2011).

This model suggests that a realized strategy can be achieved either by the application of a Deliberate strategy (i.e. pre-existing plans that are monitored and controlled to achieve the required outcome), or an Emergent strategy (i.e. the realized strategy is shaped by environmental forces). However, this model also implies that these processes are mutually exclusive.

We felt that this exclusivity may present some difficulties when applied to the practice of project management. Usher (2014) notes that project manager's exhibit characteristics of Deliberate strategy when they develop project management plans, schedules and cost plans, while concurrently exhibiting characteristics of Emergent strategy when adapting these plans to a dynamic construction environment.

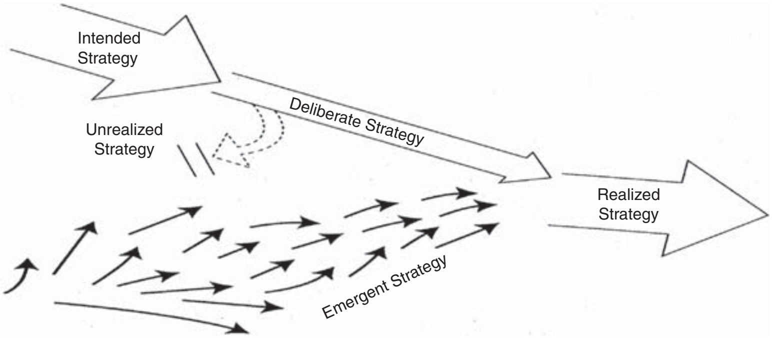


Figure 2.
Deliberate vs emergent strategies

Source: Adapted from Mintzberg and Waters (1985)

3.4 Complexity theories

Hawking (2000) predicted that the twenty-first century will be the century of complexity. This forecast has never been more true than in the field of project management. The Project Management Institute (US) (2013) states "[…] complexity is not going away, and will only increase […]" (p. 5) and Bakhshi *et al.* (2016) claim that complexity is one of the most important issues facing modern project management. In light of this, it would appear that complexity theory should be considered when attempting to augment the current theory of project management.

Complexity theories are developed from a broad range of academic fields including mathematics, life sciences and physical sciences. Complexity theories differ from other theories in that they attempt to, not only explain ideas and objects, but also to address the complex nature of the relationships that exist between these elements. Complexity theories have been applied to model dynamic systems such as weather patterns, viral infections, natural disasters, traffic networks and the world market (Ottino, 2003; Weick, 1990; Sellnow *et al.*, 2002; Cooke-Davies *et al.*, 2007).

Complexity theories attempt to explain how order, novelty and structure can arise from chaotic systems or how diverse behaviors can emerge from seemingly simple rules (Tsoukas, 1998; Cooke-Davies *et al.*, 2007; Levy, 2000). Over recent years, researchers have been investigating how complexity theory can increase our understanding of project management (Williams, 1999; Melgrati and Damiani, 2002; Richardson *et al.*, 2005; Pollack 2007; Bakhshi *et al.*, 2016; Ireland, 2013).

Complexity theories can help us understand complex adaptive systems. Stacey *et al.* (2000) explain that complex adaptive systems consist of a large number of interconnected elements and agents. Because of this plethora of connections, complex adaptive systems may appear to be chaotic, however, these systems actually behave according to their own set of order-generating rules (Zuo and Tie, 2016; Toner and Tu, 1998).

He *et al.* (2015) and Fernandez-Solis (2013) argue that construction projects are complex adaptive systems. Construction projects exhibit primary and secondary inter-relationships between their elements: they are open system that perform adaptively; they are self-organizing and have emergent tendencies; they consist of agents whose behaviors adapt to dynamic environments; they incorporate multiple feedback loops; and they progress in non-linear sequences (Cvitanovic, 1984; Thiétart and Forgues, 1995; Tsoukas, 1998).

Because of the adaptive behavior and interconnectivity that exists between agents in complex adaptive systems, these systems need to be considered as more than the sum of their individual parts. That is, the benefits, risks and challenges faced within these systems cannot be completely capitalized on, or mitigated, using reductionist tools or systems. (Aritua *et al.*, 2009; Cooke-Davies *et al.*, 2007).

Stacey (2007) identifies three models of behavior within complex adaptive systems. These are: stable equilibrium, explosive instability and bounded instability. Tetenbaum (1998) highlights that complex adaptive systems which display the characteristics of bounded instability can transform unpredictable disorder into irregular but similar forms, not unlike snowflakes which are all unique but all have six sides. Stacey (2007) notes that systems which display bounded instability appear to have the greatest ability to transform themselves and gain the most advantage from their environment.

Burnes (2005) highlights that systems which operate under the conditions of bounded instability are "[…] continually poised at the edge of chaos […]" (p. 79). It has been argued that a complex adaptive system which is constantly at the edge of chaos is operating at its optimal performance (Lewis, 1994; Kauffman, 1993). However, as Burnes (2005) rightly identifies, the conditions which create optimal performance in these systems can very quickly cause the system to devolve into utter chaos thereby causing the destruction of the system itself.

Anderson (1999) explains that the governing factor in whether a complex adaptive system operating under conditions of bounded instability operates effectively, or brings about its own destruction, is the number of interactions within the system which stay within the upper and lower limits of the order-generating rules. Where interactions between agents within the system remain between the upper and lower limits created by the order-generating rules, the feedback loops remain connected and the system can continue to adapt. However, if the interactions remain outside the limit of these rules for any length of time the system itself can become hopelessly and irrevocably unstable (Simon, 1996; Dasgupta, 2016).

Identifying a single model that conceptualizes complexity theory is extremely difficult. The primary reason for this is that "complexity theory" is not a cohesive theory (Ireland, 2013), rather it is a group of ideas regarding the dynamics of change in complex systems (Ferreira, 2001). As a result there are a myriad of models postulated to conceptualize complexity theory, and none of these are universally accepted as an accurate representation.

Although a single model has not be accepted, researchers commonly use network diagrams to conceptualize complexity theory (Strogatz, 2001; Boccaletti *et al.*, 2006; Newman, 2003). These diagrams are utilized because they help visualize the non-linearity and non-sequentiality that can exist in a complex system (Figure 3). Although having many benefits in the conceptualization of complex systems, we felt network diagrams had very little to offer project managers by way of practical tools for navigating the project management process.

4. Research question

A review of the literature has identified a potential disparity between the traditional project management body of theory and the "lived experiences" of project management practitioners.

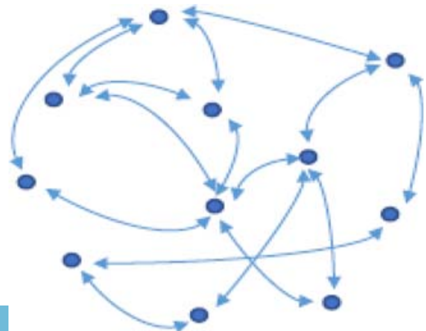


Figure 3.
A simple network diagram

Other researchers have proposed transformational production management, strategic management and complexity theory as a possible means for addressing this. These bodies of theory appear to help explain some elements of the project management experience, but none completely reconcile the theory-praxis divide.

The transformational production management body of theory appears to provide an acceptable meta-level construct to explain project management, however, its assumptions of linearity, sequentiality and environmental stability do not appear to be supported by the current body of project management knowledge.

The strategic management body of theory may provide some context for the "lived experience." However, the exclusivity for realizing the project's Final State that is implied within the Deliberate and Emergent schools may prove problematic in the project management construct.

Complexity theory addresses the issues of non-linearity and non-sequentiality, as well as providing a means for conceptualizing complex systems. However, no universally acceptable models of complexity theory exist and network diagrams provide little assistance in terms of practical tools for managing projects.

In addition to all this, there does not appear to be any discussion in the extant literature as to how these bodies of theory might relate to each other, or when and how project managers should apply each of them to optimize their combined use.

Therefore, a valid research question would appear to be:

> Can a model be synthesized from the transformational production management, strategic management and complexity bodies of theory that illuminates the complexities of projects and provides a broader conceptualization of the "lived experience" of project management?

5. Research methodology

Our research utilizes a grounded theory methodology which presupposes a subjectivist ontology (Locke, 2003). Glaser and Strauss (1967) characterize this research approach as one oriented toward the inductive generation of theory from data that have been systematically obtained and analyzed. The grounded theory methodology is especially suited to generating theory and developing novel models which relate to social processes (Glaser and Strauss, 1967; Glaser, 2014; Bryant and Charmaz, 2007).

Grounded theory research is undertaken within a specific context and develops through a simultaneous, non-sequential process of data collection and analysis (Glaser and Strauss, 1967; Locke, 2003; Milliken, 2010). The grounded theory methodology is an iterative process which cannot be formally planned in advance, as it must remain flexible enough to react responsively to emergent themes (Wastell, 2001). Franco (2005) highlights that this iterative process creates both time and space within the research to allow a deeper understanding of the key research issues to develop.

5.1 Overview of grounded theory as applied to this study

Our research took place over a six-month period. The grounded theory methodology was applied to our study in ten steps across three stages (Figure 4). The initial planning involved a preliminary review of the extant literature to allow conceptual sensitization (Milliken, 2010) and reflection on the researchers' own experiences to inform and guide the initial research (Blumer, 1969). As a result of this process the first model (Figure 5) was developed.

This first version of the model was tested against two historical case studies. Case studies within a grounded theory study can be viewed differently to those utilized in a positivist approach (Patton, 1990). In grounded theory, case studies can be purposively selected and can become an object of study in themselves (Stake, 1994). This is the approach

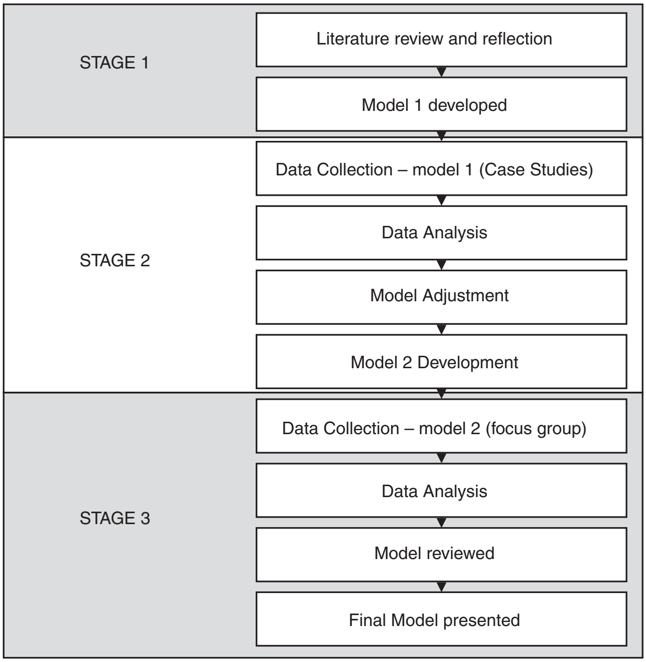
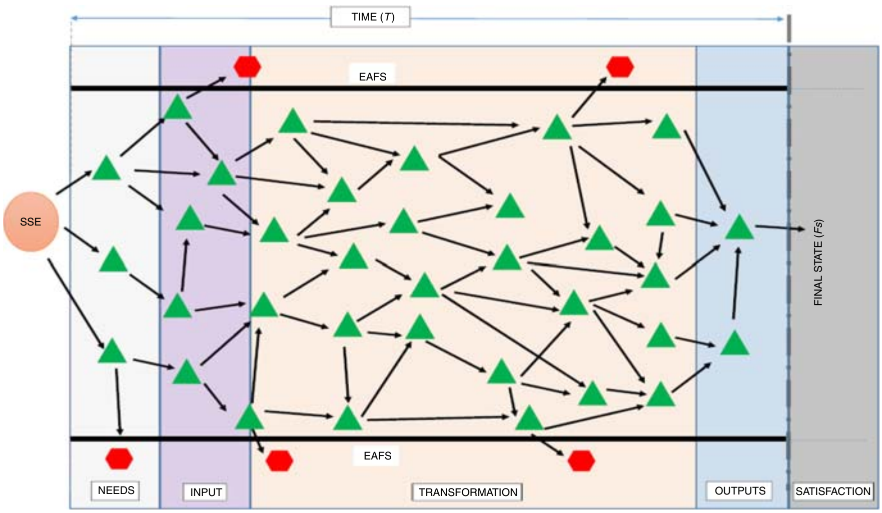


Figure 4.
Research methodology



Notes: SSE, Start State$_{\text{Existing}}$; FS, Final State; EAFS, Extent of Acceptable Final States; *T*, time

Figure 5.
Conceptual model (v1)

that we have taken in this paper, and as such, we would consider the case studies contained within this paper to fall into the "instrumental" classification as noted by Stake (1994, 1995). These case studies were purposively selected because of the potential insights they appeared to offer into this area of research.

Based on these case studies a second version of the model (Figure 8) was developed. This was tested in a focus group. Using the data collected in the case studies and focus group, we reassessed the model against the categories identified in the preliminary review before proposing it as the final model for consideration in this paper.

5.2 Grounded theory methods of analysis

The data collected during each of the research stages was evaluated using a general inductive approach. As recommended by proponents of the grounded theory methodology, the data collected in our case studies was first segmented and then coded (Glaser, 2007, 2014; Glaser and Strauss, 1967; Locke, 2003; Milliken, 2010; Bryant and Charmaz, 2007).

These codes were entered into a qualitative software program (NVivo 10) where they were subjected to numerous reviews in order to identify dominant or frequent themes (categories). Once identified, these categories were conceptualized into elements which were used to form components in the model.

These categories, now in the form of the model, were tested again through a different data collection method (focus group) to achieve data triangulation (Glaser and Strauss, 1967; Locke, 2003). The process used to develop the model is outlined in more detail in the following section.

6. Model development

6.1 Version 1 of the model

Researchers such as Aggerholm *et al.* (2012), Joiner *et al.* (2002) and Glaser (2014) have noted the misinterpretations that can arise when technical people use jargon to discuss their discipline. To mitigate this risk, we made a decision to avoid use of traditional project management definitions and terminology where possible. For us, this began by reconceptualizing the definition of a project.

Van der Hoorn and Whitty (2015) conceptualize the experience of project work to be a situation that arises when there is a lack of innate capability of the individual or organization to deal with the work at hand. This deficit may exist for a range of reasons including, but not limited to, a lack of technical ability; a decision not to use their technical capability for this project process; risk reduction; or to ensure probity.

Building on the concept of "capability deficit" we adapted Pich *et al.*'s (2002) work and defined a project as: "The process of transitioning from a Start State to a new Final State in an environment in which the client Organization acknowledges they have a capability deficit."

With a new definition of projects agreed, we commenced the development of our model by reflecting on our experiences and reviewing the extant literature on transformational production management, strategic management and complexity theories as they related to project management. Based on this data we developed a preliminary model for testing (Figure 5).

Our model conceptualizes a project as moving through the five stages outlined in the transformational theory of production management. These are needs, inputs, transformation, outputs and satisfaction. The project transitions from an existing state which we term the Start State$_{\text{Existing}}$ to a new state, which we term the Final State. This transition takes place across a set time period and within certain boundaries which are the parameters set by the client. These parameters may include budget, functionality, unique organizational requirements, etc. These parameters create the Extent of Acceptable Final States from which the Final State could potentially emerge.

In our model, the green triangles represent points in the project management process when the project manager needs to make a decision about what course of action to pursue. At each of these decision points there are a range of potential actions available to the project manager. These actions (black arrows) represent the possible pathways available to achieve the project's final outcome and stand in contrast to the linearity and sequentiality that underpins the transformational production management body of theory.

Where these choices result in an action that moves toward the Final State and remains within Extent of Acceptable Final States, an elaborating choice can be made (i.e. movement from one green triangle to another). Conversely, if the action results in an unacceptable outcome, one that will end outside the Extent of Acceptable Final States, the action cannot be pursued further. In our model, this action is represented by an arrow from a green triangle to a red hexagon.

6.1.1 Testing version 1 of the model. With a preliminary model developed, we tested it by reviewing it against two projects which were purposively selected as case studies for this research. The rationale for selecting these projects as cases studies was that:

(1) Both projects had been completed within 12 months of the development of the model. Thus, the process was clearly recollected.

(2) Researcher 1 had been involved in the projects from inception to completion. Hence, the model could be tested against the entire project management process.

Before undertaking the coding process we outlined five themes that we felt would need to be identifiable to support the preliminary model we had developed. These themes and their definitions are included in Table I.

6.1.2 Case study 1. This project was delivered for the Australian Department of Defence. The purpose of this project was to develop a close training area facilities to support new capabilities for seven user groups. The project was delivered in accordance with the Department of Defence's traditional Head Contract process. At the end of the design review process, tenders were called and evaluated in accordance with the Commonwealth Procurement guidelines. A preferred tenderer was selected for the purpose of negotiations.

Prior to the commencement of contract negotiation with the preferred tenderer, the sponsor's representative was deployed to another posting and a new representative was appointed to the project.

During the negotiation period, the new sponsor's representative advised all parties that the project budget had to be reduced by 43 percent. The project manager undertook a scope reduction workshop with the new sponsor's representative and user groups. The outcome of this workshop was a reduced project scope and an endorsed, prioritized and costed list of scope items to be reintroduced into the project as risks were retired and contingency funds were released. The contractor agreed to the reduced scope and the construction contracts were duly executed.

The physical construction of the facilities took nine month. Throughout this process the project manager met with the sponsor's representative and user groups at least monthly. All variations were reviewed and approved by the sponsor's representative prior to being executed by the project manager.

During construction the project manager worked collaboratively with the contractor and the sponsor's representative and user groups to implement the risk mitigation strategies

Theme	Definition
Parameter	A constraint which defines the extent from which the Acceptable Final State can emerge
Expectation	A characteristic or event which provides an understanding of the stakeholder's expectations of the project outcomes
Pathway	A point or event at which multiple possible directions could be selected and from which a different path to the final outcome could be created
Satisfaction	An event which impacts stakeholder's feelings of satisfaction with the project
Success	Objective criteria which indicated whether the project could be considered a success or failure

Table I. Themes and definitions

necessary to reduce the contingency allocations. As the works progressed and risk contingencies were retired, the project manager was able to reintroduce three previously removed scope items from the endorsed scope list.

Two weeks prior to practical completion the original sponsor's representative was reintroduced to oversee the final delivery of the project. During his absence from the project the original sponsor representative had no visibility of the project nor was he involved in any of the communication regarding scope reduction, risk mitigation strategies and reintroduction of deliverables.

The project was completed 0.15 percent under budget. The contractor was awarded practical completion two days prior to the contracted date for practical completion. All identified defects were rectified and closed out to the satisfaction of the sponsor's representative and user groups.

Following practical completion, the project manager facilitated a Post Occupancy Evaluation and Lessons Learnt workshop. This workshop was attended by both the original and new sponsor's representative, the user groups, design services consultants, the contractor and the project manager. At this meeting, the sponsor's representatives and user groups commended the project manager and contractor for completing the project on time and under budget. However, they also expressed their dissatisfaction with the project stating the reduced, final project outcomes seriously impacted on the operational functionality and capability requirements originally envisaged. In particular, the original sponsor's representative expressed displeasure regarding the facilities that were removed from scope as a result of the reduced budget.

6.1.3 Case study 2. This project was undertaken for a not-for-profit service provider in Australia. The stated objective of this project was to prepare a business case for the development of a mixed-use, intergenerational, community living precinct. The project manager was engaged to undertake scope definition through focus groups, semi-structured interviews and workshops; procure the technical disciplines required to develop a master-plan; and draft a business case for endorsement by the sponsor's governing body.

The development was planned to take place across 11 separate land titles, held by two business units within the client organization. One of the business units held title over three lots but had minimal liquid assets available for development. The second business unit held title over eight lots and had sufficient liquidity to undertake the development.

To gain approval through the organization's governance structure the project manager was required to obtain endorsement from five levels of governance with representatives from ten different departments. Many of these representatives had not been involved in any large-scale construction projects before.

Four master-planned options were approved for inclusion in the final business case. Multiple funding options were explored for each master-planned option and the associated financial hurdle rates were assessed. At the submission of this deliverable, the project had run 25 weeks over the original forecast (75 percent overtime) and was 39.7 percent over the original project budget. During the delivery of the project, one of the business units (the three lot title holder) had extracted themselves from the process and advised they did not wish to be involved with any further development plans.

At the presentation of the business case, the remaining organizational representatives unanimously commended the project manager for successfully developing the business case, managing the complex stakeholder and governance environment, and mentoring the sponsor's governance team.

As a result of this project, the not-for-profit organization has since requested two more business case submissions for different development sites, and engaged the project manager to oversee the development application process for the first stage of construction.

6.1.4 Findings from the testing of version 1 of the model. We analyzed the model against the case studies by identifying specific incidents that fulfilled the definition of the themes that we had established (Table I). Some examples of the process from each case study are provided in Figures 6 and 7.

Having analyzed data from these case studies, we felt that the model adequately captured the two of the themes that we were looking for. First, the model demonstrated the concept of parameters which define the boundaries of the project. These parameters are represented by the Extent of Acceptable Final State lines. Our model also highlighted how certain actions could result in outcomes that were either inside or outside of those defined parameters. Second, we felt the model captured the theme of pathways by highlighting how there can be many ways the project can develop to achieve the required Final State.

However, we also felt the data from the case studies revealed some shortcomings in the model. Specifically that the model did not:

(1) Reflect that the parameters can change as the project progressed as seen in the Case Study 1 budget reduction, and in the withdrawal of the business unit in Case Study 2.

(2) Demonstrate that many stakeholders had different expectations regarding the project outcomes. In other words, there were different perceptions about the project's Final State and not a single unified vision of the project's Final State.

(3) Identify that some of the stakeholder's perceptions regarding the project's Final State appeared to be outside the project's parameters.

(4) Conceptualize the need for the project manager to help the stakeholders redefine their perceptions of the Final State as the project parameters changed.

(5) Reflect that the changing parameters had the potential to impact on actions that the project manager had already taken.

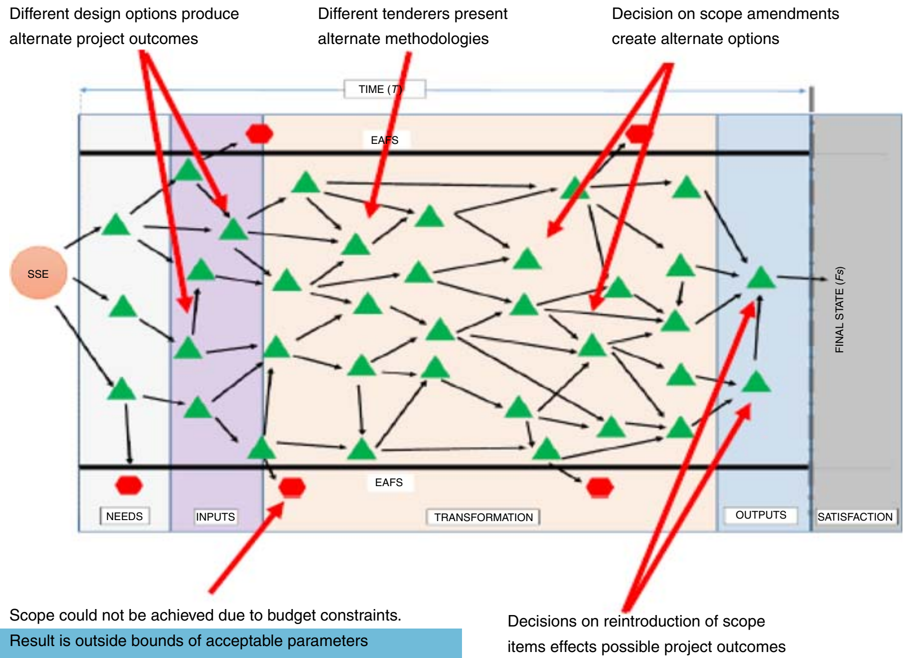


Figure 6.
Case study 1 applied to model (v1)

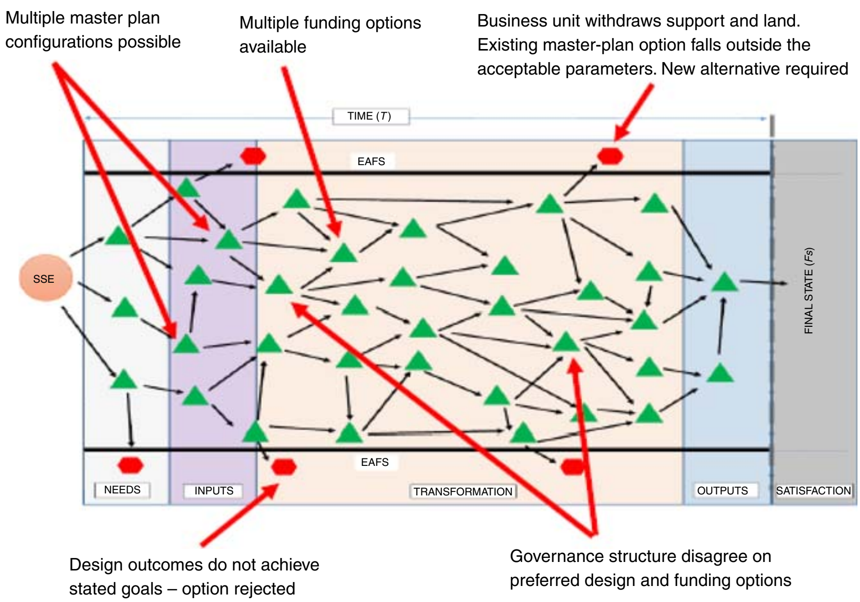


Figure 7.
Case study 2 applied to model (v1)

6.2 Version 2 of the model

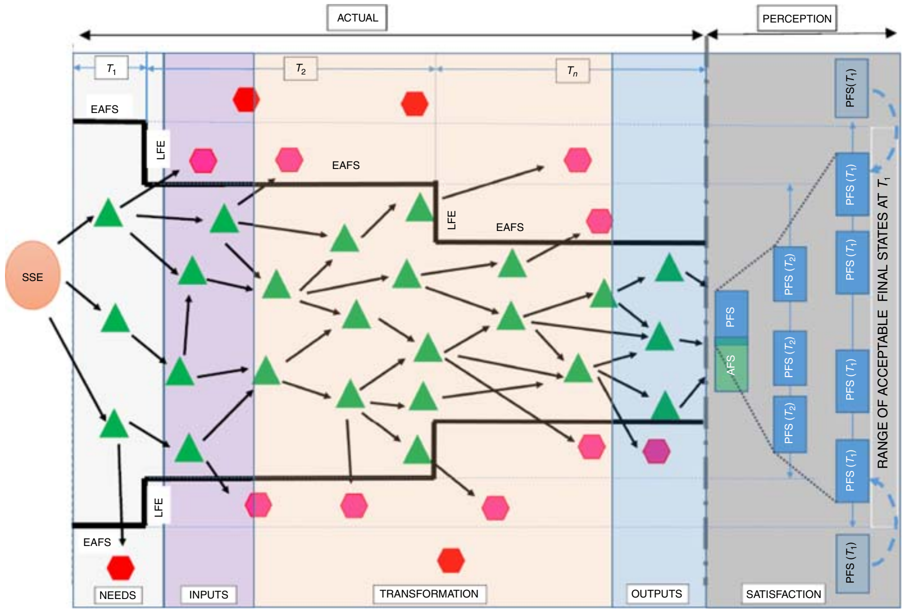
As a result of the case study analysis, we revised the model as shown in Figure 8. The revised model introduces two separate sections – "Actual" and "Perception." The blue boxes on the far right represent the different perceptions that can exist regarding the project's Final State. These multiple Perceived Final States can exist where there are multiple stakeholders. These different perceptions at the time of commencing the project are designated PFS (T_1).

Additionally, the revised model highlights that the project's stakeholders may not have a unified understanding of the final project outcome. The transparent blue boxes in this column represent Perceived Final States which are outside the Extent of Acceptable Final States. The blue dotted arrows in this section indicate project managers must help stakeholders redefine their expectations so that they fall within the bounds of the achievable outcomes.

The revised model introduces the concept of flexible parameters from which an acceptable Final State can be developed and highlights how the Extent of Acceptable Final States change due to specific events. We have designated these "Limiting Factor Events" and they can occur at any time throughout the transition process. The impact of the flexible parameters is demonstrated in the model by the steps in the Extent of Acceptable Final States and the inclusion of new time designators (T_2 and T_n) at the juncture when the parameters changed. An example of a limiting factor event is the budget reduction in Case Study 1, and the withdrawal of the development partner in Case Study 2.

Limiting factor events can create a number of changes in development of the project. First, actions which had already been taken and would have previously resulted in acceptable outcomes (i.e. green-to-green movement), may now result in actions that can no longer be pursued (i.e. green triangle to pink hexagon).

Second, the limiting factor events change the range of acceptable Final States. This also results in a variation to the range of Perceived Final States that are available. In the model this is represented by the second column of blue boxes, which are nominated as PFS (T_2).



Notes: SSE, Start State$_{\text{Existing}}$; EAFS, Extent of Acceptable Final States; LFE, limiting factor event; T_1-T_n, time; AFS, Actual Final State; PFS, Perceived Final State at Completion; PFS (T_1, T_2), Perceived Final State at Time T_1 and T_2

Figure 8.
Conceptual model (v2), the "final state convergence model"

Upon reflection we realized that there will be a time in the project when the Perceived Final States and the project's Actual Final State (AFS) will converge. This is indicated in our model by the blue and green boxes on the third column in from the right hand side. These boxes help conceptualize the feelings of displeasure voiced by the sponsor's representatives in Case Study 1 and the commendations voiced in Case Study 2. We hypothesized that the degree of stakeholder's dis/satisfaction with the project outcomes is proportional to the quantum by which these two states, the Perceived Final States and the AFSs converge. It is from this hypothesis that the name of the model, the "Final State Converge Model," was derived.

6.2.1 Testing version 2 of the model. With the refinements made to the model, we tested the final state convergence model in a focus group at Point Project Management (Brisbane) in March 2015. Invitations to participate were e-mailed to all 23 staff members. Seven project managers accepted the invitation. This sample size was considered acceptable for this stage of the study based on previous research by Kotter (1999), Mumford and Gold (2004) and Algeo (2012) which demonstrates that a sample size of five can be considered valid for a targeted research study such as ours.

The seven participants were provided with a pre-reading pack prior to the focus group. This pack included a summary of transformational production management, strategic management and complexity theories, a brief explanation of the model, and a summary of its development.

Researcher 1 facilitated the focus group. The participants included one senior project manager (more than ten years' experience), four project managers (two to ten years' experience) and two assistant project Managers (less than two years' experience). Two participants were female and five were male. The participants had a range of previous construction project management experience including defence, commercial, aviation and retail projects. Five of the participants had been involved in major construction projects, while two had experience in fit-out projects. All participants were currently managing projects.

The focus group commenced with Researcher 1 providing an explanation of the purpose, development and elements of the final state convergence model. The focus groups were asked if they felt the model, as it was described to them, accurately reflected their experiences as project managers. All of the participants agreed that it did with four participants providing more detail:

> […] [the model] outlines the fluid nature [of projects] […] and presents a more accurate reflection than the production management model […] (PM01).

> […] [the model demonstrates] how the project manager must "navigate" through the project […] (PM 02).

> […] [the model] displays a higher level of conceptualization of the project management experience than the production management model […] (PM03).

> […] [the model provides] a more realistic explanation of the role of project manager than the other models […] (PM06).

One participant (PM03) felt that the model did not adequately capture the influence that the project manager exerted in driving the project toward the Final State. Upon further discussion the participants agreed that while the transition process dictated many of the decisions that could be made, it was the role of the project manager to guide the project toward a successful completion. The participants felt the final state convergence model conceptualized the project manager as a "[…] helpless spectator […]" (PM03) rather than a driving force in achieving successful project outcomes.

In addition, the focus group participants agreed that it was possible for project managers to make decisions that progressed toward the Final State, however this did not necessarily mean these decisions created the optimal outcome. The participants felt the model needed further development to capture how project managers added value to the overall process. It was noted by the participants that the final state convergence model did not appear to capture the reporting, monitoring and controlling activities that project managers undertook during the transition process.

The participants also felt that the final state convergence model did not adequately explain how the AFS was achieved when considering the multiple pathways available in the transition process. As a result, the participants felt the model needed to be developed further to demonstrate how the project manager directed the project outcomes.

When asked if the final state convergence model altered the participant's understanding of their role as a project manager, three participant's indicated it did, with two providing more clarification, stating the model:

> […] [the model] highlighted the difference between "project success" and "client satisfaction"[…] (PM01).

> […] [the model] gives you the feeling that you are not only engaged to deliver the project but to [manage] the Client's levels of satisfaction throughout the project […] (PM03).

When asked whether the final state convergence model altered the participant's understanding of the importance and/or reasons why project managers used certain tools, four participant's indicated that it did:

> […] I believe the tools and systems can be used in a more efficient way if the Final State Convergence Model was implemented […] rather than just a single critical path, numerous paths would be analyzed […] (PM01).

> […] [the model] shows that the tools (risk registers, program, cost, etc.) are not only used as a guide for us [project managers] to deliver the project, but a guide for the Client to accept the delivered project […] (PM03).

> […] [the model draws your attention] to ensuring the Client is kept informed of the implications of changes, rather than just a simplified monthly reporting of progress, cost and quality […] (PM04).

> […] [the model] shows that using the tools and systems does not guarantee success […] (PM06).

When asked for general comments regarding the model itself, two participant's responded:

> […] I don't believe that 'incorporating' the Final State Convergence Model on a project actually changes the way projects are delivered – the Final State Convergence Model happens regardless! I see it as a more of an explanatory model to why projects occur the way they do, as opposed to a tool that can be followed (PM02).

> […] [The] model may be very useful in redefining how tools are categorized and applied, and cause a project manager to more selectively apply tools having a real understanding of the effect that is intended to be generated rather than by rote usage of an established "way" […] (PM03).

6.2.2 Findings from the testing of version 2 of the model. Based on the data collected we felt the model generally reflected the experiences of the focus group participants. However, we also felt further research and development of the model was required to:

(1) conceptualize the influence that the project managers exerted in driving the project toward the Final State;

(2) conceptualize the value that project managers added to the process;

(3) capture the planning, monitoring and controlling role of project managers; and

(4) explain how the AFS is achieved from the multiple pathways available.

7. Discussions

The findings of this study are now considered with reference to the research question. The limitations and implications for further research are also discussed.

7.1 Final state convergence model

Our findings indicate that a model can be synthesized from the transformational production management, strategic management and complexity theories. Our model, the final state convergence model, draws from the theory of transformational production management to provide a meta-level "underlay" to the model. This underlay provides an understanding of how projects move through the five stages of "Needs-Inputs-Transformation-Outputs-Satisfaction."

We felt it was important to keep this theoretical construct to reinforce that the most important aspect of any construction project is to deliver outcomes that both fulfill the initial need and achieve stakeholder satisfaction. In addition, the use of transformational production management as an underlying theoretical basis demonstrates that we do not consider the extant project management body of thought to be useless, nor do we advocate abandoning the processes and frameworks that have assisted in the evolution of the discipline. By providing this theoretical underlay, the final state convergence model can draw on the existing frameworks, processes and tools that have been developed from the transformational production management body of knowledge.

The final state convergence model also draws from both the Deliberate and Emergent schools of thought within the strategic management body of theory. Our model allows for the deliberate planning that project managers undertake to ensure their projects are delivered within set parameters. Concurrently, our model represents the adaptive actions that project managers must undertake when emergent events impact their project. Our model allows for plans to be flexible enough to cater for emergent events that may result in new and unexpected pathways to the Final State.

The final state convergence model draws on elements of complexity theory by representing the plethora of agents and interactions that can occur during the delivery of a construction project. Our model demonstrates how construction projects display the characteristics of bounded instability by representing that the system may appear to be on the edge of chaos, but it is actually functioning within the upper and lower boundaries of the order-generating rules (parameters) set by the clients and stakeholders. Furthermore, our model represents how the process of project management can transform unpredictable disorder of the construction process into unique outcomes that take on similar forms. Finally, our final state convergence model draws on complexity theory to represent how a predictable outcome can emerge from non-linear sequences.

Our findings also highlight the need for project managers to skillfully manage and influence the expectations of their clients to ensure the Perceived Final State and the AFS converge. This important aspect of the project manager's role appears to have an impact on the degree of satisfaction experienced by the client. Interestingly, this critical element does not appear to be captured in any of the bodies of theory reviewed. Table II provides a summary of our findings.

7.2 Limitations and challenges

Although grounded theory methodology advocates the use of personal experience as a basis for identifying areas of potential research, this approach does carry with it the potential for researcher bias in the data collection and data analysis process. To address this, we have attempted to view the data and emergent themes as objectively as possible and used data triangulation to remove our own bias from the process. However, these processes alone cannot guarantee the findings of this paper are free from our personal bias. Our findings will need to be subjected to further study within a wider context to reduce the potential for researcher bias.

We purposively selected three bodies of theory as the starting point for investigation – transformational production management, strategic management and complexity theory. We acknowledge that there are other bodies of theory not reviewed in this paper which may impact the future development of the model. The impact of other project management theories on the final state convergence model will be the subject of future research.

		SM			
Model component	TPM	Del	Emg	CT	FSCM
Set process for delivering a construction project	✓				✓
Link to existing project management body of theory and frameworks	✓				✓
Deliberate planning utilized by project management practitioners	✓	✓			✓
Predictable project outcomes	✓	✓			✓
Flexibility in planning to respond to emergent events			✓		✓
Bounded instability				✓	✓
Upper and lower limits of order-generating rules				✓	✓
Unpredictable disorder to unique but similar outcomes				✓	✓
Predictable outcomes from non-linear sequences				✓	✓
Disconnect between Actual and Perceived Final States					✓

Notes: TPM, transformational project management; SM, strategic management; Del, "Deliberate" school of thought; Emg, "Emergent" school of thought; CT, complexity theory; FSCM, final state convergence model

Table II. Summary of research findings

Our research was conducted within a limited organizational context, and drew from a small number of cases and research participant's experiences. While this is not inconsistent with a grounded theory methodology, we concede that the small number of cases reviewed and the focus group size may have constrained the data collected, thereby impacting the development of the model and the generalizability of the results. To address this, additional research involving a larger cohort and case studies sample is planned to further test the validity, credibility and dependability of the model (Davison *et al.*, 2004; Lincoln and Guba, 1985; Erlandson *et al.*, 1993).

The model itself appears to broadly reflect the "lived experience" of the cohort of project managers. However, further development is needed in order to address:

(1) the influence and value that the project manager provides in the transition process;

(2) the planning, monitoring and controlling role of project managers within the project management construct; and

(3) how the AFS is achieved from the multiple pathways available.

These questions will be addressed through future research and further development of the model.

7.3 Implications for research and practice

7.3.1 For academics. From an academic perspective, our final state convergence model provides a novel approach to synthesizing new bodies of theory into traditional project management theory. It adds to the theory about practice through the development of a new model which not only illuminates the complexities of project management, but enriches and extends our understanding of the actual reality of projects and project management practices.

Furthermore, our final state convergence model moves away from the simple, life-cycle models utilized in traditional project management theory and provide a new perspective on project management which can be explored through further research.

7.3.2 For practitioners. From a practitioner's perspective, our research provides a model which may help them gain a better understanding of the environment in which they operate and their role within that environment. Our model may guide them to think beyond their current conceptual base of traditional project management methodologies, systems and processes toward a broader conceptualization of project management.

Our model highlights to practitioners that there may be multiple pathways to achieve the required Final State. It also highlights how linear and sequential thinking may be hampering their ability to achieve the project's ultimate goals.

Finally, our model may help project practitioners understand why some stakeholders may feel dissatisfied with seemingly successful projects.

8. Conclusion

The Rethinking Project Management Network identified three categories for development of project management theory. Our research has developed a model which provides new insight into two of these categories, theory about practice and theory for practice.

Through our research we have developed the final state convergence model which addresses some of the Network's directions for the theoretical development of project management. The final state convergence model illuminates the complexities of project management, extends our understanding of project management beyond the traditional conceptual base, and provides a conceptualization of project management that moves away from well-defined starting objectives, lineal and sequential processes, and rigidly defined project parameters.

The final state convergence model provides a new perspective on project management. One which can be further developed through future research. In addition, the final state convergence model provides practitioners with insight into how multiple pathways exist within their project environment, and why some stakeholders might be dissatisfied with seemingly successful projects.

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