# The Impact of the Entrepreneur’s Project Manager on Project Outcomes

# [Author + byline]

The study examines data collected from 124 Israeli construction and infrastructure projects of different scales, to assess the impact of Project Managers representing the entrepreneur, on project performance. The study shows that measurable budget savings were reported in 72% of the projects, measurable time savings were reported in 78% of the projects, and cost of poor quality (COPQ) savings were reported in 76% of the projects, due to the Project Manager’s involvement. The study also found that project entrepreneurs with in-house project management systems in place achieve significantly better project performance results. In the absence of such systems, project budget overruns were found to be twice as high as in cases where such systems do exist, while schedule overruns were found to be 50% higher. The accumulated data and conclusions of this study may contribute to a further understanding of project success factors while offering tools which can be incorporated by the construction industry towards improving efficiency and increasing the prospects of projects’ success.

# Introduction

Over the past two decades, Israel’s manufacturing industry has doubled its productivity and efficiency. However, it appears that this progress has eluded the construction industry, which is at a standstill, with projects not being informed by innovative trends that have positively impacted other branches of the economy. The construction industry is known for its conservatism and resulting difficulties to introduce technological innovation and adopt efficiency measures readily adopted by other industries (Woetzel et. al. 2017). This phenomenon is not unique to Israel and is recognized throughout the global construction industry. Furthermore, the field has become competitive and complex, with growing levels of project uncertainty (Wind and Main 1998), and requirements increasing by the day. Under such conditions, it is hard to see how the construction industry will be able to supply the projected increase in the coming years without significantly improving its efficiency. Such necessary improvements will require decision makers to discuss and find solutions that will help achieve objectives without undermining construction quality.

For several decades, research has sought to identify the main factors contributing to the success of construction projects (Dvir, Sadeh and Pines 2006; Manches and Hana 2006), with the main goals being improved performance, profitability and growth, as well as creating and maintaining a competitive advantage for construction firms.

Project Management methods are continuously being developed and improved, and organizations that are able to successfully incorporate these methods into their work processes consistently demonstrate better performance compared to their industry competitors. In order to enhance the productivity of the construction industry, to lead projects to success and be able to meet projected growth rates, **a highly efficient and well-defined Project Management position is essential. Moreover, it is particularly important to define the certification, knowledge and skills required from the Project Manager.**

# Project Success

Project success has frequently been discussed in the research literature, but consensus between researchers is still lacking as to its definition (Davis 2014). According to Truman (2006), a project is usually defined as successful when its tasks are performed according to plan and without surprises. In a successful project the goals are well defined, work proceeds according to schedule, and resources are used efficiently. Furthermore, client satisfaction with the final result and completion of the process without significant disputes or lawsuits, are indicators of project success. Truman’s approach focuses on the project’s process and not necessarily on the final results. According to this approach, a successful project is one in which conflicts between stakeholders are minimized.

Conversely, Dvir, Sadeh, and Pines (2006) offer a result-oriented approach to project success. According to them, most projects are business-driven, and as such are focused on profit and growth. This systemic perception is reflected in the literature on project management, which traditionally points to schedule, budget and performance as the main indicators of project success (Wandberg et al. 2013). These researchers mention final customer satisfaction as another indicator of project success. Yet others, such as Dvir, Lipovetskey, Shenhar, and Tishler (1997), argue that customer satisfaction is the most important indicator of project success, while Baker, Murphy, and Fisher (1997) conclude that from a long-term perspective the most important indicator of project success is whether or not the parties participating in the process and affected by it were satisfied.

Projects in the Construction industry are among the most complex projects that exist (Wintch 1987). This complexity increases over time. Construction companies invest massive resources in improving their performance in four main areas: project costs, project duration, quality, and safety (Wandberg et al. 2013). Yet, budget and schedule overruns have become an inseparable part of construction projects, both in Israel and globally, with the question today not being whether there will be overruns but how serious will they be (Pressoir 1992). Furthermore, one of the factors that directly impact most project success indicators is the cost of poor quality (COPQ). This factor directly impacts profit, growth, schedule performance and customer satisfaction. In many cases it was found that the cost of work repetition exceeds project profit (Brandon 1984). In terms of budget, repetitions to correct non-conformances and defects may reach 4% of projects’ cost (Josephson & Hammarlund 1999).

Another main challenge, also related to building quality, concerns improving worker safety at construction sites (Wandberg et al. 2013). When examining the empirical connection between construction quality and safety, the latest research shows that low project performance is highly correlated with bodily injury. In fact, there is a clear correlation between a project’s approach to quality and its approach to safety. In studies that examined the causes of construction site accidents, Project Managers reported that the strong positive correlation between work repetition and bodily injuries is the result of demolition work, tight schedules and faulty work procedures. The study also found that strategically both of these indicators, quality and safety, can be improved by implementing project leadership, suitable administrative decision-making, and responsibility-taking.

Different projects in the construction industry run into the same problems repeatedly. One might have expected that in our present era of information sharing we would be able to confront such challenges more effectively, but a current study among UK construction companies (Kelly, Edkins Smyth and Konstantinou 2013) found that organizational knowledge management initiatives contribute only slightly to project success, whereas **Project Managers are the real motivating force for a project’s success, functioning as covert knowledge managers**. The study proved that the covert dimension of knowledge is critical in resolving common project challenges. There is a lack of awareness among senior management in construction firms as to the critical role that Project Managers play in knowledge building. Moreover, Project Managers themselves are only partly aware of the critical impact and importance of the knowledge they possess.

Since the key assets of the project-based professional service providers are staff, knowledge, financial resources and reputation (Gunn & Bayer 2006), it emerges that knowledge is of paramount value. How, then, is knowledge collected and transferred between projects? According to Gunn and Bayer, knowledge is collected through cooperation with academia, work group meetings, reading professional literature, receiving in-service training, using knowledge maintenance and management systems, and consultation with planners and subcontractors. However, ultimately, the best and most effective way to acquire knowledge is through consultations within the project team. Project Managers actually possess most of the knowledge needed by their work colleagues, which they distribute by providing solutions and sharing information from their practical experience and areas of expertise, essentially functioning as ‘living networks’, disseminating knowledge between team members.

This leads to the conclusion that the main function of the Project Manager is to be the best vehicle possible for contending with project uncertainties. How, then, is the body of knowledge held by the Project Manager shared within the organization? According to Waterman and Peters (1984), the best way to transfer knowledge is through principles and stories based on past experience. According to their study, successful companies possess a rich body of stories on which the organizational tradition is based and all employees identify. Apparently, people are more affected by stories that are meaningful and convey a stronger message, than by a collection of data or slogans.

Stories are powerful in transferring behavior patterns because they function as maps that help people understand how things are done (Wilkins 1984). These maps, which leave a mark on memory, guide them in decision-making and selecting their mode of operation. Laufer (1994) argues that short stories by successful Project Managers are an excellent learning tool, because a story elicits inspiration and curiosity among readers, leaves an impression over time, increases the reader’s identification with the storyteller, and cultivates readers‘ wish to know and learn.

The lessons learned from managers’ stories summarize the accumulated knowledge in the field over the years. The principles that guide them are the most powerful tools in their possession for dealing with complicated project requirements. The combination between the stories, the principles, the lessons and the tools, offer readers (whether listeners or viewers) a unique way to learn, participate, and enrich their knowledge. Since most of managers’ knowledge is ‘silent‘, a story is a means to turn their silent knowledge into ‘explicit‘ knowledge.

# Principles of success

Success in project management is not an exceptional ability that exists only among exceptional people, but a goal that most managers are capable of achieving. Furthermore, leadership can be learned and applied. A study of hundreds of business success stories by Posner and Kouzes (2006) extracted the four basic principles that lead managers to exceptional success, as follows:

*Challenging the process.* Managers who are leaders are pioneers, people willing to go into the unknown and take risks to find new and better ways to perform tasks.

*Creating a vision.* It is the role of managers to breathe life into the hopes and dreams of the people involved, help them see what the future holds, and prove they have absolute faith in their ability to make exceptional things happen.

*Motivating people***.** Successful managers know they cannot achieve success if they act alone, and must therefore include additional project staff members who will finance, manufacture, and sell the vision.

*Personal example.*Although the role confers authority, it is managers’ behavior that will gain them appreciation and respect. Managers who do what they believe in, strive to realize their vision, and apply what they committed to, receive genuine and full support.

According to Laufer, Hoffman, Russell, Cameron (2015) one of the main reasons for the failure of numerous studies on project management is the absence of a link between theory and practice. They emphasize that past studies tend to construct complex project management theories and methodologies that are not closely related to reality because they do not rely on the rich experience of outstanding Project Managers. Their research finds that the four main roles of project management are as follows:

1. *Fostering cooperation:*Selecting the right people for the job, delegating powers and granting trust.
2. *Integrated planning and continued learning:* Designing short- and long-term plans that are flexible to change and allow for constant learning from the experience of other projects.
3. *Preventing disruption:* The ability to predict the appearance of problems and deal with them when they occur.
4. *Maintaining the momentum:* Constant monitoring of the project site and solving problems with face-to-face communication.

Successful Project Managers today are ‘people-oriented’, ‘communication-oriented’, and ‘action-oriented’. In order to foster cooperation, they must be ‘people-oriented‘. In order to integrate planning while learning they must be ‘communication-oriented‘, and in order to deal with problems that confront the project they must be ‘action-oriented‘.

Necessary skills that the Project Manager must adopt in order to successfully lead the project (Main & Wind 1998) include flexibility, quick learning, long-term thinking, integrating the capacities of advanced computerized systems, performance while accommodating customer needs, and increasing employee decision-making powers. The successful Project Manager (Archibald 2003) must have the following skills: flexibility and adaptability, initiative and leadership, aggressiveness, self-confidence, persuasiveness, fluency, ambition, activeness, vigor, high communication skills, the ability to integrate different people, being driven by personal interest, prudence, enthusiasm and optimism, spontaneity, ability to regulate technical solutions on time, ability to stay within budget while correctly managing people, order and organization and high self-discipline, broad perspective, seeking to spend most of their time in planning and monitoring, and finally, the ability to identify problems and willingness to make decisions. Their success largely depends on their ability to build personal connections and trusting relationships with all the people involved in the project.

The main question that arises from the different studies is whether there is a connection between the presence and involvement of a Project Manager representing the entrepreneur in construction projects, and project performance in terms of schedule, budget, and quality.

# Methodology

The main purpose of the present study is to develop a practical principle-based theory of project management. For this purpose a large field study was conducted and data collected with the aim of mapping and analyzing the existing situation in the construction industry in Israel today. Based on the assumption that management is best learned by imitating the best, and in order to explain the information obtained from the field survey, another in-depth qualitative field study was conducted by carrying out personal interviews with successful Project Managers.

As part of the field survey, 124 recently-completed projects throughout Israel were surveyed and analyzed. The survey was conducted through an expanded dedicated questionnaire based on past research, and distributed to the population of construction and infrastructure Project Managers as part of a national conference of Project Managers, held by the Israeli Association of Construction & Infrastructure Engineers (IACIE) in November 2017.

The field survey facilitated a statistical-quantitative analysis allowing data collection on the entrepreneur as well as the Project Manager, and quantitative estimates of overrun levels (in terms of budget, schedule, and building deficiencies) in projects, along with detailed information about the project management method. Using this data, analyses and crosschecking were conducted to extract conclusions regarding the operation of the management and supervision system representing the entrepreneur in the construction project. In particular, it helped answer the question whether the presence of the Project Manager and supervision staff representing the entrepreneur had been instrumental in achieving project objectives.

As part of the qualitative field study, 15 outstanding Project Managers in entrepreneurial and management firms were interviewed, all leaders in their fields, in order to examine characteristics and principles of project management implemented in their work which lead to the success of projects. These principles and characteristics, summarizing the knowledge accumulated by those managers over decades of work, shed additional light on the results of the quantitative research.

## Project Managers’ reports

Many studies have been conducted to identify the various factors that lead to project success. Collins and Baccarini (2004) define success in project management as a function of meeting schedule, cost and quality targets. A project is ‘perceived’ as successful when project management is effective, the project meets engineering performance targets, and there is a high level of satisfaction with its results among all parties involved. Researchers Turner and Muller (2005) claim that the more complex a project, the more important the satisfaction of all those involved: entrepreneurs, clients and other stakeholders. These studies and others indicate that success is measured by budget performance, schedule, safety, and customer satisfaction. Menches and Hanna (2006) attempted to measure actual project performance versus the Project Manager’s personal assessment of the project’s success. Their study found a clear correlation between Project Managers’ assessment of a project as successful and the project’s actual performance. **In other words, the Project Manager’s perception of the project’s success is quite accurate and objective.**

Based on the results of these studies and on the indices of success that were reviewed, an expanded questionnaire was developed in which Project Managers from all industry sectors were asked to answer questions about the last project they had managed and had recently been completed or was in its final stages.

## The Questionnaire

The dedicated questionnaire was divided into four parts as follows:

1. *Data about the project management system*

This section included questions about the Project Manager, such as: number of years of professional experience, the type of firm in which they were employed (entrepreneurial, management-supervision, or a contracting firm), the number of managers working on the project at the same time, and the project management method (in-house management system, external management and supervision system or other).

1. *Data about the project*

This section included questions about the type of project (housing, infrastructure, office and commerce buildings, factories and industrial buildings, hotels and public projects), assessment of its financial scope, and schedule estimate. Also, qualitative data was collected about overruns of the project’s budget, time and quality goals:

* 1. Time index: The extent of overrun in months from the defined contractual schedule and the main reason for the delay. In addition, if there were cases in which the Project Manager’s direct intervention led to measurable time savings: how much time was saved on average.
  2. Budget index: The extent of financial overrun compared to the defined contractual budget and the main reason for the overrun. In addition, if there were cases in which the direct intervention of the Project Manager led to measurable budget savings: how much of the budget was saved on average.
  3. Quality index: The method of quality oversight in the project and assessment of the extent of building deficiencies as a percentage of the contract value. Also, to the extent that the entrepreneur’s in-house management and supervision systems measurably contributed to reducing building deficiencies, the extent of savings and their percentage of the project cost were assessed.

1. *Data about the entrepreneur*

This section included questions about the company that initiated the project (the entrepreneurial company). Data was collected about the type of company (private or public construction company, public entrepreneur, group of investors, purchasing group, etc.), the company’s seniority in the construction industry, and whether the company has an engineering mechanism in place.

# Statistical analysis

The ‘Jarque-Bera (JB)’ and ‘Kolmogorov-Smirnof (KS)’ tests were used on the collected data to show that the assumption that the data collected by the questionnaires is distributed normally cannot be accepted. Therefore, a-parametric tests must be used, based on which, by definition, significance is harder to prove. Significance was tested using the Mann-Whitney (MW) statistical test, used to show whether a randomly selected value from one population will be less or greater than a randomly selected value from a second population.

The fact that a relatively large amount of data was sampled makes it possible to reach significance levels above 5% (which is considered a very high significance level), and therefore the probability of statistical error is very low.

To check for biases between the reports of Project Managers representing management and supervision companies and those representing entrepreneurial and contracting companies, an ANOVA analysis of the sample was run, comparing the reports of both groups. The analysis found that the distribution of answers was unbiased with the probability being over 80%. Therefore, even though the two populations are usually on opposite sides of the project from the perspective of the stakeholders, it appears that their answers to the questionnaire are hardly influenced by their role in the project, a fact that strengthens the data’s reliability.

# Findings

Respondents come from different companies, distributed as follows: 38% of the respondents were employed by entrepreneurial companies, 20% by contracting companies, and 42% by project management and supervision companies.

The study examined major projects of varying scopes. The smallest project was valued as NIS 3 million and the biggest project at NIS 8 billion, with the average project being valued at $100 million.

# Project Manager’s influence on quantitative indices

The study examined the direct contribution of the Client-side Project Manager to budgetary savings, reducing schedules, and improving quality. The main findings are presented below.

## Budgetary savings

The estimated level of measurable budgetary savings in a project as a result of the Project Manager’s intervention is NIS 10.2 million, representing on average 2.8% of a project.Furthermore, 72% of Project Managers reported measurable budgetary savings as a result of the Project Manager’s direct intervention.

Figure 1 shows the distribution of Project Managers’ evaluation of the extent of budgetary savings as a result of their intervention.

### [Insert Figure 1 about here]

## Reducing schedules

Average measurable reductions in project schedule as a result of Project Managers’ direct intervention was found to be 3.3 months, meaning 11% savings on average. Furthermore, 78% of Project Managers reported measurable schedule reductions as a result of the direct intervention of the Project Manager. Figure 2 shows the distribution of Project Managers’ evaluation of project schedule reductions.

[Insert figure 2 about here]

## Building defects

Evaluation of the measurable savings of building defects as a result of the direct intervention of the Project Manager is 5.2% of project costs. Furthermore, 76% of Project Managers reported measurable reductions in building defects as a result of the direct intervention of the Project Manager. Figure 3 shows the distribution of Project Managers’ evaluation of cumulative savings in relation to project cost.

### [Insert figure 3 about here]

## Conclusions

Most Project Managers (whether representing the contractor or the entrepreneur, despite being on opposite sides of the project), believe that the presence of a Project Manager representing the entrepreneur contributes to budget savings, time savings, and the prevention of building defects. In their responses, participants specified the extent of savings achieved.

# Impact of the entrepreneur’s seniority on project results

When examining the influence of the entrepreneur’s seniority on project results, project performance was examined in terms of budget overruns, time overruns, and estimated level of building defects, relative to the entrepreneur’s years of seniority in the construction industry.

Table 1 presents a distribution of the entrepreneur’s seniority in projects.

[Insert table 1 about here]

According to the research hypothesis, the greater the project entrepreneur’s seniority, the lower the overruns would be. To test this hypothesis, the average overrun level for each category was checked.

Quite surprisingly, the findings did not confirm the research hypothesis. The greater the entrepreneur’s seniority, the less overruns were measured, but at over 30 years of seniority in the industry there was a spike in project budget overruns. This spike was inconsistent with the research hypothesis. Therefore a deeper examination was undertaken in order to determine what elements of the over 30 year category impacted the findings. This examination resulted in the additional finding that the category of over 20 years seniority included all of the public sector projects in our sample, and therefore a separate analysis was carried out for each of the two sectors. The results were unequivocal. An examination of the average budget overrun for companies with more than 20 years seniority found that the average for a public entrepreneur was 3.2% whereas in the private sector it was less than 1%. **Therefore, an entrepreneur from the private sector is three times better at meeting budget targets than a public sector entrepreneur.** In fact, the trend of decline in budget overruns is actually maintained, except that the public sector distorts the trend.

As for schedule overruns, the analysis found that in the category of over 20 years seniority, for every private sector entrepreneur, project schedule overruns continue to drop until they reach 1.2%.However, in the public sector, at more than 20 years seniority the average schedule overrun is 12.1%. Again one may conclude that the private sector operates exponentially better than the public sector, and here too the inclusion of public sector data mitigates the operation performance trend that exists the greater the entrepreneur’s seniority. If it weren’t for these projects, the trend of decline in overruns correlating with the rise in seniority would have been maintained.

The level of building defects estimated by Project Managers is very low. The findings are inconsistent with past studies. This may be because some of the defects do not come to the attention of the Project Manager, and some arise only when the Project Manager is no longer active in the project. It is likely that in order to understand the picture better a follow-up study should be held to check project customer and resident reports and compare them with the Project Manager’s reports. Figure 4 shows overrun rates by the entrepreneur’s seniority.

[Insert figure 4 about here]

Figure 5 presents Public sector vs. private sector overrun rates by the entrepreneur’s seniority.

[Insert figure 5 about here]

## Conclusions

The findings of the statistical analysis showed that ‘young‘ entrepreneurs have little organizational knowledge, and as a result show the lowest achievements in the industry. In the private sector, the more senior the entrepreneur is in the industry, the better it meets budget and schedule targets. At 30 years of seniority and more (most public entrepreneurs are in this category), there is a sudden rise in the level of overruns. A significant gap was found in meeting project targets between the two sectors: in the projects examined in this study, the private sector was found to be three times better at meeting budget targets than the public sector, whereas in meeting schedule targets the private sector was about 10 times better than the public sector.

These findings can be partially explained by a recent study published by the Bank of Israel’s research department (Mazar 2018), which checked how the private sector in a number of developed countries differs from the public sector in basic work skills that characterize educated workers. Mazar’s study indicates that the level of work skills of educated workers in the private sector in Israel is higher than that of educated workers in the public sector. However, this is not exceptional compared to the rest of the OECD countries. The study also found that the greater the difference in wage sensitivity in favor of the private sector, the higher the level of the workers’ basic skills. Which is to say, the private sector became a ‘magnet‘ for outstanding workers in the economy because it is more rewarding, and compensation is directly influenced by the worker’s personal abilities.

Since the public sector copes with unique challenges that differ from those that exist in the private sector, such as managing large-scale infrastructure projects, including sensitive and complicated ones, we suggest that follow up studies carefully examine the causes for performance disparities between the sectors.

# Effect of the existence of an engineering mechanism within the entrepreneur company

Most of the entrepreneurs reviewed maintain an active engineering mechanism in their company at some level. This study sought to examine the impact of such mechanisms on project success. In 75% of the reported projects an engineering mechanism exists in the entrepreneur company whereas in 25% of projects it does not exist.

The research hypothesis was that an internal engineering mechanism in the entrepreneur’s company facilitates project success. Figure 6 presents the initial results achieved from data analysis.

[Insert figure 6 about here]

In the analysis of all of the projects in the sample, better results are apparently achieved without using an engineering mechanism in the entrepreneur’s company. The surprising findings led to a separate analysis of the private sector while removing the public sector from the sample.

Figure 7 shows the results for the private sector.

[Insert figure 7 about here]

Indeed, after removing the public sector from the results, the clear conclusion that arises is that in the private sector an internal engineering mechanism in the entrepreneur’s company considerably and significantly reduces time and budget overruns, and constitutes a significant advantage for meeting project targets. On the matter of building defects no significant gap was observed. However, it can be assumed that the very existence of an internal engineering mechanism in the entrepreneur’s company leads to identifying building defects, whereas in the absence of such a mechanism many defects are not discovered at all and not documented. It is reasonable to assume that in quality targets, as well as budget and schedule targets, an internal engineering mechanism leads to improved outcomes.

# How in-house project management systems representing the entrepreneur impact project results

After examining the influence of an engineering mechanism within the entrepreneur’s company on project results, we checked the influence of project management methods led by the entrepreneur company on project results.

The breakdown of project management methods is as follows: in 37% of projects, project management is undertaken by an in-house management system, which is to say, by Project Managers employed by the entrepreneur’s company; in 57% of the projects the project was managed by an external management and supervision company; and in 6% of the projects the entrepreneur’s company did not use management or supervision services for the project at all.

Statistical analysis was conducted to identify the management method that yields the best project results.

When examining the influence of an in-house management mechanism on project results, project performance was examined in terms of budget overruns, time overruns, and estimated level of building defects, concerning the two types of mechanisms.

To test this hypothesis, the average overrun level for each category was measured. In Table 4.11 the projects that meet each criterion are shown, alongside the overrun level computed for that criterion.

The categories are: in-house management mechanism (with or without an external management company), an external management and supervision mechanism only, and any other mechanism (management without supervision, supervision without management, or no management and no supervision).

Figure 8 presents a summary of the overrun levels in the three areas (budget, time and quality) by project management method.

[Insert figure 8 about here]

Figure 9 presents the findings in the private sector after removing the public sector from the sample.

[Insert figure 9 about here]

## Conclusions

Entrepreneur companies with internal engineering mechanisms that manage projects with an in-house core of Project Managers are significantly more successful at meeting budget, schedule and quality targets, whether the public sector remains in the sample or not.

Most entrepreneurs in the industry appear to cope successfully with the budget challenge, as is evident from the low levels of budget overruns in their projects. However, it is possible, and there are indications to that effect from a previous study by Rosenfeld and Iuclea (2011), that they frequently cope with this by way of various strategies or ploys, such as revising the scope of the project or settling for a lower finishing quality. A more significant gap was measured in schedule overruns.

After we separated the public sector from the sample, the resulting outcome becomes even clearer and more significant: the private sector meets budget and schedule targets by a significant gap. Furthermore, in-house management systems achieve better results compared with any other system.

It is important to emphasize that in entrepreneur companies that manage projects with an internal engineering mechanism, Project Managers’ accumulated organizational knowledge and experience is maintained within the organization and channeled to project success. On the other hand, in companies that manage projects using external management and supervision systems, at the end of each project the knowledge accumulated by the external manager ‘moves on‘ with that manager and is not maintained within the organization. When comparing between the public sector and the private sector in the research sample, a very significant gap was found in reaching project targets. In terms of budget targets - the private sector is three times better than the public sector, while in terms of schedule targets - the private sector is four times better than the public sector. The main gaps between the private and public sectors were discussed above, and we recommend further research in this area.

# Field survey – Summary and main conclusions

1. In the private sector, the greater the entrepreneur’s seniority in the construction industry, the better the project meets its budget, schedule and quality targets, with significantly better achievements compared with companies having less years of entrepreneurial seniority.
2. An internal engineering mechanism within the entrepreneur’s company (engineering VP, engineering department, Chief Engineer) significantly and substantially reduces schedule and budget overruns, and is a significant advantage in meeting project targets.
3. An entrepreneur that uses an in-house project management system, in addition to or instead of an external management and supervision system, achieves better results in project performance with a substantial and significant gap compared to any other project management system.
4. A significant gap was found in terms of achieving project targets between the private sector and the public sector: the private sector meets its targets with lower overruns than average, whereas in the public sector the overruns are above average.

A gap was found between the level of building defects as reported by Project Managers and the level of building defects as arise from past research, apparently painting a ‘rosy picture’. This finding is consistent with other studies on the cost of poor quality (COPQ) in construction, that showed that the supervision mechanism is not quality oriented and does not look for defects. To understand the disparities between Project Managers’ perceptions of the extent of building defects and the extent of building defects according to previous studies, follow up research is required.

# Interview-based qualitative research with leading Project Managers in the industry

## Methodology

The qualitative methodology was based on a series of in-depth interviews with Project Managers and company engineers in senior positions in the Israeli construction industry, who manage and build dozens of large-scale projects. These Project Managers have dozens of years of experience in the industry, work with most service providers, design firms, management and supervision companies, and contracting firms, giving them a very broad perspective on the field. One of the main advantages of qualitative research as a complement for quantitative research is the ability to focus on the experience of one specific person, within the bigger context, and to obtain examples of a personal case to further understand trends and processes. Likewise, qualitative research serves to determine the categories analyzed by the quantitative study (the field survey) and examine the implications of the numerical findings.

The data is processed using content analysis (Neuendorf 2016) and encoding (Holsti 1969). Content analysis is a research tool that systematically and objectively identifies recurring attributes within certain contents, while encoding classifies responses to central categories. This section of the paper presents the findings that arose from analyzing the stories and encoding the responses of the 15 Project Managers interviewed.

## Interview structure

Interviewees were asked a fixed initial set of questions. During each interview changes were made to the order of the questions, with clarification and follow up questions added according to the progress of each individual interview. Each interview lasted between 90 and 150 minutes.

## How the findings were analyzed

During the interviews, managers were asked about the projects they managed in the past and today, the main principles they implement in their work, landmarks in their professional careers, their organizational philosophies, and their recommendations for the future.

Interviewees provided examples and unique stories capturing the knowledge accumulated in the field over the years, offering powerful tools for dealing with the complex demands of project management today. Most of the knowledge held by these leading managers can be defined as ‘silent knowledge’ and one of the aims of this study is to transform it into explicit knowledge.

## Project Manager’s influence on project efficiency

The quantitative research indicated significantly that the contribution of the Project Manager to project success in terms of budget, schedule and quality, is critical, and in all the examined indices it emerged that the Project Manager contributed directly and measurably to improving project performance from these aspects.

As part of the interviews, we sought to examine the principles by which Project Managers operate to create the added value that contributes so significantly to project success.

### Personal commitment to improve and streamline processes

Interviewees described many and varied cases of intervention in projects at critical points that led to significant improvement in the project’s ability to meet its targets, and they were unanimous in the belief that a good Project Manager is one who checks every step closely and does not take anything for granted.

Even though the stages in which Project Managers intervened were different, what they all had in common is the Project Manager’s desire, commitment, and ability to lead change completely contrary to the normal progress of the project.

Interviewees also noted that sometimes the idea for change does not come from the Project Manager, but rather from team members, but in order for it to be doable, the Project Manager’s support and commitment to lead the change is necessary, as is the Project Manager’s ability to persuade the entrepreneur to support the change.

An interesting example of such an intervention by a Project Manager that led to significant savings was raised in an interview with a senior Project Manager in a public real estate company currently building a luxury residential tower in Tel Aviv.

The intervention in question occurred at the tender stage, when he was appointed in-house Project Manager representing the entrepreneur. According to the interviewee, the tender stage is the last chance to influence the budget before the project begins. When he examined the project’s low voltage systems, and out of a broad systemic perspective, he discovered a problem that he believed was caused by a multiplicity of consultants for the project, indicating that there was planning duplicity in the work of different consultants. After working together with an external consultant who is one of the most senior planners in the business, they managed to cancel those duplicities and unite different systems, resulting, for instance, in the cost of low-voltage work on the project being reduced by more than 40%, which amounted to NIS 6 million in savings.

Also, the Project Manager noticed that changing the air conditioning in the project from one central system to a number of independent units to serve smaller spaces would lead to further savings. He asked an air-conditioning planner to make the change in the project’s design, leading to savings amounting to NIS 4 million in the project budget, in addition to improving energy efficiency in the building for its entire life span, leading to further savings for the entrepreneur. The Project Manager insisted on these changes, even though the rewriting of the plans might have led to some delay in the work.

Such personal commitment to improving and streamlining process saves both project time and budget.

## Crisis management

The interviews indicate that a good Project Manager looks at the project environment and intervenes in any crisis that may jeopardize the project’s ability to meet its targets, even if the disputed parties are not contractually connected to the project’s management.

A Project Manager who is reliable, experienced and objective and has the project’s success in mind, can win the trust pf other related parties and function as an agreed arbiter of disputes between them. An unresolved crisis can lead to litigation and delay of schedules to the point of halting the project and thereby causing its failure, as well as imposing unplanned legal expenses on the parties.

An example of such a crisis handled by a Project Manager, enabling work to proceed without resorting to the courts, was presented by a senior Project Manager in a private real estate company who specializes in building luxury towers. A recent project he had been managing encountered difficulties. The leading contractor, who fell into financial difficulties, failed to comply with expected commitments to the subcontractors, who consequently began to abandon the site until work ground to a halt. This threatened the project’s chances of meeting its targets.

Even though the entrepreneur was not contractually connected to the subcontractors but only to the general contractor, the Project Manager took it upon himself to intervene in the crisis until it was resolved. He held a series of intensive meetings with representatives of the general contractor and the subcontractors until a suitable solution was found, by which a schedule of payments was agreed upon allowing the subcontractors to move ahead with the work. They also agreed on an updated schedule. As soon as the agreement was signed, the contractors went back to work at double speed and managed to catch up with the schedule.

Had the project management not intervened in the way that it did, the project would have certainly been litigated in court; it would not have been turned over to the homeowners on time; and this would have led to lawsuits against the entrepreneur for tardiness and failing to fulfill the agreement. In fact, a professional engineering function is able to reduce the likelihood of cases ending up in court.

## Leadership

Project teams in the construction industry are composed of groups of workers and subcontractors with different interests, working for a common goal, which is the project success. This leads to human relations concerns, which may ultimately lead to quality problems and mutual accusations.

One of the roles of the Project Manager is to be the guiding hand that creates a sense of belonging to the task, leading these diverse groups to work together for the project’s success.

The leadership required from the Project Manager is emphasized in the comments of the chief engineer of a public real estate company, who until recently served as Project Manager. The project that included the construction of an advanced research laboratories building involved exceptional engineering challenges. The project’s uniqueness and complexity led to internal friction and disputes between the design and construction teams. Shortly after the beginning of the construction, progress on the project stopped on grounds of inability to solve problems and lack of cooperation. The Project Manager was required to solve the problem. He looked into the situation and discovered that some of the project planners carried emotional and economic resentments because of the delay in the design schedule and numerous changes for which they had not been properly compensated.

The Project Manager decided to add to the project team an experienced planner who was able to supply the construction teams with creative solutions in a short time. Once the substantial issues that held the project back began to be resolved from an engineering point of view, the team’s trust in the Project Manager increased, the consultants and contractors began to cooperate, and the project got back on track. The work of the Project Manager, who managed the crisis and succeeded in bringing the planning and construction teams on board, prevented chaos and resentment.

Therefore, the Project Manager’s role also includes the ongoing mission of creating a positive working atmosphere and giving all parties involved motivation to cooperate and promote the project.

## The importance of the Project Manager’s experience and seniority

The issue of seniority came up in the interviews, but interviewees referred to the Project Manager’s own seniority as the parameter that impacts project success, even though the quantitative research did not bear out that hypothesis. The quantitative findings show a significant correlation between the entrepreneur’s seniority and project success. The greater the entrepreneur’s seniority, the more improvement was observed on the indices of meeting budget, schedule and quality targets. Which is to say, the knowledge and experience accumulated in the organization, the work methods, and the organizational lesson learning, are factors the significantly impact project results.

The findings extracted from the interviews indicate that a successful Project Manager must be knowledgeable in all areas in which the project is concerned. Modern construction is characterized by a multiplicity of systems, and therefore the Project Manager must combine extensive engineering knowledge with high management skills. Since there is a broad range of specializations, the Project Manager must possess a technical understanding, the ability to identify problems and the ability to identify the parties who can help solve them. Those abilities of the Project Manager derive from experience, and therefore it is important for the Project Manager and planning staff to have experience in the field with which the project is concerned, especially when it comes to complex and multi-systemic projects.

The managers interviewed in this study noted that experienced and professional Project Managers save a lot of money for the entrepreneur. Thus, the more senior and experienced the manager, the better he or she can assess the plans made by the planners and consultants, ask the right questions, and in many cases remove overdesigning requirements.

One case that illustrates the importance of the Project Manager’s experience was described by the engineering VP of a large public real estate company. He described two projects with similar planning in nearby locations, where the construction contractor in both projects was the same company. Supposedly, the projects were managed under almost identical conditions, yet nonetheless one was extremely successful, delivered on schedule and within budget, and the clients reported a high satisfaction with the final product, whereas the other project was a failure. The main reason for the project’s success, he said, was the Project Manager representing an external management company, who was senior, professional, and possessed a high level of engineering knowledge, which helped him mediate between the planning staff and the construction staff. The Project Manager knew how to make the design accessible, motivate the partners in the project, and solve problems quickly. Meanwhile, in the project that failed, problems that arose were not resolved effectively, causing schedule delays which in turn led to mutual lawsuits. In the project that failed, project management was handed to a young external management company that lacked the necessary experience for projects of that sort.

We can see that the project that failed actually conformed with the findings of the quantitative analysis, according to which handing project management to an inexperienced company would impede the project’s success, whereas handing it to a company with experience in that particular type of project changed the trend and ultimately led to the project’s success.

## The importance of in-house management and engineering mechanisms

The findings of the quantitative research indicate a significant advantage for companies that maintain in-house management and engineering mechanisms. As part of the interviews, we attempted to understand how project management changes in cases where the entrepreneur maintains such mechanisms and why they contribute to project success.

All of the interviewees agree that good Project Managers must fully identify their own success with the project’s success. One thing that arises from that principle is the duty of the Project Manager to overcome short-term gains, plan for the long-term, and also be considerate of the time period after the building has been handed over and populated.

Actually, according to the interviewees, the main reason to prefer an in-house management mechanism is that at the end of the project the manager has accumulated a large amount of professional knowledge that can be channeled to the success of future projects by the company. On the other hand, with external management, the collected knowledge moves on with the Project Manager, and does not stay in the possession of the organization that initiated the project. Interviewees emphasized that there is no doubt that in-house management, although it is the most expensive type, is the best and most correct for project management.

An engineering VP for a large real estate entrepreneurial company presented an innovative philosophy for this type of company, by which the entire enterprising, planning and licensing process, including the construction stage, is managed by in-house Project Managers representing the entrepreneur, without the help of external management and supervision companies. Furthermore, the construction process is also performed through a subsidiary owned by the entrepreneur, which possesses all the necessary resources to build the building’s frame, from mechanical equipment to professional personnel, including a project management team with very experienced construction engineers.

Also, when the contracting company is owned by the entrepreneur’s company, the uncertainty element of the project diminishes, there is no conflict of interest between the entrepreneur and the constructor, and therefore any changes that occur in the process do not create problems for the constructor but only require updating the plans, updating the estimates, and handing down updated construction guidelines.

Another senior Project Manager claims that the less the land reserves in high demand areas, the higher the constructed buildings rise. Buildings become skyscrapers, and the project’s complexity grows. The management of such projects becomes more and more complex, and the number of people capable of dealing with such complexity diminishes accordingly. He says the secret of success is in the engineering mechanism. The founders of successful entrepreneurial companies in the industry were able to see that managing projects by a team of extremely experienced managers in the field, who are company employees, is indicative of the company’s high level of commitment towards its customers. The customers for their part understand that the company takes the projects it builds seriously, and this is reflected in the company’s sales, which grow every year, with little need for marketing efforts.

An engineering VP for one of the largest income-producing real estate companies in the industry concluded that, although managing projects through an in-house mechanism makes the project more expensive, it highly guarantees the project’s success. He claims that the Project Manager will make a significant contribution to project success only if the entrepreneur chooses the most senior and experienced person in the company for the job, and that person manages the project personally.

# Main conclusions from the interviews

## Advantages of client-side project management systems

One theme that runs like a thread through most of the interviews is that a close and tight management and supervision mechanism representing the entrepreneur definitely saves contractor costs through the building’s maintenance and warranty periods, thus actually returning the investment.

The main advantage of the Project Manager according to the interviews is crisis management. With correct and effective management, the Project Manager can at critical moments remove barriers and solve problems, thereby guaranteeing the continuity of the project and critically facilitating its success and meeting its targets.

Often the Project Manager, whose position is one of trust, serves as a mediator between the construction contractor and the project clients. In this framework, the project Manager’s professional experience and knowledge assists in finding the best solution for the parties involved.

## Refraining from hiding under the contractor’s mantel

In the absence of a protective envelope for projects in the industry, leading entrepreneurs have created a universe of their own, with its own rules. Rather than relying solely on the contractor’s performance capacities, they implement place their own in-house project management and supervision mechanisms, which sometimes include the employment of external management and supervision companies, external quality control companies, and external safety consulting companies, which are all directly accountable to the entrepreneur.

The company’s in-house team is responsible for receiving the projects from the contractor. The team sees to the quality of the assets handed over to the company, and makes sure they are delivered to the clients at the highest quality. They treat the company’s reputation as sacred, making every effort to reduce building defects and future lawsuits that might follow.

## Client-side project management method: in-house or external

Most company engineers in entrepreneurial companies interviewed for this study claim that creating an engineering mechanism in an entrepreneurial company and managing company projects through in-house Project Managers who are company employees, are the best and most correct methods to guarantee project success, albeit also being the most expensive. They claim that in-house Project Managers always have the will and motivation to contribute to project success. As for the company, it will aim to select for these positions experienced engineers with a broad range of construction and design knowledge and expertise, to ensure that the accumulated knowledge will be preserved and maintained within the organization.

# Summary and Conclusions

The quest for finding and understanding the main factors for successful construction projects has been ongoing for several decades of research with a goal of improving efficiency, profitability and growth of firms, as well as creating and maintaining a competitive advantage in a robust industry. For many years, researchers have tried to find new methods, better processes and new materials while implementing new and modern applications. According to a recent publication by the World Economic Forum, vibrant organizations that strive to improve and advance their technologies, management methods and training are most likely to create a competitive advantage and over-perform the market.

As part of this on-going efforts to shed light over the primary roots of a successful project, one of the most important aspects to consider is the impact of the construction Project Manager on the overall success of a project. In Israel, today, although not formally but de-facto, the construction Project Manager’s responsibilities also include responsibility for the ‘inspection’. In fact, the Project Manager’s role is formally undefined, and there is no mandatory obligation by law to have this position filled in any construction project. As a result, and as can be learned from past research, the actual influence of the Project Manager on the quality of the construction product is quite limited.

In order to enhance the productivity of the construction industry, and by that – to be able to meet the projected growth rate, it is essential to determine the practical and well-defined Project Manager’s functions. It is essential to define the required education, experience and training in order to become a certified Project Manager, as well as, his/her responsibilities in the construction project.

The Zeiler committee was formed to investigate the construction industry in Israel as a result of the “Versailles Halls” tragedy. The committee’s recommendations, as per the importance of the Project Manager role in the construction project, were very definite, and lined up perfectly with previous research findings according to which, although there are construction deficiencies in most of the construction projects, the project management spotted no more than 3% of them. In other words, the project management function, as defined today, is incapable of discovering and mending quality problems in the project.

This research draws guidelines for the definition of the Project Manager’s functions, using in-depth research of construction projects, and by comparing the construction industry in Israel to other developed and modern countries.

The primary purpose of the research was to assess the impact of a Project Manager on the outcomes of the project in terms of budget, schedule, and quality, and to define an effective and efficient inspection mechanism that will be able to prevent major quality deficiencies, or at least – spot them in early stages. At the end of the research we recommend a formal definition of the Project Manager’s functions in the construction industry in Israel.

The research included three levels:

## Literature and market review

In this part, the research reviewed the construction industry conditions in other developed countries, such as the USA, France, UK, and Australia, and compared them to the construction industry in Israel. This part focused on the impact of the Project Manager on the overall performance of the project.

## Detailed Field Survey

Using a detailed and focused survey, the research analyzed recently completed construction projects in Israel. The projects were selected from various fields of construction.

## Detailed Interviews Survey

By interviewing 15 leading senior managers in the industry, the research team gathered the knowledge and wisdom that has been accumulated over many years of experience. The primary goal of this section was to uncover and crystalize the main principles that make a successful Project Manager, eventually leading to a successful project.

The main findings of the study were as follows:

* Among all his/her duties, the Project Manager in Israel is also responsible for inspection. This differs from the situation in other developed western countries reviewed in this study, in which project management and inspection are strictly separated in order to prevent conflicts of interest. Those western countries adopted the proactive approach, according to which they use their authority to ensure the quality of the construction and its compliance with relevant rules and regulations.
* In Israel, it is very common for fresh engineers to start their career by managing a large scale project. However, according to our review of other countries, this path should not be recommended for creating successful Project Managers.

According to the findings, it is better for an engineer to start as a designer or as a practitioner, and only after gaining significant experience to evolve to project management. In Israel, the process is often opposite: Engineers start managing projects, and only then they partially learn the basics of design and construction methods. In this situation, and for as long as a Project Manager is also responsible for inspection, it is essential to promote a regulation that will define the necessary requirements and experience for an individual to be licensed as a Project Manager.

* There is a significant gap in performance between the private and the public sectors: The private sector outperforms the public sector in achieving the budget and schedule objectives of the project. Entrepreneurs in the private sector that use in-house project management, instead or in addition to external services, typically show significantly better performance.
* Although more expensive, the in-house management system is more likely to reduce the overall cost of the project, hence using such management system is usually a good investment.

# Data Availability Statement

[See data Availability Statement section in ASCE Journals guide]

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[Optional]

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**Fig. 1.** Budgetary Savings as a result of the Project Manager’s intervention.

**Fig. 2.** Schedule Reductions as a result of the Project Manager’s intervention.

**Fig. 3.** Building defects reductions as a result of the Project Manager’s intervention.

**Fig. 4.** Overrun rates by entrepreneur’s seniority.

**Fig. 5.** Public sector vs. private sector overrun rates by entrepreneur’s seniority.

**Fig. 6.** Impact of the existence of an engineering department at the entrepreneur’s company.

**Fig. 7.** Impact of the existence of an engineering department at the entrepreneur’s company - private sector.

**Fig. 8.** Overrun rates by project management method.

**Fig. 9.** Overrun rates by project management method - private sector.

**Table 1.** Distribution of entrepreneur’s seniority

|  |  |  |
| --- | --- | --- |
| Entrepreneur’s seniority in the construction industry  (in years) |  | Percentage of projects in the sample |
| up to 7 years |  | 11% |
| 8 to 20 years |  | 31% |
| 20 to 30 years |  | 18% |
| 30 to 50 years |  | 13% |
| over 50 years |  | 27% |