Labor Productivity Influence in the Construction Industry

An interpretive approach to project success
Bachelor Thesis in Business Administration

Title: Labor Productivity Influence in the Construction Industry
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Abstract

Background

The construction sector is one of the most important industries for the economy in Sweden. Between 2010 to November of 2020, there has been an increase in employment in the construction industry by 35.4 percent. In 2019 the Swedish construction sector was valued at EUR 53.3 billion, where the construction sub-sector makes up 47.6 percent (European Construction Sector Observatory - Country profile Sweden, 2020).

The construction industry is a fundamental part of society, whereas labor productivity, which represents the quantity of work performed per hour (Park 2006), is a vital element in the process of construction. Gunduz et al. (2020) state that labor consumes a significant amount of cost in construction projects, thus labor productivity is a determinator of cost optimization i.e., the process of making something as good or effective as possible (Cambridge Online Dictionary, n.d.). The benefit of productivity is seen as reduced construction time and cost (Fox, Marsh & Cockerham, 2010). Moreover, a lack of effective management activity towards construction resources can potentially decrease labor productivity. Thus, the familiarity of project managers with labor productivity factors is of major importance (Shehata & El-Gohary, 2011) and contributes to project success (Gunduz & Abu-Hijleh, 2020).
**Purpose**

The aim of this study is to elaborate on project success through the optimization of labor productivity. The authors are interested in representing the importance and benefits of labor productivity in the construction industry in realizing a successful project from the project manager’s perspective.

**Method**

The authors collected information from several of the biggest construction companies by turnover in Sweden and have conducted face-to-face interviews with various project managers. A broad literature review has been performed with the help of journals, articles, and books to examine the existing topics of labor productivity and factors’ influences in connection to project success in the construction industry. This thesis was written with the help of a qualitative deductive approach.

**Conclusion**

The results of this study provide empirical evidence that project success can be achieved through optimizing labor productivity through existing factors such as Communication patterns, Time, Structured planning of each stage, Risk assessment, Top management support, Quality, Education, and a Supportive leadership style. Thus, when the project manager considers these crucial factors within the project implementation process, he/she can navigate a construction project towards successful realization.
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1. Introduction

The purpose of this chapter is to introduce labor productivity and background of the Swedish construction industry. Additionally, the research purpose and the research question are being formulated.

The construction industry is quite vast and consists of infrastructure (e.g., roads, bridges, harbors, power plants, tunnels, airfields) and real estate (e.g., commercial and private buildings) (Nordstrand, 2000). Labor productivity in the construction industry, also known as efficiency, refers to units of output performed per hour by a worker (Shehata & El-Gohary, 2011).

Florez and Cortissoz (2016) note that labor is a strategic resource and of major importance in improving the levels of a project’s productivity and industry competitiveness. Al-Kinani and Adavi (2014) argue that labor productivity is a persisting issue in most countries and is one of the least studied areas in the field of construction. They also identify that profit margins on construction projects are small. Thus, being able as a contractor to emphasize cost saving through optimization of this labor productivity factor can be crucial. Jarkas (2010) defines the construction industry as labor-intensive, and that labor productivity is of essential significance.

Pinto and Slevin (1988) have developed the ten-factor model which aims to track the state of 10 identified characteristics crucial to project implementation success. In the model, the identified factors are communication, project mission, top management support, project schedule/plan, client consultation, personnel recruitment; selection and training, technical tasks, client acceptance, monitoring and feedback, and troubleshooting. Pinto and Slevin (1988) postulate additionally that the significance of different project success factors changes swiftly depending on the project life cycle stage they are in during the project implementation process.
Gunduz (2020) argued that although there is existing literature discussing the topic of labor productivity there is also a lack of research in the terms of ranking labor productivity factors by how often they are present. On the contrary, past studies have ranked labor productivity factors based on their significance.

Gunduz and Abu-Hijleh (2020) describe labor productivity as a prime contributor to the efficiency and the success of the operation. However, to boost the labor productivity these 10 characteristics need to be chosen wisely depending on the stage the project finds itself in (Pinto and Slevin, 1988), which is determined by the project manager.

The authors’ main interest lies in project success in the construction industry through the optimization of labor productivity. Furthermore, it needs to be elaborated further why labor productivity is a vital factor when it comes to the construction industry.

1.1 Swedish Construction Industry

Jonsson (2005) describes that the competition in the Swedish construction industry is quite low, and the industry is ruled by few major construction companies. He reviews the low labor productivity levels and high costs which have been identified in Sweden, West Europe, and USA. The reasons Jonsson (2005) identified were: bad planning and lack of design sketches, bad/lack of leadership and monitoring on time and costs as well as lacking quality.

SCB (2020) reviewed the prices in the construction industry compared to other sectors have increased more drastically during a long period of time and at a faster pace. Thus, stating that the building price index has increased more than the consumer prices index (Figure 1).

According to a research report by Jan Jonsson (2005), there were drastic chan’90sin the construction industry. He states that because of the financial crisis during the ’90s, the government reduced the state subsidies towards the sector and the building of apartments has been reduced significantly between 1990 and 2002.
A similar statistic from SCB (2018) shows that according to the building price index, construction costs for apartment buildings rose by 4% and by 6% for group-built family houses in the year 2017 compared to 2016. Also highlighted is that during the 2018 years the increase in these costs for both construction variations was 8%. The building price index should reflect all the costs a construction developer needs to pay in order to get a construction project built as defined by Lind (2016). In the article by SCB (2018) the index has been shown as a measurement of price development where differences in quality are deducted.

Statistics from SCB (2005) showed an increase of 2.2% of the labor force in the construction industry for the fourth quarter in 2016 compared to the same period in 2015. The salaries have been shown to be increased by 5.7% in the same report as well as available jobs increased by 13.7%.

Figure 1. Graph representing the construction price index for apartment buildings and group-built family houses with a deduction for subsidy as well as the consumer price index (KPI) between 1992-2019 in Sweden (SCB 2020)
1.2 Problem discussion

In the construction industry, various factors that disturb the labor productivity rate are identified as lack of communication or systematic overtime sessions (Paul & Adavi, 2013) and thus need to be encouraged in order to improve the efficiency of building construction projects. Moreover, innovation is also crucial since it affects labor productivity whereas process innovations are specifically supposed to increase productivity levels (Woltjer, van Galen & Logatcheva, 2019).

Paul and Adavi (2013) argue that construction personnel performance is vital to construction project success. Moreover, training, as well as communication, are fundamental elements for increasing labor productivity. They also review that regular training programs for the workers could potentially reduce the costs of projects.

Svensk Byggtjänst is a company in Sweden that maintains, collects, and provides information about the construction industry. They performed an investigation in 2014 which was similar to a previous investigation done in 2007 about costs, savings opportunities, and a prevailing lack of communication. The only difference in the approach of the new investigation were the environmental risks questions.

The results of the survey showed the lack of communication in the construction industry translated into making them more expensive. According to Svensk Byggtjänst (2014), the corresponding number of expenses increases in construction projects was 13%. Also pointed out was that the costs were 22 billion SEK in 2007, however, the number had increased to 32 billion SEK in 2014. A major cause of the lack of communication was to be corrections, edits, incorrect information, and even misunderstandings.

Communication is one of the ten factors suggested by Pinto and Slevin (1987) which are crucial to monitor when pursuing project success. Apart from that factor, Pinto and Slevin (1988) have also included in their ten-factor model project mission, top management support, project schedule/ plan, client consultation, personnel recruitment; selection and training, technical tasks, client acceptance, monitoring and feedback, and troubleshooting.
Another issue found in Sweden’s leading construction industry magazine, Byggindustrin (2018), is that most of the powerful construction companies have certain goals but nothing specifically in terms of numbers for labor productivity. An exception that was outlined in the article was the modular homes company Lindbäcks that has set a range of increase in labor productivity they pursue every year.

The above-listed problems lead towards the question of how labor productivity can be optimized in order to achieve a successful project which the authors intend to find more explicit answers about.

1.3 Purpose

The aim of this study is to elaborate on project success through the optimization of labor productivity. The authors are interested in representing the importance and benefits of labor productivity in the construction industry in realizing a successful project.

This is presented from the perspective of the project manager, who is interested in completing the scope of the project and maintaining consistency with top management objectives. Moreover, an interpretation of crucial critical factors that impact labor productivity as well as project success are overviewed to provide insights on potential ways of increasing efficiency in construction projects.

1.4 Research Question

Considering the purpose as well as the problem definition, the authors have decided on the following research question:

“How can project success be achieved through the optimization of labor productivity?”

“How can project success be achieved through the optimization of labor productivity?”
1.5 Delimitation

The Project Management Life Cycle consists of five different stages. After identifying productivity factors, the authors have chosen to take a closer look at the Project Management Process. The labor productivity factors that have been recognized can be taken into consideration during a project life cycle from a managerial perspective.

Furthermore, it has become evident that success is measured differently from company to company. To produce a standard, the authors have decided to refer to a statement made by Belassi and Tukel (1996) that emphasizes the prevailing ambiguity of project success because the goals and outcome of top management and client may differ strongly. Additionally, as different aspects of achievement were discovered, only the most prominent factors have been chosen to be analyzed.

Primary and secondary data have been used to write this thesis. Primary sources could potentially be misinterpreted due to biases or ill-will. To prevent this from occurring, the sources have been analyzed individually by Mr. Kirchev and Mrs. Bartoschek and divergent interpretations have been discussed. Secondary sources can pose a risk since they are written by an author who himself could have been biased. A non-biased viewpoint can only be established when reading more literature about the topic to form an individual objective opinion.

While working on the thesis the resources from the Jönköping University Library have been utilized as well as the databases ABI/INFORM Collection and catalog, collections such as Emerald and Semantic Scholar or Sage Journals, ScienceDirect, ASCELibrary, and DiVa-Portal.
1.6 Definitions

**Labor Productivity**
According to the International Journal of Project Management, labor productivity is defined as the hours of work divided by the units of work accomplished. This value can also be called physical labor productivity or unit rate (Abdel-Razek, Abd Elshakour M and Abdel-Hamid, 2007). Due to this consistency in description, the measurement of labor productivity is defined.

**Optimization**
"The process of making something as good or effective as possible" (Oxford Online Dictionary)

**Project**
The Guide to the Project Management Body of Knowledge (Rose, 2013) defines a project as "...a temporary endeavor undertaken to create a unique product or service". Meanwhile, Urban and Hauser (1987) describe a project as identifying the product’s benefits, determination of product attributes that are based on customer needs, the definition of the product’s functional specifications, and realization of the product in a form that meets the specifications and fulfills the key benefits.

One could say that a project is not only the physical product that the Project Manager coordinates and delivers but also the process of creating this specific product that will be delivered to the customer.

**Building Price Index**
It is a representation of price change in construction costs for newly constructed places for residence through observing price developments of the inputs used in the process (Statistics Finland, 2018).
**IT Systems**

''means the hardware, software, data, databases, data communication lines, network, and telecommunications equipment, Internet-related information technology infrastructure, wide area network, and other information technology equipment, owned, leased or licensed by the Company or any of its subsidiaries.’’ (Law Insider n.d.)

**Effectiveness**

''the quality of being successful in achieving what is wanted’’ (Cambridge Online Dictionary)

### 1.7 Project Life Cycle

A project consists of different stages from the concept to the termination. There are four crucial stages that end up determining project success. The first stage is the initiation stage, where priorities, goals, and deadlines of the project are being discussed. Secondly, the planning stage examines the tasks being outlined for the later execution of the project. The third stage is the Execution stage where everything planned is translated into action. Lastly, in the fourth stage which is also called the Closure Stage, results are analyzed, key learnings summarized, and next steps planned (Davis and Radford, 2014).
Figure 2 shows that the level of effort of each phase is dependent on the time and how far along in the different stages the project is. As also described in the figure every stage has its own tasks which are equally important but might not require as much effort as others. By the end of the project, all efforts should have ended, and the project is finalized.

1.8 Project Management Process and Stages

The Project Management Body Of Knowledge describes the process which is divided into two main categories - a project management process that describes, organizes, and completes the work of the project, and a product-oriented process that specifies and creates the project's product (A Guide to the Project Management Body of Knowledge, 2000).

Uppal (2008) further explains that organizational projects usually are carried out through a formal project management process (PMP) which evaluates them and assists with their execution. Just like the Project Life Cycle, it consists of different phases with each having distinct goals established.

In order to organize the project, the tasks are grouped into different stages:

1. The Initiation Process Group handles the Scope and the Initiation of the project.

2. The Planning Process Group manages the scope planning and scope definition, as well as time factors such as activity definition, activity sequencing, activity duration estimating, and schedule development. Additionally, they work with cost management whereas resource planning, cost estimating, and cost budgeting. This group also handles the integration of project plan development and risk management planning. Moreover, facilitating processes exist which are quality, communication, and human resources practices which are represented as organizational planning and staff acquisition. This group also works with procurement like procurement planning, solicitation planning. Furthermore, there is risk identification, qualitative risk analysis, quantitative risk analysis, and risk response planning.
3. The Executing Process Group handles integration such as project plan execution and quality assurance. Additionally, they work with communication - information distribution and human resources - team development. Along the list, there are also practices such as procurement and solicitation, source selection, contract administration.

4. The Controlling Process Group administers communications like performance reporting and integration which entails integrated change control. The group also defines the scope through scope verification, scope change control, and time through schedule control. Cost control, quality control, and risk monitoring are a part of the group’s responsibilities.

5. The Closing Process Group manages communication especially administrative closure and procurement such as contract closeout.

Afterward, there are discussions about the project and what could be ameliorated.


2. Literature Review

The purpose of this chapter is to provide information about existing research on labor productivity, project performance and project manager performance which are being elucidated as well as factors promoting success.

2.1 Labor productivity

Jarkas (2010) states that construction is a labor-intensive industry and productivity relates to human effort and performance. He also refers to labor productivity as a single factor productivity where the usage of it becomes a simple alternative to monitor measurement processes and collect data.

Yi and Chan (2014) state that the word productivity comprises the relationship between output and included inputs in a production process. Park (2006) defines labor productivity as work hours per quantity of work and further elaborated in a formula that it equals actual work hours per installed quantity. Moreover, he states that when measured like this, the lower the measurement value, the better the actual productivity performance is. Therefore, labor productivity represents the output produced per hour per construction worker. The equation presented by Park (2006) is:

\[
\text{Labor Productivity} = \frac{\text{Input}}{\text{Output}} = \frac{\text{Actual Work Hours}}{\text{Installed Quantity}}
\]

According to Yi and Chan (2014), the hourly output is defined as a more reliable source when measuring productivity for construction operations. Further, they argue that there is a challenge when determining productivity in projects since there are different units of measurement based on the construction task.

The researchers give examples of this difference, when measuring concrete placement, it is measured in cubic meters of concrete installed per hour, while steel placement is
measured in linear meters of steel installed per hour. Labor productivity is defined as ''a measure of production output relative to labor input.

Regardless of the measure used, labor productivity (or efficiency) is improved by increasing production for a given work hour or decreasing work hours for a given production.’’ (American Association of Cost Engineers, 2007)

Florez and Cortissoz (2016) state that labor productivity is a vital assessment factor of a construction project’s performance and that it accounts for 30-50% of the total costs of a project. They also argue further that the importance of crew formation is a fundamental element of labor management since the successful assigning of workers to teams and allocating the teams to various tasks is crucial to construction project success and improved labor productivity. According to a study by Herbsman and Ellis (1990), a vital factor for increasing production is labor motivation since the higher the working morale and motivation the further the increase in labor productivity.

Paul and Adavi (2013) note that more construction companies’ top management should be open to discussions and suggestions by construction workers so that communication could be a two-way process and not influenced only from top-to-bottom level in order to sustain higher labor productivity. Thus, they emphasize communication as a factor impacting labor productivity.

An issue related to labor productivity, closely looked upon by Paul and Adavi (2013), was overtime working. They stated the topic of the effect of extended working hours in the construction industry has been researched and a correlation between extended overtime working and decreased labor productivity. The researchers stated that management should always resolve that issue with other approaches than applying overtime, namely '’front-end planning and increased supervision’’(Paul & Adavi, 2013, p.862). Thus, there are visible negative effects when workers are exposed to such a prolonged period of stress.
2.2 Project performance and the importance of information systems

Performance in the construction industry is measured in different ways. There are different criteria that measure the success achieved by projects in project management. More specifically Pollack et al. (2018) view the iron triangle as a fundamental aspect where project success is viewed through means of being completed in time, according to budget, and complies with a certain level of performance and quality. They also state that the “iron triangle” is a didactic device that has the aim to communicate the relationship between the three core parameters - time, cost, quality.

A study by Jacobsson et al. (2012) on impacts of information and communication technologies in construction companies in Sweden show improved quality of work, reduction of a company’s costs, and an increase in competitiveness of the firm. The study represented even determinants of each of those three variables. The improved quality of work had stemmed from the high standard of information technology systems that help employees with decision-making, being a need in the work environment, and the implication of more accurate transfer of data and fewer errors.

Determinants about helping with decision-making to reduce company costs were information technology systems increasing the quality of employee work, providing the necessary support, and better decision-making towards environmental impacts of the company.

Finally, the determinants concerned with the connection between improvement of IT systems resulting in the increase of competitiveness of the organization were information technology systems improved the quality of work of employees as well as their positive contribution on quality of operations.
Samuelson (2010) postulates the importance of information technology systems even in the construction industry. Different IT supporting processes are chosen depending on the company, the business model they operate by, and the goal to update older information systems with new and more effective ones. Samuelson also argues that construction processes that are information-intensive need to be distinguished by proper communication between the different participants.

These specific communication needs between architects, construction designers, engineers, managers, and suppliers have created incentives for companies to invest in such new technologies with IT processes that improve the internal coordination of operations (Samuelson, 2010).

Paul and Adavi (2013) argue that communication is a crucial element in project success and important to maintain between the different levels of employees in the company. As for the construction industry, one might ask, what makes a project a success. Gemünden (2015), describes it as an evaluation of the organization, and client assessment or accomplishment of organizational goals identified by stakeholders. Demirkesen and Ozorhon (2017) have stated that factors such as project communication, safety, and cost management have shown to have a direct impact on project management performance.

2.3 Project manager performance and importance of effective decision-making

Pinto and Slevin (1988) highlight the constant emergence of project-based companies as well as improvement in project techniques and services arising from an increase in competitors in that marketplace. Essentially, the competition becomes higher and the market provides customers a wider array to select from, depending on the demand for the project or company. Thus, firms are more inclined to sustain previous customers’ relationships with the purpose of holding on to market share. A summarized view of project managers’ perspective on project success consists of emphasizing requirements for the outcome of budget, schedule, performance, and client satisfaction (Pinto & Slevin, 1988).
A study by Skitmore and Powl (2005) on project management performance conducted a questionnaire with different construction project managers in Australia and a few other countries in Europe and Asia. They note that there is more room for improvement in increasing the efficiency of project managers in the construction industry.

In terms of working effectiveness, they showed that construction project managers have the ability to be between 17 to 22% more effective and 16 to 17% more productive in finishing projects. This could suggest that a different approach needs to be taken by these managerial employees in order to capitalize on unutilized gains.

Pinto et al. (1995) highlight the vital role of planning as a project manager. In the early processes of the project, it is crucial to focus on carefully tailoring feasible project plans. They also state in their article that project managers should not be quick to respond to top management inquiries and rather not separate the planning process from the project development. Such fundamental aspects as scheduling, task allocation, budget formation, and project details should not be neglected, and an effective project manager approach requires a steady pace in performing them efficiently.

Pinto and Kharbanda (1995) outline that effective leaders could always lead a project to success even if it faces unexpected issues along the way. The authors argue that leaders are usually a focal point in mediating information between stakeholders and have the responsibility of carrying through the communication through the team. Another valuable statement in their research is that successful project managers acknowledge their limitations and work through their subordinate’s strengths.

Khan (2012) reviews in his business review article the essential part of motivation and the influence it has on employees in achieving individual goals and contributing to organizational objectives. As the firm supports its employees in achieving these goals through acknowledgment, rewarding, and providing a good job setting, the concluding statement is that motivation boosts performance. But the very essence of Khan’s study presents that firms should rather emphasize training and motivating their employees in order to reach higher performance results.
2.4 Factors promoting project success through optimization of labor productivity

The literature-based on labor productivity in the construction industry provides various research and quite a lot of findings of critical factors that contribute positively to increasing labor productivity. Womack and Jones (2003) emphasize the importance of optimization in terms of continuously improving processes in an organization and creating value while reducing costs and time.

Preenen et al. (2017) argue that a company’s capability to innovate is related with a company’s performance and the possibility of increasing its labor productivity. They additionally state that the environment today requires the ability to adapt to changes and have a response to labor demands as well as internal labor flexibility practices to be able to respond to market demands and increasing labor productivity. Such tasks include job rotation, multi-tasking, flexible working hours, or even individual customized assignments.

In a research paper by Naoum (2016) covering different topics such as pre-construction, during construction phases, leadership issues, motivational and organizational factors, plenty of determinants were emphasized and evaluated by different contractors. After the conducted survey, several factors that benefit site productivity in the pre-construction phase were identified to be the experience of site and project managers, buildability of the design, project planning, communication, leadership style, and even procurement method.

Moreover, the results of the survey reveal that labor productivity rates on-site can be impacted from pre-construction phase processes which Naoum (2016) names specifically ineffective project planning, delays caused by design error and variations, the communication system adopted as well as design and buildability related issues including specifications as causal activities.
Jarkas (2010) argues that one of the most fundamental factors influencing labor productivity is buildability. As defined by the Construction Industry Research and Information Association it is the extent to which the design of a building facilitates ease of construction, subject to the overall requirements for the completed building (CIRIA, 1983)

There is an interdependence and correlation between labor productivity and motivation as outlined in a study by (Kazaz, et al., 2008). They have noticed that performance by workers at the site is generally impacted by motivation thus the more appropriate motivation for the labor staff the higher the labor productivity would naturally be. According to Kazaz et al. (2008), motivation is a combination of tools facilitating the influence of human behavior and encouragement towards accomplishing tasks and reaching objectives. Moreover, a study by Herbsman and Ellis (1990) implies that a vital factor for increasing production is labor motivation.

In their research paper, Al-Kinani and Adavi (2014) argue about several common big factors that influence labor productivity across the world in the construction industry. These include - Overtime working, Automatization, Manpower group, Supervision, Project Management factors, Safety, Motivation, and Quality of equipment and materials.

Hartman et al. (2002) describe critical success factors and project metrics within project management. The article shows, in order for a project to be completed on time or even ahead of schedule, the owner must be informed about the project status, and a request for his/her approval is needed at every stage. To secure those deliverables are identified, proper communication channels need to be established at appropriate levels in the project team.
The project achieving its stated business purpose is required to have a defined project completion metric. A detailed project plan with schedules and goals as well as a specified budget is required to ensure the project is aligned with the redescribed budget. Hartman et al. (2002) also suggest in their study effective communication and expectation management are implemented throughout the project life cycle as project management tools.

Project performance relates to various factors that contribute to the potential outcome. Anantatmula (2010) has outlined several of these factors that could be tied with the project manager role. Define project milestones and potential outcomes in the early stages of a project, allocate job tasks and responsibilities, communication of expectations of the project, implementation of project management processes to increase the effectiveness of operations and tasks, creating a culture of trust and transparency, providing support, clear goals so the project can be monitored and assessed. Anantatmula (2010) also noted that leadership has to do with creating a vision, communicating it, and motivating people to meet requirements regardless of the work environment.
2.5 Competent Project Manager (PM)

Project management takes a huge part when discussing the construction industry and the appropriate managers selected for the job are responsible for a successful project. Effective project managers and site managers need to skillfully allocate work tasks, equipment, and resources to achieve project completion in time as stated by Gunduz and Abu-Hijleh (2020).

With the characterization of “reconnecting means and ends, facts and values” (Tsoukas and Cummings, 1997, p.668), a project manager additionally needs to work with uncertainty, interpretation of information, interdependence, and cooperation (Bredillet, Tywoniak, and Dwivedula, 2015).

The competence of a PM described in the International Journal of Project Management is input competence “the knowledge and understanding, skills and abilities that a person brings to a job” (Crawford, 2005, p.8–9), the personal competence “the core personality characteristics underlying a person's capability to do a job” (Crawford, 2005, p.8) and performance-based output competence “the ability to perform the activities within an occupational area to the levels of performance expected in employment” (Crawford, 2005, p.9).
3. Theoretical Framework

The purpose of this chapter is to outline the main theories and concepts used in this thesis. This includes project success and an overview of factors of success.

![Figure 3. Belassi & Tukel’s theory of success (1996)](image)

3.1 Defining project success

The research paper by Belassi and Tukel (1996) remarks the insufficient research of critical success factors that impact project success as well as the prevailing of more general or situational factors in the literature. The framework which identifies critical success factors that impact project success in construction projects (Figure 3) has the purpose to provide a more analytical list of critical factors, the consequences of interaction between them. Both the customer or the construction company of a project could have different views on perceiving a project as successful or as a failure (Belassi & Tukel, 1996).
Pinto and Slevin (1988) state that there are more complex determinants rather than just completing the issued project on time, complying with the proposed budget, and final results which are not satisfactory to contractors. They state that there are existing examples of projects that were deemed as successful but at the same time they were completed after the scheduled time and expenses were higher than the predetermined budget. Furthermore, there are also existing examples of construction projects perceived as failures once finalized but over the course of time became quite successful.

Thus, Pinto and Slevin (1988) remark that project management has seen this topic of project success as vague, directing project managers or their employers to develop systems/ratios that account for project performance. Therefore, Client satisfaction has recently become a more popular measure amongst project management in the construction industry.

There is a difference in perception about project success amongst different stakeholders. A situation in which top management has had different standards in the planning stage than the outcome of the project has been also mentioned which could be in discrepancy with the perception of success by the client and the contractor (Pinto & Slevin, 1988).

Frefer et al. (2018) postulate that a project can be completed within time and budget but still be perceived as project failure if it is in discrepancy with the objectives of the company. Thus, they argue that project management success and project success are different.

The entire theory of success by Belassi and Tukel (1996) has classified factors responsible for success in projects into categories and aims to determine what is their actual combined effect on project performance. Another part of the complexity in determining success or failure of projects is exactly as stated by Belassi and Tukel (1996) the fact that most projects are unique and specific factors that contribute to the success to some might not deliver the same outcome to other projects.
Belassi and Tukel (1996) state as well that a project could be seen as successful by top management but a failure by the customer and vice versa. Another finding through their research refers to the existence of various success factors promoting project success but the absence of categorizing them by criteria and monitoring interaction between them.

3.2 Overview of the classification of factors determining project success

The proposed model classifies factors and elaborates on their influence over project performance. A fundamental part is the allocation of factors into different categories and the interaction between them.

The framework (Figure 4) represents system responses to obstacles caused by different combinations of factors and the importance of factors concerning the project managers’ performance, team members, organization, and the external environment (Belassi & Tukel, 1994).

The different categories are related between each other and factors belonging to various groups could have an impact on each other. Moreover, random combinations of various factors could potentially result in project failure (Belassi & Tukel, 1996). In this manner, it becomes easier to trace back in case of project failure whether the main cause was the project manager, the project, or the external environment.
3.2.1 Factors related to project

Belassi & Tukel (1996) elaborate on a few more vital characteristics which are listed in the model but overlooked in some construction projects such as the size and value of the project, difference in project activities, density of project network, project life cycle, and the urgency of the project outcome. They argue that there are penalties imposed on projects which are finalized after a given deadline in the form of financial charges or even loss of credibility which could affect the organization.
There is an emphasis on the fact that when assessing project performance, construction companies must be aware of the size and type of the project. Furthermore, if the operations/activities required for the project differ from standard procedures, the more difficult the project manager’s work becomes. Allocating labor hours is affected by density. Resource constraints create a need for project managers to involve overtime working which is detrimental to budget frames and project completion times (Belassi & Tukel 1996).

Pinto and Slevin (1988) identify urgency as the need to implement the project as soon as possible which is also an important characteristic when implying project performance. Belassi and Tukel (1996) argue that project performance requirements are sometimes not met since too much emphasis is put on urgency and lack of planning as well as scheduling often leads to costs exceeding the budget and the project being perceived as a failure.

3.2.2 Factors related to project manager and team members

Belassi and Tukel (1996) state that there is underlying importance about the skills that project leaders and team members possess as well as the existence of factors that navigate them towards project success.

Pinto and Slevin (1988) have listed project manager factors related to project implementation success where the qualities required are described as technical, administrative, and interpersonal competence as well as the amount of authority to perform his/her tasks.
They further go on to describe the importance of the project manager clearly defining a project mission which is a vital guideline during all phases of the project cycle.

Planning is also seen as a helpful tool in order to maintain operations on track, provide guidance about tasks and promote success in project execution. The leadership style of the project leader is also seen as a deciding factor when discussing project success. The leading of the project manager becomes crucial when the execution stage begins as their core competencies and technical skills could benefit in completing a successful project (Pinto & Slevin, 1988).

Belassi and Tukel (1996) also highlight the requirement of competent team members which could be vital during the implementation stage. Lewis (2007) describes that it is rather significant to build a team from the construction group available through team building. The difference between having a group and a team is that in the first, the members are a part of something but not necessarily committed to common goals and achievements.

Demanded skills that team members have during their recruiting are listed as - skills matching the required tasks to be performed as well as the ability to work even at a faster pace to meet deadlines, ability to blend in with other members of the team and flexibility when it comes to overtime working and completing various project requirements (Lewis, 2007).

The competence of the project manager and the team members both contribute to client satisfaction and project acceptance as noted by Belassi and Tukel (1996).
3.2.3 Factors related to organization

Top management support along with project mission, client acceptance, and urgency during the planning phase of a project are seen to be responsible for a significant 65% in contributing to project success as described by Pinto and Slevin (1988). Tukel and Rom (1998) describe project success in the construction industry as measured by the cost and the ability to finalize the project due date is seen as a vital planning objective. Thus, they further elaborate that top management support is one of the most significant factors for successfully completing projects.

However, Pinto and Slevin (1989) argue that top management support is most significant during the execution stage for contributing to project success and reaching out to project managers in circumstances of unanticipated outcomes or trouble.

Belassi and Tukel (1996) highlight that top management support would be most effective if there is a project champion who can mediate information and the importance of requirements of the project to the project managers which are agreed upon by clients and top management of the company. The access to various resources available for the project manager is regulated by the top management team while the content is controlled by functional managers.

Moreover, the support provided by functional managers is regulated by top management support. For organizations where the project belongs to the functional managers’ unit then they become the project managers (Belassi & Tukel, 1996).

Lewis (2007) argues that top management should also have an overview of fundamentals regarding the project so it could anticipate potential outcomes. He outlines that many of the seniors in top management have many tasks to handle but a possible reason for project failure can be unrealistic expectations in terms of project standards and time frames.
3.2.4 Factors related to external environment

The factors in this group are relevant to project success but are external to the company. External environmental factors consist of political, economic, and social elements as well as those related to advances in technology or natural disasters/weather conditions that could affect project outcome in general (Belassi & Tukel, 1996). Pinto and Slevin (1989) note that environmental factors affect project success to the greatest extent during the planning stage. However, Belassi and Tukel (1996) note that factors such as weather conditions and social environment could be attributed to all stages of a project life cycle.

Clients of a project who are not members of the organization are also acknowledged as external factors which have an influence over project performance. Further on, competitors in the construction industry or subcontractors are also representatives of the external environment, thus all factors that belong in this group could have an impact on the availability of resources and respectively the performance of project managers (Belassi & Tukel, 1996).

3.3 Intermediate effect of factor groups

The classification of these various factors into categories is not enough to review project success/failure caused by them. Each group of factors is partially affecting the project implementation process. Different combinations of factors from the groups can cause difficulties which could result in complications in project implementation, potentially leading to project failure. The performance of the project manager is affected by the organization, project manager abilities, external environment, and project characteristics. Thus, by utilizing the critical success factors framework, project managers could track and remove factors that have a negative influence on their performance (Belassi and Tukel, 1996).
3.4 Significance of project success factors

Belassi and Tukel (1996) have found that not only top management support but the competence of project managers and the proper coordination between tasks and workers are vital qualities influencing success. The importance of technical background and dedication of the team members was also found to be a deciding factor in the construction industry. Technology, economy, and the client are other elements correlated with environmental factors that are also beneficial in the construction sector.

The importance of the size, density, and value of the project is worthwhile mentioning and depending on that different project have different life cycles and processes. The commitment of the team members in a large project is the most crucial factor that influences success. A strong relationship was also discovered by project managers’ level of technical background and the ability to cope with their job requirements in the construction industry (Belassi & Tukel, 1996).

3.5 Critical Factors in Successful Project Implementation

Project Success is measured differently from author to author. For that reason, Pinto and Slevin have created a model with ten strategic and tactical factors that can lead to the promotion of success within the life cycle of a project.
3.5.1 10-Factor-Model

The author’s group success factors into strategic and tactical. The strategic success factors are mostly related to top management support, project mission, and project scheduling. The tactical success factors include client consulting, human resource selection, and personnel training.

The categorization, however, has proven to be insufficient, and that also the different phases of the project life cycle, the initiation stage, the planning stage, the execution stage, and the closure stage, need to be taken into consideration. Omezzine (2021) states that project management scholars agreed with Pinto and Slevin's findings, and proposed sets of critical project success factors based on the various phases of the project's life cycle.’

Kerzner (2001) acknowledges the findings of Pinto and Slevin, as he stated that the concept of project success was related to the finalization of project procedures according to a predetermined time, budget frame, and quality. This also includes as of Kerzner (2001) limitation of minimum changes in the scope of activities without interruptions in the workflow, without shifts in the corporate culture, and with full acceptance of results by the project client.
However, project success often exceeds the three project constraints cost, time, and performance, and that there are other factors affecting project success. Since a project is dynamic, relevant critical success factors need to be identified for the different project life cycle stages (Pinto and Prescott, 1988). Meaning that priorities set at the beginning of the project might change throughout the execution.

Figure 5 gives a representation of the identified factors by Slevin and Pinto.

1. *Project Mission* initial clarity of goals and general direction
2. *Top Management Support* willingness of top management to provide the necessary resources and authority/ power for project success.
3. *Project Schedule/ Plan* a detailed specification of the individual action steps required for project implementation.
4. *Client Consultation* Communication, consultation, and action listening to all impacted parties.
5. *Personnel* Recruitment, selection, and training of the necessary personnel for the project team
6. *Technical Tasks* Availability of the required technology and expertise to accomplish the specific technical action steps.
7. *Client acceptance* the act of ‘selling’ the final project to its ultimate intended users.
8. *Monitoring and Feedback* Timely provisions of comprehensive control information at each stage in the implementation process
9. *Communication* The provision of an appropriate network and necessary data to all key actors in the project implementation
10. *Troubleshooting* Ability to handle unexpected crises and deviations from plan.

(Pinto and Prescott, 1988)
Implementing the success factors into the project life cycle, Pinto and Prescott (1988) have found significance with most factors except monitoring, feedback, and communication which have shown to be important but not to have a high significance.

In the first stage of the project life cycle also known as the defining stage, project mission and client consultation have been seen as the most significant factors to end this phase with success. In the second phase, the planning phase, project mission, top management support, client acceptance is seen as the most promising factors that lead to success.

The third stage, the execution phase, project mission, troubleshooting, schedule/plan, technical tasks, and client consultation were the most important factors.

In the delivering stage, the fourth phase, technical tasks, mission, and client consultation have been highlighted to lead to success.

This shows that the factors that lead to success are not static and thus not bound to the stage in one phase of the project life cycle. They rather are to act within multiple stages, where they also might take on different definitions of the factor (Pinto and Prescott, 1988).
4. Methodology

This chapter describes which methodology approach has been used. This is followed by the methods for data collection, sampling strategy and the research approach. Furthermore, the authors describe the underlying standards of research ethics.

4.1 Types of Methodologies

There are three main types of methodologies. The qualitative, the quantitative, and the mixed methods methodology (Easterby-Smith, 2018).

The quantitative approach is used when one wants to generalize conclusions and development from larger populations. Tools for quantitative data acquisition are surveys and self-completion questionnaires (Easterby-Smith, 2018). Thus, it would be a difficult challenge to obtain enough answers that could satisfy quantitative research. This thesis is industry-specific and for a quantitative study, various factors such as time, possible interview denials, and reaching a big number of managers could prevent realizing it.

The mixed approach which is an ensemble of the quantitative and the qualitative approach would only be possible to apply if multiple managers would allow the authors to shadow and observe them, inquiries sent out have stayed unanswered. Thus, the mixed methodologies approach does not suit the research (Easterby-Smith, 2018).

The qualitative approach is used in the analysis of non-numerical data to understand and explain concepts (Easterby-Smith, 2018). The authors have set out to find underlying opinions and discover trends that might lead to change. A common tool within the qualitative approach is interviews within the population.
In order for the topic to be examined and to find the root for the general labor productivity decrease in projects. As well as finding answers to be connected to the research purpose and the research questions as to what project success is and in which way labor productivity can be optimized from the perspective of a project manager. The authors have chosen to conduct face-to-face interviews with several project managers, thus the qualitative approach seemed most appropriate.

4.2 Qualitative Approach

In order to administer the qualitative deductive approach, the authors have decided to conduct interview questioning to acquire primary data.

Purposive sampling has been conducted by contacting different construction companies asking for participation in online interviews via Zoom with the main questions concerning labor productivity and project success. The target participants were only project managers from the construction industry and interview questions can be found in Appendix 1, Appendix 2, and Appendix 3.

Before conducting the interviews, it had been decided that there will be open-ended interview questions to promote a discussion and in-depth interviews with follow-up questions. This has respectively been determined to promote an open dialogue to obtain more information for a deeper understanding of how a project manager copes with risk and success (Easterby-Smith, 2018). Moreover, the in-depth interviews would be significantly useful in tailoring questions based on findings in the existing literature and how these factors are looked upon from the perspective of a Swedish project manager.

Secondary data, such as literature and reports, have been used to analyze the responses of the participating project managers. There has been an emphasis on the construction reports as well as reports by the European Commission for Sweden.
4.3 Sampling Method

Generally, it is required to derive a sample, which is a specific group of individuals from which data is collected from the population. A population is an entire group that conclusions should be drawn about (Easterby-Smith, 2018). In this thesis, the authors have chosen the project managers and operations managers of the 30 biggest construction companies by turnover as their sampling frame. The sample size has been derived from the qualitative methodology approach, which limited the taking of sampling to face-to-face interviews.

There is probability sampling in which each person in the population gets offered an equal chance to be selected. There are four different types of probability sampling such as the random sampling, the systematic sampling, the stratified sampling, and the cluster sampling.

However, additionally, there is a non-probability sampling method, the purposive sampling method, which fits the thesis’ scope well (Easterby-Smith, 2018). Non-probability sampling is a method where it is not obvious which individual from the population will be chosen for the sample. Purposive sampling entails the author’s judgment in choosing the members of the population that participate in the study (Black, 2010).

To the authors, the purposive sampling method seemed most appropriate, since there were a limited number of people the authors were able to interview. This resulted in the use of the purposive sampling approach and the sample size of five subjects from different ages and different companies.

There are many companies in the construction industry in Sweden, but the main focus has been on the 30 biggest construction companies by turnover since they have solidified themselves with high standards of practice as well as success rates (30 största byggföretagen | Byggföretagen, 2020).
Nevertheless, the authors could not perform any interviews with any of the three market leaders in the construction sector as of 2019, which were Peab, Skanska, and NCC. However, interviews were conducted with JM (5th place), Svevia (6th place), and Atrium Ljungberg.

Atrium Ljungberg is mainly a real estate company with some focus on project development. This means that they are not a construction company at their core and have no own workers, but instead purchase all parts of their project from different contractors. Although they do act as the main contractor themselves many times where they manage their project as a construction management project, i.e., divided into many parts.

The first interviews were conducted in late March with JM AB where the authors spoke with three employees who were all project managers. These interviews, due to the busy schedule of the interviewees, took about 30 minutes to complete. In April, the other two interviews were organized with each one employee from Svevia AB, who is a business unit manager, and one employee from Atrium Ljungberg, who is also working in a managerial position currently. These interviews required 30 to 40 minutes.

### 4.4 Data Collection

After interpretation of an extensive literature review, several critical labor productivity factors within the construction industry were identified. Overtime, Automatization, Managerial Factors as Coherence between Action and Planning, Workforce, Leadership style, Supervision, Project Management Factors, Human Behavioral, and Psychological Patterns, Communication Patterns are the factors that have most commonly been recognized from the literature.

Upon interviewing multiple employed project managers various labor productivity factors have been identified such as time, quality, safety, standardized work, training, follow-up with managers, detailed planning, follow-up of planning, countermeasures, and correct conditions.
4.5 Analysis of Data - Content Analysis

Firstly, to conduct the analysis, the interview recordings were transcribed. Both researchers listened to the recordings and read through the transcript multiple times to ensure accuracy. More information concerning the interviews and the questions can be found in Appendices 1, 2, and 3.

Once the interviews have been conducted, content analysis must be done in order to organize and understand the data gathered. The authors have chosen the content analysis approach, since “that aims to draw systematic inferences from qualitative data that have been structured by a set of ideas or concepts.” (Easterby-Smith, 2018, p.361). The author of the book describes it as a deductive method of analysis where codes are agreed upon and specifically sought out from the collected data.

In order to conduct content analysis describing the connection and importance of project success and labor productivity, the following steps were taken (Easterby-Smith, 2018)

1. Determining the number of criteria for the selection of relevant material based on the research question.
2. Selecting materials to analyze to detect emerging concepts relevant to answer the research question.
3. Patterns emerge between concepts and ideas so that arguments and supporting information can be used as a way of verification.

Figure 6. Process of coding (Saldaña, 2015)
4.6 Inductive and Deductive Reasoning

The Inductive research approach is mainly used when the researcher finds little to no existing literature on the topic (Easterby-Smith, 2018). Since there is no theory to test, the researcher himself needs to identify a pattern. This is done in the following three steps:

The first stage is to Observe, the second is Pattern Recognition and lastly, the Development of a theory.

The Deductive research approach is used when there are theories accessible to the researcher and the author tests an existing theory (Easterby-Smith, 2018). Due to the research found about the topic of labor productivity in the construction industry and the crucial factors that promote it, the authors were influenced to research this topic with a deductive approach.

4.7 Research Ethics

The well-being of the research participants is the most crucial part of conducting research. Concerning research ethics, the authors and the participants have agreed to record the face-to-face Zoom interviews as well as to delete the recording once the conversations have been transcribed and the information does not hold any further purpose to the authors, specifically after handing in the thesis paper.

The fundamental research ethics principles such as respect for individuals, beneficence, justice, and respect for communities (Qualitative Research Methods: A Data Collector’s Field Guide, n.d.) have been upheld by taking them seriously and allowing the participant to exit the conversation in case of feeling uncomfortable. To achieve informed consent the participants have been educated about the purpose of the research, the expectations the authors have towards the research participants, how confidentiality will be ensured, and the author’s contact information if further questions or concerns arise.
5. Empirical findings

The purpose of this chapter is presenting the empirical findings of this research paper. This includes quotes from five interviews, conducted prior with three different companies. The data has been organized by the main topics of this thesis which is labor productivity, project success and optimization.

Empirical findings identified on the topics of project success and optimization of labor productivity are based on five interviews conducted with two different construction companies and a real estate company from Sweden. The companies respectively are JM AB, Svevia, and Atrium Ljungberg. For that purpose, the authors have conducted in-depth interviews and an open discussion with different project managers from these companies.

Each company will be presented individually, and a case description will be presented in the introduction of each organization to provide concise information about the firm.

5.1 Atrium Ljungberg

The company Atrium Ljungberg originated in 2006 after the merging of Ljungberg Gruppen and Atrium Fastigheter. Ljungberg Gruppen have had a background in construction and real estate since Tage Ljungberg founded the company in 1946. The company has been listed on the stock exchange since 1994. Atrium Fastigheter on the other hand was a prominent leader in commercial buildings around Sweden with primarily a competence in the management of retail properties. "The merger between Ljungberg Gruppen and Atrium Fastigheter created a real estate company with a strong real estate portfolio and a unique mix of expertise in trade and project development." (Atrium Ljungberg n.d.). The authors have become interested in the company and interviewed Bakhtiar Afzalan, working in a managerial position.

The collected data below is from the interview conducted with Mr. Afzalan, a project manager at Atrium Ljungberg.
5.1.1 Project development within the company

Although the company purchases parts of a project from other contractors, the main concern was if the degree of difficulty for achieving a successful project was higher based on budget, quality, and time.

However, the company is seen to have a better position than a straightforward construction company since AtriumLjungberg owns the entirety of the process from the early design to the completion. Although, it is possible that they contract a construction company for a large project such as building a hotel because of insufficient time or management. Unlike construction companies that inherit a design they need to finalize, AtriumLjungberg has its own design followed by a bidding stage where the contract is finalized.

The project manager remarked that the most efficient way to handle projects would be to own the design during the project lifetime since you can solve issues in the earlier stages and reap the benefits later. Furthermore, there is a similarity between how construction companies and AtriumLjungberg operate according to Mr. Afzalan. Essentially, he added that there are not many construction companies that do most of their construction with their own labor, meaning they often must hire workers.

One of the most important practices of AtriumLjungberg is project development. Their core lies mainly in city planning and as Mr. Afzalan stated ”We desire the most to deliver free access to parts of the city and develop it so that we have a city where everybody wants to live, work and go to school. That is an important trait in our DNA in Atrium Ljungberg AB.” They own a few new projects around the city which the company has won in a bidding stage and the city plan decides whether the buildings will be facilitated to housing residences or offices. In such projects, AtriumLjungberg identifies appropriate customers for the buildings and designs them according to the demands of the city planning department.
Risk assessment is also a standard procedure within the company which is an essential part of the quarterly reports. Projects developed by AtriumLjungberg become large and it is necessary to meet certain requirements. Thus, every three months a report containing budget, updated time schedule, and risk assessment is conducted.

5.1.2 Construction project processes

AtriumLjungberg is mainly a real estate company, however, they do act as the main contractor themselves where they manage their project as a construction management project which is divided into many parts. The process consists of design, purchasing of contractors or subcontractors, and the production phase. Moreover, strategies towards a certain building are important to acknowledge and communicate which plays a big part in construction projects.

The working background of the project manager Mr. Afzalan the authors have conducted an interview with is mainly focused on the construction industry. He shared his insights that the focus there lies in the production part, bidding stages for subcontractors, production management, and not much emphasis on design work. The aim is more directed at finalizing a project like, for example, a building.

However, the stage of a project cycle where the final cost is affected the most is the design stage, according to Mr. Afzalan. In his own words, "'If you have the first part wrong it is difficult to get it right afterwards. I put all my energy on the design phase.'" Thus, he puts most focus on this phase since if that cycle of the project is not thought through well it would be difficult to succeed in later stages according to him.

Another fundamental insight provided by Mr. Afzalan was that more effort is put in in the beginning, rather than fragmenting efforts. Thus, a project manager would be able to have the guidelines of how to manage the project earlier which helps tremendously in the later stages of the process.

Moreover, he elaborated that "'It is a bit difficult to get that through since it means you need to have a larger cost early in the project. If you own the project from the beginning
until the end of it then it is much easier to accept the costs early since if you are convinced, they are going to pay back then you can have these costs in the beginning.

5.1.3 Communication management

According to the project manager interviewed, communication is the most difficult part of the project management process. In his own words, Mr. Afzalan stated "The most difficult part of project management in my opinion. It is often you communicate something and if you have 10 different recipients, they understand it in different ways."

Therefore, Atrium Ljungberg uses BIM objects as a designing tool. This digital program represents a 3D design tool used by engineers, architects, and construction manufacturers that provides ideas and options to create models for construction projects (BIM Object, n.d.). Mr. Afzalan described BIM Objects as a system that facilitates designing digitally, working on the same platform with everybody, and using different types of issue management. Questions are published live, available for all participants, as well as documentation of answers is stored in this system. After describing BIM Objects, the project manager stated that this system helps project managers in the company quite a lot and ensures everybody has the same access to information.

Furthermore, another task for the project manager according to the interviewee was access to information and communication skills. "The second part as a project manager is not only to write long protocols, but you also have to somehow ensure that information is available, communicate and understand when and where people do not understand you and identify the parts where you miscommunicate."
A personal strategy towards these obstacles created by communication, Mr. Afzalan states there are many meetings that project managers attend, and it is crucial that the recipients understand the information presented. Moreover, he states that the responsibility of transferring the information in an appropriate manner and ensuring the receivers grasp the messages lay on the project managers, which also are required to be competent enough for the project.

5.1.4 Project Mission and Top Management Support

AtriumLjungberg develops, builds, and manages buildings. The facility management is a big part of costs in the building which according to Mr. Afzalan has a long-term benefit. That perspective was explained as that time and money invested early in a project can earn a return in the next ten years if you have made sure to optimize maintenance costs to below. AtriumLjungberg have developed design strategies in terms of achieving a good sustainable design. They have a direct communication channel with their maintenance team so that technical errors are avoided, and professional expertise is exerted early into the project.

Concerning support from top management, generally, there are control groups different managers belong to. Mr. Afzalan described “When we have larger projects, we have control groups for the project and depending on the size we have different people in those groups. The group is to make sure the project manager, the leasing manager, the developer that everybody is on point and work for the same goal.”

The cooperation between everybody in the control group balances each other out but Mr. Afzalan states that these managers also need to report to their supervisors to provide information that they are on track with the requirements demanded by the project management side. Furthermore, the structure of the organization is more decentralized according to him, “I feel that it is a bit decentralized so as a project manager I feel we have decisions within our own grasp as long as we deliver on time and budget and so on. It is up to us to choose the approach and I acknowledge that different project managers work differently.”
5.1.5 Project Manager Merits

Apart from competence and technical background, which Mr. Afzalan agreed on a project manager should display, another fundamental quality is being able to work in a team with other colleagues. He also added, "'As a project manager we don’t want to be uncomfortable since we have a set approach, and this is how we do it and we don’t want to take a sharp turn but we have to.'"

Although his perspective on the technical background importance was positive, he still resolved to the fact that a factor of higher significance related to project manager merits would be communication, cooperability, and managing skills.

5.1.6 Leadership style and Approach

From Mr. Afzalan's perspective, the organization part is very important to him, and he has colleges that he can trust in terms of them giving their best. His approach drifts towards engaging more people in a project and directs the vision of the group towards working together. Even if the contractors or subcontractors may be on a different side of the contract, AtriumLjungberg maintains good relationships with them and values their effort and working hours invested, thus being able to work together as a group is seen as a mutually beneficial situation.

Furthermore, ensuring the groups engaged in the project are competent, they can discuss existing issues and help each other to move the project forward are aspects of the project management process the interviewee acknowledged as well. Mr. Afzalan noted "'That is what I believe what we have to do as project managers, identify problems, find people who know the solutions, and get them on the project.'"
5.2 Svevia

Svevia is a Swedish construction company which is owned by the state and was established in 2009 and operates under four regions - North, Central, West, and South. In 2011 the real estate and machinery subsidiaries were divided into two different companies. (Svevia, n.d.)

Originally, the company has operated for many years by the name of Vägverket Produktion, which was a production department in the authority Vägverket which currently represents the Swedish Transport Administration. In 1990 The Swedish Road Administration had been divided into client and contractor categories. Two years later, the production division began operating. In 1996, the division branched into three separate departments - Vägverket Produktion, Vägverket Konsult, Vägverket Färjerederiet. (Svevia, n.d.)

In the year 2000, there were efforts into incorporating the Swedish Road Administration Production, but they had not been accepted as a cooperation by then. Later on, in 2008 the government accepted the incorporation, and the name Svevia was administered. (Svevia, n.d.). Due to its listing in the 30 biggest companies by revenue article (30 största byggföretagen | Byggföretagen, 2020), the authors have become interested in the company and interviewed Håkan Kers, working in a managerial position.

The collected data below is from the interview conducted with Mr. Kers, a business unit manager in Svevia.
5.2.1 Project Development and Labor Productivity within the company

Before starting on a new project, Mr. Kers stated that calculations are required to be made to estimate capacities of workers and machinery such as fixed reference numbers which display for example kilos of steel a worker puts in a foundation per hour. He elaborated further that there are occasional monitoring procedures during the project in order to ensure processes are according to schedule because the capacity is integrated into a time schedule as well as costs. The values used in a project are set aside and used as guidelines for a future project.

Concerning concrete constructions, it is simpler to monitor progress and have reference numbers. However, when it comes to groundworks, the technical conditions vary significantly between projects, thus it is hard to draw conclusions from concrete projects to ground projects.

Mr. Kers elaborated, "I have been a business unit manager for our construction works in this part of Sweden. We have about 50 to 60 people working on our projects. We look at the projects and usually have the project management and workers to a certain amount. We may have to take in more workers if it is a big project but mainly for concrete and groundworks, we have our own workers." Moreover, Svevia sometimes resorts to working with subcontractors.

Automatization processes benefit increasing labor productivity and for example, excavation machinery has become more digitized with GPS systems which provide an opportunity to have design and drawings within the machines. Concrete works have had some help of reinforcement as well during the years. Also, drones are used to have an overview of the construction sites where permission is granted because in most places around the cities it is prohibited.
When asked whether these automatization processes increase labor productivity, Mr. Kers replied “I think so. You might avoid mistakes and take priority actions. In the wind farm business where there are 30-40 km of roads, we are working on the supervisors can not be at these places all the time. It is beneficial to monitor if things are going according to plan. In these projects we have had development with our subcontractors making concrete on-site. They have mobile batching plans for example.”

5.2.2 Construction project processes

Mr. Kers has been a business unit manager in Svevia for 18 years and from his perspective, the first step to approaching a project is selecting a project which the company is interested in, and thinks would potentially be a success.

Due to the current situation with the ongoing pandemic, Svevia proceeds to select a project depending on its availability. The interviewee stated, “Due to the current situation we try to choose projects depending on how our organization is available. After that, we make these calculations and estimations. If we make a bid for 10 projects, we may get 1 or 2 of them so we never know what projects exactly we will fulfill. There is a competition between construction companies.”

Afterward, calculations and estimations are performed. If the organization makes a bid for ten projects it could result in potentially winning only a few of them, due to the competition between the leading construction companies in the market. Nevertheless, the company still goes through a selection process of the projects available at the moment.

Regarding major requirements that need to be satisfied in the beginning phase of a project, Mr. Kers described that “Internally in the organization, we have to fulfill requirements in terms of the bids. The main issue is the demand for the client which can be of various types. Often you must show that you have experience from the type of projects you are making, and you have an organization that is skilled for the actual project. Maybe you have to show that you even have financial strength.”
The company mainly focuses on concrete and groundworks. From the perspective of concrete works, new bridges and foundations for wind farm projects are built. The design and construction are both responsibilities of Svevia in these types of projects. However, they cooperate often with design firms that consider how to put reinforcement in the foundation in the best way possible. The design could be optimized but it could be difficult to put reinforcement in the foundations.

When questioned about difficult projects and the underlying motivation of workers to engage in them, Mr. Kers replied "'If it is a difficult project, it could be a challenge. No experience of such a project well, you should be careful in one way or another it is better to collaborate with people with experience. Otherwise, if it is a complex bridge or complex foundation for the wind industry that is more challenging.'".

However, risk management comes into the discussion when assessing risk and possibilities. Mr. Kers noted that "'We always make valuations of risk and possibilities. If you have the skill, you can be more competitive with difficult projects rather than with easier ones.'"

5.2.3 Project management processes

Mr. Kers described the use of Svevia’s project management system which provides clear guidelines on the allocation of tasks. "'In our company, we have a quality system where you have documents that describe how we should work in different stages of our projects. One thing that is important is that it clarifies what person has what responsibilities in certain parts of the project. Responsibilities are one thing and who is doing the work is another thing but still an important thing to clarify in the beginning of the project. I think even if it is a project that maybe is only going for a couple of years you have to check since there are different stages in a project and be on track with any changes implemented.'"
5.2.4 Communication management

Communication is one of the hardest tasks in projects because it is easy to generate errors if this factor is lacking according to Mr. Kers. He said, ‘’Communication is one of the hardest tasks in our projects since it is so easy to get it wrong. It works very well in our projects because there are different forms where communication is supposed to go from site managers to on-site employers and we have weekly meetings and routines for these. Today it is easy to get information wrong and get people to misunderstand things if you only communicate them by mail for example. One of the things that could go wrong in projects and not only internally with us but in contact with sub-contractors and clients there can often be misunderstandings.’’

5.2.5 Project Manager Merits

In the construction business education is highly valued but the experience is extremely important as well. The processes carried through on the construction sites require a good grasp. Mr. Kers added ‘’In the construction business of course education is highly valued, but experience is extremely important as well. The things we are doing on our construction sites you need to have a good grasp on. If you come directly from school or just sitting in an office or even calculating and not having experience from construction sites, you need to work a couple of years on construction sites to get experience and understanding as well as learning from people working there. I myself have worked a lot of years on construction sites after technical university before I climbed into a higher position in an office.’’
5.2.6 Construction worker merits

Svevia tries to have both employees with education and with work experience. Both are beneficial but previous work experience is a stronger quality. As previously Mr. Kers mentioned it applies the same for management because from his perspective education is an obvious benefit, but many times work experience could be just as good. In his own words, “It is good with having education, but many times work experience could be as good. We have people that have been working as lorry drivers or working with excavation machines that have become supervisors or site managers. I would say we need a mixture of people with different backgrounds and experience. That is the way of success the way I see it.”

5.2.7 Leadership style and Approach

Mr. Kers resolved the question “There is no formula, you need to figure it based on the person you are. You have to feel comfortable in that way of leading. It is all about putting together a team with different skills and personalities that together can be a strong unit for a successful project. That is one of our toughest tasks many times.”

5.2.8 Supervision

Supervisors are a fundamental part of projects. Time frames in projects are broken down into smaller time frames. There is no standard procedure for supervision, so flexibility is demanded from supervisors and depending on the stage of the project life cycle different things need to be focused on and monitored.
5.2.9 Views on future labor productivity goals

One of Svevia’s leading engagements is to specialize in achieving higher efficiency in the way they work in projects they specialize in. The company’s main focus is infrastructure, roads, bridges, and projects with wind farms which also consist of roads and foundations. The firm aims to increase its efficiency in those terms.

Mr. Kers noted ‘’I guess that the most important thing would be to have a good organization, skilled people who enjoy working together and building strong teams. If you want to have high efficiency you need to have people who like to work in these projects, like to work in our company and like to work together.’’

5.3 JM AB

The company John Mattson Byggnads AB, for short JM AB, was founded in 1945 by the builder John Mattson. In the 1950s, due to the American culture swarming into the Swedish market, new housing concepts gained popularity and increased the sales of the young company. In the year of 1982, JM AB was listed on the stock exchange and in 1987 Skanska became a majority owner (JM, n.d.). Due to its listing in the 30 biggest companies by revenue article (30 största byggföretagen | Byggföretagen, 2020), the authors have become interested in the company and interviewed three employees working in managerial positions.

The collected data below is from the interviews conducted with JM AB project managers - Mr. Wimmerstedt, Mr. Eklöf, and Mr. Baumann.
5.3.1 Project Development and Labor Productivity within the company

Generally, JM AM is concerned with engaging their project managers in the building of a viable strategy for the project. Therefore, as Mr. Eklöf explains, there is a lot of planning involved throughout the entire project. Every phase of the activity is thought through and continuous throughout the project. Mr. Wimmerstedt adds that together with the company they are building plans and strategizing carefully.

“If you don’t have the time to plan, you don’t have the time to work” - Mr. Wimmerstedt.

Additionally, “planning is the basis for high labor productivity”. Since JM AB is able to work on a project from start to finish, they own the entire process, and the end product can be adapted according to the planning from the start. This way high productivity is achieved. Mr. Wimmerstedt and Mr. Eklöf believe that the success of a project is mostly decided in the planning phase, and that risk and opportunities must be carefully considered. Moreover, they admit that a substantial part of success is being derived from good planning.

As for factors concerning labor productivity, the interviewees identified time, quality, safety, standardized work, training, follow-up with managers, detailed planning, follow-up of planning, countermeasures, and correct conditions. When asked about the appropriate conditions required, Mr. Eklöf answered:” Safety and very good communication with the people working with you.”

5.3.2 Labor Productivity Fluctuations

Mr. Wimmerstedt recognizes that changes in mechanization and automatization have “mostly increased the productivity” of the workers. Mr. Eklöf additionally acknowledges that “still much can be done” in order to increase labor productivity in the future.

Thus, overtime working decreases productivity dramatically and is, therefore “only used as a last resort, when all else fails”. Mr. Baumann recognizes working overtime as an important tool and that the right motivation will lead to good working outcomes.
5.3.3 Project Manager Merits

All interviewees agreed that in order to fill the role as a competent project manager, the person needs to have experience but also had to be trained in training programs as well as acquired academic knowledge of the role. A project manager additionally, needs to be able to communicate but also listen to reasons that might not align with the scale of the project or his views. Thus, when in question, a project manager should “go and see for yourself and involve coworkers to find solutions”, as Mr. Eklöf explained. Therefore, the manager of a project needs to be a team player with an open ear for worries and good ideas on how to rework the plan due to unforeseen consequences, according to Mr. Eklöf.

5.3.4 Leadership style and Approach

Mr. Eklöf states that in order to be most successful with the team, the coaching leadership style should be prioritized, where the project manager motivates and assists the team, so they can grow their competencies. Whereas Mr. Baumann promotes standardized work, that his team knows exactly what needs to be completed, as well as spending a lot of time on-site, so that the issue causing problems is identified quicker. “As a leader, you need to see, hear and confirm your colleagues to make them want to perform their very best”- Mr. Eklöf.

Mr. Wimmerstedt believes that motivation and communication are both important when working on a project. However, his opinion is that a motivated team without good communication can lose their motivation. Whereas Mr. Eklöf and Mr. Baumann believe that a motivated team can overcome any obstacles and they will do whatever it takes to make the project work.
6. Analysis and Results

This chapter aims to develop an analysis of the empirical findings using the ten-factor model and the theoretical framework. The analysis will be used as a foundation for results and conclusions.

6.1 10-factor-model and Labor Productivity Factors

Pinto’s 10-factor model describes success factors in effective project implementation. According to the factors identified from the literature and personal experiences from project managers, five of these factors which lead to labor productivity enhancement are interrelated to Pinto’s model.

These are project schedule/plan, personnel recruitment, selection and training, communication, monitoring and feedback, and troubleshooting. One can therefore say that half of Pinto’s 10-factor model for effective project implementation also comprises critical factors to labor productivity. However, it must additionally be noted that different managers have diverse concepts of how labor productivity can be utilized to enhance labor productivity. And that this is a representation of the managers the authors have interviewed.

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<th>10–Factor-Model</th>
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<td>Communication</td>
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<td>Project Mission</td>
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<td>Top Management Support</td>
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<td>Project Schedule/ Plan</td>
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<td>Client Consultation</td>
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<td>Personnel Recruitment, Selection and Training</td>
<td>Personnel Recruitment, Selection and Training</td>
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<td>Technical Tasks</td>
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<td>Trouble Shooting</td>
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Table 1 Complementing Factors
1. **Project Schedule/ Plan.** In the interviews and the literature, there has been an emphasis on Managerial Factors such as Coherence between Action and Planning and a leadership style that fits the project.

2. **Personnel recruitment, selection, and training** has been seen as a vital part of high labor productivity, which also ensures work of quality and a safer environment.

3. **Communication.** Standardized work, meaning everyone knows exactly what they need to do as well as good conditions which enhance communication have been mentioned as critical factors.

4. **Monitoring and Feedback.** The interviewees have mentioned that follow-up with managers and follow-up with planning have been vital to keep productivity up and to make less work through prevention.

5. **Troubleshooting.** Once something does go wrong, specifically overtime work and quick countermeasures were being mentioned by literature and through the interviews.

As these factors complement each other and fit into Pinto’s 10-factor model there is a positive relationship between the success factors in effective project implementation and critical factors to project success.

Regarding the labor productivity factors and the 10-factor-model, the following proposition emerges:

*P1: Success factors identified by the interviewees and Critical factors to success by Pinto and Slevin are congruent.*
6.2 Optimization of Labor Productivity

In the process of determining similarities between sources and interviewee opinions, there is a clear representation of more general factors in existing literature compared to the project managers’ opinions on what is important to them and their projects. As for coherence between action and planning the interviewees have described the importance of follow-up with managers, detailed planning, and follow-up of planning as well as countermeasures.

Communication patterns described by the literature have been defined by the managers as standardized work and correct conditions. Quality, safety, and training have been categorized as supervision by the literature. The segment over time has been recognized by the managers but only as time in general and that it is crucial to success within a project.

It needs to be pointed out that the interviewees did not put much emphasis on the categories Workforce and Human Behavioral and Psychological factors as identified in the literature. This could be since many people do not recognize human behavior as a labor productivity factor, but that motivation provokes to perform the behavior (Chatterjee, 2009).

P2: Communication patterns, Time and Standardized work are valued methods to enhance labor productivity.
6.2.1 Personnel

The personnel are a representative factor of the critical project success in the ten-factor model by Pinto and Slevin (1988) and identified by Al-Kinani and Adavi (2014) as an important determinant in influencing labor productivity in the construction industry. The term is described by Pinto and Slevin (1988) as recruiting and training employees.

Construction workers that are recruited are preferred to have an education, however, the work experience is of major importance. Construction companies strive to have employees that have both, but amount of cost in construction projects, thus labor productivity is a determinator of cost optimization i.e., the process of making something as good or effective as possible practical expertise is more key merit. Moreover, different backgrounds and experiences are also valued when recruiting a whole team together. However, previous work experience is the stronger quality since education provides valuable knowledge and theoretical insights but, in the construction, industry being on-site, performing construction tasks, and working in a team are irreplaceable practical qualities that school does not provide.

P3: Work experience and education amongst construction workers play a role in achieving a higher labor productivity.

6.3 Achieving Project Success

6.3.1 Planning in the beginning stage

Concerning the evaluation of project success, measures like compliance with predetermined budget, schedule, proof of performance capabilities, and technical validity are mentioned by Pinto and Slevin (1988) in their ten-factor model. However, this model aims to provide a deeper development of factors critical for project implementation (Pinto and Slevin, 1988).

In the case of AtriumLjungberg, there is a positive effect on project success by solving issues in the earlier stages of a project life cycle to reap benefits later in the following
stages. The project manager interviewed from that company emphasized the importance of exerting more effort specifically in the planning stages.

When project planning and expenditure estimation are done according to organization requirements, it would prevent significant errors in upcoming stages. Furthermore, clearer guidelines for managing the project would be available which also would facilitate proceeding ahead in the project. Thus, project mission which is a prominent factor in the ten-factor model by Pinto and Slevin (1988) is carefully developed within the construction companies and a clear set of goals are identified early in the project cycle.

This resonates well with the planning phase described by Pinto and Slevin (1988) where planning is an inevitable part of constructing the guidelines for meeting specific organization goals. All three companies seem to own the entire project process from the design stages until the finalization. Although, there is a slight difference in Svevia because they cooperate from time to time with design firms for assessing namely the most effective way of putting reinforcement in a foundation in concrete works.

In JM AB, there is a tendency to emphasize planning throughout the project and evaluate it at every stage of the project life cycle. Pinto and Slevin (1988) specify in their study that the planning function decides on the availability of resources, budget frames, and task allocation. Furthermore, assessment of risk and possibilities before reaching the planning stage is a fundamental procedure in construction companies.

*P4: The planning of each stage of the project is crucial and will determine either success or failure.*
6.3.2 Top management support

Top management support is another critical factor of project success presented in the ten-factor model by Pinto and Slevin (1988) and belongs to factors related to the organization in Belassi and Tukel’s theory of success (1996). Project managers in construction companies have control groups where they must cooperate with other managers and work together on important decisions in reaching the predetermined set of goals. Top management ensures operations and progress are living up to expectations thus, their support is framed as a monitoring process ensuring the various managers’ performance is aligned with organizational goals.

Belassi and Tukel (1996) relate to another factor related to the organization which is the project champion who helps project managers understand and ensure they are working in the right direction of achieving established objectives by the company or client. In this sense, in AtriumLjungberg project managers report to their respective supervisors from top management who are responsible for monitoring alignment between performance and objectives. Thus, the project champion position may be held by several top management representatives in this case.

P5: Top Management Support is needed for a project to progress in a way that is specific to the organizational regulations and goals.

6.3.3 Project schedule and Technical tasks

The project schedule/plans factor specified by Pinto and Slevin (1988) defines clear specifications of steps involved in implementing a project. There is a clear process in Svevia where they specifically select a project which is available, the company has an interest in, and anticipate success. Construction companies perform calculations and estimations before beginning with the project, which is part of the risk assessment process.
Technical tasks are another critical success factor and according to Pinto and Slevin (1988) represent the availability of technology and competence of a company required to resolve persisting technical issues. The project schedule/plans factor slightly overlaps with the technical tasks factor, as risk management is also a part where calculations and estimations are made concerning the possibility of developing a project.

Lack of experience in challenging projects as noted by the Svevia manager is problematic thus, collaborating with a more experienced company with the appropriate skill set is a better solution, and risk management should be implemented. Challenging projects such as bridges or foundations for the wind industry require previous experience and the ability to cope with the technicalities demanded. However, if a company has the expertise and skills a construction company can be competitive even with challenging projects.

Thus, engaging in challenging projects requires the capability to cope with technical specifications and the ability to resolve issues arising from lack of experience which could be solved by collaboration with an experienced company.

In some construction companies such as Svevia, the integrated quality system providing guidelines on tasks and operations carried through different stages of the project cycle are beneficial to supplying a structure and allocation of work. Even when changes are made during years of developing a project the system is up-to-date and provides current specifications. This correlates well with the Troubleshooting factor represented in the ten-factor model which is described by Pinto and Slevin (1988) as the capability of the company to manage unexpected changes in a project life cycle.

\textit{P6: Processes for scheduling and planning, risk assessment, and quality supervision aid the project manager and the process to progress according to plan.}
6.3.4 Client consultation and communication

Client consultation is an external factor in the theory of success (Belassi and Tukel, 1996) and a prominent factor in the ten-factor model by Pinto and Slevin (1988). Pinto and Slevin (1988) describe this as a process of communication and coordination between involved parties and describe communication as a separate factor contributing to project success.

Client consultation has relative similarities with the communication factor since misinterpretation and miscommunication could emerge if the information is respectively not presented or understood well (Pinto and Slevin, 1988). Thus, issues could arise between the company and the client if the communication is not carried out in a clear and structured manner.

According to the findings, Svevia’s project manager interviewed stated that these issues from miscommunication could easily become apparent when the communication is through email and not in face-to-face meetings. Moreover, client consultation requires diligence.

However, communication is displayed as a difficult task in construction companies since the flow of information between project managers, on-site managers, supervisors, workers, and contractors needs to be constantly available. It is rather easy for an issue to arise. As previously stated, misinterpretations or miscommunication between a sender and a recipient could abrupt ongoing processes or cause uncertainty between the involved parties.
Furthermore, project managers need to be dedicated and have expertise from previous projects especially around planning and termination stages (Belassi and Tukel, 1996) and be able to provide availability and flow of information in an appropriate manner so it is well-defined and clear as identified by the project manager interviewed from AtriumLjungberg. Communication channels distributed between the project manager, workers, and client need to be structured and maintained (Belassi and Tukel, 1996).

*P7: Communication, though a difficult task for managers and personnel, is crucial to labor productivity and project success.*
6.3.5 Characteristics of the project manager

According to Pinto and Slevin (1988), the quality of the leader is an additional factor identified in their study regarding the ten-factor model and project success. They review this characteristic as independent of the project team’s power but acknowledged as capable of impacting project success.

The characteristics of the leader represent the competencies and administrative, social and technical skillset of the project manager coupled with the jurisdiction of his/her position. Management skills are viewed as already cultivated but training support and utilization of management tools could positively influence a manager’s expertise (Pinto & Slevin, 1988).

The interviewed project managers represented a similarity in describing qualities vital for a managerial role and leadership approach. The overall view emphasized work experience and communication skills to be crucial merits along with education. The project managers represent a tendency towards a supportive, collaborative leadership role which views working as a unit is a primary approach. Al-Kinani and Adavi (2014) note that experienced managers could potentially deliver great results even with a mediocre workforce group and leaders are responsible for being able to motivate their team to increase their potential.

P8: Work experience, communication skills, and relevant education are quality merits required in project managers. A supportive and collaborative leadership approach with a view on all involved in the process as a unit represents the preferred managerial style in the construction industry.
7. Conclusion and Discussion

This section’s purpose is to conclude key findings derived from the study and formulate a discussion. The connection to the purpose is presented, the results of this study are summarized, and the research question is answered. Finally, limitations and future recommendations are reviewed.

7.1 Discussion

The research performed prior to conducting the interviews aimed to provide an extensive view of labor productivity in the construction industry. The various literature sources facilitated introducing the topic of labor productivity and project success presented from different perspectives and countries. There is more to be researched in this field due to many researchers mentioning that labor productivity in the construction sector is a topic that lacks investigation.

There is also a challenge when attempting to list crucial factors of labor productivity in a more general sense when they can vary depending on the country. Quality of equipment and materials along with weather conditions are labor productivity factors that are seen to be vital in some countries in the Middle East while they do not seem to be as crucial in the European or American construction markets. Thus, more in-depth research is demanded to identify specifically overlapping labor productivity factors between different countries.

Concerning the interview questions the authors have conducted, the main reason they were distinct from each other was the type of company interviewed. AtriumLjungberg is mainly a real estate company while JM AB is a construction company. Thus, the authors realized beforehand that the outcome would provide different perspectives and findings from the real estate company. It was also predicted that not as many significant insights on the topic of labor productivity would be obtained but rather the topic of project success would provide beneficial understanding. The interview with AtriumLjungberg was an open discussion interview with follow-up questions.
However, the difference in the in-depth interview questions between JM AB and Svevia, which are both construction companies, was since the representative of Svevia was a business unit manager compared to JM AB representatives that were project managers. Therefore, different positions would provide different perspectives on both labor productivity and project success.

Nevertheless, the authors could have decided on conducting interviews with fewer questions and asked specifically about the training of construction workers and the managers’ perspective on this topic related to labor productivity.

### 7.2 Connection to the purpose

The aim of this study was to elaborate on project success through the optimization of labor productivity. With this study the authors intended to represent the importance and benefits of labor productivity in the construction industry in realizing a successful project.

The purpose and the goal of utilizing Pinto’s ten-factor model and Belassi and Tukel’s theory of success aim to provide an overview of crucial factors of project success and labor productivity in the construction industry as well as to develop propositions for influencing labor productivity with the help of answering the research question.

The research question is directed towards identifying approaches and tools to achieve project success through optimization of labor productivity, thus including the ten crucial factors identified by Pinto and Slevin (1988). The analysis showed that communication, supervision, and planning are viewed as amongst the most significant project management factors in the construction industry and are seen as difficult tasks at times. Personnel qualities such as work experience and the ability to work as a unit with other team members are also vital merits required in order to impact labor productivity.
7.3 Answering the research question

In this research paper, the authors describe and analyze factors that aim to answer the research question of “How can project success be achieved through the optimization of labor productivity” considering the identified purpose of understanding the importance and benefits of labor productivity to a successful project within the construction industry.

After conducting the analysis, the following propositions were formed that respond to the research question:

- **P1**: Success factors identified by the interviewees and Critical factors to success by Pinto and Slevin are congruent.
- **P2**: Communication patterns, Time and Standardized work are valued methods to enhance labor productivity.
- **P3**: Work experience and education amongst construction workers play a role in achieving a higher labor productivity.
- **P4**: The planning of each stage of the project is crucial and will determine either success or failure.
- **P5**: Top Management Support is needed for a project to progress in a way that is specific to the organizational regulations and goals.
- **P6**: Processes for scheduling and planning, risk assessment, and quality supervision aid the project manager and the process to progress according to plan.
- **P7**: Communication, though a difficult task for managers and personnel, is crucial to labor productivity and project success.
- **P8**: Work experience, communication skills, and relevant education are quality merits required in project managers. A supportive and collaborative leadership approach with a view on all involved in the process as a unit represents the preferred managerial style in the construction industry.
The detected factors as seen in the propositions above tie together the contribution to
success as well as labor productivity and optimization leading to a higher chance of
project success:

- Communication patterns
- Time
- Structured planning of each stage
- Risk assessment
- Top management support
- Quality
- Education
- Supportive leadership style

Therefore, the authors argue that in order to achieve project success, labor productivity
factors must be optimized. As seen from the analysis, not all labor productivity factors
evidently lead to project success. However, optimizing the most identified factors as
named above induces an increase in labor productivity and a potential successful project
realization.
7.4 Limitations

The authors could not establish any interviews with the leading construction companies in Sweden which are Skanska, Peab, and NCC. Since these companies have dominated the market by turnover for the last years, interviewing project managers could have provided this thesis with more reliability and further interpretations as well as perspectives on labor productivity optimization tools that could be analyzed and presented.

Since these three companies are market leaders systematically it would suggest that the selection process of project managers is of high quality thus, the most competent and skillful talents of the industry should be allocated mostly there. Of course, this could not be accepted as a proven statement but a possibility of interviewing any project managers within Skanska, Peab and NCC could have provided more quality insights and recommendations.

More insights and diverse perspectives could have been brought up to this study if the authors had reached female project managers. Moreover, the thesis would have provided gender diversity amongst interviewees. The importance of providing more perspectives on the topics of labor productivity and project success and versatility in approaches between different gender project managers is significant and would have been beneficial.

In general, more construction companies interviewed would have also been helpful. Furthermore, a broader view on optimizing labor productivity would have been present. In other words, the more project manager participants included in the study, the higher reliability would have been achieved.
7.5 Future Research Recommendations

This study offers many possibilities for future research. Based on the limitations of the thesis it would be interesting to research how each of the individual factors that have been identified, can be optimized to promote success. Speaking of not only the theory behind optimization but real-life situations, in which the question arises, what needs to be changed in order for the factor to use its full potential.

Additionally, in this thesis, the managerial perspective was used to derive factors driving labor productivity and success. Writing a different paper comparing the managerial viewpoint to the viewpoint of a construction worker would open a discussion about which of the manager's ideas and modifications aid the construction workers without putting more stress on them. A first impetus given as described by Mohebbifar et al. (2014) “managers need to pay more attention to understanding the job motivational factors and make their views closer to their employees’ real motivational needs”.

Lastly, this paper only focused on the correlation between labor productivity and project success, however, there are many more factors that lead to a successful project. As it was written in the Journal of Engineering, Design, and Technology (2015), “Users should [...] strive to master the art of effective communications throughout the construction activity by fastidiously communicating, following up [and] confirming[...]. Hence, “[...] contributing toward the overall successful implementation [...]” Communication is a crucial topic that this thesis has briefly touched upon but needs further research in order to fully understand the impact this factor has.
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9. Appendix

Appendix 1

In-depth interview questions with JM project managers:

1. Which labor productivity factors can you identify? -Which ones do you classify as most significant and why? -Are there any restraining factors to labor productivity based on your experience?

2. Would you say that a motivated team or good communication would be most beneficial viewed from the management’s perspective? If a motivated team is more significant, why? If good communication is more significant, why?

3. How do you set up the planning phase with a new project? In which way has it proven itself to be reliable during the planning phase? Do you think success of the project is decided in the planning phase?

4. What leadership style is particularly preferred by your company to successfully navigate construction projects?

5. Is work experience (of 3 or more years) regarded higher than academic knowledge and training programs?

6. Have you ever experienced decreasing labor productivity and looking back on experience, what have you done to accelerate it? Can you tell us about an incident where it happened?

7. Is supervisor attendance allocated across specific stages in a construction project or is daily supervision required instead? Why? From your perspective, why is supervision important?
8. Are project initiation procedures such as sufficient critical construction equipment or labor viewed as a vital part in the planning stage? - How has automatization and mechanization increased/decreased labor productivity?

9. Has working overtime occurred often on a monthly basis in your company’s construction projects? - Has work output increased/decreased during these periods? - Have you seen a decrease in productivity when working overtime for a long time?

10. Has there been a reduction of on-site accidents in the past 5 years (in percentage)? - Is there a regulatory standard that needs to be satisfied?

11. Comparing your early career to your career now, has it in any way changed how you administer the defining phase of a construction project? - Have you built a specific strategy or your own approach towards dealing with the planning phase?

12. How important is labor productivity to your company in a construction project on a scale of 1-10?

13. In your experience, are there any crucial factors in the defining stage that could potentially cause failure in construction projects? - Would you think it is possible to adapt to changes with more experience in the industry or does it rather rely on the situation? - What precautions would you take to prevent these from occurring?
Appendix 2

In-depth interview questions with SVEVIA business unit manager:

1. How is the definition/planning stage approached when conducting a project?

2. Are there any major requirements that need to be satisfied or specific approaches?

3. Can the buildability of the design of the construction project be linked to labor productivity?

4. Does that mean if you have a difficult project that people would be more eager to work with or do you think concerning labor productivity people would rather have an easier project?

5. In what way does project planning emphasize on labor productivity?

6. Does the company allocate a certain number of workers based on the size of the project?

7. Is communication between construction project managers, supervisors and on-site employees a crucial element that drives a construction project to success?

8. Can ineffective communication cause delays in finalizing the project?

9. Are there project management processes implemented in the defining/planning stage?

10. Do these processes help with challenges along the life cycle of the project?

11. What leadership style do you prefer for your role as a project manager?
12. Do you find it beneficial in terms of increasing the labor productivity in construction projects?

13. Is having technical background and competence important qualities for a project manager?

14. Would you value a worker that has education from a construction school more or a person without a degree but with relative experience of a couple of years on construction sites?

15. Are there automatization processes available in your projects?

16. Do they increase/decrease labor productivity?

17. Is frequent on-site supervision a tendency that is beneficial in terms of monitoring if the processes are going according to the plan?

18. Is labor productivity a merit that your company aims to increase by a certain amount each year or in the long-term?

19. Svevia works hard to have high efficiency. What do you do in order to increase efficiency?
Appendix 3

Open discussion questions with AtriumLjungberg project manager:

1. When you manage some of your projects as a construction management project what parts does the whole process consist of?

2. Which one of these factors would take most time or be more costly?

3. In which way do you manage communication, so it works and is profitable?

4. As the sender of the information you are basically trying to keep it short and sweet and then wait for people to answer back so that you understand if they understood properly?

5. As a real estate company how much emphasis is put on project development?

6. Since the company is not a construction company at its core, and it purchases parts for the project from other contractors does this mean that it is more difficult to achieve a successful project in terms of budget costs, quality and time?

7. Is there risk assessment done during early stages of projects?

8. Are there specific guidelines for project mission identification or do you go by what is demanded by specific customers or areas?

9. Is there emphasis on client consultation in any stages during the project cycle?

10. Which area in the project management process would require more improvement in Atrium Ljungberg to increase the success rate in project development?
11. Is there top management support provided to project managers or is the company more decentralized?

12. Are competence and technical background huge merits when project leaders try to apply for a job in Atrium Ljungberg AB?

13. Is there a specific leadership style you implement as a project manager?

14. From your experience as a project manager, are there any insights or specific approaches you have learned yourself to implement when you are facing a new project?

15. As a project manager seeking information out of the company to assess Atrium Ljungberg AB operations and identify issues that need to be approached?
Appendix 4

GDPR Thesis Study Consent Form

GDPR Consent for Labor Productivity Influence in the Construction Industry

Please tick the appropriate boxes

Taking part in the study

I consent to JIBS processing my personal data in accordance with current data protection legislation and the data delivered.

☐ ☐

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

☐ ☐

My signature below indicates that I choose to take part in the thesis study and consent to JIBS treating my personal data in accordance with current data protection legislation and the data delivered.

_______________________  ________________________  _______________________
Name of participant       Signature                          Date

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Participant Information Sheet template

You are being invited to take part in a thesis study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study collecting personal data?

The purpose of the Bachelor thesis is to elaborate on project success through the optimization of labor productivity. The authors are interested in representing the importance and benefits of labor productivity in the construction industry in realizing a successful project from the project manager’s perspective.

- The interviewee will contribute with up to 60 minutes of interview data that will be recorded, transcribed, and analyzed by the authors.
- Access to the transcript will be limited to Malin Bartoschek, Filip Kamenov Kirchev, and academic supervisors.
- All data collected will be stored for two months after the thesis has been reviewed and approved.

It is entirely up to you to decide whether or not to take part. If you decide to do so, you will be given this information sheet to keep and will be asked to give your consent. ‘All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications.

Under GDPR you have the following rights over your personal data:

- The right to be informed. You must be informed if your personal data is being used.
- The right of access. You can ask for a copy of your data by making a ‘subject access request’.
- The right to rectification. You can ask for your data held to be corrected.
- The right to erasure. You can ask for your data to be deleted.
- The right to restrict processing. You can limit the way an organisation uses your personal data if you are concerned about the accuracy of the data or how it is being used.
- The right to data portability. You have the right to get your personal data from an organisation in a way that is accessible and machine-readable. You also have the right to ask an organisation to transfer your data to another organisation.
- The right to object. You have the right to object to the use of your personal data in some circumstances. You have an absolute right to object to an organisation using your data for direct marketing.
- How your data is processed using automated decision making and profiling. You have the right not to be subject to a decision that is based solely on automated processing if the decision affects your legal rights or other equally important matters; to understand the reasons behind decisions made about you by automated processing and the possible consequences of the decisions, and to object to profiling in certain situations, including for direct marketing purposes.

You should also know that you may contact the data protection officer if you are unhappy about the way your data or your participation in this study are being treated at dpo@ju.se

Thank you for reading this information sheet and for considering whether to take part in this research study.'