KEYWORDS project planning success efficiency plan

THE IMPACT OF PLANNING on project success A LITERATURE REVIEW

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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 quality and success. The literature appears to be generally consistent showing an average value of R2 = .33 correlation with efficiency and R2 = .34 for overall project success. This indicates a significant impact if compared to the reported approximate 20-33% recommended planning effort.

INTRODUCTION

Traditional wisdom is that planning and analysis are important and with planning in a project, the project will be more successful *(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 trillions 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 *(Milosevic & Patanakul, 2005)*. 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 lifecycle.

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 and 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.

- Is planning important for perceived project success?
- What level of effort expended on the planning phase is most correlated with project success?
- What level of effort spent on the planning phase is counterproductive or neutral towards project success?

1. Methods and Methodology

This paper takes a post-positivist view that a relationship can be found between measures of project planning and perceived overall project success. Post-positivism falls between positivism where a completely objective solution can be found to a research question and phenomenology where all experience is subjective *(Trochim, 2006)*. Because perception and observation are at least partially based on subjective opinion, results cannot be fully objective. Some concepts such as project success may not be fully quantifiable and are impacted by subjective judgment of the participants and sponsors. Therefore the epistemology approach will be post-positivism. Post-positivism understands that though positivism cannot tell the whole truth in business research, the insights are none-the-less useful.

The literature in this area is varied but not sufficiently extensive so that an attempt at an exhaustive review was feasible. 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 project management body of research has been described as an immature field by Blomquist, Hällgren, Nilsson and Söderholm *(2010)*, which may explain the relative lack of research in this area. 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 more generally addressed planning and success. That effort cannot be described as exhaustive, however.

In total more than 280 papers and books were reviewed with approximately 50 of those sources being citied in this paper. The table below lists the journals contributing two or more papers to this review.

Journal Title	Number of Papers
International Journal of Project Management	8
Project Management Journal	4
IEEE Software	2
Journal of Management in Engineering	2

TABLE 1. *Sources of Articles by Most Cited Journals.*

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 or project manager success, but rather to enterprise success. The strategic enterprise planning literature is concerned with selecting projects to maximize company and enterprise success, but do not explore how to deliver those projects successfully. Some exceptions were made to literature that spoke to the general relevance of planning as a strategic concept.

- Literature that addressed project success without some link to planning or planning activities was not extensively reviewed other than to help define project success.
- Similar papers which were published in proceedings and in journals were only included once. Also, literature which reanalyzed similar data to studies already cited was not included.

2. 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: 67)*, state "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". 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: 106)* state that measuring project success 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."

Shenhar, Dvir, Levy and Maltz *(2001)* define four levels of project success:

- Project efficiency
- Impact on the customer
- Business success
- Preparing for the future

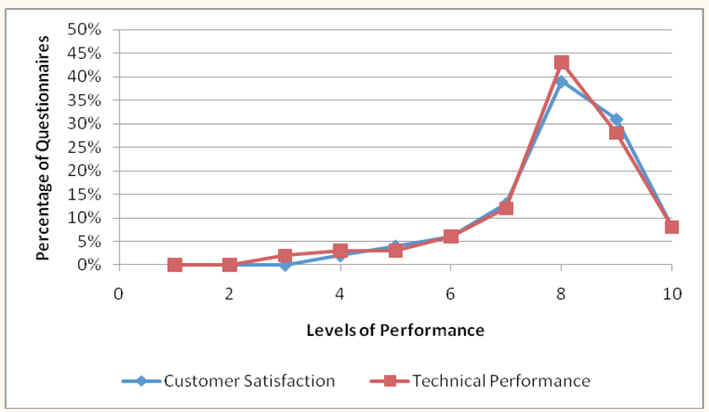

FIGURE 1. *Frequency distribution of technical performance and customer satisfaction, from Zwikael and Globerson (2006).*

Zwikael and Globerson *(2006)*, however, note that aspects of success are often correlated. *(see* **Figure 1***)*.

Also, Dvir, Raz and Shenhar *(2003: 94)*, 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."

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.

3. 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)*. In construction, pre-project planning is defined as the phase after business planning where a deal is initiated and prior to project execution, *(Gibson & Gebken, 2003)*.

PMBOK® *(PMI, 2008: 46)* 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." Another definition of planning 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 come before execution in a project;
- 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.

4. Reasons Not to Plan

Andersen *(1996: 89)* questions the assumption that project planning is beneficial from a conceptual standpoint. He 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?" Bart *(1993)* makes the point that in research and development *(R&D)* projects, too much planning can limit creativity.

Collyer, Warren, Hemsley and Stevens *(2010: 109)* describe examples of failed projects such as the Australian submarine and the Iridium satellite projects "While useful as a guide, excessive detail in the early stages of a project may be problematic and misleading in a dynamic environment." Collyer and Warren *(2009)*, state that in dynamic environments creating detailed long-term plans can waste time and resources and lead to false expectations. Aubrey, Hobbs and Thuillier *(2008)* note that for one project management office *(PMOs)* studied, overly rigorous planning processes resulted in an impediment to rapidity. Flyvbjerg, Holm, and Buhl *(2002)* highlight that senior management can choose not to use the estimates from the planning phase.

Zwikael and Globerson *(2006)* note that even though there is a high quality of planning in software and communications organizations, these projects still have low ratings on success. Chatzoglou and Macaulay *(1996)* note that any extra planning will result in a chain reaction delay in the next phases of the project. Thomas et. al. *(2008)* write that for most projects there are pressures to reduce the time and effort spent on the planning phase. As well Chatzoglou and Macaulay *(1996: 174)* touch on why planning is sometimes shortened or eliminated because managers think "it is better to skip the planning and to start developing the requested system. However, experience shows that none of the above arguments are valid".

In general, 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.

5. 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 varies between project types. Through three case studies in two different companies they also noted that 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 of the PMBOK® Guide's nine knowledge areas to project success and analyzed the impact by industry. *(see* **Table 2***)*.

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 from industry to 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-oriented. 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

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

TABLE 2. *Knowledge areas' relative importance in each industry type after Zwikael (2009).*

or the fact that 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.

In general, little empirical research has been done on the differences in planning between industries and the overall body of research is not extensive. However, two industries have a more extensive body of research on planning and success: construction and information technology. For this reason they will be given special consideration in this review.

6. Planning in the Construction Industry

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 had the highest criticality index of .870 of all the Critical Success Factors *(CSF)* studied.

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. *(see* **Figure 2***)*.

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 index does not measure work effort, only completeness.

The PDRI is a method to measure project scope definition for completeness. Developed by the Construction Industry Institute *(CII)* in 1996, this tool has been widely adopted by various owners and designers in the building industry, *(Gibson & 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, while a score of 200 or less is good planning, *(Wang & Gibson, 2008)*.

Gibson and Pappas *(2003: 37)* reported the following results showing a marked difference in empirical measurements of project success based on the project PDRI score. *(see* **Table 3***)*.

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." The following diagram summarizes the result of this survey and shows a clear relationship between the PDRI score and project success. *(see* **Table 4***)*.

Moreover, 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." *(41)* Wang and Gibson *(2008)* found that preproject planning is identified as having direct impact on the project success *(cost and schedule performance)*. The following diagram summarizes the result of this survey and shows a clear relationship between the PDRI score and project success. *(see* **Figure 3***)*.

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.

7. 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. Posten *(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. *(see* **Figure 4***)*.

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. *(see* **Figure 5***)*.

This data strongly points to the benefit of doing more planning and requirements analysis in software development projects. Similarly, Furuyama, Arai and 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. 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.

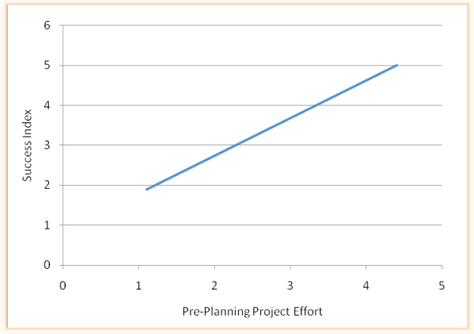

FIGURE 2. *Success Index vs. Preproject Planning Effort Index, after Gibson et al. (2006)*

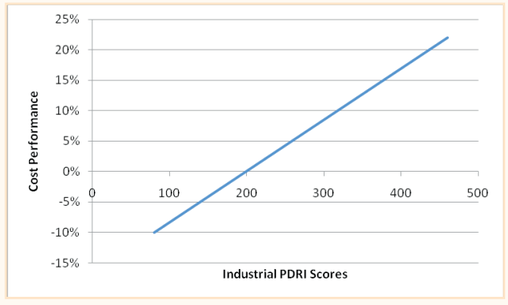

FIGURE 3. *Cost Performance vs. Industrial PDRI Score, after Wang and Gibson (2008)*

	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 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	9% above budget
Schedule	1% ahead of schedule	8% behind schedule
Change orders	6% of budget (N=35)	8% of budget (N=27)

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

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.

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.

8. Planning and Success in the General Project Management Literature

Thomas et al. *(2008: 105)* state "the most effective team cannot overcome a poor project plan" and projects started down the wrong path can lead to the most spectacular project failures. Morris *(1998: 5)* similarly argued that "The decisions made at the early definition stages set the strategic framework… Get it wrong here, and the project will be wrong for a long time". Munns and Bjeirmi *(1996)* state that for a project which is flawed from the start, successful execution may matter to only to the project team while the wider organization will see the project as a failure.

Blomquist et al. *(2010: 11)* state "Plans are a cornerstone of any project; consequently, planning is a dominant activity within a project context." This is a recurring theme: planning is inherently important to project success or one could argue project management would not exist.

Pinto and Prescott *(1988)* 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. Pinto and Prescott *(1990)* again found that 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" *(R2=.35)* and "Client satisfaction" *(R2=.39)*. The coefficient of determination R2 provides a measure of how well future outcomes are likely to be predicted by a model.

Shenhar *(2001)* 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 quality of planning had a +.35 impact on R2 for efficiency and a +.39 impact on R2 for customer satisfaction.

Dvir, Raz and Shenhar *(2003)*, in a rigorous paper 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. The correlation was .297 for functional requirements and .256 for technical requirements. Zwikael and Globerson *(2006: 694)* noted the following "organizations, which scored the highest on project success, also obtained the highest score on quality of planning." Salomo, Weise and Gemünden *(2007)* studied the relationship between planning and new product development projects. They found that project risk management and project planning had an R2 impact of .28, though the contribution of project planning was not significant. We consider risk planning part of the planning phase in this review therefore, overall R2 = .28. In addition, they reported process formality and goal clarity gave an R2 = .33 to success which are defined in the planning phase.

We can therefore generalize for all industries:

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

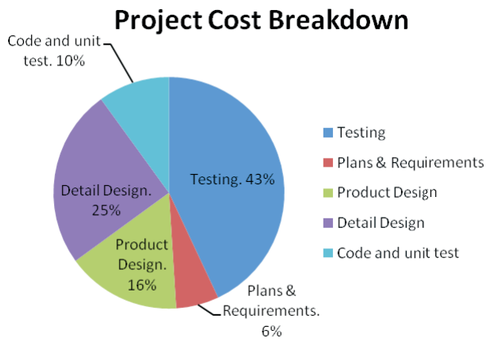

FIGURE 4. *Project Cost Breakdown, after Posten (1985)*

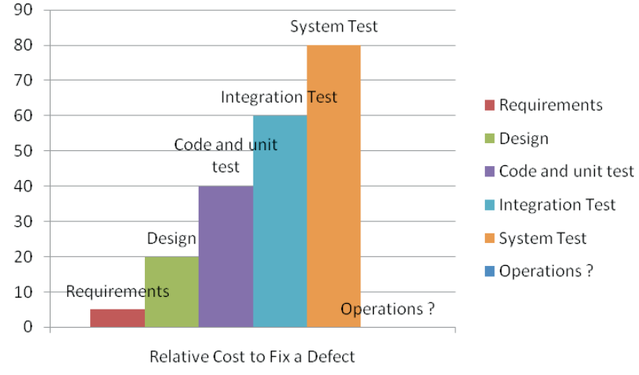

FIGURE 5. *Relative Cost to Fix a Defect, after Posten (1985)*

9. Planning and Agile/ Iterative Methods

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. Smits *(2006: 8)*, in a whitepaper on agile 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." Similarly, Coram and Bohner *(2005: 6)* 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".

Boehm *(2002)* notes a balance between traditional planning and agile methods is usually appropriate. 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. Ceschi, Sillitti, Succi & De Panfilis *(2005)* studied a data sample comprising managers of software companies— 10 adopting agile methods and 10 using traditional ones. They found that managers of agile projects were more satisfied with their project planning than managers using traditional techniques.

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.

10. How Much to Plan

Surprisingly little research has been done on how much planning should be done in projects. Daly *(1977)* states that schedule planning should be 2%, specifications 10% and final design 40% of the total cost. However, now much design is done during execution. Similarly Posten *(1985)*, states that plans and requirements should be 6% of project cost, product design should be 16% and detailed design 25%. Empirical guidance on how much time to plan has become less common over time in the technology literature. Whether this is because this guidance was found not to be effective, the diversity of technology projects increased or it simply fell out of favor is not clear.

Chatzoglou and Macaulay *(1996: 183)* outline a rule of thumb for planning effort: The three-times-programming rule and the lifecycle stage model. "one estimates how long it would take to program the system and then multiply by three" to get the total. Software 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)* found front-end activities made up a least 20% of the project time. Similarly, Wideman *(2000)* states that the typical effort spent in the planning phase in construction projects is approximately 20% of the total work hours.

Choma and Bhat *(2010: 5)* found "the projects with the worst results were those that were missing important planning components". However, they also found "the projects in this sample that took longer in planning had the worst results" *(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.

11. 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)*.

Dvir et al. *(2003: 94)*, 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." 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: 6)*, state become a hygiene factor for successful projects, "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." In general, the research is consistent: the majority of studies, with a few outliers, state planning is important to project success. *(see* **Table 5***)*.

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. A meta-analysis using weighting was considered as described in Hwang, Windsor and Pryor *(2000)* but this was rejected given the varied nature of the source documents: different industries, different methodologies and different types of cross-functional projects. A high level meta-analysis reviewing the means was completed instead. *(see* **Table 6***)*.

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 & Prescott *(1988)* Pinto & Prescott (1990) Hamilton & Gibson (1996) Deephouse et al. (1996) Müller & Turner (2001) Shenhar et al. (2002) Dvir et al (2003) Gibson and Pappas (2003) Dvir & Lechler (2004) Gibson et al. (2006) Zwikael and Globerson (2006) Salomo et al. (2007) Wang and Gibson (2008) Choma & Bhat (2010)	Tausworthe (1980) Chatzoglou and Macaulay (1996) Munns and Bjeirmi (1996) Morris (1998) Shenhar (2001) Shenhar et al. (2001) Ceschi (2005) Smits (2006) Zwikael & Globerson (2006) Thomas et al. (2008) Shehu and Akintoye (2009) Blomquist et al. (2010) Collyer et al. (2010)	Flyvbjerg et al (2002)	Bart (1993) Anderson (1996) Boehm (1996) Zwikael and Globerson (2006) Collyer et al. (2010)	Choma and Bhat (2010)

TABLE 5. *Summary of Positions of Reviewed Literature on Project Planning*

Study	Empirical Relationship	Normalized to R^2		
		Aggregate	**Efficiency**	**Overall Success**
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 quality 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	
Salomo et al. *(2007)*	R^2 = .27 between project planning/risk planning and innovation success R^2 = .33 between goal clarity/process formality and innovation success	R^2= .27 R^2= .33 Average R^2= .30		R^2 = .30
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 = .34

TABLE 6. *High Level Meta-Analysis Summary of Empirical Results*

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: At a high level, research shows an average value of R2 = .33 correlation with efficiency and R2 = .34 with 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 be 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, we make the following conclusions:

- Pressure exists in the project environment to reduce the time spent planning rather than increase it.
- Planning requirements vary in different industries.
- The level of planning completeness is positively correlated with project success in the construction industry.
- Planning is associated with project success; both project efficiency and overall project success
- Dynamic and fast paced environments do not lend themselves to a single up front planning phase although planning is still required.
- As an approximation, research shows an average value of R2 = .33 correlation with efficiency and R2 = .35 with success.

We now review the research questions:

- Is planning important for project success?;
- This is confirmed by Conclusion 4.;
- What is the impact of the planning phase on project success?

This is answered by conclusion 6.

What level of effort expended on the planning phase is most correlated with 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.

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