The Impact of the Planning Phase on Project Success

Abstract

Project planning is widely thought to be an important contributor to project success. However, does the research affirm its impact and give guidance as to how much effort should be spent planning? The literature in project management, and to a lesser extent in general management, is reviewed to find the reported link between planning and project success. Overall, the literature points to a strong link between planning and project success. A summary of the available studies shows unexpectedly consistent empirical results for the correlation of planning and success. The literature appears to be generally consistent showing an average value of R^2 = .33 correlation with efficiency and R^2 = .35 for overall project success. This indicates a significant impact if we compared to the reported approximate 20-33% recommended effort.

Keywords: **Project, Planning, Success, Efficiency, Plan**

Introduction

Traditional wisdom is that planning and analysis are important and the more planning there is in a project, the more successful the project will be, Wang, and Gibson (2008) , Dvir, Raz and Shenhar (2003). Time spent on these activities will reduce risk and increase project success. On the other hand, inadequate analysis and planning will lead to a failed project, Morris (1998), Thomas, Jacques, Adams and Kihneman-Woote (2008).

If poor planning has led to failed projects (from large to small), then perhaps billions of dollars have been lost, Sessions (2009). But how much is too much? “Light weight” project management techniques such as Agile are gaining popularity. Part of their ethos is that less initial planning is better and an evolutionary process is more efficient. Agile methodologies seem to imply that up front planning is not useful. There is also a phenomenon in business called analysis paralysis. This is when so much analysis takes place that no actual work is started or it is started much later than ideal.

Knowledge Gap

The fact that a large fraction of the effort in each project is spent on research and analysis warrants investigation. According to the Project Management Book of Knowledge (PMBOK® Guide) Fourth Edition (PMI, 2008), a project manager is expected to perform 42 processes, including 20 planning processes. Therefore, planning processes consist of about 48% of all processes that should be performed by a project manager during the project life cycle.

However, practitioners of agile methods would probably disagree with the statement that more planning is always better, Boehm (1996), Collyer & Warren (2009). If 50% of a project’s time and budget is spent on planning and analysis, is this beneficial to the project or does it increase project costs and timelines without providing a corresponding benefit? Choma & Bhat (2010) note that too much time spent planning can be associated with poorly performing projects. In general the optimum amount of effort spent planning and its relationship to success is an area of interest to researchers and practitioners. It is of interest to

researchers as it speaks to the general nature and characteristics of projects and practitioners as guidance when defining project structure and timelines.

Research Questions

This paper will review the literature written on the subject of the planning phase and its relationship to project success. The following are the research questions we will examine.

1. Is planning important for perceived project success?
2. What level of effort expended on the planning phase is most correlated with project success?
3. Are there are project characteristics which correlate to higher or lower levels of indicated project planning effort?
4. What level of effort spent on the planning phase is counterproductive or neutral towards project success?

Methods

An extensive review of the literature on project planning and its impact on success was undertaken. Initial investigations involved web searches and extensive Google Scholar searches. In addition, other sources of information such as Business Sources Complete, JSTOR and Networked Digital Library of Theses and Dissertations (NDLTD) were investigated. Finally, for all reviewed literature, their references were reviewed and relevant sources added to the literature review list.

The literature in this area is varied but not extensive so an attempt at an exhaustive review was feasible. The project management body of research has been described as an immature field, Blomquist, Hällgren, Nilsson and Söderholm (2010). When the number of studies directly studying planning effort or completeness and project success was found to be limited, the search was broadened to include literature that touched more generally on planning and success. That effort cannot be described as exhaustive, however. In total more than 210 papers and books were reviewed with approximately 70 of those sources being citied in this paper.

Exclusions

- Strategic enterprise planning literature, both information systems and general, was not included in this review as the field is not directly relevant to project success rather to enterprise success. Some exceptions were made to literature that spoke to the general relevance of planning.
- Literature that addressed project success without some link to planning was not extensively reviewed other than to help define project success.
- Similar papers which reanalyzed similar data were only included once.

Literature Methodologies

There are relatively few papers that directly study the relationship between the planning phase and success. There are no papers that provide a quantitative relationship between planning effort and project success. However, there are papers that indirectly give insight into

aspects of planning and success. Papers in this review are divided into the following categories:

Table 1 - Five Methodology Categories

A wide variety of research techniques are used within these categories: conceptual discussions, surveys and case studies. Empirical papers measured either time and cost budgets or completeness of deliverables. Papers which discussed completeness of deliverables depended on the subjective judgement of participants but this method far outnumbered papers which studied budgets or effort.

Literature Categories

Papers were grouped into categories. The background categories provided definitions for the remaining review.

- Project Success
- Project Planning

Papers which spoke to aspects of planning and success were further broken down into the following categories.

- Reasons Not to Plan
- Planning Variation by Industry
- Planning in Construction and the Project Definition Rating Index (PDRI)
- Planning in the Software Industry
- Planning and Success in the General Project Management Literature

- Planning and Agile/Iterative Methods
- How Much to Plan

Project Success

Before it is possible discuss the impact of the project planning phase on success, it is useful to define what a successful project is. Pinto and Slevin, (1988), stated "There are few topics in the field of project management that are so frequently discussed and yet so rarely agreed upon as the notion of project success" (p. 67). However it is worthwhile to select a reasonable definition from the literature for the purposes of comparing projects based on planning characteristics. Thomas, Jacques, Adams & Kihneman-Woote (2008) state that measuring project success in not straightforward: "Examples abound where the original objectives of the project are not met, but the client was highly satisfied. There are other examples where the initial project objectives were met, but the client was quite unhappy with the results." (p. 106). Collyer & Warren (2009) cite the movie, Titanic, which was originally touted as a late, over budget flop but eventually became very successful.

Project success has been measured in a variety of ways. While the measure of project success has focused on tangibles in the past, current thinking is that ultimately, project success can best be judged by the judgment of the primary sponsor. As Shenhar, Levy, and Dvir (1997) note, assessing success is time-dependent: "As time goes by, it matters less whether the project has met its resource constraints" (p. 12). Shenhar, Dvir, Levy and Maltz (2001) define four levels of project success:

1. Project efficiency
2. Impact on the customer

3. Business success

4. Preparing for the future

Zwikael and Globerson (2006), however, note that aspects of success are often correlated.

Figure 1: Frequency distribution of technical performance and customer satisfaction, from Zwikael and Globerson (2006)

Also, Dvir, Raz & Shenhar (2003), state that "all four success-measures (Meeting planning goals; End-user benefits; Contractor benefits; and Overall project success) are highly inter-correlated, implying that projects perceived to be successful are successful for all their stakeholders." (p. 94) Cooke-Davies (2002) makes the point that there is a difference between project success and project management success. Meeting the cost, scope, timeline requirements may not mean the project is seen as successful in the long term by the organization. Current terminology uses project efficiency instead of project management success. Therefore we will refer to:

Project efficiency – meeting cost, time and quality goals

Project success – meeting wider business and enterprise goals

Project Planning

We next need to define what is meant by project planning. The classic definition of planning is "working out in broad outline the things that need to be done and the methods for doing them to accomplish the purpose", (Gulick, 1936). Goetz (1949) defines planning as "fundamentally choosing" (p. 2) and "Without plans, action must become merely random

activity producing nothing but chaos". (p. 63) Koontz (1958) defines planning as "the conscious determination of courses of action designed to accomplish purposes." (p. 48). Mintzberg (1994) describes planning as the effort to formalizing decision making activities through decomposition, articulation and rationalization. We may take a page from the terminology used in the construction industry. In construction, pre-project planning is defined as the phase after business planning where a deal is initiated and prior to project execution, Gibson and Gebken (2003).

PMBOK® (PMI, 2008) has a similar definition for the planning phase. "The Planning Process Group consists of those processes performed to establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives." (p. 46). The greatest difference between the definitions is that construction project planning specifically includes analysis and evaluation steps. PMBOK® (2008) does not specifically include analysis tasks: items such as technology assessment, high-level design, architecture and analyzing different vendors or options. However, it is implied. Another definition of planning in projects suggested by Shenhar in reviewing early parts of this paper is "what comes before action", Shenhar (personal communication, 2011). However, the simplest definition of the planning phase for the purposes of this paper will give the greatest flexibility and access to the widest range of literature. For the purpose of this review, we will define the planning phase as follows:

Planning Phase: The phases and associated effort that comes before execution in a project.

and

Planning effort - the amount of effort in money or work hours expended in planning

Quality of planning - the quality or completeness of components of the planning phase or the phase overall

Reasons Not to Plan

Anderson (1996) questions the assumption that project planning is beneficial. He wonders if its benefits are real and asks "How can it be that project planners are able to make a detailed project plan, when either activities cannot be foreseen or they depend on the outcomes of earlier activities?" (p. 89) and says "Planners are compelled to make decisions early in the project, when very little is known of the project's future." (p. 90) He questions the value of detailed planning from a conceptual standpoint. Bart (1993) makes the point that in research and development (R&D) projects, too much planning can lead to failure as formal control limits creativity. However, he also finds that in some cases managers reduce control and planning too far to the point that it detrimental to the project.

Flyvbjerg, Holm, and Buhl (2002) investigated infrastructure projects and found overwhelming statistical significance that the cost estimates used to decide whether such projects should be built are misleading. This highlights that even if planning and analysis are undertaken, senior management can choose not to use the resultant information. However, van Marrewijk, Clegg, Pitsis and Veenswijk (2007) state that large infrastructure projects are more often impacted by political and structural problems than misleading estimates. They also state additional planning and control cannot resolve these issues.

Collyer, Warren, Hemsley and Stevens (2010) describe examples of projects such as the Australian submarine project and the Iridium satellite project (p. 110). The technology and environment changed so much during the course of the projects that the originally planned project outputs could not be successful. They state that in dynamic environments projects

need to cope with changes in technology during the course of the projects. “While useful as a guide, excessive detail in the early stages of a project may be problematic and misleading in a dynamic environment.” (p. 109) Poon, Young, Irandoos and Land (2011) in using fuzzy set analysis on five case studies, found that high-level planning was ranked second lowest in importance out of five critical success factors studied. Planning was ranked below top management support, user involvement and methodology.

Collyer and Warren (2009), state that in dynamic environments events arise faster than they can be accommodated by re-planning. Creating detailed long-term plans in the first place for these projects can waste time and resources and lead to false expectations. Aubrey, Hobbs and Thuillier (2008) in a study of project management offices (PMOs) note that for one organization studied, overly rigorous planning processes resulted in an impediment to the rapidity required to sustain successful projects.

Zwikael and Globerson (2006) note that even though there is a high quality of planning in software and communications organizations, these projects still have relatively low ratings on success. They note this effect may be due to riskier technologies and environments, control issues or overly ambitious commitments. Chatzoglou and Macaulay (1996) touch on why planning is sometimes shortened or eliminated in information technology (IT) projects because managers think “it is better to skip the planning and to start developing the requested system.” (p. 174). Experience shows that this approach does not save time. Lack of planning is likely to lead to incorrect assumptions and poorly thought out execution; the rework require to fix these mistakes will usually use up significant portions of project time.

As well Chatzoglou and Macaulay (1996) make some points as to why it is rare that too much time is spent on requirements planning or as they term it, requirements capture and analysis (RCA). Deadlines need to be met; any delay in the planning phase will result not only in the increased cost of the planning stage but also in a chain reaction in the next phases of the project. Thomas et al. (2008) write "Project managers are constantly pressured to 'get started with work' or 'make progress' by senior management who fail to recognize the value of planning in a project.".(p. 109). In most projects there are pressures to reduce the time and effort spent on the planning phase.

The literature does not support the conclusion that planning should not be done in projects although some caveats are highlighted. We therefore report the following:

Conclusion 1: Pressure exists in the project environment to reduce the time spent planning rather than increase it.

Planning Variation by Industry

Different industries may require different types of projects and have different project management needs, Collyer, et al (2010). This may have an impact on the need for planning and the effect of planning on success.

Nobelius and Trygg (2002), in analyzing front end activities which are largely analogous to the planning phase, note that the component vary between project types. Through three case studies in two different companies they also noted the impact of the different activities varies between project types. For example, business analysis was found to be the number two priority for a project to build on an existing product line but was not found to be important in

either a research/investigational project or in an incremental change project to an existing product.

Zwikael (2009) identified the importance the PMBOK® Guide's nine knowledge areas to project success and analyzed the impact by industry.

Table 2 - Knowledge Areas' Relative Importance in Each Industry Type after Zwikael (2009).

This shows a marked difference in the types of knowledge areas that impact project success by industry. The study implies that the importance of planning and which areas of planning are most important can vary by industry.

Zwikael and Globerson (2006) found that construction and engineering had the highest quality of planning and success while production and maintenance companies had the lowest quality of planning and success. The production and maintenance industry is deemed to be less project focused. The services industry is third in planning and second in success while software and communications were second in planning and third in success. These last two results, as pointed out by the authors, can be attributed to either differences in the impact of planning in each industry or the fact the software and communications industries are challenging environments. Collyer, Warren, Hemsley and Stevens (2010), in interviews from 10 varied industries, found that approaches to planning varied greatly within those industries. They report differences in the formality of planning dependent on the dynamism of the environment. This ranged from less dynamic (construction and defence) to highly dynamic (film, venture capital and technology).

Conclusion 2: Planning requirements vary in different industries.

Planning in Construction and the PDRI

Project management has a long history in the construction industry and there have been a number of studies in the construction project management field on the relationship between planning and project success: this is a well-studied area in comparison to other industries or other areas in project management. Hamilton and Gibson (1996) found that an increase in preproject planning for construction projects increased the likelihood of a project meeting financial goals. The top third of projects from a planning completeness perspective had an 82% chance of meeting those goals while only 66% of projects in the lower third did (a difference of 16%). Similar results are seen for schedule and design goals. Shehu and Akintoye (2009) found in a study of programme management in the construction industry that effective planning was the number one critical success factor identified. Effective planning had the highest criticality index of .870 of all the Critical Success Factors (CSF) studied.

The PDRI is a method to measure project scope definition for completeness. Developed by the Construction Industry Institute (CII) in 1999, this tool has been widely adopted by various owners and designers in the building industry, Gibson and Gebken (2003). It has gained acceptance in the facilities and construction industry as a measure of the quality of preproject planning. The PDRI offers a comprehensive checklist of 64 scope definition elements in a score sheet format. Undertaking no planning correlates to a PDRI score of 1000 where a score of 200 or less is good planning, Wang and Gibson (2008).

Gibson, Wang, Cho and Pappas (2006) noted that research results show that effective preproject planning leads to improved performance in terms of cost, schedule, and operational characteristics. This study found that "the PDRI score and project success were statistically related; that is, a low PDRI score (representing a better-defined project scope definition package just prior to detailed design) correlates to an increased probability for project success." (p.37). The following diagram summarizes the result of this survey and shows a clear relationship between the PDRI score and project success.

Figure 2 - Success Index vs. Preproject Planning Effort Index, after Gibson et al. (2006)

The index is established with a score ranging from one (the lowest level of preproject planning effort) to five (the highest level). Note that the relationship is linear. In the construction industry, project success is closely linked to project efficiency so this can apply to efficiency and success, Collyer et al. (2010). The PDRI does not measure work effort just completeness. In addition, Gibson and Pappas (2003) reported the following results showing a marked difference in empirical measurements of project success based on the project PDRI score.

Table 3 - Comparison of Projects with PDRI-Building Projects Score Above and Below 200, after Gibson and Pappas. (2003)

Table 4 - Comparison of Projects with PDRI-Industrial Projects Score Above and Below 200, after Gibson and Pappas. (2003)

Further, they note "Indeed, due to the iterative and often chaotic nature of facilities planning, many owners face such uncertainty that they skip the entire planning process and move to project execution, or decide to delegate the preproject planning process entirely to contractors, often with disastrous results." (p. 41) Wang and Gibson (2008) found that preproject planning is identified as having direct impact on the project success (cost and schedule performance)

Figure 3 - Cost Performance vs. Industrial PDRI Score, after Wang and Gibson (2008)

This graph clearly shows a linear relationship between the quality of planning and the cost aspect of project success. In reviewing these papers in the construction field, we can note:

Conclusion 3: The level of planning completeness is positively correlated with project success in the construction industry.

Planning in the Information Technology Industry

The reports of high failure rates for software projects and some well-known large failed projects have likely also driven the growth of project management in IT, Sessions (2009), Standish Group (2011). A small number of studies in this area tried to quantify how much planning should be done for software projects. Poston (1985) states that in software development projects, testing costs 43% of overall project costs for the projects studied, whereas planning and requirements accounted for only 6% of effort.

Figure 4 - Project Cost Breakdown, after Poston (1985)

He also presents evidence that the earlier defects are identified in the process, the less they cost to fix. This has become a tenet of software development projects and points to the benefit of more effort in the early stages of projects, including the planning stage.

Figure 5 - Relative Cost to Fix a Defect, after Poston (1985)

This data strongly points to the benefit of doing more planning and requirements analysis in software development projects. Similarly, Furuyama, Arai, & Lio (1994) conducted a study to measure the effects of stress on software faults. The authors found that 75% of the faults in software development projects were generated during the design phase of the project. Olsen and Swenson (2011) note that "If faults are detected earlier in the software development process, fewer steps are required to be repeated. As a result, the costs associated with the fault can be dramatically reduced" (p. 7). Jones (1986) also found that the cost of rework is typically over 50% of very large projects and also that the cost of fixing or reworking software is much smaller (by factors of 50 to 200) in the earlier phases of the life-cycle than in the later phases.

Müller and Turner (2001) reported a correlation between post-contract planning (detailed planning after a contract had been signed) and project schedule variance. They report that a quality of post-contract planning that is at least good is required to meet schedule goals. Also, Tausworthe (1980) notes the impact of the work breakdown structure (WBS) as an important planning tool with demonstrated benefits on software project success. The WBS is a key deliverable of planning, PMBOK® (2008). Catersels, Helms, and Batenburg (2010), in reviewing critical success factors identified by 129 Enterprise Resource Planning system (ERP) consultants, did not identify project planning in their top 22 critical success factors.

However clear goals and objectives were listed as number four in the list and these would be defined in a planning phase. Interestingly, poor project planning appears as number six in the list of critical failure factors. Weak definitions of requirements and scope was number four which again is defined in the planning phase. Umble, Haft, and Umble (2003) reported similar findings in ERP implementations: goals not being clearly defined and schedules not being achievable (i.e. poor planning), would lead to project failure. Yeo (2002) in studying critical failure factors in information system projects notes "a significant proportion of problems information system projects faced are related to project planning issues." (p. 246).

Deephouse, Mukhopadhyay, Goldenson and Kellner (1996) assessed the effectiveness of software processes on project performance and showed that certain practices, such as project planning, were consistently associated with success, while other practices studied had little impact on the project outcomes. Though the study was to focus on process factors and their relationship to success, planning was found to be the leading predictor of meeting targets (efficiency) and quality. The dependency for successful planning was .791 for meeting targets and .228 for quality. Though they do note the following caveat about responses: "They may have allowed the outcome of the project to influence their response as to how well the project was planned. They could have reasoned. 'The project was late, so clearly the plan was not realistic.'" (p. 198). The responses of the survey participants does as a minimum highlight that they considered planning important.

Planning and Success in the General Project Management Literature

Statement of the impact of planning from a conceptual standpoint

Thomas, et al (2008) state that the front-end of the project is at least as critical as the subsequent phases that deal with detailed planning and execution. “the most effective team cannot overcome a poor project plan” (p. 105) and projects started down the wrong path in the early stages can lead to the most spectacular project failures. Morris (1998) similarly argued that “The decisions made at the early definition stages set the strategic framework within which the project will subsequently develop. Get it wrong here, and the project will be wrong for a long time” (p. 5). Munns and Bjeirmi (1996) make a similar point in stating that a project which is flawed from the early stages is unlikely to be saved by good execution. In fact successful execution may matter to only to the project team, while the wider organization will see the project as a failure. Besner and Hobbs (2011) similarly state “The most important analysis and initial plans are done during the front-end of the project. If the wrong direction or no clear direction is taken during the early definition phase, it is always difficult to get the project back on track.” (p. 21)

The literature studying CSFs does not usually address planning as a CSF although components of the planning phase are noted. But interestingly poor planning is often noted as a critical failure factor, Umble et al (2003), Catersels et al (2010), Yeo (2002). Ewusi-Mensah (1997) noted that key factors in cancelled projects are poor project goals, poor technology infrastructure and escalating costs and timelines. These would normally be analyzed and addressed in a thorough planning phase. Yeo (2002) states that of the issues of influence noted in this study of critical failure factors, project planning was ranked as number one. This research again supports contention that planning is a hygiene to project success, Turner and Müller (2003).

However, many critical success factors mentioned in this body of literature contain deliverables, which are created in the planning phase, often near the top of the lists. White and Fortune (2002) note that clear goals and objectives and realistic schedule were the two most mentioned critical success factors. Again these are factors defined in the planning phase. Pankratz and Loebbecke (2011) noted that all 11 participants in their interviews mentioned planning, monitoring and control as a project success factor, one of only two items to be mentioned by all participants. Blomquist, Hällgren, Nilsson and Söderholm (2010) state "Plans are a cornerstone of any project; consequently, planning is a dominant activity within a project context." (p.11). This is a recurring theme: projects and project management are about planning and controlling to ensure successful project deliverables. Planning is inherently important to project success or one could argue project management would not exist.

Planning tools impact on project success

Besner and Hobbs (2006) in studying project management tools and success found that five of the eight "super tools" most clearly linked to project success are used or created during the planning phase: Software for task scheduling, Scope statement, Requirements analysis, Gantt chart and Kick-off meeting. Although planning typically is a fraction of overall project effort, it has a disproportionate impact on project success. In a paper published subsequently, Besner and Hobbs (2011) found that initial planning was the number one used toolset reported by the 744 respondents. Similarly, Zwikael (2009) studied the contribution of the PMBOK® Guide's nine knowledge areas to project success. He reported that the knowledge areas

related to the planning phase had the highest impact on project success "the more frequently planning processes - which are related to these Knowledge Areas—are performed, the better project success is.". Conversely, "Cost and Procurement are the Knowledge Areas that contribute least to project success, maybe because they are practiced mainly during project execution." (p.98).

Planning phase component completeness/quality and project success

Pinto and Prescott (1988) analyzed the impact of critical success factors on project success. They found that a schedule or plan had a correlation of 0.47 with project success, while detailed technical tasks had a correlation of 0.57 and mission definition a correlation of 0.70. These success factors are products of what we have defined as the planning phase. Shenhar, Tishler, Dvir, Lipovetsky and Lechler (2002) using multivariate analysis state that design considerations have a major impact on the success of high technology/high uncertainty projects. In addition, documentation deliverables were also linked to success for most project types. These documents are typically produced in the planning phase. Another aspect of the planning phase, the WBS creation is also critical in high-uncertainty projects although it is less critical in low uncertainty projects. The creation of a detailed WBS may itself be a key part of planning as it can be critical in helping the team ensure all project tasks have been considered.

Pinto and Prescott (1990) in a seminal study found that that when internal measures of project efficiency are compared to critical success factors, planning is perceived to be of high importance at the initial stages but is overtaken by tactical issues. However, for external success measures or overall project success, planning factors dominate throughout the project

lifecycle. Planning was found to have the greatest impact on the following success factors: "Perceived value of the project" (R^2=.35) and "Client satisfaction" (R^2=.39). The coefficient of determination R^2 provides a measure of how well future outcomes are likely to be predicted by a model. This result highlights the impact of planning on success in projects.

Planning phase completeness and project success

Shenhar (2001) in survey of project managers on the differences between projects with varying technical uncertainty notes better planning is the norm in high and super-high technology projects. This was found to apply consistently to the deliverables normally produced in the planning phase. Dvir and Lechler (2004) found a correlation between the quality of planning, project efficiency and customer satisfaction. Quality of planning had a +.35 impact on R^2 for efficiency and a +.39 impact on R^2 for customer satisfaction.

Planning phase effort and project success

In a paper on the topic, Dvir, Raz and Shenhar (2003), noted the correlation between aspects of the planning phase and project success. The planning procedures effort was found to be less important to project success than defining functional and technical requirements of the project. Both classes of activities are part of what we have defined as the planning phase. However, their definition of planning procedures include a wide range of project management processes, many of which are more often used during the execution phase although they are initiated in the planning phase. It can also be argued that some of the items on this list are not standard project management processes but leading edge processes. They

reported that some aspects of project planning such as defining functional requirements and time spent on technical specifications are correlated with perceived project success. The correlation was .297 for functional requirements and .256 for technical requirements. They also state "although planning does not guarantee project success, lack of planning will probably guarantee failure." (p. 94) Based on the body of the literature, we can therefore generalize conclusion three to include projects outside the construction industry:

Conclusion 3: The level of planning completeness is positively correlated with perceived project success in projects in general.

The main conclusions Dvir et al (2003) reach is that "There is a significant positive relationship between the amount of effort invested in defining the goals of the project and the functional requirements and technical specifications of the product on one hand, and project success on the other" (p.94-95). They conclude by stating that no reasonable effort should be spared early stages of a project to properly define the project goals and requirements. Zwikael and Globerson (2006) noted the following "Construction and engineering organizations, which scored the highest on project success, also obtained the highest score on quality of planning. Production and maintenance organizations, which scored the lowest on project success, received the lowest quality score as well." (p. 694). They also noted this is not the case for software and communications organizations that had a high degree of planning but still often delivered projects with poor results. They stated that this may be due to riskier technology and environment, control issues or overly ambitious projects. They conclude that there is a relationship between project planning effort and project success. Therefore it is clear from the preponderance of the literature that we can report:

Conclusion 4: Planning is associated with project success; both project efficiency and overall project success

What appears to be clear is that activities which we define as part of the planning phase such as requirements definition, scope definition and technical analyses are important to project success, Shenhar et al (2002). One can argue that the planning the planning phase is not as important as what come with it or as Eisenhower is said to have stated “In preparing for battle I have always found that plans are useless, but planning is indispensable.", reported in Blomquist et al (2010).

However it is clear that the activities that occur prior to execution and along with planning are important to project success although the narrowly defined planning processes of creating timelines and Gantt charts are not as critical to project success as are some other activities, Dvir et al (2003). Catersels, et al (2010) and Poon et al (2011) found that high-level planning was the least important of the CSFs that they studied. Turner and Müller (2003) also note that “There is growing evidence that competence in the traditional areas of the project management body of knowledge are essential entry tickets to the game of project management, but they do not lead to superior performance. They are hygiene factors, necessary conditions for project management performance, but they are not competitive factors for which improved competence leads to superior project performance.” (p. 6) Perhaps it is the detailed planning and analysis that occurs during the planning phase that is critical.

Planning and Agile/Iterative Methods

Koontz noted as early as 1958 that “no effective manager makes a plan and then proceeds to put it into effect regardless of what events occur.” (p. 54) Agile methods use a minimum of

documentation to facilitate flexibility and responsiveness. Collyer et al (2010) in interviews with 31 project managers from 10 varied industries, found that traditional planning had difficulties in dynamic environments. The following are noted as areas that would often change during project execution (p. 113).

- Changing Materials, Resources, Tools, and Techniques
- Changing Relationships with Other Related Projects, Services, or Products
- Changing Goals

They advocate a strategy of aim, fire, aim: that is, plan and execute but re-plan during the project to adapt to changes. This is similar to the rolling wave approach, Turner and Cochrane (1993). This allows the project to react to setbacks and opportunities that occur during the project and re-plan based on these occurrences. Collyer and Warren (2009) note that it is important to have flexibility and be able to adapt: "Pfizer's disappointing heart medication, Viagra, turned into a success because they took the time to investigate its side effects" (p. 359). Not keeping to the original plan paid handsome dividends; it became one of Pfizer's most profitable drugs. Boehm (1996) discussed challenges in software development. He pointed to a need for as a minimum some up-front planning. He also reported "a cost improvement from $140 to $57 per delivered line of code and a quality improvement from more than 3 to 0.35 errors per thousand delivered lines of code." (p. 82) using a spiral model, which included a planning phase and execution phase in each spiral. A spiral is a phase similar to a wave in rolling wave or stories in agile. Smits (2006), in a whitepaper on planning in agile methods, notes that there are different types of planning that are important:

Product Visioning – Level 1

Product Roadmap – Level 2

Release Planning – Level 3

Iteration Planning – Level 4

Daily Plan – Level 5

He also notes the need for the higher level planning and that substantial planning is completed in daily meetings and "This daily meeting is not often seen as a planning session, but certainly is." (p. 8). Similarly, Coram and Bohner (2005) note that agile methods do require upfront planning. Working with the customer is needed to provide requirements for the first release. They also note "With so many small tasks, it is argued that agile processes require more planning… it is a constant task to ensure optimal delivery results" (p. 6)

Boehm (2002) notes when projects have excessively specified plans: "Such plans also provide a source of major contention, rework, and delay at high-change levels." (p. 65) However, a balance between traditional planning and agile methods is usually appropriate. Certain factors, such as the size of the project, safety requirements and known future requirements call for upfront planning even in agile projects. He notes there is a "sweet spot" which is dependent on project characteristics where the effort expended in initial planning pays off in project success. Too much or too detailed planning can result in wasted effort and too much plan rework, whereas not enough initial planning on certain projects can result in project failure. Mann and Maurer (2005) found, in a study on the impact of Scrum (an agile methodology) on overtime and customer satisfaction, that customers believed that the daily meetings kept them up to date and that planning meetings were helpful.

Ceschi, Sillitti, Succi & De Panfilis (2005) studied a data sample comprising managers of software companies— 10 adopting agile methods and 10 using traditional. They found that even in agile "Eight-five percent of the managers would like to improve process planning,

even though 70 percent of managers are sufficiently satisfied with it and 20 percent are very satisfied." (p. 24) Managers of agile projects were slightly more satisfied with their project planning: 20% of non-agile mangers were dissatisfied with their planning while none of the agile project managers were dissatisfied with their planning process. From the literature we can therefore note the following:

Conclusion 5: Dynamic and fast paced environments do not lend themselves to a single up front planning phase although planning is still required.

How Much to Plan

Surprisingly little research has been done on how much planning should be done in projects. This guidance would be useful for practitioners and researchers. Daly (1977) in a paper on software development states that for software projects, planning (i.e. Schedule planning should be 2% of total project cost while specifications should cover 10% of the total cost. Final design was to take a further 40% of cost.). However, the practice and technology has changed in the more than 30 years since this paper was written. Design does not need to be all done up front low level design and coding are now completed together. Similarly Poston (1985), states that plans and requirements should be 6% of the project cost, product design should be 16% and detailed design 25%. It is interesting to note that empirical guidance on how much time to spend on each phase was more common in the earlier years of software development project management. Studies on this topic subsequently have not specified how much time to spend on each phase. Whether this is because this guidance was found not to be effective, the diversity of technology projects greatly increased or it simply fell out of favor is not clear

Chatzoglou and Macaulay (1996) state "How much planning is enough? There is no standard one single answer to this question. The right amount of planning depends on the size of the project, the size of the development team and the purpose of the plan."(p. 175). They also outline a rule of thumb for planning effort: The three-times-programming rule and the lifecycle stage model. "With this method, one estimates how long it would take to program the system and then multiply by three to estimate how much effort it will take to deliver a tested, documented system." (p. 183). Software development testing is estimated to take roughly an equal amount of effort as development, Kaner, Falk, & Nguyen (1999). This leaves one third of total effort for the planning phase and other miscellaneous tasks.

Nobelius and Trygg (2002) analyzed front-end activities (similar to planning phase) for three projects in varied industries. They reported that in these three case studies, front-end activities made up a least 20% of the project time. Similarly, Wideman (2000), using data derived from a fairly large sample of building projects with budgets up to several million dollars, states that the typical effort spent in the planning phase in construction projects is approximately 20% of the total work hours. He states that work hours typically make up 40% of total costs. Therefore for building projects approximately 20% of person hours and 8% of budget is spent planning.

Choma and Bhat (2010) analyzed 73 projects from 49 different organizations. They report "As would be expected, the projects with the worst results were those that were missing important planning components at authorization," (p. 5). However, they did not find a correlation between time spent in the planning phase front end loading (FEL) and project success. In fact, "the projects in this sample that took longer in planning had the worst results. On average, the Worst Projects had an FEL phase that was roughly 71 percent longer than the

average for the Best Projects. Thus, the time spent in FEL does not determine the quality of planning; rather, it is the deliverables completed in FEL that are most correlated with results." (p. 7) Their analysis points to either that too much planning can be negative to project success or that a planning phase that lasts too long can be an indicator of a problem project.

There has been relatively little research on what is the optimum percentage of efforts for the planning phase and the literature that exists is not recent and may not be fully consistent. The literature does point to a recommended planning effort of 20-33% but these recommendations are not based on empirical research, Wideman (2000), Nobelius and Trygg (2002), Chatzoglou and Macaulay (1996).

Discussion and Conclusions

The literature notes the importance of planning in management at least as far back as early last century, Gantt (1910), Gulick (1936), Goetz (1949), Koontz (1958), Carroll and Gillen (1987). Though since the 1970s some researchers put greater importance on action and interpersonal communication as a method of management then time spent planning, Mintzberg (1975), Kotter (1999). However Carroll and Gillen (1987) highlight the continued importance of planning in management. In the body of work of project management literature, which is younger than the general management literature, the study of planning and project success started in the 1980s, Pinto and Prescott (1988). During this time software project management literature attempted to define ideal effort levels for planning, Poston (1985). More has been written in the 1990s and the new century on project success and several papers now link planning phase completeness and project success, Pinto and Prescott

(1990), Hamilton and Gibson (1996), Dvir, et, al,(2003), Dvir, and Lechler (2004), Zwikael and Globerson (2006)

Dvir et al. (2003), state "with the advancement in computerized planning tools and the blooming in project management training, a certain level of planning is done in all projects, even in those that eventually turn out to be unsuccessful projects. Hence, when a certain level of planning is done in all types of projects, a significant statistical correlation cannot be found in the data." (p. 94). This is a critical point. The question of whether planning is correlated with project success may be a moot point. The benefits of planning have been confirmed through the practice of project management as well as through research. It has thus become an expected part of all projects and project management. It has, as Turner and Müller (2003), state become a hygiene factor for successful projects. In general, the research is consistent: the majority of studies, with a few outliers, state planning is important to project success.

Table 5 – Summary of Positions of Reviewed Literature on Project Planning

From this table, we can see that the preponderance of the literature has found that planning and the level of completeness of planning are important for project success. From the literature review alone we can answer the first research question and confirm that for Question 1: Is planning important for project success? The conclusion is yes. The next table summarizes the empirical results encountered in the literature review from a high level.

Table 6 – Summary of Empirical Results (non-rigorous)

These studies used different methodologies and even different definitions of planning and success. However, the results appear to be generally consistent and we can report:

Conclusion 6: As an approximation, research shows an average value of R^2 = .33 correlation with efficiency and R^2 = .35 with success.

This indicates a significant impact on project success. If we compare this to the approximately 20-33% effort spent on planning reported by Nobelius and Trygg (2002) and Wideman (2000), there appears to a clear return on this investment in terms of project success. However, whether there is an ideal amount of effort that should be spent planning in a project is still an area for future investigation.

In summary, from this literature review we can take the following conclusions:

1. *Pressure exists in the project environment to reduce the time spent planning rather than increase it:* Collyer, et al. (2010), Flyvbjerg, et al. (2002), Chatzoglou and Macaulay (1996), Thomas et al. (2008)
2. *Planning requirements vary in different industries.* Nobelius and Trygg (2002), Zwikael and Globerson (2006), Zwikael (2009), Collyer, et al. (2010)
3. *The level of planning completeness is positively correlated with perceived project success:* Pinto and Prescot (1988), Dvir, et al.(2003), Zwikael and Globerson (2006), Shenhar et al. (2002), Choma and Bhat (2010), Hamilton and Gibson (1996), Gibson et al. (2006), Wang and Gibson (2008), Dvir, and Lechler (2004).
4. *Planning is associated with project success; both project efficiency and overall project success*: Thomas et al (2008), Morris (1998), Besner and Hobbs (2006), Zwikael (2009), Johnson, et al. (2001), Jones (1986), Poston (1985)

5. *Dynamic and fast paced environments do not lend themselves to a single up front planning phase although planning is still required:* Collyer and Warren (2009), Boehm (1996), Collyer, et al. (2010), Ceschi (2005)
6. *As an approximation, research shows an average value of R2 = .33 correlation with efficiency and R2 = .35 with success.*

If we go back to our original research questions, and compare them to the conclusions from our review:

1. Is planning important for project success?
    - This is confirmed by Conclusion 3: *The level of planning completeness is positively correlated with perceived project success*
2. What level of effort expended on the planning phase is most correlated with project success?
    - This is not fully answered by the literature, though Conclusion 6 provides an approximate answer (*As an approximation, research shows an average value of R2 = .33 planning correlation with efficiency and R2 = .35 with success*).
3. Are there are project characteristics which correlate to higher or lower levels of indicated project planning effort?
    - This is not fully answered by the literature, although Conclusion 2 (*Planning requirements vary in different industries*) points that this may be true
4. What level of effort spent on the planning phase is counterproductive or neutral toward project success?
    - The literature in this area does not appear to be consistent or recent in nature.

It is clear that additional research is warranted and would be useful for both for academic researchers and as guidance to practitioners.

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Table 1 - Five Methodology Categories

1. Statement of the impact of planning from a conceptual standpoint.
2. Planning tools impact on project success
3. Planning phase component completeness/quality and project success
4. Planning phase completeness and project success
5. Planning phase effort and project success (primary subject area)

Figure 1: Frequency distribution of technical performance and customer satisfaction, from Zwikael and Globerson (2006)

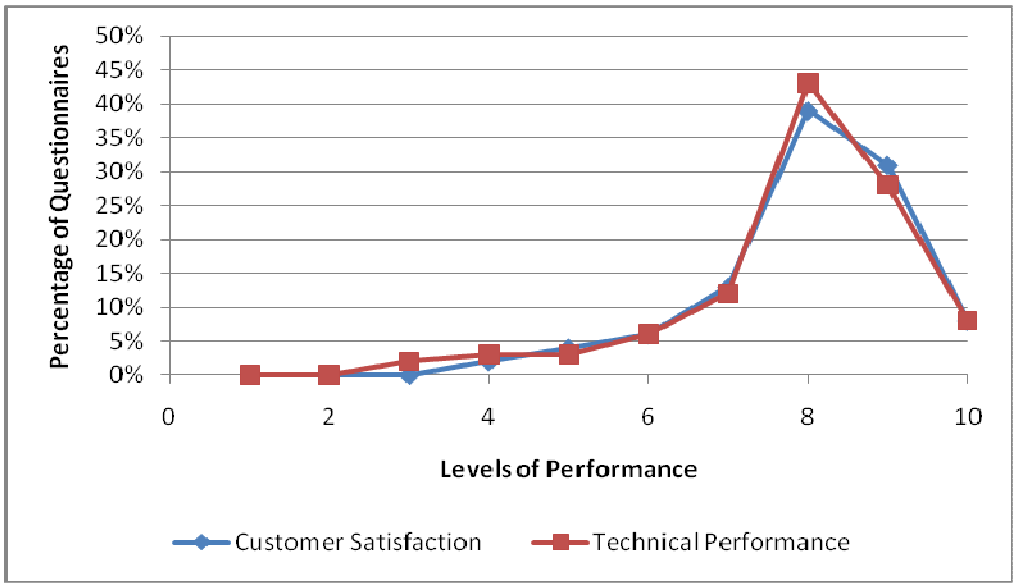

Table 2 - Knowledge Areas' Relative Importance in Each Industry Type after Zwikael (2009).

Knowledge Areas	Construction and Engineering	Software	Production	Communications	Services	Government
Integration	1	6	3	3	7	8
Scope	9	9	8	8	8	9
Time	7	1	6	1	1	2
Cost	2	5	9	4	2	5
Quality	6	2	2	2	6	3
Human resources	3	3	7	9	5	6
Communications	5	7	1	6	9	4
Risk	4	4	5	7	4	1
Procurement	8	8	4	5	3	7

Figure 2 - Success Index vs. Preproject Planning Effort Index, after Gibson et al. (2006)

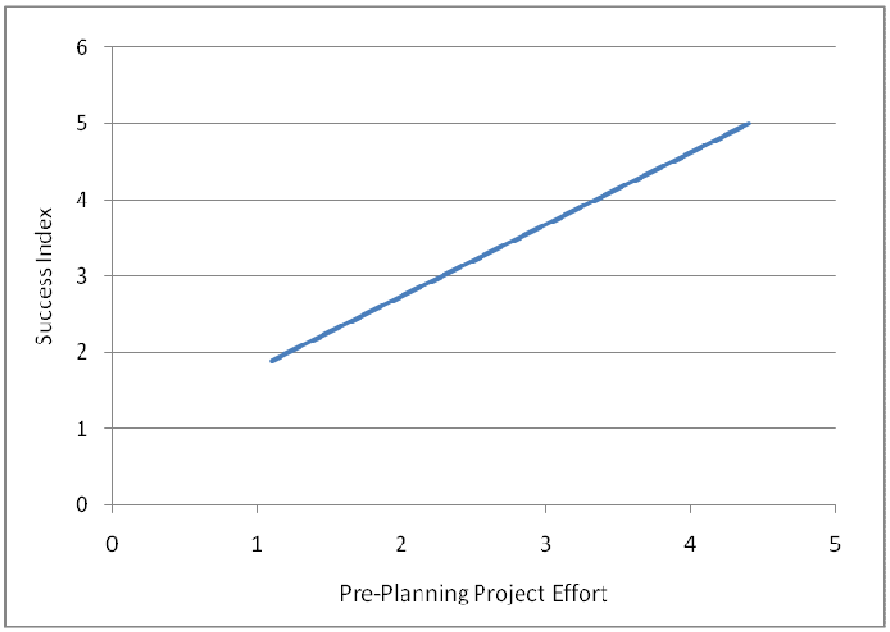

Table 3 - Comparison of Projects with PDRI-Building Projects Score Above and Below 200, after Gibson and Pappas. (2003)

	PDRI score	
Performance	<200	>200
Cost	3% below budget	13% above budget
Schedule	3% ahead of schedule	21% behind schedule
Change orders	7% of budget (*N*=17)	14% of budget (*N*=61)

Table 4 - Comparison of Projects with PDRI-Industrial Projects Score Above and Below 200, after Gibson and Pappas. (2003)

	PDRI score	
Performance	<200	>200
Cost	3% below budget	9% above budget
Schedule	1% ahead of schedule	8% behind schedule

Change orders	6% of budget (*N*=35)	8% of budget (*N*=27)

Figure 3 - Cost Performance vs. Industrial PDRI Score, after Wang and Gibson (2008)

Figure 4 - Project Cost Breakdown, after Poston (1985)

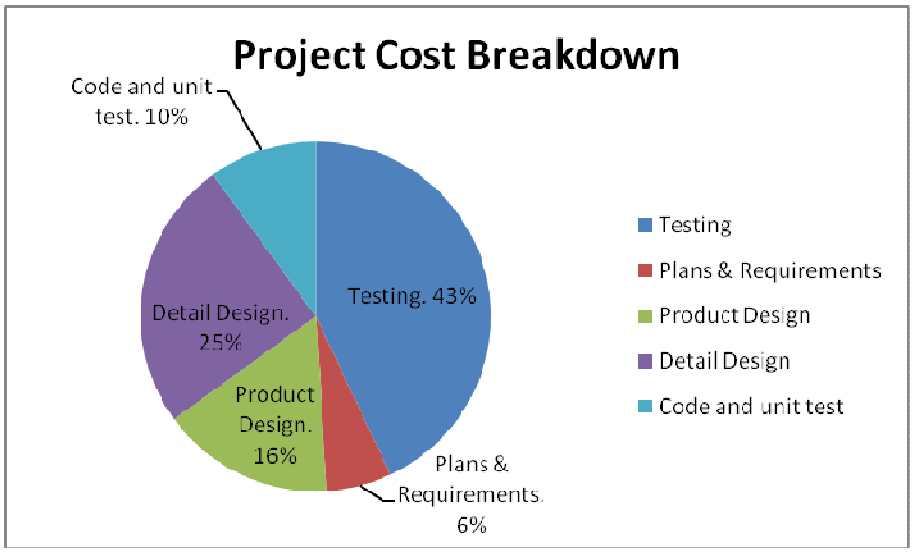

Figure 5 - Relative Cost to Fix a Defect, after Poston (1985)

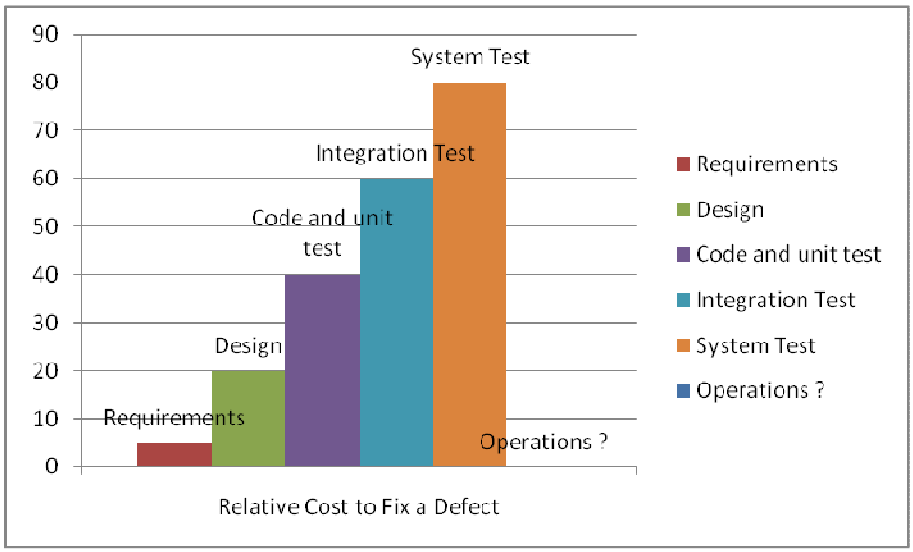

Table 5 – Summary of Positions of Reviewed Literature on Project Planning

Positive Empirical relationship between Planning and Success	Conceptual Positive Relationship between Planning and Success	No relationship between Planning and Success	Conceptual Negative Relationship between Planning and Success	Empirical negative Relationship between Planning and Success
Pinto and Prescott (1988) Pinto and Prescott (1990) Hamilton and Gibson (1996) Deephouse et al (1996) Müller and Turner (2001) Shenhar et. al. (2002) Dvir, et, al,(2003) Gibson and Pappas (2003) Dvir, and Lechler (2004) Gibson et al. (2006) Zwikael and Globerson (2006) Besner and Hobbs (2006) Wang and Gibson (2008) Zwikael (2009) Choma and Bhat (2010)	Tausworthe (1980) Chatzoglou and Macaulay (1996) Munns and Bjeirmi (1996) Ewusi-Mensah (1997) Morris (1998) Johnson, et al. (2001) Shenhar (2001) Yeo (2002) Umble, et al. (2003) Ceschi (2005) Mann and Maurer (2005) Besner and Hobbs (2006) Smits (2006) Thomas et al (2008) Shehu and Akintoye (2009) Zwikael (2009) Blomquist et al (2010)	Flyvbjerg, et al (2002)	Bart (1993) Anderson (1996) Boehm (1996) Zwikael and Globerson (2006) Aubrey et al (2008) Collyer, et al. (2010) Poon et al (2011)	Choma and Bhat (2010)

	Collyer et al. (2010) Catersels, et al. (2010), Besner and Hobbs (2011) Pankratz and Loebbecke (2011)			

Table 6 – Summary of Empirical Results (non-rigorous)

Study	Empirical Relationship	Normalized to R^2		
		Aggregate	Efficiency	Overall Success
Pinto and Prescott (1988)	Project success is correlated for the following planning activities R = .47 for schedule/plan R= .57 for technical tasks R= .70 for mission definition	R^2= .22 R^2= .32 R^2= .49 Average R^2 = .34	Average R^2 = .34	
Pinto and Prescott (1990)	Planning found to have the greatest impact on success factors Perceived value of the project (R^2=.35) Client satisfaction (R^2=.39)	R^2=.35 R^2=.39 Average R^2 =.37	R^2=.37	R^2=.39
Hamilton and Gibson (1996)	The top third best planned projects had an 82% chance of meeting financial goals while only 66% of projects in the lower third did. Similar results were seen in these projects' results relating to schedule performance and design goals met.			
Deephouse et al. (1996)	The dependency for successful planning was .791 for meeting targets and .228 for quality.	R^2=.625 R^2=.052 Average R^2 =.34	R^2=.34	
Dvir, et, al,(2003)	Meeting the planning goals is correlated .570 to overall project success measures.	R^2=.32		R^2=.32
Dvir, and Lechler (2004)	Quality of planning had a +.35 impact on R^2 for efficiency and a +.39 impact on R^2 for customer satisfaction.	R^2=.35 R^2=.39 Average R^2 = .37	R^2=.35	R^2=.39
Zwikael and Globerson (2006)	Planning effort correlates as follows: R = .52 for cost R = .53 schedule R= .57 technical performance R= .51 customer satisfaction	R^2 = .27 R^2= .28 R^2= .32 R^2= .26 Average R^2 = .28	R^2=.28	R^2=.29
Gibson et al. (2006)	R^2 = .42 Correlation between planning completeness and project success	R^2 = .42	R^2 = .42	
Wang, and Gibson (2008)	PDRI score of a building construction project is related to project cost and schedule success (R = .475)	R^2 = .23	R^2 = .23	
Overall Average		R^2 = .33	R^2 = .33	R^2 = .35