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Recent Trends in Theory Use and Application within the Project Management Discipline

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Abstract: The following paper highlights the theories used to further project management (PM) research spanning the 15 year time period of 1999-2013. The analysis examined 273 articles drawn from seven widely recognized PM journals with the aim of uncovering the most utilized theories in the discipline's academic investigations. The review found these theories to be: Stakeholder Theory (ST), Fuzzy Sets Theory (FST), Utility Theory (UT), Theory of Constraints (TOC), and Actor-Network Theory (ANT). This collection of theories represents a diverse group of thought constituting a large portion of the PM literature's theoretical foundations. Both UT and TOC have diminished in popularity while ANT and ST have improved in favor; FST has remained consistent in its use. The appendix to this manuscript includes a "ready reference" of all the theories utilized in PM research found within the reviewed journal outlets from the 15 year review period.

Keywords: Theory review, actor-network, fuzzy sets, constraints, stakeholder, utility.

1. Introduction

Since the early 1950s, project management (PM) has been viewed as an academic "discipline" (Cleland and Gareis, 2006, p. 1). Over the years, PM has come into its own as a major sub-discipline within the management field, and has generated multiple avenues of academic knowledge, streams of practitioner methodology, and a library of best practices.

In an appendix to the Project Management Institute's (PMI) report on the future of PM (PMI, 1999), Fugate and Knapp (1999) posited that a body of theoretical knowledge is a key component of any established profession, and mastery of that theory, along with practical skill, separates profession from craft. The PM literature is replete with manuscripts utilizing theories from several of the reference disciplines, including psychology, engineering, and mathematics. PM academics have posited theories of PM (Shenhar and Dvir, 1996), as well as claimed there are no definitive theories of PM (Koskela and Howell, 2002). Taken as a whole, the broad collection of literature, grounded in a wide range of theory from multiple reference disciplines, represents the body of knowledge in the practice and art of PM.

PMI's 2014 Research and Education Conference was entitled *Standing on the Shoulders of Giants: In Search of Theory and Evidence*. Concerned with the future of the discipline and the further development of PM knowledge, it highlighted how the discipline should build upon the research that has already been done in the field to further advance PM knowledge. Part of the conference's stated theme was to ascertain the role of theory within the discipline, and investigate if any progress has been made on further developing a theory of PM as called for in Koskela and Howell (2002). Clearly the PM discipline is beginning to pay more attention to the role of theory and theory development.

In light of this call for a greater understanding of the use of theory in the discipline, we offer the following paper as a guide to existing theory use within the PM discipline. In the following pages we address these research questions:

1. What are the top theories utilized in the PM literature over the period 1999-2013?
2. How were these top theories applied to PM research and practice?
3. What were the top theories usage trends, if any, during the period?

The remainder of this manuscript catalogues the primary theories cited in PM literature spanning the 15 years 1999-2013. Further, it offers the academic and practitioner alike a ready reference to the multitude of theories and theory development that has helped shape the academic body of knowledge within the PM discipline. Specifically, the manuscript uncovers the five most cited theories in PM literature, relates the theory's conception, and describes its application within PM literature and practice. The appendix also contains a detailed recounting of all papers and theories reviewed in the preparation of the manuscript, providing a quick reference for future research.

2. Method

To build this review, the appropriate academic journals had to be identified. We followed the lead of Littau et al. (2010), a previously published literature review, and used the identified PM outlets from that investigation. The following seven journals were used in this literature review: *Project Management Journal*, *International Journal of Project Management*, *International Journal of Managing Projects in Business*, *Construction Management and Economics*, *Journal of Construction Engineering and Management*, *Automation in Construction*, and *International Journal of Project Organisation and Management*. The search dates for the review were 1999 to 2013. Editorials, book reviews, and other non-peer reviewed items were discarded, scoping our review to peer-reviewed work only (Littau et al., 2010).

The target journals were then examined for the words "theory" or "theories" within the title, abstract, and/or key words to identify study-relevant articles. For papers containing more than one theory, the dominant (or base) theory was considered to be that manuscript's primary theory. Next, the relevant articles were categorized by theory and tabulated. After tabulation, the five top theories were investigated to ascertain the theory's primary use in its originating paper. Then, we captured how the theory has been positioned in the PM literature. Based on the theory's positioning in the PM literature, we developed conceptual "themes" for each theory (please refer to Fig. 1 for research process).

After analysis was conducted of all papers published in the reviewed journals, the top five theories in use were: *Theory of Constraints*, *Actor Network Theory*, *Fuzzy Sets Theory*, *Utility Theory*, and *Stakeholder Theory*. Please refer to Fig. 2 for a visual of their frequencies across the review time period. Each theory is detailed in the following section according to this format a) theory's origin; b) theory discussion; c) theory's general application; and d) theory's use in PM.

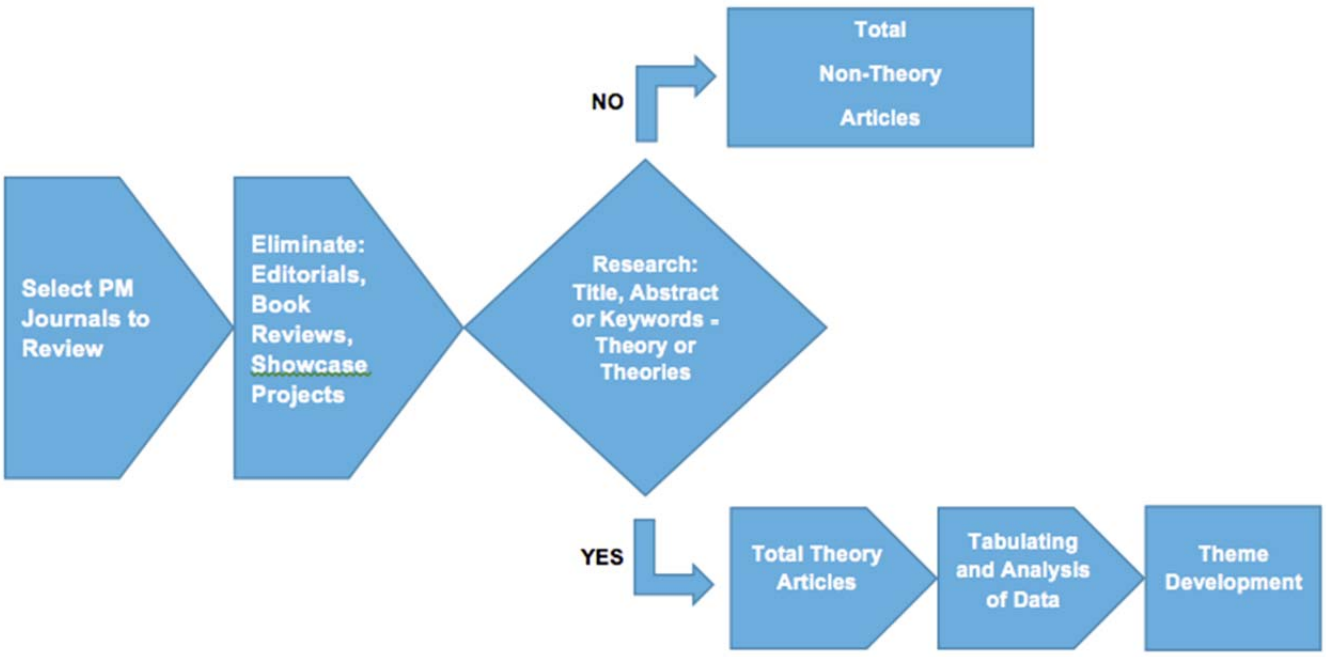


Fig. 1. Research process

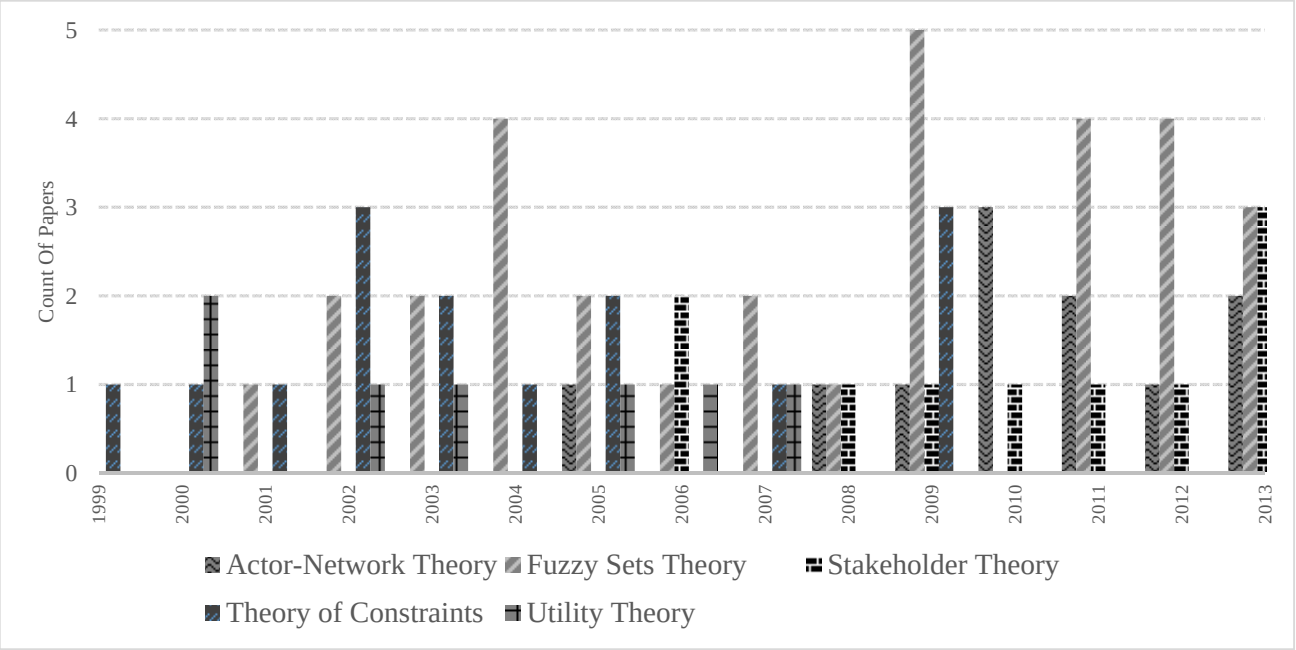


Fig. 2. Papers by theory and publication year

3. Analysis of the top five cited theories from the reviewed PM literature, 1999-2013

3.1. Fuzzy Sets Theory

Fuzzy Sets Theory (FST) found its genesis in a 1965 paper by Lofti Zadeh. The term "fuzziness" defines a symbol that characterizes a set of objects with ambiguous borders (Dubois and Prade, 1980). In Zadeh's original manuscript, he used the notion "classes of objects" and posited that most "*…classes of objects in the real physical world do not have precisely defined criteria of membership*" (1965, p. 338). He followed this with an example using a "class" of animal. We know that animals are cats, lions, sharks, etc.; dirt, furniture, and cars are clearly not in that class of objects… there is no question. However, the status of dogs, fish, and moose within the class "animal" is more nebulous. This same ambiguity can be applied to all manner of objects, including numbers. Since many objects don't fall into easily defined categories, FST has been hailed as an appropriate vehicle for modeling virtually any type of vague or ill-defined phenomena (Smithson, 1982). FST sharpens "fuzzy" inputs such as oral statements, by converting them to quantitative data through mathematics and formal logic (Klir and Yuan, 1995).

Although not found directly in the PM literature, FST began to appear in the literature of related disciplines in the late 1980s. Lehtimäki (1987) applied FST to supply chain management issues regarding supplier approval of customer change orders. Since change orders may require multiple decisions to be made regarding scheduling and delivery, factors that are often fluid and ill-defined, fuzzy logic could be applied to address them. Kangari and Halpin (1990) soon followed in their work utilizing FST to investigate the need-based, technological, and economic feasibility of automation in various construction projects. Recently, Kabir and Sumi (2013) combined FST and Delphi Method to develop a multi-criteria inventory classification model.

FST started to come more into the sphere of PM in the mid-90s, with heavy emphasis continuing in the construction literature. Huat and Low Sui Pheng (1994) applied FST in their discussion of the Singapore construction industry and the industry maturity grid (IMG) tool. By applying FST to decision models in the IMG, the authors found its typical qualitative features can be converted to a semi-quantitative method for capturing expert judgments via a linguistic scale (e.g. comments such as "*highly unlikely*" are converted to a numerical scale). Continuing in a construction theme, Moselhi (1995) proposed a risk-pricing algorithm utilizing FST to help contractors decide on appropriate bid prices for highway construction projects. That same year, Wong and So (1995) posited a reasoning model utilizing FST to assist in contract type decision making processes.

Mak (1995) reviewed analytical risk analysis in the construction industry and opined that although information technology (IT) resources were making risk analysis more affordable and precise, they were not always the most accurate. FST was found to be applicable to risk analysis making it a viable alternative to IT enabled analysis. Risk analyses utilizing FST were found to provide more accurate and interpretable results than IT enabled analysis (Mak, 1995). Lorterapong and Moselhi (1996) further brought FST into the PM literature when they applied the theory to network scheduling and path creation.

More recently, and within the scope of our literature review, the PM discipline has found a range of uses for FST. For instance, FST has been used to analyze risk elements in the development of project financial models (Sachs and Tiong, 2009), construction projects (Baloi and Price, 2003; Nieto-Morote and Ruz-Vila, 2011; Okoroh and Torrance, 1999), and has aided in the creation of enterprise risk management schema (Zhao et al., 2013). The theory has also been utilized to develop a monitoring and controlling geographic information decision support system (DSS) for excavation activities (Cheng et al., 2002), as well as a DSS for observing hillside stabilization rates (Cheng and Ko, 2002). FST has also

been used in fault tree analysis (Nang-fei Pan, 2006) and found to be useful because estimating the probability of fault events related to human error was difficult. The FST model developed in the paper can be helpful for safety engineers to better assess the integrity of buildings.

FST has been found a useful method for tackling the vagueness of cost, time, and activity duration inputs (Ashuri and Tavakolan, 2012; Chou et al., 2013; Maravas and Pantouvakis, 2012; Shi and Blomquist, 2012; Wang and Liang, 2004). It has also been used to examine a range of trade-off problems (time and cost) (Eshtehardian et al., 2008; Sou-Sen Leu and An-Ting Chen, 2001; Zahraie and Tavakolan, 2009; Zheng and Ng, 2005). Ammar et al. (2013) and Kishk (2004) examined whole-life costing models and the utilization of FST in providing data and input where historical and other empirical data are imprecise.

FST has been used to analyze enterprise resource planning (ERP) selection projects in Taiwan (Wei and Wang, 2004). Utilizing FST, they were able to create aggregated weights for selection criteria by utilizing linguistic and subjective inputs concerning choices about ERP systems. Subsequently, Wei et al. (2007) examined supply chain selection criteria and utilized FST to aid in assessing linguistic evaluations of competing supply chain systems.

In Tzu-Liang Tseng et al. (2004), project team formation is the focus. Specifically, they address multi-functional teams working in distributed networks across different functional areas. These team formations are vital for project success, but are often plagued by poor communication and inadequate information (i.e. vague and fuzzy inputs) in the initial stages of team formation. FST is used to build a methodology for addressing these issues. Kale (2009) explored how construction companies are becoming increasingly cognizant of how they manage their knowledge assets in order to remain competitive. Combining an intellectual capital index with FST, Kale (2009) offered business executives the prospect of identifying their strengths, weaknesses, and business opportunities by developing a framework that dealt with the vagueness and uncertainties of intellectual capital.

Several research projects dealing with contractor/subcontractor selection have employed FST. Singh and Tiong (2005) applied FST when examining a contractor's capability in completing projects according to buyer specifications. Since buyers are increasingly looking at more than simple tender price when choosing a contractor, a selection method involving FST is developed to incorporate multiple capabilities of the possible contractor into the decision making process. Likewise, Juan et al. (2009) applied FST with positive results when investigating ambiguous projects concerning contractor refurbishment work involving risk, uncertainty, and coordination inputs. They found that while selecting the appropriate contractor is critical to project success, a pre-qualification process can be utilized to make sure any contractor considered for tender is adept and capable. Similarly, Plebankiewicz (2012) and Nieto-Morote and Ruz-Vila (2012) examined FST's use in contractor pre-qualification procedures. Yang et al. (2003) explored how FST can be combined with House of Quality to create a type of fuzzy Quality Function Deployment system for evaluating how well client expectations line up with design and construction processes. Employing FST, Xia et al. (2011) addressed design-build (DB) variations available to customers, and created a multi-criteria decision making model for choosing the best variation option. Using the provided model, potential customers would be able to quantitatively assess the assorted DB variations available to them. FST has been used in a myriad of ways in PM research. It is likely that the theory will continue to influence future PM research.

3.2. Theory of Constraints

In 1988, a "radically new" approach to controlling and managing the flow of materials (and later resources) in factories was developed by Eliyahu Goldratt published what has been referred to as the "Theory of Constraints" (TOC) (Goldratt, 1988). TOC has been considered a management philosophy that considers a limited number of assumptions designed to provide a process for continuous improvement. According to Watson et al. (2007), many notable organizations have utilized TOC successfully including 3M, Amazon, and Boeing to name a few.

Some have referred to this systemic approach as "Management by Constraints" (Ronen and Starr, 1990). While studying TOC's application, a constraint was summarized as "…anything that limits a system's performance…" (Lin et al., 2009). Most businesses or projects can be considered a system of ordered, process steps. As such, when considering improvement aims rather than keeping with the traditional improvement approaches - breaking down a process and improving the efficiency of each step - this theory "…requires managers to focus on bottlenecks, or constraints, that keep the process from increasing (or improving) its output" (Bevilacqua et al., 2009). In order to improve the output or efficiency of any system in accordance with Goldratt's TOC (Goldratt, 1984) five successive, improvement steps are required: 1) identify the system's constraint, 2) decide how to exploit (or "elevate") the system's constraint, 3) subordinate all other processes to the constraint, 4) decide how to eliminate the system's constraint, and 5) reanalyze the system identifying the next constraint and do not allow inertia to become the next constraint.

Goldratt first introduced the possibilities of TOC within PM and specifically toward scheduling in the book *Critical Chain* when he defined the "critical chain" as the path that determines project duration (Goldratt, 1997). With the publication of this book, TOC transitioned from the factory floor to PM in 1997. When considering the application of PM and critical chain, Shu-Shun and Shih (2009) refer to TOC as "a conceptual theory that treats schedules as problems of resource insufficiency and risk issues" (p. 859). Later, TOC was employed across various PM manuscripts dealing with: improving control and resource allocation, project cost management, project risk management, and single project scheduling to reduce project duration (Steyn, 2002).

Critical chain seems to be in response to Parkinson's Law (Parkinson, 1957), which posits that "work expands to fill the time given for execution" (Cohen et al., 2004, p. 40). Rand (2000) suggests, "The reason for the development of *Critical Chain* is the existence of chronic problems that existing methods, approaches and even expensive software have not been able to remove" (p. 174). It was reasoned that critical chain thinking reduces predicted activity durations by eliminating safety margins.

Further, Cohen, et al. (2004) stated, "critical chain methodology aims at developing a sound schedule, using buffer management, in order to avoid project overruns… it gives project managers a heuristic framework and guidelines for project managers on how to plan, schedule, and control their projects…" (p. 40).

Several researchers have praised the use of TOC (or critical chain) within the PM literature (Leach, 1999; Steyn, 2002 and 2000), while others have been more reserved (Shou and Yeo, 2000; Herroelen et al., 2002; Herroelen and Leus, 2001). Several of the similarities and differences between critical chain and traditional PM practices have been noted in the literature, particularly in those investigations of critical chain's applications within PM initiatives. "The critical chain is similar to critical path PM although there are three major differences: the method of assigning activity times, the use of buffers, and the elimination of resource conflicts" (Bevilacqua, et al., 2009, p 420). Within PERT/CPM, safety times are added at the end of each activity. Conversely, in critical chain thinking, safety times are aggregated and relocated toward strategic positions, otherwise viewed as "padding," and are used to protect the project's critical path of activities. The time estimates or durations of activities may be reduced but a project buffer is added at the end of the project. Some have been critical of the Theory of Constraints. Wei et al. (2002) noted an absence of a rule to establish the resource buffer, posited that the right time to employ the project buffer and "feeding buffer" is ambiguous, and determined that since the difficulty and duration of activities are not identical. As such, applying a standardized cut to all activities could be ill advised. Cohen et al. (2004) stated that, "The methodology is not well defined in the sense that it does not provide precise definitions for some project entities and scenarios" (p. 40).

Moreover, Goldratt himself has received substantial critique. Duncan (1999) posits that TOC borrows heavily from systems dynamics developed by Forrester in the 1950s and from World War II era statistical process control. More recently, Herroelen et al. (2002) suggested that "this concept (critical chain) is not new; Wiest (1964) introduced the concept of a critical sequence more than 30 years ago" (p. 50). Additionally, Trietsch (2005) declared that TOC should be thought of, not as a theory, but more "management by constraints". Alternatively, Steyn (2000) concluded his comments by saying, "The application of the TOC principles to reduce project duration was by no means common prior to the advent of *Critical Chain*. The TOC approach puts together concepts that have not been put together in the same way before and is therefore considered an innovation" (p. 369). Although opinions differ as to the roots of TOC, emphasis on the "critical chain" appears to be a viable activity for project managers.

3.3 Actor-Network Theory

Actor-Network Theory (ANT) originated in manuscripts by Michel Callon (1986) and Bruno Latour (1987). ANT has been defined as a "material-semiotic" method that accounts for the essence of nature and societies. It accomplished this by positing how various material–semiotic mechanisms interrelate to act as a single entity (Latour, 2007).

One of the strengths of the actor-network concept was its ability to provide analytical tools for explaining how new technologies are adopted into practice. Scholars studying ANT asserted, "the strength [of the organization, culture, or society] does not come from concentration, purity and unity, but rather from dissemination, heterogeneity and the careful plaiting of weak ties" (Latour, 2007, p. 3). ANT investigators posited that "innovation can be described in a network vocabulary that emphasizes the interrelated and heterogeneous relations of all its components, whether social or technical" (Bijker and Law, 1992, p. 18). Additionally, ANT can be employed to understand how professionals within the network interact with physical technologies and artifacts to create outcomes (Lingard et al., 2012).

ANT's ontological framework is also useful for investigating socio-technical interactions. One of its key features is the notion of "symmetry" in which neither a social nor a technical position is privileged (Lingard et al., 2012). Instead, "both material and semiotic components should be integrated into the same conceptual framework to avoid technological or social determinism" (Latour, 2005, p. 84). According to Latour (2005), an actor-network may not be a technical network - it may have no compulsory paths, no strategically positioned nodes, nor limit itself solely to human actors but extend the word actor - or "*actant*" - to non-human entities.

To examine the dynamic process of association, change and reconstitution between actors and actants in a network, scholars must identify various actors of the network and examine when and how they interact (Latour, 2005; Lingard et al., 2012). Actors can be classified into "intermediaries" and "mediators". An intermediary is defined as a passive entity of the network that "transports meaning or force without transformation (Latour, 2005, p. 39)." In contrast, mediators are active entities within an actor-network that "translate, distort and modify the meaning of elements they are supposed to carry" (Latour, 2005, p. 39) with more uncertainties.

Actor-networks are characterized by continual transformations and reconfigurations of actors and artifacts occurring through interaction (Harty and Whyte, 2010). In a network those actors will be associated in such a way that they "make other actors act through transforming their world" (Latour, 2005, p. 107).

In 1990, ANT became a popular tool for analyzing disciplines such as informatics, health studies, geography, organizational analysis, anthropology, sociology, feminist studies, and economics. Additionally, ANT began to be used as a method for developing PM knowledge (Pollack et al., 2013). Linde and Linderoth (2006, p. 156) posited that ANT "…can be applied to the analysis of a project process and can expand project management theory. This approach has some useful implications for practitioners." ANT has also proven useful in shifting PM research more toward behavioral elements, and away from its bias regarding tools and techniques (Leybourne, 2007, p. 69).

Several extensive uses of ANT exist in the PM literature. Blackburn (2002) employed ANT in summarizing actions project managers perform in practice. Sage et al. (2011) posited that "...an ANT perspective on project complexity is worthy of more attention" (p. 288). Parkin (1996) and Harty and Whyte (2007) engaged ANT to study decision making in PM, while Aubry et al. (2007) used ANT to discuss relationships between various actors in PM offices.

Although slow to start, ANT seems to have secured a place in the PM research community.

3.4. Stakeholder Theory

Stakeholders play a crucial role in successful project outcomes (Beringer et al., 2013; Aaltonen, 2011; Assudani and Kloppenborg, 2010; Wang and Huang, 2006). Research has shown a strong relationship between project performance and stakeholder management (Donaldson and Preston, 1995). Moreover, various researchers (Mitchell et al., 1997; Jamali, 2008; Walker et al., 2008) suggested that stakeholders (as a result of their influence and power) created and sustained values, goals and PM performance targets. Considering such, it seems prudent for project managers to engage in some level of stakeholder management.

"Stakeholder theory is a theory of organizational management and ethics" (Phillips et al., 2003, p. 480) whose concept originated from strategic management (Beringer et al., 2013). Stakeholder Theory (ST) had its roots in the year 1984 when Freeman defined stakeholders as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 46). Freeman and Reed (1983) acknowledged the growing connectedness of external stakeholders (e.g. environment, communities, "commons") across ever increasing permeable organizational boundaries. ST with its triple effect of descriptive accuracy, instrumental power and normative validity (Donalson and Preston, 1995) has appeared in various forms which are crucial in understanding and describing the dimensions and structures of societal and business relationships (Carroll, 1993; Jamali, 2008). Further ST has been viewed in different perspectives - the social science ST, instrumental ST and convergent ST (Bourne and Walker, 2006). The basic assumption of ST is "…that a firm, represented by its management, has relationships with many constituent groups of individuals in the firm and in its external environment, and that those groups do not only play a vital role in the success of a firm, but also the interests of all (legitimate) stakeholders…" (Beringer et al., 2013, p. 18).

Prior to discussing the elements of stakeholder management, it may be necessary that we first consider the components of a "stakeholder's stake." According to Carroll and Buchholtz (2000, p. 65), a *stake* could be a right, ownership or an interest. A *right* is either a "legal right when a person or group has a legal claim to be treated in a certain way or to have a particular right protected" or a "moral right." *Ownership* is a circumstance "when a person or group has a legal title to an asset or property." An *interest* is defined as a circumstance in which "a person or group will be affected by a decision; it has an interest in that decision" (Carroll and Buchholtz, 2000, p. 65). The majority of projects will have one, two or all three types of stakeholders. "Most project stakeholders will have an interest, many will have a right…and some will have ownership" (Bourne and Walker, 2006, p. 6).

The "*stakeholder*" was defined by Sutterfield et al. (2006) when they posited, "The generally accepted definition of a *stakeholder* is an individual or group of individuals that are directly or indirectly impacted by an entity or task" (p. 27). According to Mitchel et al. (1997), three attributes of a stakeholder were proposed: 1) legitimate relationship with the organization, 2) power to influence the organization, and 3) urgent claim on the organization. He posited that at least one of those attributes must be present for the existence of stakeholder status. Kaler (2009) categorized stakeholders into two groups: "primary stakeholders" and "secondary stakeholders;" the former being employees and shareholders, and the latter being customers, lenders and suppliers. Sutterfield et al. (2006) furthered stakeholder research by asserting that a *project* stakeholder is "any individual or group of individuals that is directly or indirectly impacted by a project. Stakeholders can be internal or external to the project team or they can be internal or external to the project scope" (p. 27).

The field of PM was introduced to stakeholders, and the processes included in stakeholder management, by Cleland (1986). This introduction was made possible through the emphasis of stakeholder identification, classification, analysis and approaches to management. One of the key soft skills that successful project managers must possess is stakeholder management (Morris et al., 2006; Winter et al., 2006; Crawford, 2005). The process of stakeholder management is comprised of the following steps: 1) stakeholder identification, 2) stakeholder classifications (including "internal" or "external" and high/low influence levels), 3) stakeholder analysis (including stakeholder project views of "for," "against" or "neutral"), and 4) frequent stakeholder communications modes ("lean" or "rich") as prescribed in the communications plan.

Project managers can better ascertain the stakeholder's goals, objectives, and level of project understanding by collecting stakeholder requirements and expectations. Active stakeholder management provides several potential benefits to project outcomes, including a decrease in the likelihood of the project failure due to unresolved issues and a limiting of distractions to the project (PMI, 2013). The importance of the "art" of stakeholder management seems likely to increase as organizations' projects grow in complexity which includes rising levels of informational "noise," conflicting priorities, political pressures, seemingly incongruent tasks and competition for resources.

3.5. Utility Theory

Economists have used the term *utility* to characterize personal happiness. In the literature, Utility Theory (UT) has been defined as a means to understand individual choices and preferences when maximizing a utility function (Brickley et al., 2001).

First proposed by Daniel Bernoulli in 1738 (Chen and Lee, 2000), Expected Utility Theory (EUT), a category of UT, plays an important role in management science and decision-making under conditions of uncertainty (Einhorn and Hogarth, 1986; Kutsch and Hall, 2005). Specifically, the EUT is for decision makers to determine individual's preferences between complex alternatives with uncertain and/or multi-dimension outcomes. This theory has been generally accepted in risk management literature as a model of rational choice for making risky decisions (Jaeger et al., 2001).

Unlike expected value criterion, which only takes into account the sizes of payouts and the probabilities of occurrence, implying that both the payoffs and the

probability are linear function (Chen and Lee, 2000), the EUT model suggests that rational individuals also take into account stakeholder's risk attitude in maximizing expected utility. The risk attitude is directly related to the curvature of the utility function: risk neutral individuals have linear utility functions, risk seeking individuals have convex utility functions, and risk-aversion individuals have concave utility functions. The degree of risk aversion can be measured by the curvature of the utility function.

The management discipline is replete with studies of UT. For example, Greenberg and Collins (1966) and Krugman (1966) reported the use of UT in marketing research in brand-preference and related research. Simiarly, Read (1964) applied the theory to quality control applications in the food industry. UT has been employed to develop corporate strategies, assign electronic components to ships, evaluate product defects, and evaluate power-system alternatives (Fishburn, 1968).

Although UT has been considered one of the most successful works in management science (Chen and Lee, 2000), many psychologists criticized it, such as Kahneman and Tversky (1973, 1982), and Hogarth (1987). Most criticisms centered on the fact that judgments were made by decision makers that did not consistently follow the axioms of rationality (Chen and Lee, 2000; March, 1978). Additional criticism focused on inappropriate measurements of utility or probability (Ellsberg, 1961).

Risks and uncertainties are integral to projects, and as such, risk management is included as one of the knowledge areas in the PM Book of Knowledge (PMI, 2013) wherein several processes and tools for managing risk are defined. Stakeholder risk tolerance, and preferences in making decisions under the conditions of uncertainty, can be improved by the application of the rational approaches found in UT.

Piney (2003) presented a set of measures of expected utility values (EUV), rather than using expected monetary values (EMV), to accommodate stakeholders view of risk toward project risk propensities. This expected utility measurement presents a variable named "regret" for negative impact, and extends this concept to include positive ("rejoice") outcomes as well as after-the-event reviews, for which a "resentment" value is described. By doing so, the project managers are able to understand the nonlinear and asymmetric nature of the utility curve, factor in the utility value of the impacts of uncertainties, and take into account project stakeholders' specific tolerance to risk. In order to make the decision-making processes more objective, and to accommodate different decision makers' preferences, Elmisalami et al. (2006) applied UT to construction projects by integrating technical, economic and risk attributes into a multi-criterion model.

A conceptual approach for applying UT to contractor selection was developed by Nicholas et al. (2000). The buyer organization's risk attitude (risk averse, risk neutral, and risk seeking) was measured in balancing the potential gains with the risks and efforts on achieving utility increase. With a knowledge of potential gains and losses, discretion based on the notion of "gut feelings" was reduced and replaced to some extent with decisions based on qualitative and quantitative knowledge. Similarly, when dealing with contractor selection, Wang (2002) presented a UT based model that simulated a cost approach to reflect owner's preferences.

Despite the fact that EUT has proven a rational approach to understanding project risk, concerns remain with activities that interrupt risk management processes predicted by UT. Kutsch and Hall (2005) demonstrated that project managers often ignore, avoid, deny, or even delay dealing with risk due to decision maker and environmental conditions. As a result, risk management processes are adversely impacted. The authors argue that those intervening conditions in project risk management deviate from the claims of this theorem, and many psychological factors are not adequately captured by EUT.

4. Discussion

Our review has revealed that theory has had its place in the PM community. During this manuscript's period of study from 1999-2013, there were 131 various theories applied or expounded upon within the reviewed PM literature. In consideration of Fig. 3, which exhibits the total number of theories used per year in the review period, it appears that theoretical inclusion within the PM literature has trended up over the study period. This trend suggests that theory has played a significant role in PM thought and practice, and those trends are likely to continue into the near future. Although Koskela and Howell (2002) called for further theory development and use, it appears that, based on the parameters of this study, theory use was already trending up at that time (Fig. 3). Additionally, after their call for increased theory presence, and perhaps due in part, theory utilization in the PM literature continued to trend positively (Fig. 3).

Examining in more detail the occurrence of theory in PM literature, it is possible to study the slope of two trend lines to ascertain what, if any, difference occurred. The trend line up to Koskela and Howell's (2002) call for more theory (1999-2002), and the trend line post that call through the duration of the study period (2003 - 2013) offer insights. By examining the slope of each trend line, it appears that theory inclusion in PM literature accelerated slightly after Koskela and Howell's (2002) work. Fig. 4 offers both trend lines and respective slope equations. It appears that the time from 2003 to 2013 enjoyed a slope of 1.99 while that of 1999-2002 saw a slope of 1.30. This represents a 53% increase in theory use count.

Narrowing the field to the top five theories, as presented in Table 1, are a diverse group. Table 2 shows the theories' origins and offers potential PM knowledge area application.

Mathematics forms the foundations of FST and allows qualitative data to be used for creating semi-quantitative information via a linguistic scale. Goldratt's (1997) TOC emphasized that all systems have a limiting factor, or "bottleneck." As such, practitioners must endeavor to identify the bottleneck, then minimize (or eliminate) said factor. In a departure from the quantitative arena, ANT centers its focus on networks. ANT scholars put emphasis on the technical components and social interrelations within the network. Distancing itself even further from the quantitative, ST was introduced to PM by Cleland

(1986). He advised that fostering relationships with stakeholders, via interpersonal affiliation, is key because it can positively or negatively influence project outcomes. Uncertain conditions surrounding managerial decisions created a need for UT. A strength of UT is its ability to ascertain an individual's preferences between complicated choices associated with potentially vague outcomes.

Related to UT, ST offers project managers rational decision-making support when considering stakeholder preferences and tolerances in uncertain environments. Considering that research has shown a direct relationship between project performance and stakeholder management, project managers are wise to engage in aggressive stakeholder management.

FST appears to be far and away the most active theory base for the PM literature in the 15 years under review. The PM literature has been heavily laced with manuscripts based on FST suggesting a flexible and wide-reaching theory useful for future research in many areas of PM. While UT and the TOC were both popular in the early part of the 15 year review, they have cooled in their relative employment by academics. On the other hand, ANT and ST were slow starters in the period of years reviewed for this paper. They have now overtaken UT and the TOC in their usage in the literature. Interestingly, the citations for each of these four theories have flip-flopped, while FST has remained fairly constant over the review period. A graphical analysis of the literature citation counts can be seen in Fig. 5. The slopes for each of the theory counts over the review time period have been plotted and overlaid on the graphs. Based on the historical use and precedence of these theories in PM literature, it may provide an indication of future utilization of these theories. If true, ANT and ST may continue to increase in their frequency of use in future PM literature whilst FST employment may remain constant.

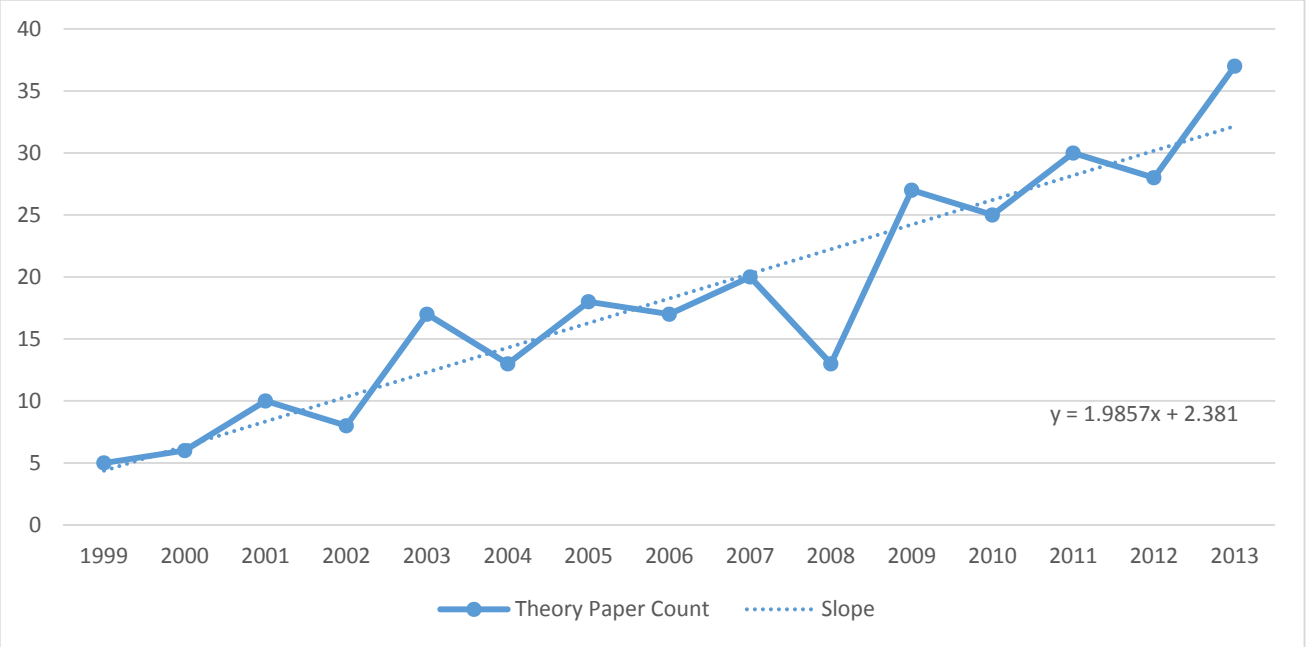
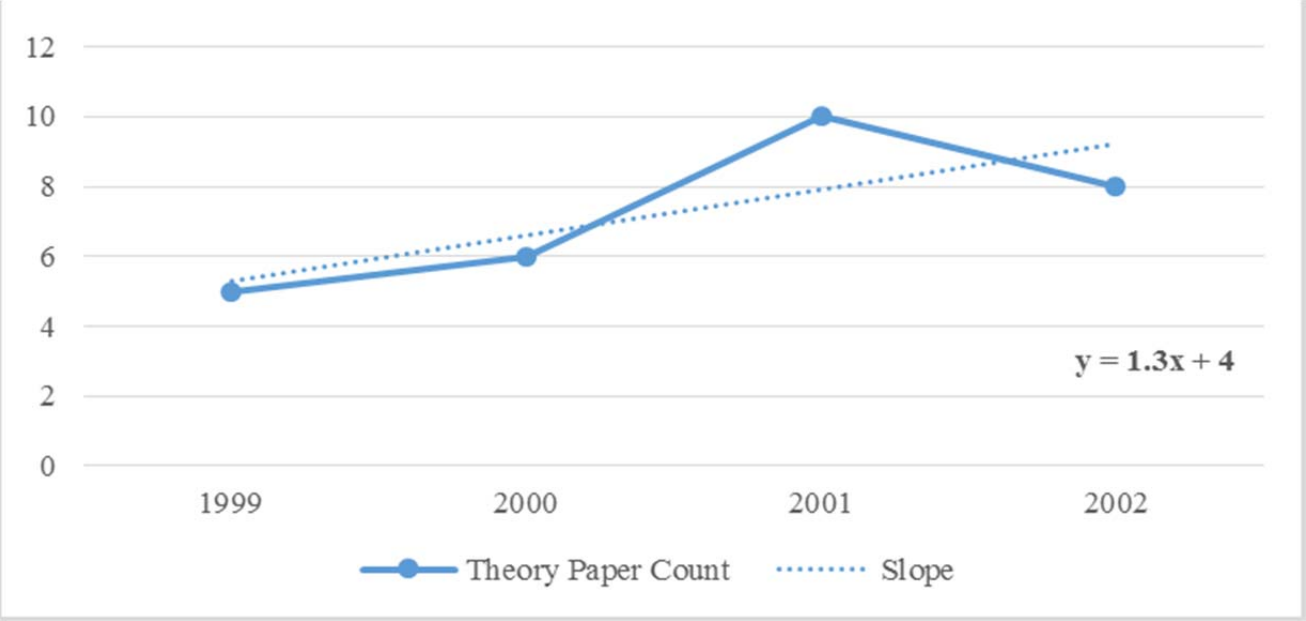
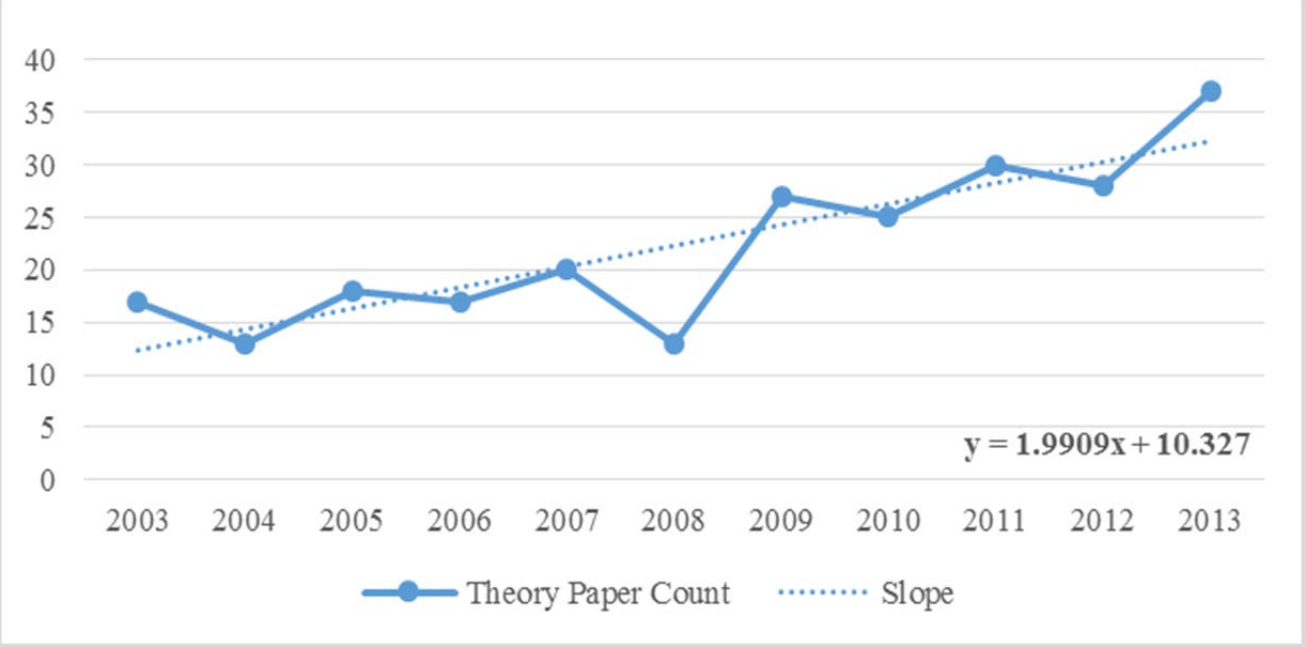


Fig. 3. Theory count per year 1999-2013 within reviewed PM literature



(a) Theory use paper count (1999-2002)



(b) Theory use paper count (2002-2013)

Fig. 4. Graphical analysis of citation counts in pm literature pre/post (Koskela and Howell, 2002)

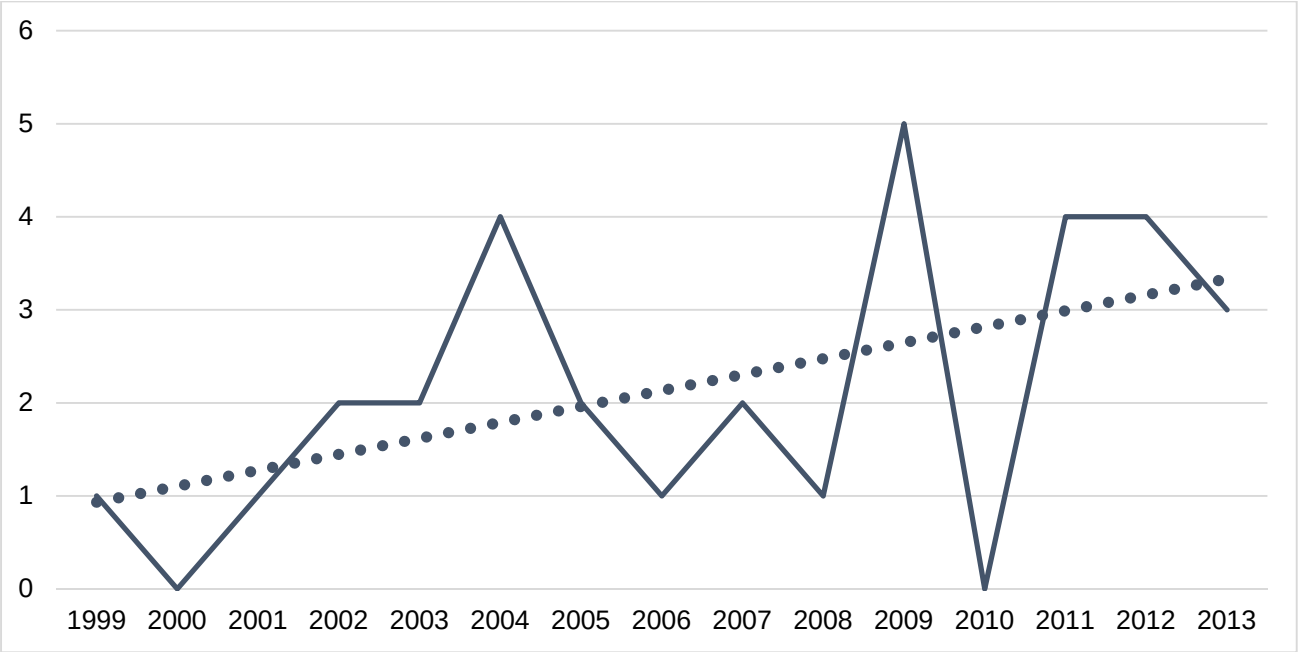
Table 1. Theory frequency by journal

Journal Title and Theory	# Articles
Automation in Construction	10
Fuzzy Sets Theory	8
Theory of Constraints	1
Utility Theory	1
Construction Management and Economics	15
Actor-Network Theory	5
Fuzzy Sets Theory	5
Stakeholder Theory	2
Theory of Constraints	1
Utility Theory	2
International Journal of Managing Projects in Business	4
Actor-Network Theory	2
Stakeholder Theory	2
International Journal of Project Management	20
Actor-Network Theory	2
Fuzzy Sets Theory	8
Stakeholder Theory	2
Theory of Constraints	7
Utility Theory	1
Journal of Construction Engineering and Management	17
Actor-Network Theory	1
Fuzzy Sets Theory	11
Theory of Constraints	3
Utility Theory	2
Project Management Journal	9
Actor-Network Theory	1
Stakeholder Theory	4
Theory of Constraints	3
Utility Theory	1

** None of the top five theories were found in the IJPOM*

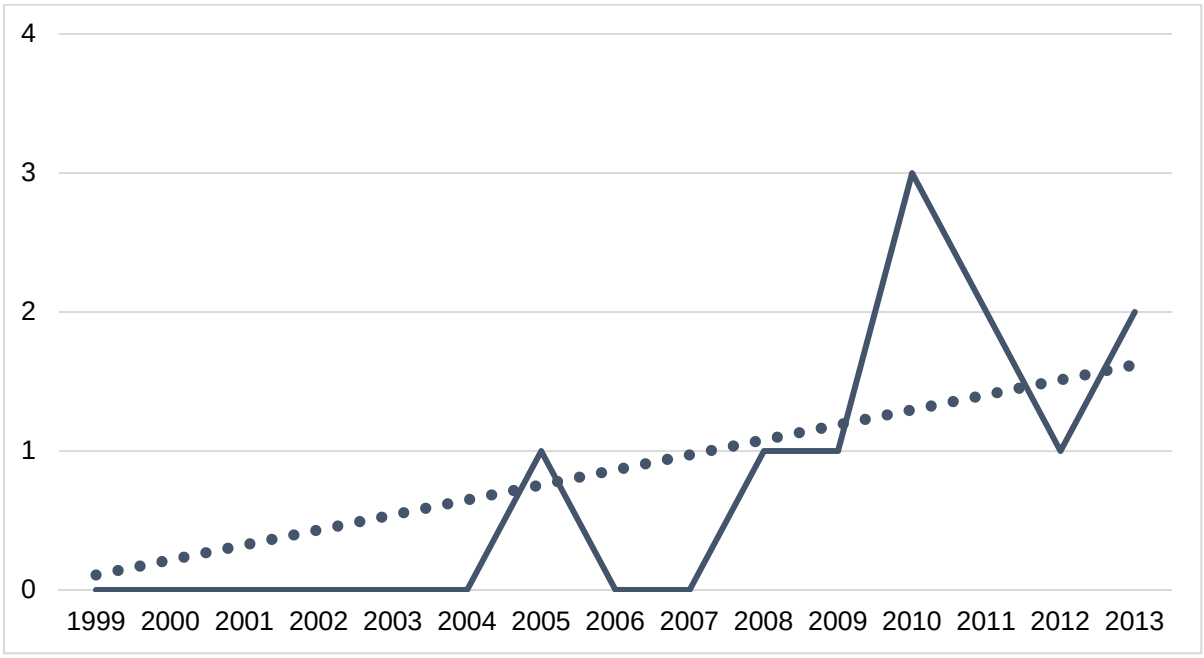
Table 2. Theories' diverse origins and application areas

Theory	Origin	PM Knowledge Area
Fuzzy Sets	Logic and Mathematics	Scheduling, Costing
Stakeholder Theory	Strategy	Stakeholder Management
Theory of Constraints	Operations Management	Scheduling, Portfolio Management
Actor Network Theory	Psychology	Change Management
Utility Theory	Economics	Risk Management

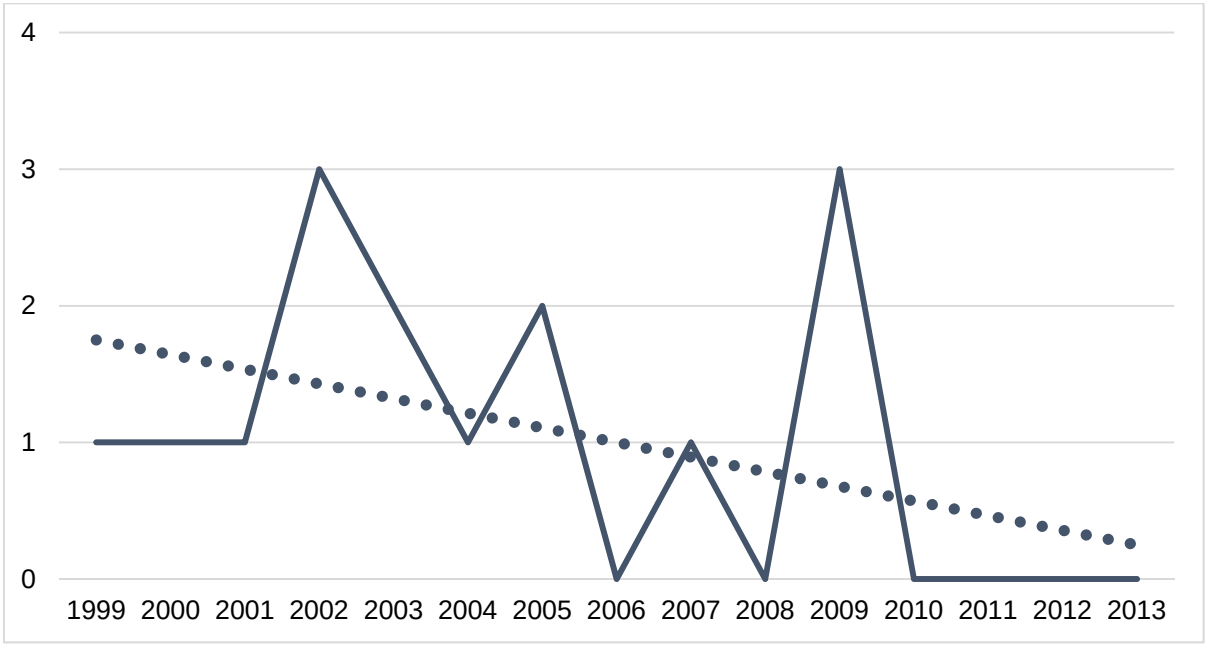


(a) Fuzzy Sets Theory

Fig 5. Graphical analysis of citation counts in PM literature 1999-2013 with trend

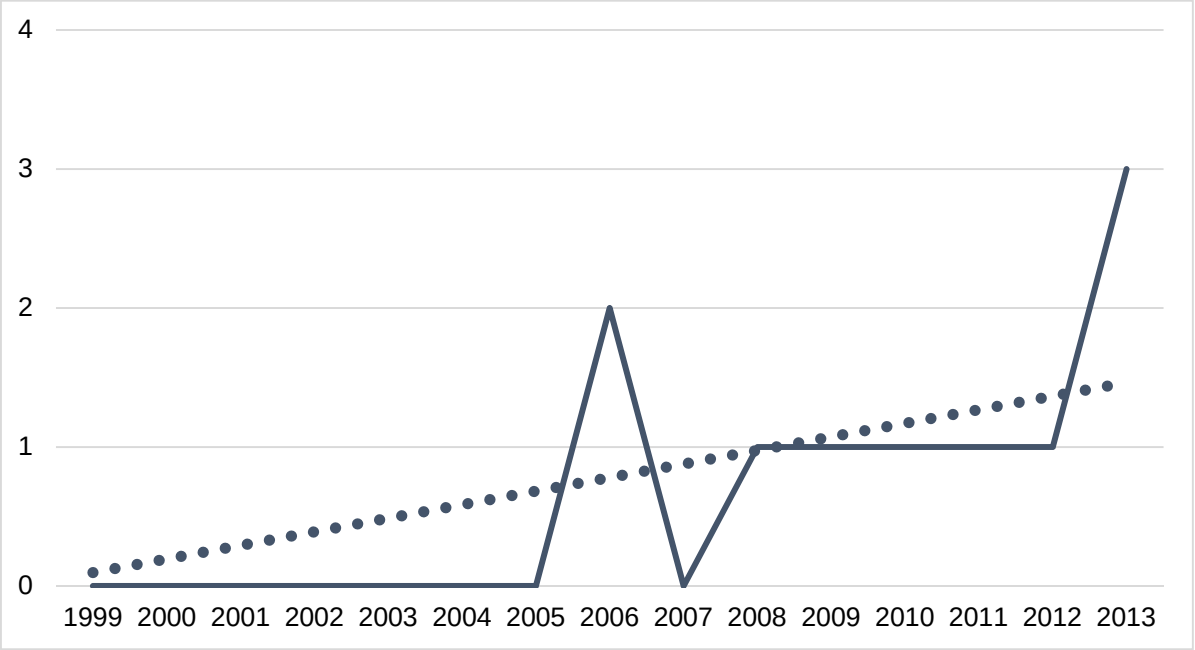


(b) Actor-Network Theory

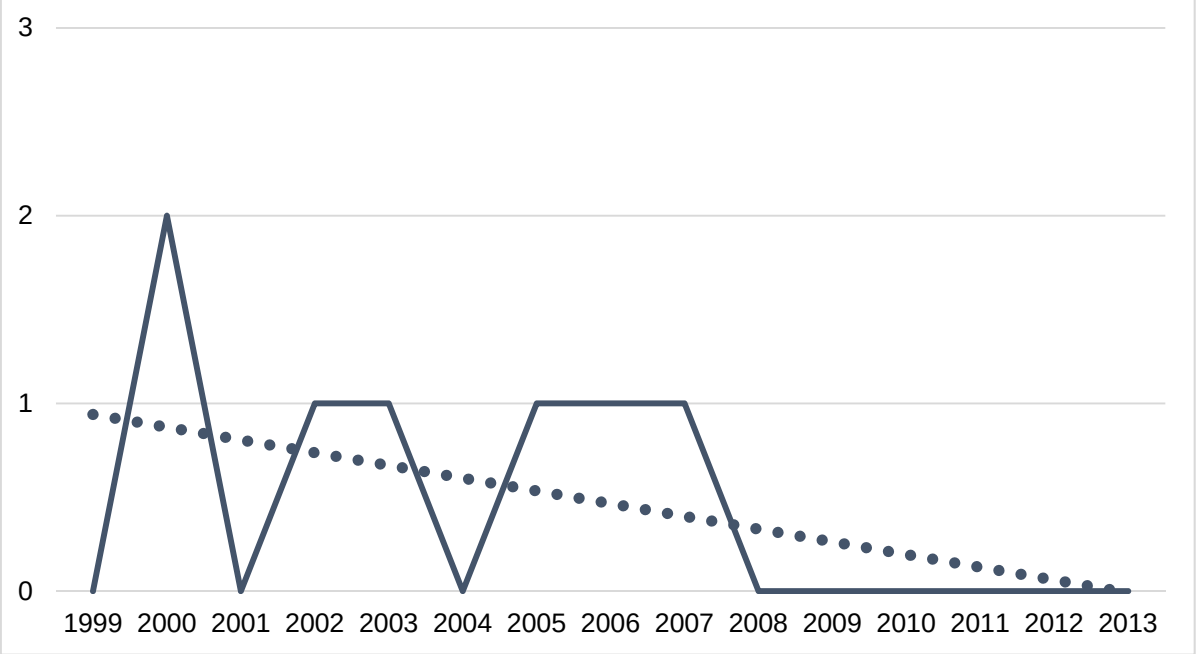


(c) Theory of Constraints

Fig 5. Graphical analysis of citation counts in PM literature 1999-2013 with trend (continued)



(d) Stakeholder Theory



（e）Utility Theory

Fig 5. Graphical analysis of citation counts in PM literature 1999-2013 with trend (continued)

5. Limitations

Since our methodology followed the lead of Littau et al. (2010) for choosing the pool of peer reviewed journals to consider in our review, it does present a limitation in that we did not consider all PM journals, books, or other academic PM outlets. Subsequently, utilizing the Littau et al. (2010) method, we limited our search to the word *theory* in the reviewed articles' title, abstract or keywords. As such, there could be additional words or phrases revealing theory not collected here. Additionally, other theories may have been employed without the term *theory* appearing in our search criteria. Hence, the conclusions drawn in our review were formed from articles explicitly stating *theory* in our search criteria.

We recognize a recent 15-year review does not cover the entire library of PM theoretical knowledge. However, our scope was designed to uncover recent theoretical trends in the PM literature.

6. Contribution and future research

As the PM body of knowledge continues to grow and expand, a meta-analysis considering the most utilized and/or cited theories within that knowledge domain seems reasonable. An additional aim of this research was to also bring attention to the strength and variety of the theoretical underpinnings of various PM researchers within the 15-year time period of 1999-2013. A significant contribution of this manuscript is the inclusion of all the theories found during our review (included in

Appendix 1). This appendix should provide future investigators an advantage and "ready-reference" when considering theoretical implications within the PM knowledge domain.

FST has been utilized in time-cost trade off modeling, activity duration calculations, costing models, project selection, and risk management. Future research might investigate whether FST could be used as part of project manager selection or development programs.

TOC has been used within PM for project scheduling, improving project control, allocating resources, risk and cost management. TOC might be utilized in multi-project portfolio management and international, supply chain dependent projects. These seem like fertile ground for future TOC research.

ANT has been employed as a research methodology to discover new PM knowledge and has the ability to shift some PM investigations away from tools and techniques to behaviors. ANT has also been used in examining project complexity, PM decision-making and PM office interpersonal relations. ANT might prove a useful lens for research and evaluation of PM maturity in organizations or the strength of matrix-styled organizations as compared to other organizational forms when considering PM outcomes.

As it pertains to stakeholders, ST suggests the importance of identifying, classifying, analyzing and communicating with influencers who may cast a positive or negative effect on the project and/or its outcome. Considering the implications of not doing so could motivate project managers to become "stakeholder centric," thus increasing risk to other parts of the project. Considering such, future research might investigate what stakeholder management level is "ideal" for successful project outcomes so as to balance stakeholder needs with other project needs.

Finally, UT concerns itself with preferences and choices by utilizing a utility function. UT has found application with PM specifically in building relationships between contractors and suppliers. Future research could explore whether aspects of UT could be applied to project selection and/or team member selection. Further, UT might be utilized to resolve conflict in matrix-based organizations when conflict arises because of competing resource needs.

7. Conclusion

Our 15-year review indicates there to be a broad and diverse interest in theoretical application in PM research and practice. Moreover, the substantive dissimilarity in the composition of the theories within this review suggests an academic community that welcomes additional theoretical considerations.

Taking a closer look at specific theory usage in the study period, but narrowing the focus to the last four years (2010-2013), some of the top five theories continued to remain prominent while others rose in popularity. As the trends lines indicate in Fig. 5, FST, ANT and ST enjoyed positive trending, while TOC and UT's use among PM researchers trended down. In the last four years (2010-2013), FST, ANT and ST maintained their positive trend. However, two other theories, Contingency Theory and Grounded Theory, improved in researcher interest (Appendix 1). Narrowing the scope further to 2013 only, the three theories most probed among PM researchers were: FST, ST and Grounded Theory (Appendix 1). Based on the review's parameters, these theories seem to be peaking academic's curiosity in recent years and are pushing the discipline ever forward into new practice and philosophy.

Although a validated Theory of Project Management has yet to be developed or defined (Sauer and Reich, 2007; Turner, 2006; Williams, 2004), much theoretical inclusion has been conducted over the past several years. Indeed, the discipline has stood on the shoulder of giants and is continuing to evolve from a solely practice-based discipline to a more dynamic arena that finds significance in both practice and theory. Our work suggests that we are moving in that direction due to the varied theoretical implications found in this review. To that end, further inclusion of theoretical work should only strengthen the PM body of knowledge moving forward.

For any growing and sustainable academic body of knowledge, theory application and development must be present. This manuscript's review highlights the significant impact of several theories on the PM discipline. It is likely that each of these theories, among others, will continue to be further developed and find new application and purpose as the discipline evolves.

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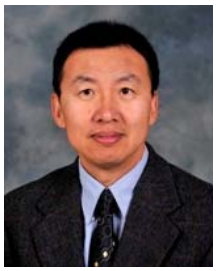

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Appendix: All PM Papers Reviewed for Theory Citation, 1999-2013

Journal Abbreviations: PMJ: *Project Management Journal*, IJPM: *International Journal of Project Management*, IJMPB: *International Journal of Managing Projects in Business*, CME: *Construction Management and Economics*, JCEM: *Journal of Construction Engineering and Management*, AIC: *Automation in Construction*, and IJPOM: *International Journal of Project Organisation and Management*.

Theory	Date	Author(s)	Name of Paper	Journal
Absorptive Capacity Theory	2009	Pernilla Gluch, Mathias Gustafsson, Liane Thuvander	An absorptive capacity model for green innovation and performance in the construction industry.	CME
Activity Theory	2011	Jacob Vakkayil	Learning through shared objects in outsourced software development.	IJMPB
Activity Theory	2013	Shen-Pao Shih, Ruey-Shiang Shaw, Ta-Yu Fu, Che-Pin Cheng	A Systematic Study of Change Management During CMMI Implementation: A Modified Activity Theory Perspective.	PMJ
Activity Theory	2013	Stefan Christoffer Gottlieb, Kim Haugbølle	Contradictions and collaboration: partnering in-between systems of production, values and interests.	CME
Actor-Network Theory	2005	Henrik Linderoth, Giuseppina Pellegrino	Frames and inscriptions: tracing a way to understand IT-dependent change projects.	IJPM
Actor-Network Theory	2008	Chris Harty	Implementing innovation in construction: contexts, relative boundedness and actor-network theory.	CME
Actor-Network Theory	2009	Susse Georg, Kjell Tryggestad	On the emergence of roles in construction: the qualculative role of project management.	CME
Actor-Network Theory	2010	Kjell Tryggestad, Susse Georg, Tor Hernes	Constructing buildings and design ambitions.	CME
Actor-Network Theory	2010	Chris Harty, Jennifer Whyte	Emerging Hybrid Practices in Construction Design Work: Role of Mixed Media.	JCEM
Actor-Network Theory	2010	Daniel Sage, Andrew Dainty, Naomi Brookes	Who reads the project file? Exploring the power effects of knowledge tools in construction project management.	CME
Actor-Network Theory	2011	Monique Aubry	The social reality of organisational project management at the interface between networks and hierarchy.	IJMPB
Actor-Network Theory	2011	Neil Alderman, Chris Ivory	Translation and convergence in projects: An organizational perspective on project success.	PMJ
Actor-Network Theory	2012	Helen Clare Lingard, Tracy Cooke, Nick Blismas	Designing for construction workers' occupational health and safety: a case study of socio-material complexity.	CME
Actor-Network Theory	2013	J. Pollack, K. Costello, S. Sankaran	Applying Actor–Network Theory as a sensemaking framework for complex organisational change programs.	IJPM
Actor-Network Theory	2013	Kjell Tryggestad, Lise Justesen, Jan Mouritsen	Project temporalities: how frogs can become stakeholders.	IJMPB
Agency Theory	2010	Robert Mahaney, Albert Lederer	The role of monitoring and shirking in information systems project management.	IJPM
Agency Theory	2013	Alexia Nalewaik	Factors affecting capital program performance audit findings.	IJMPB
Agency Theory	2013	S. Mahdi Hosseinian, David G. Carmichael	Optimal Incentive Contract with Risk-Neutral Contractor.	JCEM
Ant Colony Optimization Theory	2013	Heng Li, Hong Zhang	Ant colony optimization-based multi-mode scheduling under renewable and nonrenewable resource constraints.	AIC
Asymmetric Information Theory	2012	Pengcheng Xiang, Jin Zhou, Xiaoyu Zhou, Kunhui Ye	Construction Project Risk Management Based on the View of Asymmetric Information.	JCEM
Auction Theory	2008	Martin Skitmore	First and second price independent values sealed bid procurement auctions: some scalar equilibrium results.	CME
Bandura's Self-Efficacy Theory	2012	Tak Wing Yiu, Sai On Cheung, Lai Ying Siu	Application of Bandura's Self-Efficacy Theory to Examining the Choice of Tactics in Construction Dispute Negotiation.	JCEM
Bandura's Social Learning Theory	2007	Iain Cameron, Roy Duff	A critical review of safety initiatives using goal setting and feedback.	CME
Bargaining Game Theory	2007	L.Y. Shen, H.J. Bao, Y.Z. Wu, W.S. Lu	Using Bargaining-Game Theory for Negotiating Concession Period for BOT-Type Contract.	JCEM
Bargaining Game Theory	2012	Shinya Hanaoka, Hazel Perez Palapus	Reasonable concession period for build-operate-transfer road projects in the Philippines.	IJPM
Bass and Avolio's Leadership Theory	2013	Mastura Jaafar, Cheng Chye Nee	An assessment of the leadership style in Malaysian construction firms	IJPOM
Bass's Transformational Leadership Theory	2005	Antony Chan, Edwin Chan	Impact of Perceived Leadership Styles on Work Outcomes: Case of Building Professionals.	JCEM

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Theory	Date	Author(s)	Name of Paper	Journal
Behavioral Theory	2013	Mattias Jacobsson, Thommie Burström, Timothy Wilson	The role of transition in temporary organizations: linking the temporary to the permanent.	IJMPB
Capital Theory	2006	Gerard de Valence	Building as an economic process: the Austrian approach revisited.	CME
Catastrophe Theory	2008	Sai On Cheung, Tak Wing Yiu, Andrew Yee Tak Laung, On Ki Chiung	Catastrophic Transitions of Construction Contracting Behavior.	JCEM
Catastrophe Theory	2012	Pui Ting Chow, Sai On Cheung, Tak Wing Yiu	A cusp catastrophe model of withdrawal in construction project dispute negotiation.	AIC
Chain Management Theory	2013	Scott Fernie, Stuart Tennant	The non-adoption of supply chain management.	CME
Chaos Theory	2010	Xiaoshu Lu, Derek Clements-Croome, Martti Viljanen	Integration of chaos theory and mathematical models in building simulation: Part I: Literature review.	AIC
Chaos Theory	2010	Xiaoshu Lu, Derek Clements-Croome, Martti Viljanen	Integration of chaos theory and mathematical models in building simulation: Part II: Conceptual frameworks.	AIC
Coase's Theory	2008	Lawrence Wai Chung Lai, Felicity Wai Ngar Ng, Ping Yung	The Coase Theorem and a Coasian construction economics and management research agenda.	CME
Competitive Bidding Theory	2005	Carrie Sturts, F.H. Griffis	Addressing Pricing: Value Bidding for Engineers and Consultants.	JCEM
Complexity Theory	2007	Terry Cooke-Davies, Svetlana Cicmil, Lynn Crawford, Kurt Richardson	We're Not in Kansas Anymore, Toto: Mapping The Strange Landscape Of Complexity Theory, and Its Relationship To Project Management.	PMJ
Complexity Theory	2009	Kenneth Rose	Exploring the complexity of projects: Implications of complexity theory for project management practice.	PMJ
Complexity Theory	2010	Manfred Saynisch	Beyond frontiers of traditional project management: An approach to evolutionary, self-organizational principles and the complexity theory—results of the research program.	PMJ
Complexity Theory	2011	Kenneth Rose, Prasad Kodukula	Complexity theory and project management.	PMJ
Complexity Theory	2012	Julien Pollack	Transferring knowledge about knowledge management: Implementation of a complex organisational change programme.	IJPM
Component Unit Pricing Theory	2012	David William Cattell	An overview of component unit pricing theory.	CME
Construction Simulation Theory	2010	Simaan AbouRizk	Role of Simulation in Construction Engineering and Management.	JCEM
Construction Simulation Theory	2011	S. AbouRizk, D. Halpin, Y. Mohamed, U. Hermann	Research in Modeling and Simulation for Improving Construction Engineering Operations.	JCEM
Contingency Theory	2009	Brian Sauser, Richard Reilly, Aaron Shenhar	Why projects fail? How contingency theory can provide new insights – A comparative analysis of NASA's Mars Climate Orbiter loss.	IJPM
Contingency Theory	2010	Cécile Godé-Sanchez	Leveraging coordination in project-based activities: What can we learn from military teamwork?	PMJ
Contingency Theory	2011	Gonzalo Lizarralde, Michel de Blois, Iskra Latunova	Structuring of temporary multi-organizations: Contingency theory in the building sector.	PMJ
Contingency Theory	2012	Bastian Hanisch, Andreas Wald	A Bibliometric View on the Use of Contingency Theory in Project Management Research.	PMJ
Contingency Theory	2013	Fei Deng, Hedley Smyth	Contingency-Based Approach to Firm Performance in Construction: Critical Review of Empirical Research.	JCEM
Contract Theory	2007	John Wilson Twyford	Additional payments under construction contracts.	CME
Coordination Theory	2008	Liaquat Hossain, Matthew Kuti	CordNet: Toward a distributed behavior model for emergency response coordination.	PMJ
Cumulative Prospect Theory	2011	David Cattell, Paul Bowen, Ammar Kaka	Proposed Framework for Applying Cumulative Prospect Theory to an Unbalanced Bidding Model.	JCEM
Cybernetics Theory	2012	Ahmed Alojairi, Frank Safayeni	The dynamics of inter-node coordination in social networks: A theoretical perspective and empirical evidence.	IJPM
Decision Theory	2012	Sorin Piperca, Serghei Floricel	A typology of unexpected events in complex projects.	IJMPB
Design Theory	2012	Sylvain Lenfle	Exploration, project evaluation and design theory: a rereading of the Manhattan case.	IJMPB

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Theory	Date	Author(s)	Name of Paper	Journal
Douglas' Cultural Theory	2012	Aeli Roberts, John Kelsey, Hedley Smyth, Adam Wilson	Health and safety maturity in project business cultures.	IJMPB
Duck Alignment Theory	1999	Derek Lidow	Duck Alignment Theory: Going Beyond Classic Project Management to Maximize Project Success.	PMJ
Economic Game Theory	2006	Rafael Sacks, Michael Harel	An economic game theory model of subcontractor resource allocation behaviour.	CME
Entropy Theory	2009	Xiaolong Xue, Qiping Shen, Heng Li, William O'Brien, Zhaomin Ren	Improving agent-based negotiation efficiency in construction supply chains: A relative entropy method.	AIC
Equity Theory	2011	Tak Wing Yiu, Yee Man Law	Moderating Effect of Equity Sensitivity on Behavior-Outcome Relationships in Construction Dispute Negotiation.	JCEM
Ethical Theories	2009	Margaret Lee	E-ethical leadership for virtual project teams.	IJPM
Ethnographic Theory	2013	Andreas Phelps, Michael Horman	Ethnographic Theory-Building Research in Construction.	JCEM
Evolution Theory	2011	Stephen Jonathan Whitty	On a new philosophy of project managementAn investigation into the prevalence of modern project management by means of an evolutionary framework.	IJMPB
Exchange Theory	2010	Ravikiran Dwivedula, Christophe Bredillet	The relationship between organizational and professional commitment in the case of project workers: Implications for project management.	PMJ
Extenics Theory	2007	Chi Ming Tam, Thomas Tong, Bill Wong	An integrated system for earthmoving planning.	CME
Fuzzy Logic Theory	2009	Llewellyn Tang, Andrew Leung	An entropy-based financial decision support system (e-FDSS) for project analysis in construction SMEs.	CME
Fuzzy Multiple-Objective Decision-Making Theory	2001	K.C. Lam, A.T.P. So, Tiesong Hu, Thomas Ng, R.K.K. Yuen, S.M. Lo, S.O. Cheung, Hongwei Yang	An integration of the fuzzy reasoning technique and the fuzzy optimization method in construction project management decision-making.	CME
Fuzzy Neural Network Theory	2001	K.C. Lam, Tiesong Hu, S. Thomas Ng, Martin Skitmore, S.O. Cheung	A fuzzy neural network approach for contractor prequalification.	CME
Fuzzy Number Theory	2007	Yawei Li, Xiangtian Nie, Shouyu Chen	Fuzzy Approach to Prequalifying Construction Contractors.	JCEM
Fuzzy Sets Theory	1999	M.I. Okoroh, V.B. Torrance	A model for subcontractor selection in refurbishment projects.	CME
Fuzzy Sets Theory	2001	Sou-Sen Leu, An-Ting Chen	A GA-based fuzzy optimal model for construction time-cost trade-off.	IJPM
Fuzzy Sets Theory	2002	Min-Yuan Cheng, Chien-Ho Ko	Computer-aided decision support system for hillside safety monitoring.	AIC
Fuzzy Sets Theory	2002	Min-Yuan Cheng, Chien-Ho Ko, Chih-Hung Chang	Computer-aided DSS for safety monitoring of geotechnical construction.	AIC
Fuzzy Sets Theory	2003	Yi Qing Yang, Shou Qing Wang, Mohammad Dulaimi, Sui Pheng Low	A fuzzy quality function deployment system for buildable design decision-makings.	AIC
Fuzzy Sets Theory	2003	Daniel Baloi, Andrew Price	Modelling global risk factors affecting construction cost performance.	IJPM
Fuzzy Sets Theory	2004	Roger Chun-Chin Wei, Mao-Jiun Wang	A comprehensive framework for selecting an ERP system.	IJPM
Fuzzy Sets Theory	2004	Mohammed Kishk	Combining various facets of uncertainty in whole-life cost modelling.	CME
Fuzzy Sets Theory	2004	Tzu-Liang Tseng, Chun-Che Huang, Anthony How-Wei Chu, Roger Gung	Novel approach to multi-functional project team formation.	IJPM
Fuzzy Sets Theory	2004	Reay-Chen Wang, Tien-Fu Laing	Project management decisions with multiple fuzzy goals.	CME
Fuzzy Sets Theory	2005	D. Singh, Robert L.K. Tiong	A Fuzzy Decision Framework for Contractor Selection.	JCEM
Fuzzy Sets Theory	2005	Daisy X.M. Zheng, S. Thomas Ng	Stochastic Time–Cost Optimization Model Incorporating Fuzzy Sets Theory and Nonreplaceable Front.	JCEM
Fuzzy Sets Theory	2006	Nang-Fei Pan	Evaluation of building performance using fuzzy FTA.	CME
Fuzzy Sets Theory	2007	Chun-Chin Wei, Gin-Shuh Liang, Mao-Jiun Wang	A comprehensive supply chain management project selection framework under fuzzy environment.	IJPM

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Theory	Date	Author(s)	Name of Paper	Journal
Fuzzy Sets Theory	2007	Ahmed Shaheen, Aminah Robinson Fayek, S.M. AbouRizk	Fuzzy Numbers in Cost Range Estimating.	JCEM
Fuzzy Sets Theory	2008	Ehsan Eshtehardian, Abbas Afshar, Reza Abbasnia	Time-cost optimization: using GA and fuzzy sets theory for uncertainties in cost.	CME
Fuzzy Sets Theory	2009	Serdar Kale	Fuzzy Intellectual Capital Index for Construction Firms.	JCEM
Fuzzy Sets Theory	2009	Ehsan Eshtehardian, Abbas Afshar, Reza Abbasnia	Fuzzy-based MOGA approach to stochastic time–cost trade-off problem.	AIC
Fuzzy Sets Theory	2009	Yi-Kai Juan, Yeng-Horng Perng, Daniel Castro-Lacouture, Kuo-Sheng Lu	Housing refurbishment contractor selection based on a hybrid fuzzy-QFD approach.	AIC
Fuzzy Sets Theory	2009	Tillmann Sachs, Robert Tiong	Quantifying Qualitative Information on Risks: Development of the QQIR Method.	JCEM
Fuzzy Sets Theory	2009	Banafsheh Zahraie, Mehdi Tavakolan	Stochastic Time-Cost-Resource Utilization Optimization Using Nondominated Sorting Genetic Algorithm and Discrete Fuzzy Sets.	JCEM
Fuzzy Sets Theory	2011	A. Nieto-Morote, F. Ruz-Vila	A fuzzy approach to construction project risk assessment.	IJPM
Fuzzy Sets Theory	2011	Bo Xia, Albert Chan, John F.Y. Yeung	Developing a Fuzzy Multicriteria Decision-Making Model for Selecting Design-Build Operational Variations.	JCEM
Fuzzy Sets Theory	2011	Baabak Ashuri, Mehdi Tavakolan	Fuzzy Enabled Hybrid Genetic Algorithm-Particle Swarm Optimization Approach to Solve TCRO Problems in Construction Project Planning.	JCEM
Fuzzy Sets Theory	2011	Alexander Maravas, John-Paris Pantouvakis	Fuzzy Repetitive Scheduling Method for Projects with Repeating Activities.	JCEM
Fuzzy Sets Theory	2012	Ana Nieto-Morote, Francisco Ruz-Vila	A fuzzy multi-criteria decision-making model for construction contractor prequalification.	AIC
Fuzzy Sets Theory	2012	Edyta Plebankiewicz	A fuzzy sets based contractor prequalification procedure.	AIC
Fuzzy Sets Theory	2012	Qian Shi, Tomas Blomquist	A new approach for project scheduling using fuzzy dependency structure matrix.	IJPM
Fuzzy Sets Theory	2012	Alexander Maravas, John-Paris Pantouvakis	Project cash flow analysis in the presence of uncertainty in activity duration and cost.	IJPM
Fuzzy Sets Theory	2013	Jui-Sheng Chou, Anh-Duc Pham, Hsin Wang	Bidding strategy to support decision-making by integrating fuzzy AHP and regression-based simulation.	AIC
Fuzzy Sets Theory	2013	Xianbo Zhao, Bon-Gang Hwang, Sui Pheng Low	Developing Fuzzy Enterprise Risk Management Maturity Model for Construction Firms.	JCEM
Fuzzy Sets Theory	2013	Mohammad Ammar, Tarek Zayed, Osama Moselhi	Fuzzy-Based Life-Cycle Cost Model for Decision Making under Subjectivity.	JCEM
Fuzzy Systems Theory	2011	Varun Kishore, Dulcy Abraham, Joseph Sinfield	Portfolio Cash Assessment Using Fuzzy Systems Theory.	JCEM
Fuzzy Theory	2004	Ting-Ya Hsieh, Shih-Tong Lu, Gwo-Hshiung Tzeng	Fuzzy MCDM approach for planning and design tenders selection in public office buildings.	IJPM
Game Theory	2005	S. Ping Ho	Bid Compensation Decision Model for Projects with Costly Bid Preparation.	JCEM
Game Theory	2006	S. Ping Ho	Model for Financial Renegotiation in Public-Private Partnership Projects and Its Policy Implications: Game Theoretic View.	JCEM
Game Theory	2007	Francesca Medda	A game theory approach for the allocation of risks in transport public private partnerships.	IJPM
Game Theory	2011	JeongWook Son, Eddy Rojas	Evolution of Collaboration in Temporary Project Teams: An Agent-Based Modeling and Simulation Approach.	JCEM
Game Theory	2011	Hakan Unsal, John E. Taylor	Modeling Interfirm Dependency: Game Theoretic Simulation to Examine the Holdup Problem in Project Networks.	JCEM
Goal-Setting Theory	2002	Anita Liu, Mei-yung Leung	Developing a soft value management model.	IJPM
Graph Theory	2009	Maryam Darvish, Mehrdad Yasaei, Azita Saeedi	Application of the graph theory and matrix methods to contractor ranking.	IJPM
Grounded Theory	1999	Martin Loosemore	A grounded theory of construction crisis management.	CME

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Theory	Date	Author(s)	Name of Paper	Journal
Grounded Theory	2000	Andrew Dainty, Barbara Bagilhole, Richard Neale	A grounded theory of women's career under-achievement in large UK construction companies.	CME
Grounded Theory	2004	Korin Kendra, Laura Taplin	Project Success: A Cultural Framework.	PMJ
Grounded Theory	2005	Jane Helm, Remington Kaye	Effective Project Sponsorship An Evaluation of the Role of the Executive Sponsor in Complex Infrastructure Projects By Senior Project Managers.	PMJ
Grounded Theory	2007	Jerry Wellman	Leadership Behaviors in Matrix Environments.	PMJ
Grounded Theory	2009	Peter Barrett, Monty Sutrisna	Methodological strategies to gain insights into informality and emergence in construction project case studies.	CME
Grounded Theory	2010	Stuart Green, Chung-Chin Kao, Graeme Larsen	Contextualist Research: Iterating between Methods While Following an Empirically Grounded Approach.	JCEM
Grounded Theory	2012	Beverly Pasian, Shankar Sankaran, Spike Boydell	Project management maturity: a critical analysis of existing and emergent factors.	IJMPB
Grounded Theory	2013	Andreas Phelps, Michael Horman	Ethnographic Theory-Building Research in Construction.	JCEM
Grounded Theory	2013	Dirk Klimkeit	Organizational context and collaboration on international projects: The case of a professional service firm.	IJPM
Grounded Theory	2013	Scott Fernie, Stuart Tennant	The non-adoption of supply chain management.	CME
High Reliability Theory	2010	Tim Brady, Andrew Davies	From hero to hubris – Reconsidering the project management of Heathrow's Terminal 5.	IJPM
Innovation Diffusion Theory	2005	Serdar Kale, David Arditi	Diffusion of Computer Aided Design Technology in Architectural Design Practice.	JCEM
Innovation Diffusion Theory	2006	Serdar Kale, David Arditi	Diffusion of ISO 9000 certification in the precast concrete industry.	CME
Innovation Theory	2000	Sarah Slaughter, Hikaru Shimizu	`Clusters' of innovations in recent long span and multi-segmental bridges.	CME
Innovation Theory	2007	Kristian Widén, Bengt Hansson	Diffusion characteristics of private sector financed innovation in Sweden.	CME
Institutional Theory	2001	David Greenwood	Subcontract procurement: are relationships changing?	CME
Institutional Theory	2005	Jaakko Kujala, Tuomas Ahola	The value of customer satisfaction surveys for project-based organizations: symbolic, technical, or none.	IJPM
Institutional Theory	2007	Ashwin Mahalingam, Raymond Levitt	Institutional Theory as a Framework for Analyzing Conflicts on Global Projects.	JCEM
Institutional Theory	2010	Amy Javernick-Will, Raymond Levitt	Mobilizing Institutional Knowledge for International Projects.	JCEM
Institutional Theory	2010	Amy Javernick-Will, W. Richard Scott	Who Needs to Know What? Institutional Knowledge and Global Projects.	JCEM
Institutional Theory	2011	Cheryl Chi, Amy Nicole Javernick-Will	Institutional effects on project arrangement: high-speed rail projects in China and Taiwan.	CME
Knowledge Creation Theory	2003	Patrick Fong	Knowledge creation in multidisciplinary project teams: an empirical study of the processes and their dynamic interrelationships.	IJPM
Leadership Theory	2013	Ana K. Tyssen, Andreas Wald, Patrick Spleth	Leadership in Temporary Organizations: A Review of Leadership Theories and a Research Agenda.	PMJ
Lean Production Theory	2006	Albert Agbulos, Yasser Mohamed, Mohamed Al-Hussein, Simaan AbouRizk, John Roesch	Application of Lean Concepts and Simulation Analysis to Improve Efficiency of Drainage Operations Maintenance Crews.	JCEM
Learning-Curve Theory	2000	Christopher Waterworth	Relearning the Learning Curve: A Review of the Derivation and Applications of Learning-Curve Theory.	PMJ
Learning-Curve Theory	2009	Jimmie Hinze, Svetlana Olbina	Empirical Analysis of the Learning Curve Principle in Prestressed Concrete Piles.	JCEM
Learning-Curve Theory	2010	Abdulaziz Jarkas	Critical Investigation into the Applicability of the Learning Curve Theory to Rebar Fixing Labor Productivity.	JCEM
Learning-Curve Theory	2011	Abdulaziz Jarkas, Malcolm Horner	Revisiting the applicability of learning curve theory to formwork labour productivity.	CME

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Theory	Date	Author(s)	Name of Paper	Journal
Learning-Curve Theory	2012	Roberta Pellegrino, Nicola Costantino, Roberto Pietroforte, Silvio Sancilio	Construction of multi-storey concrete structures in Italy: patterns of productivity and learning curves.	CME
Legitimacy Theory	2013	Kirsi Aaltonen	The establishment of legitimacy: the case of international projects.	IJMPB
Life Cycle Management Theory	2006	Gang Xie, Jinlong Zhang, K.K. Lai	Risk avoidance in bidding for software projects based on life cycle management theory.	IJPM
Limit Analysis Theory	2013	B. Riviero, M. Solla, I. de Arteaga, P. Arias, P. Morer	A novel approach to evaluate masonry arch stability on the basis of limit analysis theory and non-destructive geometric characterization.	AIC
Management Theory	2007	John Alfred Rooke, Lauri Koskela, David Seymour	Producing things or production flows? Ontological assumptions in the thinking of managers and professionals in construction.	CME
Market Segmentation Theory	2009	Henk-Jan Van Mossel, Ad Straub	The need for customizing maintenance services in social housing.	CME
Marketing Theory	2007	Perry John Forsythe	A conceptual framework for studying customer satisfaction in residential construction.	CME
Maximal Flow Theory	2004	Jinming Liu, Fred Rahbar	Project Time-Cost Trade-Off Optimization by Maximal Flow Theory.	JCEM
Measurement Theory	2007	Hsiuyu Tsai, Lungchang Wang, Leekuo Lin	A study on improving the ranking procedure for determining the most advantageous tender.	CME
Media Richness Theory	2003	Ralf Müller	Determinants for external communications of IT project managers.	IJPM
Membrane Theory of Thin Shells	2010	I. Vizotto	Computational generation of free-form shells in architectural design and civil engineering.	AIC
Modularity Theory	2008	Erik de Waard, Eric-Hans Kramer	Tailored task forces: Temporary organizations and modularity.	IJPM
Neoclassical Microeconomic Theory	2006	Martin Skitmore, Goran Runeson, Xinling Chang	Construction price formation: full-cost pricing or neoclassical microeconomic theory?	CME
Neoclassical Microeconomic Theory	2007	Martin Skitmore, Hedley Smith	Pricing construction work: a marketing viewpoint.	CME
Neoclassical Microeconomic Theory	2013	Wen-der Yu, Kwo-Wuu Wang, Ming-Teh Wang	Pricing Strategy for Best Value Tender.	JCEM
Network Theory	2011	Abu Naser Chowdhury, Po-Han Chen, Robert Tiong	Analysing the structure of public-private partnership projects using network theory.	CME
Network Theory of Embeddedness	2003	Yean Yng Ling	A conceptual model for selection of architects by project managers in Singapore.	IJPM
New Institutional Economics Theory	2012	H. Ping Tserng, Jeffrey Russell, Ching-Wen Hsu, Chieh Lin	Analyzing the Role of National PPP Units in Promoting PPPs: Using New Institutional Economics and a Case Study.	JCEM
Niche Theory	2013	Huan Yang, Weisheng Lu	Niche comparisons: toward a new approach for analysing competition and organizational performance in the international construction market.	CME
Normal Accident Theory	2010	Tim Brady, Andrew Davies	From hero to hubris – Reconsidering the project management of Heathrow's Terminal 5.	IJPM
Open System Theory	2004	Korin Kendra, Laura Taplin	Project Success: A Cultural Framework.	PMJ
Option Pricing Theory	2001	Said Boukendour, Rahim Bah	The guaranteed maximum price contract as call option.	CME
Option Pricing Theory	2002	S. Ping Ho, Liang Y. Liu	An option pricing-based model for evaluating the financial viability of privatized infrastructure projects.	CME
Option Pricing Theory	2003	S. Ping Ho, Liang Y. Liu	How to Evaluate and Invest in Emerging A/E/C Technologies under Uncertainty.	JCEM
Option Pricing Theory	2009	Islam El-adaway, Amr Kandil	Contractors' Claims Insurance: A Risk Retention Approach.	JCEM
Option Pricing Theory	2011	R. David Espinoza	Contingency estimating using option pricing theory: closing the gap between theory and practice.	CME
Organization Theory	2004	Almula Koksal, David Arditi	Predicting Construction Company Decline.	JCEM

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Theory	Date	Author(s)	Name of Paper	Journal
Organization Theory	2009	John Alfred Rooke, Lauri Koskela, Mike Kagioglou	Informality in organization and research: a review and a proposal.	CME
Organization Theory	2012	Tuomas Ahola, Andrew Davies	Insights for the governance of large projectsAnalysis of Organization Theory and Project Management: Administering Uncertainty in Norwegian Offshore Oil by Stinchcombe and Heimer.	IJMPB
Organization Theory	2012	Jonas Söderlund	Project management, interdependencies, and timeInsights from Managing Large Systems by Sayles and Chandler.	IJMPB
Organizational Theory	2003	J. Rodney Turner, Ralf Müller	On the nature of the project as a temporary organization.	IJPM
Organizational Theory	2006	Andrew Chang, Chih-Chiang Tien	Quantifying uncertainty and equivocality in engineering projects.	CME
Organizational Theory	2013	Anna Jerbrant, Tina Karrbom Gustavsson	Managing project portfolios: balancing flexibility and structure by improvising.	IJMPB
Personal Construct Theory	2008	Zhikun Ding, Fungfai Ng	A new way of developing semantic differential scales with personal construct theory.	CME
Personal Construct Theory	2010	Zhikun Ding, Fungfai Ng	Personal Construct-Based Factors Affecting Interpersonal Trust in a Project Design Team.	JCEM
Possibility Theory	2001	Sherif Mohamed, Alison McCowan	Modelling project investment decisions under uncertainty using possibility theory.	IJPM
Possibility Theory	2006	Nang-Fei Pan	Evaluation of building performance using fuzzy FTA.	CME
Practice Theory	2011	Monique Aubrey, Ralf Müller, Johannes Glückler	Exploring PMOs through community of practice theory.	PMJ
Practice-Based Theory	2013	Christian Koch, Christian Thuesen	Knowledge sharing in construction partnering projects – redundancy, boundary objects and brokers	IJPOM
Price Intensity Theory	2013	Mohd Azrai Azman, Zulkiflee Abdul-Samad, Suraya Ismail	The accuracy of preliminary cost estimates in Public Works Department (PWD) of Peninsular Malaysia.	IJPM
Principal Component Analysis Theory	2012	Wei-ming Li, Hong-ping Zhu, Lie-yun Ding, Han-bin Luo	Structural damage recognition by grouped data based on Principal Component Analysis theory.	AIC
Principal-Agent Theory	2005	Ralf Müller, J. Rodney Turner	The impact of principal–agent relationship and contract type on communication between project owner and manager.	IJPM
Principal-Agent Theory	2008	Ping Yung, Lawrence Wai Chung Lai	Supervising for quality: an empirical examination of institutional arrangements in China's construction industry.	CME
Probability Theory	2011	Yvonne Moret, Herbert Einstein	Experience in Expert Estimation of Probabilities and Correlations for Rail Line Construction.	JCEM
Production Theory	2010	Clementinah Ndhlovu Rooke, John Alfred Rooke, Lauri Koskela, Patricia Tzortzopoulos	Using the physical properties of artefacts to manage through-life knowledge flows in the built environment: an initial exploration.	CME
Project Contingency Theory	2010	David Howell, Charlotta Windahl, Rainer Seidel	A project contingency framework based on uncertainty and its consequences.	IJPM
Project Management Theory	2003	Keith Snider, Mark Nissen	Beyond the Body of Knowledge: A Knowledge-Flow Approach to Project Management Theory and Practice.	PMJ
Project Management Theory	2006	Lynda Bourne, Derek Walker	Visualizing Stakeholder Influence--Two Australian Examples.	PMJ
Project Management Theory	2010	J. Davidson Frame	Project management theory and practice.	PMJ
Project Management Theory	2011	Bastian Hanisch, Andreas Wald	A project management research framework integrating multiple theoretical perspectives and influencing factors.	PMJ
Project Management Theory	2012	Darren Dalcher	The nature of project managementA reflection on The Anatomy of Major Projects by Morris and Hough.	IJMPB
Project Portfolio Theory	2008	Bodil Stilling Blichfeldt, Pernille Eskerod	Project portfolio management – There's more to it than what management enacts.	IJPM
Project Risk Theory	2009	David James Bryde, Jurgen Marc Volm	Perceptions of owners in German construction projects: congruence with project risk theory.	CME
Project Theory	2013	Anna Jerbrant, Tina Karrbom Gustavsson	Managing project portfolios: balancing flexibility and structure by improvising.	IJMPB
Prospect Theory	2011	Budi Hartono, Chee Meng Yap	Understanding risky bidding: a prospect-contingent perspective.	CME

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Queer Theory	2013	Paul Chan	Queer eye on a 'straight' life: deconstructing masculinities in construction.	CME
Queer Theory	2013	Nick Rumens	Queering men and masculinities in construction: towards a research agenda.	CME
ueuing Theory	2009	Min-Yuan Cheng, Hsing-Chih Tsai, Yun-Yan Lai	Construction management process reengineering performance measurements.	AIC
Real Options Theory	2010	Carol Menassa, Feniosky Peña Mora, Neil Pearson	Study of Real Options with Exogenous Competitive Entry to Analyze Dispute Resolution Ladder Investments in Architecture, Engineering, and Construction Projects.	JCEM
Real Options Theory	2011	Roberta Pellegrino, Luigi Rainieri, Nicola Costantino, Giovanni Mummolo	A real options-based model to supporting risk allocation in price cap regulation approach for public utilities.	CME
Reinforcement Theory	2001	C.M. Tam, Ivan Fung, Albert Chan	Study of attitude changes in people after the implementation of a new safety management system: the supervision plan.	CME
Resource Partitioning Theory	2012	Huan Yang, Albert Chan, John F.Y. Yeung, Qiming Li	Concentration Effect on Construction Firms: Tests of Resource Partitioning Theory in Jiangsu Province (China) from 1989 to 2007.	JCEM
Resource-Based Theory	2005	Ren-Jye Dzeng, Kuo-Sheng Wen	Evaluating project teaming strategies for construction of Taipei 101 using resource-based theory.	IJPM
Revenue Equivalence Theory	2006	Derek Drew, Martin Skitmore	Testing Vickery's Revenue Equivalence Theory in Construction Auctions.	JCEM
Risk Management Theory	2005	Hazel Taylor	Congruence between risk management theory and practice in Hong Kong vendor-driven IT projects.	IJPM
Role Conflict Theory	2010	Ravikiran Dwivedula, Christophe Bredillet	The relationship between organizational and professional commitment in the case of project workers: Implications for project management.	PMJ
Rough Set Theory	2006	Chi Ming Tam, Thomas Tang, K.K. Chan	Rough set theory for distilling construction safety measures.	CME
Situated Learning Theory	2013	Kam Jugdev, Gita Mathur	Bridging situated learning theory to the resource-based view of project management.	IJMPB
Social Cognitive Theory	2009	Martin Morgan Tuuli, Steve Rowlinson	Empowerment in project teams: a multilevel examination of the job performance implications.	CME
Social Conflict Theory	2011	Guangshe Jia, Fangjun Yang, Guangbin Wang, Baonan Hong, Rui You	A study of mega project from a perspective of social conflict theory.	IJPM
Social Identity Theory	2003	Florence Phua, Steve Rowlinson	Cultural differences as an explanatory variable for adversarial attitudes in the construction industry: the case of Hong Kong.	CME
Social Identity Theory	2004	Florence Phua, Steve Rowlinson	Operationalizing culture in construction management research: a social identity perspective in the Hong Kong context.	CME
Social Identity Theory	2004	Florence Phua	The antecedents of co-operative behaviour among project team members: an alternative perspective on an old issue.	CME
Social Identity Theory	2010	Ravikiran Dwivedula, Christophe Bredillet	The relationship between organizational and professional commitment in the case of project workers: Implications for project management.	PMJ
Social Interdependence Theory	2011	Neeraj Parolia, James Jiang, Gary Klein, Tsong Shin Sheu	The contribution of resource interdependence to IT program performance: A social interdependence perspective.	IJPM
Social Network Theory	2005	Stephen Pryke	Towards a social network theory of project governance.	CME
Sociotechnical Theory	2004	Korin Kendra, Laura Taplin	Project Success: A Cultural Framework.	PMJ
Source Credibility Theory	2003	Martin Ekström, Hans Björnsson, Clifford Nass	Accounting for rater credibility when evaluating AEC subcontractors.	CME
Stakeholder Theory	2006	J. Scott Sutterfield, Shawnta Friday-Stroud, Sheryl Shivers-Blackwell	A Case Study Of Project and Stakeholder Management Failures: Lessons Learned.	PMJ
Stakeholder Theory	2006	Lynda Bourne, Derek Walker	Visualizing Stakeholder Influence--Two Australian Examples.	PMJ
Stakeholder Theory	2008	Campbell Fraser, Chunxue Zhu	Stakeholder perception of construction site managers' effectiveness.	CME
Stakeholder Theory	2009	Jin Wang, Yujie Xu, Zhun Li	Determinants for external communications of IT project managers.	IJPM
Stakeholder Theory	2010	Paul Littau, Nirmala Jyothi Jujagiri, Gerald Adlbrecht	25 years of stakeholder theory in project management literature (1984–2009).	PMJ

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Stakeholder Theory	2011	Anita Liu, Richard Fellows, Martin Tuuli	The role of corporate citizenship values in promoting corporate social performance: towards a conceptual model and a research agenda.	CME
Stakeholder Theory	2012	Claus Beringer, Daniel Jonas, Hans Georg Gemunden	Establishing Project Portfolio Management: An Exploratory Analysis of the Influence of Internal Stakeholders' Interactions.	PMJ
Stakeholder Theory	2013	Claus Beringer, Daniel Jonas, Alexander Kock	Behavior of internal stakeholders in project portfolio management and its impact on success.	IJPM
Stakeholder Theory	2013	Kjell Tryggestad, Lise Justesen, Jan Mouritsen	Project temporalities: how frogs can become stakeholders.	IJMPB
Stakeholder Theory	2013	Pernille Eskerod, Martina Huemann	Sustainable development and project stakeholder management: what standards say.	IJMPB
Strength-of-Tie Theory	2009	Kon Shing Kenneth Chung, Liaquat Hossain	Measuring performance of knowledge-intensive workgroups through social networks.	PMJ
Structuration Theory	2008	Stephan Manning	Embedding projects in multiple contexts – a structuration perspective.	IJPM
Supply Chain Theory	2001	Kerry London, Russell Kenley	An industrial organization economic supply chain approach for the construction industry: a review.	CME
System Intelligence Theory	2008	Johnny Wong, Heng Li, Jenkin Lia	Evaluating the system intelligence of the intelligent building systems: Part 2: Construction and validation of analytical models.	AIC
System Reliability Theory	2012	Ran Tao, Chi-Ming Tam	System reliability optimization model for construction projects via system reliability theory.	AIC
System Reliability Theory	2013	Ran Tao, Chi-Ming Tam	System reliability theory based multiple-objective optimization model for construction projects.	AIC
Systems Theory	2011	Kaj U. Koskinen	Project-based companies as learning organisations: systems theory perspective	IJPOM
Systems Theory	2013	Seokho Chi, Sangwon Han	Analyses of systems theory for construction accident prevention with specific reference to OSHA accident reports.	IJPM
Technology Acceptance Model Theory	2012	Ghang Lee, Joonbeom Cho, Sungil Ham, Taekwan Lee, Gaang Lee, Seok-Heon Yun, Hyung-Jun Yang	A BIM- and sensor-based tower crane navigation system for blind lifts.	AIC
Tendering Theory	1999	Göran Runeson, Martin Skitmore	Tendering theory revisited.	CME
Theory of Constraints	1999	Patrick Barber, Cyril Tomkins	Decentralised site management--a case study.	IJPM
Theory of Constraints	2000	Graham Rand	Critical chain: the theory of constraints applied to project management.	IJPM
Theory of Constraints	2001	Herman Steyn	An investigation into the fundamentals of critical chain project scheduling.	IJPM
Theory of Constraints	2002	Willy Herroelen, Roel Leus, Erik Demeulemeester	Critical Chain Project Scheduling: Do Not Oversimplify.	PMJ
Theory of Constraints	2002	H. Steyn	Project management applications of the theory of constraints beyond critical chain scheduling.	IJPM
Theory of Constraints	2002	Chiu-Chi Wei, Ping-Hung Liu, Ying-Chin Tsai	Resource-constrained project management using enhanced theory of constraint.	IJPM
Theory of Constraints	2003	D.K.H. Chua, L.J. Shen, S.H. Bok	Constraint-Based Planning with Integrated Production Scheduler over Internet.	JCEM
Theory of Constraints	2003	S.E.E. Elmaghraby, W.S. Herroelen, R. Leus	Note on the paper “Resource-constrained project management using enhanced theory of constraint” by Wei et al.	IJPM
Theory of Constraints	2004	Izack Cohen, Avishai Mandelbaum, Avraham Shtub	Multi-Project Scheduling And Control: A Process-Based Comparative Study Of The Critical Chain Methodology And Some Alternatives.	PMJ
Theory of Constraints	2005	D.K.H. Chua, L.J. Shen	Key Constraints Analysis with Integrated Production Scheduler.	JCEM
Theory of Constraints	2005	Dan Trietsch	Why A Critical Path By Any Other Name Would Smell Less Sweet?	PMJ
Theory of Constraints	2007	Ming-Kuan Tsai, Jyh-Bin Yang, Chang-Yu Lin	Synchronization-based model for improving on-site data collection performance.	AIC
Theory of Constraints	2009	Liu Shu-Shun, Kuo-Chuan Shih	A framework of critical resource chain for project schedule analysis.	CME

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Theory of Constraints	2009	M. Bevilacqua, F.E. Ciarapica, G. Giacchetta	Critical chain and risk analysis applied to high-risk industry maintenance: A case study.	IJPM
Theory of Constraints	2009	Pei-Chun Lee, Wen-Yen Lee, Ming-Yen Lee	Exploring Problems and Undesired Effects in the Construction Development Process: The Case of a Small- to Medium-Sized Developer in Taiwan.	JCEM
Theory of Contextual Performance	2003	Yean Yng Ling	A conceptual model for selection of architects by project managers in Singapore.	IJPM
Theory of Conventions	2003	Christophe Bredillet	Genesis and role of standards: theoretical foundations and socio-economical model for the construction and use of standards.	IJPM
Theory of Inventive Problem Solving	2005	Y. Mohamed, S. AbouRizk	Application of the Theory of Inventive Problem Solving in Tunnel Construction.	JCEM
Theory of Inventive Problem Solving	2005	Y. Mohamed, S. AbouRizk	Technical Knowledge Consolidation using Theory of Inventive Problem Solving.	JCEM
Theory of Inventive Problem Solving	2009	Xiaoming Mao, Xueqing Zhang, Simaan AbouRizk	Enhancing Value Engineering Process by Incorporating Inventive Problem-Solving Techniques.	JCEM
Theory of Job Performance	2003	Yean Yng Ling	A conceptual model for selection of architects by project managers in Singapore.	IJPM
Theory of Planned Behavior	2012	Peihua Zhang, Fung Fai Ng	Analysis of knowledge sharing behaviour in construction teams in Hong Kong.	CME
Theory of Planned Behavior	2013	Mengchun Zhang, Dongping Fang	A cognitive analysis of why Chinese scaffolders do not use safety harnesses in construction.	CME
Theory of Planned Behavior	2013	Peihua Zhang, Fung Fai Ng	Explaining Knowledge-Sharing Intention in Construction Teams in Hong Kong.	JCEM
Theory of Process Simulation	2006	Zhen Chen, Heng Li, Stephen C.W. Kong, Ju Hong, Qian Xu	E-commerce system simulation for construction and demolition waste exchange.	AIC
Theory of the Firm	2003	Yean Yng Ling	A conceptual model for selection of architects by project managers in Singapore.	IJPM
Theory of Waste Behavior	2001	M.M.M. Teo, M. Loosemore	A theory of waste behaviour in the construction industry.	CME
Traits Theory of Leadership	2007	Dean Gehring	Applying Traits Theory of Leadership To Project Management.	PMJ
Utility Theory	2000	Eric Wong, George Norman, Roger Flanagan	A fuzzy stochastic technique for project selection.	CME
Utility Theory	2000	J. Nicholas, G.D. Holt, M. Mihsein	Contractor financial credit limits; their derivation and implications for materials suppliers.	CME
Utility Theory	2002	Wei-Chih Wang	SIM-UTILITY: Model for Project Ceiling Price Determination.	JCEM
Utility Theory	2003	Crispin Piney	Applying Utility Theory to Risk Management.	PMJ
Utility Theory	2005	E. Kutsch, M. Hall	Intervening conditions on the management of project risk: Dealing with uncertainty in information technology projects.	IJPM
Utility Theory	2006	Tarek Elmisalami, Russell Walters, Edward Jaselskis	Construction IT Decision Making Using Multiattribute Utility Theory for Use in a Laboratory Information Management System.	JCEM
Utility Theory	2007	Sung-Lin Hsueh, Yeng-Horng Perng, Min-Ren Yan, Jen-Rong Lee	On-line multi-criterion risk assessment model for construction joint ventures in China.	AIC
Value Management Theory	2007	Stuart Green, Anita Liu	Theory and practice in value management: a reply to Ellis et al. (2005).	CME