



Performance measurement in construction projects – an ethnographic study

Master's Thesis in the Master's Programme Design and Construction Project Management

Johan Sundman

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CHALMERS UNIVERSITY OF TECHNOLOGY

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ABSTRACT

Performance measurement has attracted interest both from companies and research during the last decades. Nevertheless a gap has been identified between the conceptual arguments in research, which point out the use of performance measurement as favourable, and reality where little or no action is taken on measurement outcome. In order to bridge the gap, an ethnographic study has been performed with the purpose to answer the questions why performance measurement generally not is used and working in construction and what performance measurement should contain in order to be successfully used. The ethnographic study was performed from late January to early June, 2015, at a large contractor in Örebro, Sweden. In the examination, several barriers for the usage of performance measurement have been found. First, construction is characterized by complexity, uncertainty and fragmentation, which force construction managers to assess performance subjectively instead of using objective measurement. Since no objective measuring is done, beneficial outcomes as coordination, improvement of certain aspects and knowledge transfer are missed. Secondly, performance measurement can be used a control mechanism where managers either are checking the position and confirm priorities, or control behaviour of subordinates. If performance measurement is handled in the right manner, measurement outcome should constantly be analysed and interacted with workers, in order to empower and invite them to be part of the decisions making. This is not the case today, where performance measurement rather is perceived as control of behaviour which enhances the tension between managers and workers. How performance measurement is perceived is not only dependent on the metric itself, also chosen leadership style will affect the outcome of measurement on performance and motivation. Therefore performance measurement cannot be evaluated only based on the metric chosen, but also how the measurement outcome is interpreted and used by managers affect the benefits.

Key words: Performance measurement, performance assessment, construction, complexity, uncertainty, fragmentation, ethnography.

Performance measurement i byggprojekt – en etnografisk studie

Examensarbete inom masterprogrammet Design and Construction Project Management

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SAMMANFATTNING

Performance measurement (PM) har varit ett hett ämne både inom företag och akademisk forskning de senaste årtiondena. Trots det massiva intresset har en skillnad mellan den faktiska användning av PM och de potentiella fördelar PM sägs ge påträffats. I byggprojekt används PM sällan, och de gånger det används utnyttjas inte det spektrum av möjligheter forskningen pekar ut som möjliga. För att undersöka varför PM, trots teoretsikt stora möjligheter, inte används i byggprojekt har en etnografisk studie genomförts. Den etnografiska studien har genomförts från januari till juni på ett stort byggföretag med kontor lokaliserat i Örebro, Sverige. I undersökningen har flera svårigheter kopplat till PM påträffats. Exempelvis är byggprojekt start karakteriserat av komplexitet, osäkerhet och fragmentering. Detta leder till att arbetsledare på byggprojekt till stor del använder sig av subjektiva bedömningar istället för objektiv PM. I och med detta förbises många av de fördelar PM för med sig såsom koordinering av arbete, förbättringsåtgärder i speciella delar av aktiviteter och kunskapsåterföring. PM kan också användas i syfte att kontrollera hur en aktivitet ligger till i förhållande till schema, efterfrågad kvalitet eller tidigare utförda aktiviteter. En sämre typ av kontroll är också möjlig, nämligen kontroll av underordnades beteende vilket riskerar att skapa spänningar mellan arbetsledning och arbetare. För att istället nå full potential av PM ska kontinuerlig analys och interaktion med berörda arbetare ske, vilket kan ses som en motsats till kontroll av beteende. Detta leder till ökad motivation och mer delaktiga arbetare, vilket i sin tur kan leda till bättre performance. Utifrån detta kan härledas att PM handlar inte bara om vilka mätdata som väljs, utan till stor del också hur mätdata tolkas och kommuniceras, vilket påverkas av vald ledarstil.

Nyckelord: Performance measurement, byggprojekt, bygg, komplexitet, osäkerhet, fragmentering, etnografi.

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Preface

This master thesis has been performed full time during the spring 2015 and completes my education in Civil engineering at Chalmers University of Technology.

I would like to thank all people at Skanska Mark, Örebro, which all helped me by answering my stupid questions and showed how construction works on site. A special thanks to Dan Lidström and Fredrik Johansson which have taken a lot of their time to explain and demonstrate their own roles in the projects and which always have acted as support, whatever the hassle may be.

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Örebro June 2015

Johan Sundman

1 Introduction

In this chapter, the background of the thesis is presented and the purpose and research questions are outlined.

1.1 Background

Construction business revolves around projects, where the outcome of the project can be seen as the end product, which should be delivered on time, within budget and with desired quality among other requirements set in the building contract (Jingsheng and Halpin, 2003). The evaluation of how well an action or process have been executed is most times referred to as performance outcome (Neely et al, 1995, Moullin 2007), and to determine performance outcome, measurements can be used as a mean of evaluation. By using performance measurement, as well as monitoring specific improvements initiatives, quality awards and changing demands can be established (Beatham et al, 2004). However, the interest for performance measurement most probably derives from the enhanced performance outcome of practicing companies, as well as increased organizational result (see de Wall and Kourtit, 2013). Nasir et al (2012) claim that improvement of performance always has been challenging in construction, and regardless of the introduction of new technologies, performance seems to be unchanged over time. Therefore, measurement plays a key role in order to improve performance in construction companies. Also in academia the interest of performance measurement have been considerable. As in construction where companies make use and interpret performance measurement differently, academic research has multiple interpretation of the term, for example on which level measurement should be done, what performance should include and how it should be used in order to maximize outcome (Bassioni et al, 2004, Cox et al 2003, and Crawford and Vogl, 2006).

Important performance outcome should derive from a company's strategy, and in order to control whether operational aims are reached, it has to be measured (Bassioni et al, 2004). Kaplan and Norton (1992), who developed the famous Balanced Scorecard, argued that earlier performance measurement practices focused merely on economic outcome, which is a metric produced when projects already are finished and not alone sufficient in terms of being a success determinant in today's competitive environment. For continuous improvement and a wider perspective of process outcome, operational measures have to be considered as well, and the quote "*what you measure is what you get*" have been widely spread (Kaplan and Norton, 1992). Measurement should according to Kaplan and Norton be performed in order to control that progress is according to plan. This control is usually the responsibility of a manager, and measuring could thus be attributed as being a typical management control practice. In the same era as Kaplan and Norton developed the Balanced Scorecard, which also critically discussed the practice of measuring, many other measuring frameworks also appeared (Bassioni et al, 2004). Hence, the interest for performance

measurement was considerable increasing in the 1990's and has been so ever since.

Comprehensive research on performance measurement has been done in the construction environment (Bassoini et al, 2004, Beatham et al, 2004, Chan and Chan, 2004, Cheng and Teizer, 2013, Costa et al, 2006, Crawford and Vogl, 2006, El-Mashaleh et al, 2007 among others), but still the beneficial outcome of performance measurement remains unclear. Although great interest for performance measurement have been established both in companies and research last twenty years, the use of it leaves a great deal to be desired in the context of construction (Bassioni et al, 2004, Chen and Teizer, 2013, Costa et al, 2006, Nasir et al, 2012). Examples of shortcomings are no action on measurement outcome (Bassioni et al, 2004), manually recorded metrics which complicate real-time information of performance (Chen and Teizer, 2013) and overwhelming numbers of measurement (Costa et al, 2006). According to Bassioni et al (2004), measurement can be considered as meaningless if no action is taken on measurement outcome. When action instead is taken, the measurement outcome acts as a support in decision making and the measurement can add value to the performance of the company. In order for this procedure to be successful measurement information has to be real-time based, in order to account for contingencies and changes in processes, as a result of decisions taken. Further, Costa et al (2006) state that construction companies today measure performance, but only a few have processes which should provide measurement output to support the decision making. Also the link between measurement and key processes determining project success is lacking (Nasir et al, 2012).

A quote from de Wall and Kourtit (2013) clearly express the ambiguity of performance measurement: *"Performance measurement is at a crossroads. From an academic perspective, studies in literature on the impact of performance on business are inconsistent in their findings. This suggests that our understanding of this field is far from complete"*. The uncertainty regarding beneficial outcome versus the use of performance measurement "in reality" is one such ambiguity. Multiple attempts of implementing efficient and functional performance measurement have been done, nevertheless, criticism regarding the lagging nature of metrics, lacking of soft values and failures in terms of identifying indicators that facilities change, have been pointed out (Cox et al, 2003, Haponova and Al-Jibourini, 2012). Haponova and Al-Jibourini (2012) also call for more process-oriented measurements in order to enable feedback on performed process. Existing measurement used today rather deals with either the organizational- or the unit level, leaving the links to performance on the process level largely underexplored. The presumed advantage of process-oriented measurement is besides the linking to operations also the possibility of transferring knowledge within the company. Still no successful use of measurement on the process level has been reported on in construction research. Successful implementation of performance measurement can however be found in other industries, for example manufacturing (Mohamed, 1996, Nasir et al, 2012). According to de Waal and Kourtit (2013) multiple research articles support the hypothesizes that systematically used performance measurement

increase organizational result in the long run and that companies using performance measurement perform better than they who do not (see de Waal and Kourtit, 2013).

There seems to exist a consensus amongst researchers regarding the potential that properly used measurement tool has in terms of increasing performance. In this regard performance measurement tools should be of interest for construction managers. However, there is a gap between the conceptual arguments in research, which clearly point out favorable aspects of performance measurement, and reality, which instead seems to be little or no action on measurement outcome (Bassioni et al, 2004), lacking of real-time measurement (Chen and Teizer, 2013), too many metrics and fail in identifying of success-factors (Costa et al, 2006). It is obvious that the use of performance measurement suffers deficiencies within construction companies (Bassioni et al, 2004, Beatham et al, 2004, Chan and Chan, 2004, Cheng and Teizer, 2013, Costa et al, 2006, Crawford and Vogl, 2006, El-Mashaleh et al, 2007 among others). Bourne et al (2005) state that the gap between favorable theoretical outcome of performance measurement and the shortcomings in applying applicable measurements cannot be bridged by one single study, rather a number of studies regarding different techniques, conducted in different context using different perspectives and approaches, are required to get an understanding how performance measurement can be used successfully.

1.2 Purpose

The purpose of this thesis is to investigate why performance measurement not is successfully used at the process level in construction. By doing so this thesis aims to bridge the aforementioned gap between the conceptual reasoning about performance measurement in construction and the actual realities of the construction companies, down at the process level. Prior studies point out that no actions on measurement outcome are taken, lacking of real-time measurement, too many metrics and failures in terms of identifying success-factors, as problematic. However, none of these studies further explore why these shortcomings actually exist, even though the issue of poor performance has been widely discussed. In this thesis, the hindrances for applying performance measurements at the process level in construction (building project) will be explored. Based on these findings a concluding discussion will highlight what such measurements actually should contain and how they should be used, in order to be successful. In order to answer to the study's purpose, the thesis is drawing on insights from an ethnographic study. Ethnographic studies are discussed but still well adapted to construction environment due to its ad-hoc nature (Pink et al, 2010). As this thesis aims to investigate the use of performance measurement on the process level, the ethnographic study seemed like a suitable method, in terms of its proximity to the "reality" that the performance measurements are measuring.

This study thus complement those prior studies (Bassioni et al, 2004, Beatham et al, 2004, Crawford and Vogl, 2006, Haponova and Al-Jibourini, 2012, Nudurupati et al, 2007 among others) performed with conventional methodologies. In contrast to earlier research on the subject which most times aims to find an

applicable tool or framework for implementing measurement, this study aims to investigate *why* performance measurement not seems to work although potential beneficial outcomes have been pointed. Findings in this study are recorded at a Swedish contractor acting in civil engineering, making outcome relevant for the thesis' purpose.

1.3 Research questions

- Why is performance measurement generally not used and working in construction?
- What should performance measurement contain in order to be successfully used in construction?

2 Theory

In this chapter, a background of prior research done on the subject is presented in order to give an understanding of essential elements and characteristics of the construction industry in general, the shaping of construction sites, the working environment in construction and performance measurement. The aim of the chapter is to support the discussion and concluding remarks of this thesis.

2.1 Performance measurement

Performance measurement has been on the agenda for long time and widely debated in academic research (Neely, 1999). The competitive nature of today's business environment requires companies to be alert and up-to-date regarding performance to not lose market shares, which encourage the use of performance measurement, still making it topical in as well companies and research. Evaluation of specific improvement initiatives, quality awards, changing external demands and the power of information technology which has increased the last decades, making new way to record and collect metrics possible have also increased the interest for performance measurement (Neely, 1999). Although the term performance measurement is and has been widely discussed, it is rarely defined. Neely et al (1995) interwove the literally perspective, which is the process of quantifying action, with the marketing perspective, which is satisfying customer more effective and efficient than competitors. Thereby, their definition of performance measurement is *"the process of quantifying the efficiency and effectiveness of action"*. This definition is generally used, however not without criticism. Moullin (2007) address the importance of clear definitions in order to successfully implement new processes. According to Moullin, the definition above opens for different interpretations of what should be quantified and also why. Instead the definition *"evaluating how well organizations are managed and the value they deliver for customers and other stakeholders"* is proposed. Whatever the definition be, organizations struggle with their performance measurement and the difficulty to develop cost-effective and meaningful metrics which drive performance improvement. Improvements in performance can only be determined if it is measured, and properly used performance measurement should beside the progress indicator provide managers and decisions makers with useful information where and how performance improvements can be achieved, i.e. a support in decision making (Nasir et al, 2012).

Whatever definition chosen, the list of reasons to the upturn of performance measurement clearly indicate performance measurement and managerial issues as inseparable. Typically, performance measurement help to follow up, coordinate, control and improve certain aspects of activities (Elg, 2007), in other words the metric helps determine either success or failure of both organizational and functional performance (Phusavat et al, 2009). This is some of the fundamental issues and responsibilities for a manager, and Phusavat et al (2009) argue that the use of performance measurement generate information regarding ongoing processes to the degree that manage and take decisions without performance measurement is difficult. To be able to manage and take decisions on the information provided from the measurement, the information however need to current and relevant for managers. Continuous improvement is another

managerial issue which also is dependent of performance measurement in order to declare progress.

The performance measurement process consist of transformation of an activity's or task's raw data to information displaying how performance was at that certain activity or task, information valuable for the responsible manager (Elg 2007). The measurement and transformation procedure does however involve different people with diverse agendas all with impact on how and what should be presented. Hence performance measurement rarely can be seen as objective, even if the metric itself appear to be unbiased. The separation between the responsible for collection of data and the managers which use the data for decision making is a hinder in objective and reliable performance measurement. This also enhance the statement that existing performance measurement tools are often used for centralized control where higher managers take note of what is going on at site (Costa et al, 2006). The downside of centralized control systems are the risk of rejection by potentially exposed employees and as stated, the image of performance measurement as a reflection of reality not necessary has to be true.

When the Balanced Scorecard was introduced in 1992, Kaplan and Norton (1992) state that *"what you measure is what you get"* and promote the effect performance measurement has on employees' behavior. According to Kaplan and Norton (1992), measurable goals trigger and affect people in their endeavor to reach the set targets, wherefore employees adopt behavior to what is required and enhanced performance can be achieved. Another explanation to the enhanced performance outcome as a result of performance measurement is in many operational studies described and named as Hawthorne effect, which has it origin in the Hawthorne studies in the 1930's (Wickström and Bendix, 2000). The Hawthorne studies examined how external changes such as lightning, working hours and breaks affected productivity of workers in manufacturing. The studies showed that productivity increased, even if the changing factor decreased the possibility to perform better. For example the productivity went up when lightning was increased, but still remained up when light was reduced to lower than it was before the first alteration. The increasing productivity could therefore not be linked to changes of working environment, instead the upturn was explained by behavioral changes due to the awareness of being observed, e.g. through measurement. Later research has questioned the conclusions of the Hawthorne studies due to multiple reasons. One weakness of the study was the absence of analysis how human relationships affected the outcome, another the presence of threat that the studies would end if productivity would not met the researchers' expectations, and workers then would be sent back to the ordinary working tasks or even lost their job due to the economic depression (Hansson and Wigblad, 2006).

What also mentioned by Kaplan and Norton (1992) was the negative impact performance measurement can cause on employees' behavior, depending on the purpose of the measurement. Many existing performance measurement rather strive to control behavior instead of acting as a guide towards enhanced performance. Sewell et al (2011) differentiate two orientations of performance

measurement, first one about *care*, which measure performance in order to protect team against free-riding and other anti-social behavior. The orientation *care* is seen as beneficial for as well workers and managers performing the measurement. The other orientation is named *coercion* and is done in order to ensure that workers work as hard as they possible can all the time, making stress arising as worker are compared to co-workers. The first orientations, *care* can be seen as the few watching the many in interest of the many while the second rather can be explained as the few watching the many in the interest of the few (Sewell et al, 2011). The chosen orientation of measurement affect not only the relationships within the performing team and between workers and managers, it also affect the motivation of workers. In construction, motivation plays a significant role in order to avoid unproductive time, and motivated workers will also lower production cost and shorter production time, two of the cornerstones in performance and productivity evaluation (Smithers and Walker, 2000, Hewage and Ruwanpura, 2006). If the coercion orientation appears, motivation can be expected to decrease (Sewell et al, 2011).

In order to increase motivation of workers, Dai et al (2009), De Vries (2004) and Santos et al (2002) all point out higher level of involvement of workers, put differently the ability to choose what one will do. That method will also improve team unity. Usually the term empowerment is used for this purpose with the aim to share project's objectives between workers and managers and thereby encourage a co-operative spirit in the project team (Smithers and Walker, 2000). Ukko et al (2007) point out empowerment as one beneficial outcome of right handled performance measurement. However, contingencies are allied with empowerment in construction, for example managers tend to have a strong need for achievement, managers which in turn should be both empowered and empower. De Vries (2004) explain this behavior as an unconscious dynamic taking place which plays an important role in all organizational life. Empowerment also include a more decentralized view of decision making where workers are more involved in the way tasks should be performed (Ladyshevski, 2009), and this approach requires managers to submit some of its managerial control (Dai et al, 2009).

There is no doubt that performance measurement can affect and *influence subordinate's* behavior (Beatham et al, 2004). As seen, the use of performance measurement does not for sure enhance the result and actually improve performance. If performance measurement will have a positive impact on performance depends on multiple reasons, but the research of Bourne et al (2005) point out the difference between performance measurement as a simple control approach and where control not is the main purpose of measurement as essential. In measurement where the simple control rules, improvement are rarely seen while when the measurement is analyzed and continual interacted with subordinates, gains in performance are achieved. This view resembles Ukko et al (2008) which emphasize the commitment of employees in implementation and decision making. If this is succeed and employees understand why measurement take place, the outcome will gain motivation and clarity in what is expected of them and thereby higher performance is possible. Performance measurement is therefore so much more than just the metric itself. How stats

will be used and presented is up to the manager and the leadership chosen. Ukko et al (2007) discuss the impact of performance measurement on leadership style and address that a successfully implemented metric will gain more motivation to workers by empowerment. The reasoning can also be reversed, that the leadership style will determine either the metric will gain positive outcome or not. Hence performance measurement is not only what is measured, it is also about how it is measured which is closely linked to management and leadership style.

Beside the possibility to influence subordinate's behavior, a second control aspect can be found in performance measurement, namely the manager's need to know where they are and what they can improve (Beatham et al, 2004). This aspect of performance measurement can be divided into four own categories:

1. *Checking position.* An establishment of current status and monitoring of progress over time. Making benchmarking possible.
2. *Communicating position:* Some statistics must be done to annual reports, or they are expected by customers or employees. Can also be used as marketing.
3. *Confirm priorities:* The performance data provides an insight on what is important for the organization, and extra focus can be put there.
4. *Compel progress:* Can be a helpful tool for an organization to focus extra on specific issues and find new ways to improve performance.

The first point, checking position enables benchmarking against own activities, competitors or other industries (El-Mashaleh et al, 2007). Benchmarking can be done in order to evaluate strengths and weakness relative to others but it can also contribute to organizational learning and knowledge transfer as well within an organization and between organizations (Southard and Parente, 2007). Benchmarking was developed and successfully implemented in the manufacturing industry at the same time as the interest for performance measurement increased in the 1990's. However, the implementation in construction organizations was abortive due to misunderstanding of the concept and the characteristics of construction where projects' type, budget, delivery system and prerequisites are unique for each project. Beside the fact that these predetermined variables shift, also complexity of the project and performance of other involved actors can change as project progress goes on, all making performance measurement comparison hard to perform equitably (Southard and Parente, 2007).

Beside the control aspect of performance measurement, one advantage of right handled and efficient measurement is support in decision making (Kaplan and Norton, 1992, Parameter, 2010, Bassioni et al, 2004, Haponova and Al Jibourini, 2012). To be able to act as a support, the measurement has to be active instead of today's measurement which tends to be re-active. An active measurement can never be financial, instead, the active and non-financial measurement act as leading indicators for the lagging financial performance relevant for the top level of the organization (Nudurupati et al, 2007). Financial metrics tell the story of past activities, not the ongoing or future performance obtained from investment done in customer, supplier, employees etc. The development of active

measurement linked to factors which drive success is a commonly occurring issue in companies trying to implementing performance measurement (Parameter, 2010).

In general, earlier research done on performance measurement all point out shortcomings in the managing of measurement in construction. Except the lacking of active measurement already mentioned, the metrics used in construction today seems to be focused on organizational level instead of process oriented (Haponova and Al-Jibourini, 2012), maladjusted to reality (Bassioni et al, 2004), data is not used for learning (El-Mashaleh et al, 2007), the metric is used to control participants' behavior (Beatham et al, 2004), fail in identifying factors which will drive performance (Cox et al, 2003), not aligned with organizational strategy and not work as a base for decisions (Bassioni et al, 2004, Haponova and Al-Jibourini, 2012), among others. Further, in construction most discussions regarding performance have been about productivity. Productivity is the relation between input and output i.e. the process where resources in form of material and labour produce physical elements that advance construction projects (Crawford and Vogl, 2006, Goeutt et al, 2011 and Park et al, 2005). As performance indicate how efficient and effective an action or process is performed, productivity conform to performance definition. Several research articles have been published where productivity issues in construction have been marked as low compare to other industries and also unchanged although development of technology significantly have improved. Regardless this is true or not, a vast majority insist that improvement in efficiency is necessary (Haponova and Al-Jibourini, 2012).

2.2 Characteristics of construction industry

Construction industry is often described as temporary, fragment and with short term focuses (Haponova and Al-Jibourini, 2012). Further the high number of inserted resources together with uncertainties regarding technologies and budgets resulting in complex managerial control (Chan and Chan, 2004). Therefore managing of construction projects requires enormous amount of information between involved actors to clarify localization and interdependencies between the concerned resources (Cheng and Teizer, 2013). In this section, these and other characteristics will be further presented.

2.2.1 Complexity

Construction industry is in contrast to manufacturing and other industries invariably complex and perhaps construction projects are the most complex project to be found (Baccarini, 1996, Laufer et al, 2008). Due to the complex nature of construction project, conventional system developed to support project managers may be inappropriate. For example, project complexity influence the selection of projects inputs, affect objectives of time, cost and quality and hinders clear identification of overall goal and objectives of projects (Baccarini, 1996). For construction projects, two definitions of complexity is applicable, (i) complexity is the consisting of many varied interrelated parts and (ii) complexity is equal to complicated, involved and intricate. According to Baccarini (1996), the second view cannot be ignored, but the level of difficulty in a project is in the eyes of the observer and therefore subjective. Anyhow, the first view seems well

suited to construction due to the industry's characteristics of varied tasks, different specialization, and several components, all interdependence or connective in some degree. Further, complexity can be conceptually divided into technological complexity and organizational complexity. Technological complexity is the transformation process converting input to output, and as the construction sector develops, projects have become more technologically complex since structures generally are bigger, higher, built in crowded areas and involve more advanced systems (Laufer et al, 2008). The result of the more technological complexity is a higher demand of information flow between several actors at a certain time. The organizational complexity is about organizational structure and growth in direct proportion to the number of sub-organizations and the interdependencies between them (Baccarini, 1996). The sub-organizations typically consist of various specializations and knowledge, grouped together for a specified and limited time to complete a construction project. This creates a multiorganizational, no cohesive structure of the construction organization at site. The construction site can per se be seen as the most complex point in the construction environment (Smithers and Walker, 2000). This alteration can be explained by the fact that the construction site is the focal point in the project based environment including temporary organization and coordination of multiple actors to construct a unique product. Office work in construction (e.g. design and architectural assignments) can in a higher degree be perceived as a permanent organization with defined tasks more involved in the pre-production and peripheral activities of construction, and since uncertainty is greater in temporary organizations than in permanent, the level complexity can seem as lower. By reason of this, managers need an understanding of the construction site environment to make use of performance measurement results (Smithers and Walker, 2000).

2.2.2 Uncertainty

Baccardi (1996) distinguish a differentiation of the terms complexity and uncertainty, both common used to describe the construction industry. While complexity deals with differentiation and interdependencies, uncertainty is submitted the difficulties to perform a task due to lack of predictability and understanding of new issues and events. During a project process, uncertainty is progressively reduced through time (Winch, 2010). This is illustrated in figure 1, showing how construction process starts with high levels of uncertainty which is reduced until all information is possessed as the final product is finished. In construction, where each project is unique, repetitive operations are rarely seen (Winch, 2006). This feature is especially common in soil works where ground conditions are hard to predict, making repetitive operations unusual. In some construction activities enough information is available for assign a probability for a risk to occur, making proactive handling possible. But many aspects of uncertainty in project activities are not even detected until they are exposed, and stay unknown unknowns for employees at site.

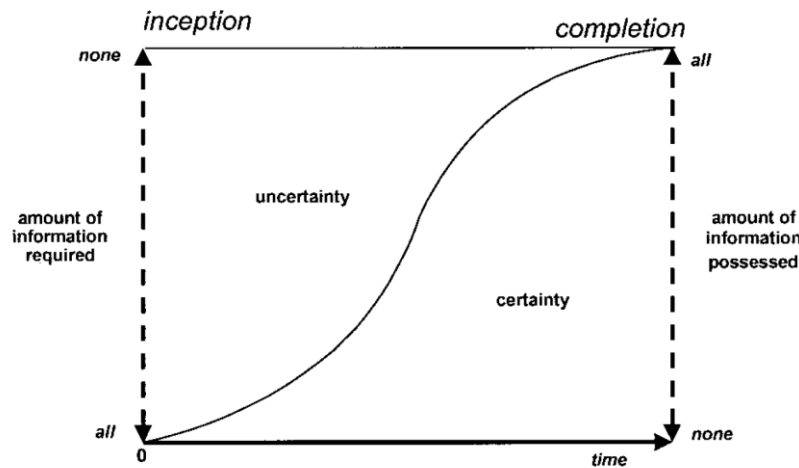


Figure 1: How uncertainty is reduced through time in construction process (Winch, 2010).

Uncertainty can appear in both time for completion of solitary activities and total project duration (Wang and Xu, 2012). Project duration also has direct influence on project cost due to the general cost a project establishment cause. Therefore, uncertainty regarding time also reflects cost uncertainty. According to Laufer et al (2008) the increasing uncertainty in construction takes its origin in the more and more client-oriented market which is a result of market competition. In order to stay competitive, contractors needs to stay flexible for changes during project duration to quickly be able to meet customer needs. Therefore, some projects are released for execution before planning is completed. As in complexity, communication is challenged due to uncertainty in construction project. New planning tools and methods are developed to address this challenge, but none are resisting to changes caused by uncertainties which plays a significant part of today's project (Laufer et al, 2008, Wang and Xu, 2012).

2.2.3 Fragmentation

Another common term commonly used for describing the construction industry is fragmentation. Reasons can be that characteristic for construction is the local and volatile market where subcontractors represent a substantial part of labor and material used (Fulford and Standing, 2014). Also, in order to achieve a balance between production capability and actual workload, construction companies make use of both internal resources and external, obtained from open market at a market price (Jingsheng and Halpin, 2003). The use of both internal and external resources takes its origin in shifting demand of resources depending on size of order stock. The use of external resources therefore acts as safety to shifting demands, but also making relations at site new for each project. By exploitation and utilization most of both internal and external resources, maximum business objective can be achieved, but in order to succeed this, comprehensive planning of activities and projects has to be done.

Construction projects require various specialization and knowledge to a high degree, wherefore subcontractors and external resources are procured (Fellows and Liu, 2012). The use of subcontractors and external resources can be viewed as the construction supply chain. A supply chain is a collection of partners connected through financial, information and product/service flow. For

successful outcome, information sharing and collaboration are essential. The extensive use of subcontractors in the construction industry is according to Green et al (2005) due to the low intensity of knowledge, making entry barrier to the market low. As a result of the high number of customers and the short and temporary time frames of construction projects, the construction industry features low trust between actors.

Closely connected to the supply chain is the management of all involved actors. Supply chain management with a holistic view adapted to overview all involved actors in the system have successfully been implemented in other industries. As with performance measurement (see above), the trend has spread also to construction (Green et al, 2005). The outcome have not been as successful as in comparable industries and multiple explanation why exist. Fulford and Standing (2014) mention that information sharing capabilities tends to be lacking in small and medium enterprise which is common in construction. In other industries, information technologies have improved partnership between actors within the supply chain. Green et al (2005) point to the low trust which pervades the construction industry to prevent new innovative business practices. Another reason to deficient collaboration is that procurement of subcontractors is done on mainly on price, wherefore relationships risk being adversarial.

3 Method

To be able to answer the research questions of this thesis, an ethnographic study was chosen as research design. The use of an ethnographic study seemed to be well adapted to the construction context due to the ad-hoc characteristics of the realities of the construction process level taking place at the building site (Pink et al, 2010). Throughout this study I have therefore put myself in the researched context, in order to collect impressions and observations to answer to the purpose of the thesis. This thesis was executed in collaboration with Skanska Mark in Örebro which provided me with information and material from a wide range of projects as well as a working desk at their office.

3.1 Company presentation Skanska

Skanska is a Swedish construction company with operations concentrated to the Nordic region, other European countries and the U.S. The mission and vision are to develop, build and maintain the physical environment for living, travelling and working by being a leader in the home markets. Skanska express their values in five zeros, zero loss-making projects, zero environmental incidents, zero work site accidents, zero ethical breaches and zero defects. The total number of employees worldwide is 55,600 and the annual turnover 2013 was 136 billion SEK. (Skanska, 2015)

In Sweden, operations are divided into four branches; Construction, Residential Development, Commercial property development and Infrastructure development. Each of these is divided in divisions, regions and support functions. The number of employees in Sweden is 11.000 and the annual turnover for the Swedish market in 2013 was 33 billion SEK. (Skanska, 2015)

3.2 The study

The initial idea to this thesis came from one of the managers at Skanska Örebro which wanted to find out if there was possible to determine any common feature between different preschools Skanska Mark had received in a partnering contract. The origin idea was developed to compare performance between the preschools in order to see whether some of them stood out in either positive or negative way, and also determine why. This was done by development of a tool where different performance measurements were tested in order to assess their suitability for the construction industry. Accessibility to all available data from the projects encompassed in the partnering contract was given, such as calculations, quarterly forecasts, invoices, blueprints and final reconciliations. The material was examined and broken down to smaller, more manageable parts which were compared against each other in order to find common features of the projects. Due to the ad-hoc nature of construction projects, there was a need of getting questions answered by managers involved in the preschools. For example, all costs at the projects were posted in different bank accounts due to the activity the cost was linked to. The list of activities was comprehensive, wherefore the managers of the projects have grouped the activities together in order to keep the number of accounts down. Since the activities in many cases already were predefined at the wholesaler or subcontractor, some activities ended up in wrong account. When looking at the system from the “outside” as I

did, confusion and several questions were raised. Since I was stationed at the construction office, questions like these were always quickly answered by the managers who knew the systems and understood why and how the costs could burden the wrong account. By this, a deeper understanding of the systems and routines used by Skanska to send invoices, getting paid and general economic systems was gained. However, as the development of the performance measurement tool went on, I realized that the result did not add any value to either the organization or the intended research. There was always an explanation to odd values, rather caused by characteristics derived from the construction environment than poor performance. At this point, the study instead turned to focus on how people in the construction sector act and appear in regards to measurement systems and the term performance in general.

Ethnographic studies are done by spending time in the examined environment where participating in activities, observing behaviors, writing notes, asking questions and reflecting on one's own role as researcher take place (Pink et al, 2010, Löwstedt, 2014). Ethnographic studies can be explained as "telling it from the inside", i.e. examining the point of the study by taking a step in to the environment and explore why things appears as they do (Pink et al, 2010). Ethnographic studies are still infrequent used in construction research and are often regarded with suspicion. However, Raftery et al. (1997) emphasize the research design as a paradigm shift from conventionally used methods in construction, and promote a merge of conventionally models and ethnographic research. One argument to use ethnographic studies is that handling and procedures of individuals and groups in specific settings best can be explained by an understanding of how these people's encumbrance and habits have derived from the context, which is gained by own experiences and observations from that certain context (Phelps and Horman, 2010, Rooke et al, 2004, Löwstedt, 2014). In order to accomplish adequately findings derived from the examined context, the ethnographer has to adapt to and appreciate the setting to the same extent that any other member of the setting has (Rooke et al, 2004). If this understanding has been achieved or not cannot be judged by the ethnographer himself, this can only be done by some other participant in the examined setting. In contrast to the reasoning about total adaptability by Rooke et al (2004), Löwstedt (2014) argues that observations by "outsiders" can give new insights, but rarely the same as ordinary members of the setting would do. Due to this in-built aspect of temporally visiting the "realities" of other people, Löwstedt (2014) emphasizes the importance of taking a self-reflexive stance as a researcher. By the consideration how the author's status, background and experiences influence the research process, the position and identify of the author becomes known to the reader and so also the transformation how the author's own identify changes throughout the research process (Löwstedt, 2014). In this thesis, a self-reflexive approach has been adopted, wherefore I view will refer to myself throughout the discussions in this thesis.

An issue disuniting the researchers of ethnographic studies is how the researcher shall relate to earlier research on the examined subject. One side argues ethnography is a theory building method, and therefore, no earlier research on the subject should be considered (Rooke et al, 2004). By completely

isolating theoretical principles from the research setting, a theory building method is ensured. This view is supported by Wilson and Chaddha (2009) who emphasize that good ethnography is theory driven. By nature, qualitative research design as ethnography is inductive where the researcher begins with as few preconceptions as possible in order to build a theory. In contrast is deductive research where a hypothesis is derived from existing theory which is tested by sampling of empirical data. Ethnographic research tends however to land somewhere in between inductive and deductive approach by using features of both. These studies can for example start out with deductive theory and end up with generating theory derived from an inductive research process. Pink et al (2010) support this relationship to existing theory and suggest to self-consciously consider how theory and practice interact to each other throughout the whole research process in order to use earlier research as a complement to on site observations. In this case, the ethnographer is tempted to not allow own preconceptions and theorizing to intrude on findings, which would stage the researcher to search for evidence to support already stated hypothesis, making the ethnographic study resemble conventional research designs (Barratt et al 2011). If interaction between own findings and earlier theories are interacted, it enables to state finding on one hand, and theory and recommendations on the other (Rooke et al, 2004).

3.3 The setting

As mentioned, this thesis was executed in collaboration with Skanska Mark in Örebro. By this I was located at the office together with site managers of different levels which all had their desk at the office. As manager also spent time out on site and that the office also served as break facilities for workers, a constant and shifting mix of people always were present and the office became the focal point for construction operations for Skanska Mark in Örebro. My primary assignment was to take in and observe the environment wherefore I joined the managers on their visits to the construction sites as well as spoke to both them and the workers in the breaks. Managers gladly showed their sites and I rather had to reject invitations to come along than ask to follow, and since the office accommodated several managers, most with more than one project running at time, the range of projects visited was wide. My days at the office therefore became similar to the managers, with visits on sites varied with writing and analysis at the office. Managers also discussed issues recorded at site in between, discussions which was of high value for me in order to collect a comprehensive and overall picture of the environment.

In this setting, I was not employed nor had any of the manager's responsibilities, however I took part and was included in the community and managers asked for my point of view in issues taking place on site as everyone else at the office. Even if not all time was spent on site, the setting gave me insights in the manager's role and therefore, the study mainly takes its origin from the manager's point of view on performance measurement. Some episodes used in this thesis is however recorded almost a year before this thesis was written when I was working as intern for three month. The time as intern was mostly spent as worker out on site, which also gave me insights in the daily life as a worker. The

contradiction between manager and worker perspective will be further developed in the discussion.

In total, I spent four months at the office, from late January to early June. By spending such long time at the workplace, I was part of the everyday life that took place, for example, I have been involved in discussions at the breaks, invited to events and courses and asked to take care of easier tasks. In other words, I became one of the managers, with the only exception that I sometimes jokingly was called an intern. I referred the other at the office as my colleagues, and at same time they treated me as a colleague as anyone else. However, my task, in contrast to the other which ran construction projects, was to examine how performance measurement could be used in construction industry by comparing and monitoring a set of projects.

The progress to become a manager already started the summer as intern, even if I then spent most time as a worker. My ambition has however always been to be a manager, and by getting access to a own desk and constantly start and end the days at the office, the transformation from a student to construction manager became fulfilled, even if still not was employed or served as a manager all the way. The managers at the office did already from the start grunted to my intensions to measure performance. According to them, the environment in construction not allowed such performance measurement and comparison. Until then, I had effusively denied that fact and thought the managers in some way did not want to measure performance, but the failure of the measurement tool gave also me an insight to the impact construction characteristics play on site. The new direction for the thesis did however not changed the plans notable from the original purpose, as one plan already from the start was to investigate why performance measurement not is working in construction environment.

To be able to remember observed episodes played out during the thesis was written, a diary containing these episodes was written. Various types of episodes were documented, for example characteristics of the construction environment, discussions about performance and productivity, different types of measurement systems and daily life at the office. The episodes could be based on both specific events and general impressions, all to get an overall view and understanding and thereby, be able to answer the research questions.

3.3.1 Theory building versus testing existing theories

As some researcher state, ethnographic research is applied as an inductive theory building method wherefore no earlier research should be considered in order to stay unbiased (Rooke et al, 2004 and Wilson and Chaddha, 2009). To begin this thesis without any linkage to earlier research were not possible due to earlier studies within the area. Therefore, the hypothesis in this thesis is derived from earlier research done in performance measurement in the construction sector. The literature review has then been executed in parallel with the ethnographic research throughout the whole thesis progress. The study cannot be argued to be merely inductive, but not either merely deductive as environment was examined in parallel as the literature review was performed. In strive to answer the research questions, a holistic view of examined environment

was generated and the merging of recorded episodes and theory will be further discussed later in this thesis. To which degree the episodes was recorded and perceived with earlier research in mind is hard to distinguish, but the differentiation between research and reality is obvious. Due to the clear distinction between earlier research and reality inductive outcome can be argued to emerge.

The initial part of this thesis, the theory, was performed in order to gain understanding, overview and introduction to the subject. The literature review also works as a theoretical framework and a retrospective view of already performed research on the subject. In the discussion chapter, theories from the literature review will be linked to the results from the ethnographic study. The literature review is based on scientific articles and books in the area of productivity, performance, measurement and benchmarking mostly from a construction point of view. The literature has been found by searching on databases such as Scopus, Google Scholar and Chalmers Library using keywords such as performance, productivity, performance measurement systems, benchmarking, Key Performance Indicators and construction industry characteristics. The literature study has been executed throughout the whole master thesis duration, starting with pre-study and continues during data collection, analysis and discussion.

3.4 Limitations

The study only involves Skanska Marks undertakings in the projects, i.e. not the whole construction process. Further, the study mainly focuses on a set of projects, where most of the projects are procured as partnering contract. By this, the investigation tends to be of internal focus and the result is mainly demonstrating the setting at the examined projects. Transfers of findings to other environments should be done cautiously.

4 Result

This chapter contains the result of the study. The first part of the result is presented as episodes played out during my time at the office along with reasoning why the specific behavior and actions took place. These episodes, which were collected at the site, illustrate the difficulties of measuring performance and why performance measurement not is used in construction. All these episodes are related to the characteristics complexity, uncertainty and fragmentation mentioned in the theory. The second part of the result deals with the impact of organizational structure in the construction environment and the effect it has on the usage of performance measurement.

4.1 Episodes from the construction site

In the following section episodes played out during my time at the office will be presented. The episodes are recorded at my visits on the construction sites along with managers and from my time as intern when I acted as a worker.

4.1.1 Grass rolling

Skanska Marks undertakings in the construction process mostly consisted of excavating and soil work. Since the working area could be huge, weather protection was no alternative to ensure reasonable conditions. Work always had to adapt to current circumstances either if it was snowing or the sun shined and by that, situations where work had to be done occurred, even if the weather condition not was ideal for the desired activity. One such situation appeared during my time at the office.

At one of the ongoing projects, an area of roughly 2000 square meter should be prepared for grass. The grass was rolled out, an activity where the worker brought a roll of grass to the point where it should be and then rolled it out. When the rolling was finished, the area was provided with water and cut at least three times before hand-over to client. To avoid maintenance of the grass more than necessary, the planting was done as late as possible, however, such late planning ushered for disturbance in planning if something unexpected would happen. This time, it had been raining for long time when the rolling was performed and due to the long period of raining the ground was swampy and impossible to enter without high boots. Usually, a truck transports the grass rolls close to the planting area to ease the workload and enable high efficiency, but since the soil was loamy and wet, workers instead had to walk a long distance to reach the rolls. During normal circumstances, other activities would have replaced the grass rolling at this certain time, but in order to finish the project on time, and also to not dry out the purchased grass rolls, rolling had to be performed.

As most of my time was spend with managers, and the most of the discussions I took part of were between managers, I could see the reason to place the activity as late as possible, both for economic reasons but also to release workforce from unnecessary work load in form of maintenance. This time, the tactic failed when weather suddenly changed the conditions and performance was reduced. Grass rolling was an activity well adapted to performance measurement due to its

repetitive nature, large areas and absence of interfering activities and during normal circumstances the activity has an aiming performance value of 200 square meters per day by one worker. Although a target value of performance existed, no measurement was done. Instead, the manager used his own experience of how long time and how many workers there were need for in order to finish the activity on desired date. When I asked the manager if not objective data would have been better, he answered: *Well, there is a desired value, but it depends on several reasons, for example who is performing the task, ground conditions, slopes and as now, weather. Besides that, the value to relate to is more often than not wrong and impossible to reach, at least according to the workers. We glance at the value when planning the duration, but in the end, we adapt work force to finish the activity on time. If needed, extra workers can be placed at the activity in order to finish it on time.*

The quote clearly picturize how managers perceived uncertainty of planning and therefore stayed flexible if something unexpected would occur, such as weather disturbance. I could see the subjective approach to measurement due to the potential uncertainties where only a few were manageable. But the subjective approach to measurement was experienced at more projects, for example at one bigger project which involved several actors. Once a week, an assessment of if work progress went on according to plan was made. One person, responsible for the schedule asked each one of the actors of their status in ongoing activities. If actors were lagging, the time schedule was adjusted and an overall status of the project was obtained. In the answers how work progress went on, all used subjective assessment. In a scenario where the activity length was 10 days, and should be finished within 5 days, the answer of how progress went was always in line with “*we are doing fine, we have done roughly 60 percent, so there will not be any problem to finish on time*”, or, “*we are lagging a bit, but will try to finish on time. There might be one day delay depending if I can get some extra work force or not*”. I attended three of these meetings, and never heard anyone declare an objective view of a working progress.

4.1.2 Jointing of stone slabs

Another activity on construction site where weather played a significant role was jointing of stone slabs. Many activities were perceived as more or less strenuous for workers to perform depending on weather conditions, but some, as this type of jointing of stone slabs could be impossible to do during wrong circumstances. At one project, which except the jointing already was finished, two workers prepared for the activity. As all other activities already were completed, the two workers stayed alone at site. Suddenly it started to drizzle, and since the stone slabs needed to be dry when jointing was performed, the workers went in and waited. With no other task available, the time was spent on coffee and resting. The responsible manager was not informed of the sudden interruption wherefore no other direction was sent and workers instead had to wait an hour or two to let the surface dry out.

The jointing was an additional job ordered from the client, wherefore workers noted the time spent to get paid. For Skanska Mark, the method of jointing was new and therefore a rough calculation of time spent per square meter was done

in order to get a value to benchmark against and use in future calculations for new jobs. The value was expressed in time per area, a value obtained from noted time of worked hours and area of slabs. However the waiting time was removed from workers' timesheet or not before the calculation remained unclear, wherefore the future use of the value became uncertain. Fortunately such small variations on such small activities will not play decisive role of the overall price in calculations for new jobs.

The situation described above was not only characteristic for the performance measurement, rather the construction at site as a whole. Unexpected events occurred, and this time, management was not available for contact when workers could not perform the intended activity. The careless attitude towards performance metrics shown in the episode most probably derived from the lack of subsequent use of the metric and reasons why metrics not were continuously used can be many, for example the absence of similar activities due to the uniqueness of projects or impact of uncertain factors such as weather. Both these reasons were present in the jointing of slabs. As outcome was reliant on these factors, continually objective measurement would not add value enough to interest managers at Skanska Mark.

4.1.3 Assemblage of fence

The uniqueness of projects made new activities as the jointing mentioned above happened. At another project, I met a guy who put up a fence where the model was new for him, but where an instruction how installation should be done was available. The handrail should be attached to the poles with rivets, and the equipment needed for this was provided by the manager. The problem was that the rivets was too coarse for the provided machine, making installation of each rivet a long and tough task. After a while, the machine was broken due to the coarse rivets, and a new one was needed.

As earlier examples, no measurement was done. I found three reasons why performance measurement not would have added any value to the organization in this activity. First, even if fences have been installed earlier, this type was new and so also the procedure. Consequently, no data to benchmark against was available. Second, due to wrong equipment provided by manager, time was wasted first on long installation time for each rivet, and then in waiting time for a new machine, making eventual metric useless as benchmark. Third, the new equipment needed burdens the activity with an extra cost. Also cost for transportation and time for management to get the equipment can be seen as inputs in the activity, and can thereby also be part of the performance. Differing views how these values should be counted were present in the managers' workload. If they should be counted, complexity how also appears due to the unbound role of managers which can make several services at one single visit at site. Measurement would also burden the management with workload, and since no use of metrics was found in this activity, measurement would only be waste of resources.

4.1.4 Assemblage of equipment for playgrounds

At several projects visited, equipment for playgrounds has been installed. The equipment was delivered in pieces and installed by workers at site. For each set of equipment, a description of how installation should be performed was attached together with perceived time required to finish the assemblage. The workers resembled the process with assemblage of furniture from IKEA, but in bigger scale. Various suppliers were chosen in the projects, but equal for all equipment was the underestimated time for assemblage. When managers, who glanced at the estimated value when schedule was determined, realized the difference in estimated and actual time, the supplier had to respond on why the value shifted. It appeared that the estimated value took its origin in assemblage made by the suppliers' employees indoor. Not only had the circumstances differed from reality on site where weather, security requirements and sand affected the time for installation, also the experience of assemblage personnel differed. Since playground equipment was different at all the projects, both in form of supplier and model, uncertainty regarding time for the activity remained for all projects even if the activity in itself could be seen as repetitive.

At the tendering stage for a set of pre-schools, experience from these projects pointed out the procurement and assembling of playground equipment as an activity improvements were possible. With hindsight, all equipment should have been procured from one supplier and maybe also have been delivered already assembled when arriving to site. This would however had increased the cost for transportation, but on the other hand uncertainties regarding assembling of equipment at site would be removed. Thereby workers' skills could be more efficient used which urges for higher performance. This line of thoughts expressed contractors' dilemma when construction method should be determined, and since no objective measurement was performed, no unbiased evaluation of desired procedure was possible. The concern regarding poor performance was only based on project managers own perception. But since model and supplier differed between the projects, an objective approach to measurement would have been hard to apply in this activity.

4.1.5 Sewage and pipe installation

The subjective measurement described in the episodes above derived in some activities from the hardness to obtain objective metrics, for example the assemblage of playground equipment. The same scenario appeared in sewage and pipe installation. Potential measuring of performance in sewage and pipe installation included consideration of multiple inputs which affected the outcome of performance, for example dimension of pipes, depth of excavation and characteristics of soil. In addition the activity was performed under the land surface wherefore encounter of unexpected objects were common. Objects encountered were often stones not found in soil investigation or old cables. At one ongoing project, installations of sewers were taking place when a manager was contacted by the workers. At site, old cables were found in the same height where the new pipes were planned. As the manager was responsible for the construction, he was the one who took the decision to lift the new pipe over the found cable, making gradient lesser in the reaming part of the pipe. From the

time workers came across the cable, a new activity had to begin, but since the projects only was in its startup phase, no other activities had started and no equipment to start up a new one was available. Instead the workers had some waste of time just waiting for manager to first come and see the collision, and then wait for the decision how to solve it.

When I arrived to site, I asked the workers about how long time they thought the whole activity would take to finish. The answer was as simple as *“it takes the time it takes, not longer, not shorter”*. I insisted, and asked what the planned duration was, but again, get the same answer. For me, with background from school where planning, monitoring and supervision were essential part of education, it was hard to admit this view, which to me seemed to completely lack a vision of completion time. The workers who performed the task were two older men with acknowledged accomplishments in pipe installation, still not willing to give an answer of how long time the activity would take for them to perform. For them, unexpected events like the unexpected cables were common, and this time the cable fared, which not was the certain outcome when unexpected cables appeared. If the cable would have been severed, the stop would have been longer and also repairing of the broken cable would have been necessary.

The installation of sewage and pipe installation included excavating, which was executed in pretty near all projects and at same time an activity which many times represented a significant part of the overall construction budget, wherefore interest of performance measurement could be presumed to be high in this activity. Still, at none of the projects I visited, objective measurement was performed. The manager at one project explained that not only unexpected objects below surface as described above affects the performance, the overall prerequisites differ and change the performing outcome a lot. Examples of prerequisites which affected performance were characteristics of soil, if work was performed in densely built-up environment or at unobstructed areas, chosen excavator and if the old surface was paved or not. During these circumstances, objective measurement has to deal with a high number of interdependencies which complicate the procedure. Instead, managers used their experience of earlier, similar settings and made a subjective measurement of performance. The subjective measurement, which was more of assessment than measurement, was quickly done and enabled orders for example higher speed. For me, with nearly no experience from construction, this way to determine performance was problematic to execute in an efficient manner, even if I attended the activity from start to end. My experience of earlier projects was lacking wherefore distinguish between the good performances and not so good became hard.

Temporary stops and unidentified objects were not in itself obstacles for measuring performance objectivity. The stops did however hindered the work progress, and potential performance metrics could therefore be seemed to illustrate more about the working circumstances as numbers of unidentified objects and earlier mentioned influencing aspects than actual performance by the team executing the activity.

4.1.6 Laying of setts

The high number of influencing aspects in excavating described above could be found in multiple construction activities, but expressed in various ways. The example below about lying of setts was recorded during my time as intern the summer before this thesis was written. In an area of stone slabs, a small puddle should be constructed by raising a ring of slabs around some lower ones in the middle. The concept of the puddle was easy to overview, but as the surface at same time should drop against a well, uncertainties how to construct the puddle were raised. This resulted in several visits at the site office in order to brought clarity what the designer intended. The blueprints lacked some crucial metrics, which made construction hard to perform in the right manner. Beside the confusion regarding the blueprints, the puddle also required extra effort to construct compared to ordinary, plane areas of stone slabs.

The performance of lying setts was as earlier described activities highly influenced of multiple factors. When the activity was performed, I asked the workers about their opinion regarding piece-work contract which I knew was used by some disciplines in the construction industry. The asked workers would however not appreciate that type of wage due to the non-repetitive nature of the activity. I suggested stone slabs as a suitable activity due to its repetitive nature, but realized its complexity when I was performing the activity myself. Not all slab areas got installed puddles, but corners, wells and need of cutting the slabs differed, wherefore necessary and fairly measurement could not be performed in order to avail piece-work. Besides that, at the projects I visited, the paved areas were small, making the activity not endured longer than a couple of days at a time.

In the described episode above, both involvement of multiple actors and deviation from normal design affected performance. If measurement should be performed in this activity, different conditions would require different performance aim, for example, one higher aim for non-hurdle areas, one medium aim for areas containing corners, wells and cutting of slabs and one lower aim for unusual constructions such as the puddle. Anyhow, when measurement should be done, someone has to determine which of these “levels” the paved area should be in, which still makes subjective components of measurement critical in measurement outcome. Whatever level chosen, blueprints have to be correct and apparent for the workers to interpret, otherwise performance will be affected and hard to evaluate.

4.1.7 Spatial conflicts

Beside earlier mentioned adoptions regarding prerequisites, work on a construction site always has to be adapted to other participants in the project. In house construction, Skanska Mark usually collaborated with Skanska Hus. Even if there were two departments of the same company, disputes occurred regarding time, costs and space during projects. At normal and optimal circumstances, Skanska Mark started the project with ground work and pipes installation before Skanska Hus entered the site. Skanska Mark then leaved the site until at least the house’s facade was finished to then complete the outside areas of planting and

paving. In some projects, the time schedule compelled forcing to complete the project on time. In these cases, Skanska Mark and Hus had to share the space, which vouched for spatial conflicts. In the initial idea to this thesis, a set of comparable projects was evaluated in form of project cost and time. One of the projects appeared to have significant shorter completion time, and according to the responsible construction manager this was due to a forcing start of the project where Skanska Mark had to share the space with Skanska Hus already from day one. When the same manager was asked to rank the projects from performance point of view, this pre-school was although the short completion time ranked as the last one. This was based on the spatial conflicts taking place during the project duration. The total cost of this project was anyway roughly the same as in comparable projects, hence subjective and objective metrics can be argued to differ. On the other hand, performance can also be argued to include more than cost and time.

Spatial conflicts with the housing contractors appeared at other projects as well. At one ongoing project I joined the project manager to visit the site before the return to finish the spatial outside environment. In discussions with the project manager responsible for the housing part, he told they lagged behind schedule due to several reasons wherefore the scaffoldings still remained around the house. The scaffoldings obstructed Skanska Mark both in sense of available area for machines and activity scheme planning. In addition, the final inspection was decided to hold earlier, compressing the time for completion in both ends for Skanska Mark. The schedule overrun was known but not to which degree, but the new date for final inspection was total new for Skanska Mark. This resulted in more workers and a forcing of work progress as soon the site was available. The uncertainty when activities could start was always current during my time at the office where new information always appeared. This time the new information gained from other stakeholders in the project required a higher performance, but the manager assured me that this type of external information was common and could also obstruct and change ongoing activities. Eventual measurement would at the explained situation not be affected, but if information instead required new techniques or other changes in already ongoing activities, also measurement would be suffered. Spatial conflicts also hindered Skanska Mark from performing activities as they wanted themselves. One example of an activity frequently hindered was lying of setts and other paved areas which in many projects had to stop close to the house due to the scaffolding. The activity could be finished first when the scaffolding was removed. Stops like this in activities would also require stops in measurement, and then resumption when the activities restart.

4.1.8 Resource conflicts

Another common conflict with the housing contractor was unloading of material. Since Skanska Mark usually got an excavator at site, an efficient way for Skanska Hus to solve the problem with unloading was to call for the excavator. The excavator then had to stop the ongoing activity to unload the material before work could be resumed. Also in cases of cleaning of site and movement of larger equipment the excavator was efficient, but the primary task of taking work progress forward was these times reduced. Ordinary activities performed by the excavator many times also involved one worker, which sometimes had to wait to

the excavator was back on the ongoing activity. Therefore, the interruptions caused by other tasks at site affected the rhythm of the primary activity. Again, these interruptions do not in itself cause problems for eventual measurement of performance, but they disrupt the measurement outcome and rather provide information about how many interruptions the primary activity has been endured than the actual performance.

4.2 Workers and managers as one team?

As mentioned in the episodes above, performance measurement was mostly subjectively done by managers. As measurement was done by managers on workers, workers were evaluated by managers in a subjectively way. This opened up for diverse interpretation of performance and work progress and disputes between managers and workers when the perceived performance differed. One example of this was during installation of pipes, an activity described in episodes above. The responsible manager perceived the work progress to be slow when the performing team not succeeded to finish two installed pipes per day and informed the workers about the desired rate, which were two or more pipes each day. The response was annoyed and upset and the workers stopped talk to the manager and walked away. Anyhow, the reprimand had effect since the rate of installed pipes per day increased, at least to the subjective evaluation made by the manager.

This illustrate some of my experiences where monitoring of work progress was seen as a problematic area. Monitoring was performed by managers on workers, two groups which worked for the same organization in the same projects, preferably with the same objectives for the projects, but still two groups which stood far apart from each other when it came to mentality and attitude towards performance measurement.

Since I was stationed at the office, I identified myself as manager. The unity at the office was good, of course some disputes existed but not more than what can be expected at a workplace and the general feeling was positive and welcoming. At the office, breakfast was served every morning, managers get the latest mobile devices, trips and conferences were arranged and there were abilities to take part of classes to further develop skills to perform working tasks better, i.e. the prerequisites for a good working-life was satisfying. I also took part of some of these benefits, and I guess the purpose of these was fulfilled, namely encouragement and belonging to the organization.

Out on site, the workers daily life was completely different. I was working out on site for a period of two month roughly a year before this thesis was written, and experiences from that time was divergent from what I now perceived at office. There, breakfast was as most offered once every second week, mobile devices was older and coffee was brought from home. The difference could also be observed at the office since some of the workers used the facilities for breaks. At breakfast, workers were placed at one table and managers at one. Workers still brought own food and coffee, even if bread was served and the coffee-machine were available for all. Integration between the two groups only took place if the "own" table was full.

I would argue this behavior and habit created two teams, one “we” and one “them”. Experiences from the time spent out on site enhanced the view, where workers lifted up their roles in the project, and at same time attenuated the managers’ work to sit at office with arms folded and drinking coffee. Managers at their side asked themselves if the workers really knew what the managers did at work. Managers admitted the importance of workers, for example were no work done if workers absented from site while managers’ work most time could wait to another day. Anyhow, I perceived the monitoring from managers as a risk to intrude on workers’ working life. The mentality at site was rather as earlier mentioned “*it takes the time it takes*” than we can do this fast and more efficient and by that earn more money, which the managers would prefer. One possible reason to why managers asked for monitoring tools was the responsibility for project outcome and economic result. Managers were always evaluated on their economic result at the projects and if the result was negative, I was told “*a red warning sign*” will light up higher in the organization.

Skanska expressed their value in five zeros, zero loss-making projects, zero environmental incidents, zero work site accidents, zero ethical breaches and zero defects. The managers were primarily evaluated by these as basis, but when talking with managers, the zero loss-making projects was by far the most important or at least most dealt with during project duration. The red warning sign would light up also if some of the other core values were broken, but the economic result will always be the ground foundation in all projects. Due to the responsibility for these five zeros, managers seemed to be accustomed in evaluation of performance. The workers who perform the construction at site were also regularly evaluated, however not with the same frequency and not with objective measurement.

The way responsibility was divided in projects created a special nature of relationship between managers and workers. The summer I did as intern and was placed together with the workers daily taunts about both individual managers and managers in general were heard. That I strived to be a manager was also noted, and jokes about higher salary, more time to perform tasks and treats was mixed with concern about my young age and lack of experience from construction sites. The fact that I had spent four years in school studying construction and management was laughed about, the construction site was real life not possible to record in other way than by own experiences. From the workers perspective, the construction site was their home ground, while the managers were comfortable and drinking coffee at the office. I guess I already last summer due to my intentions to become a manager was seen as one by the workers, wherefore I was not included in the community, but still not rejected.

In a discussion with a manager, the question of if the workers understand the responsibilities of managers was raised. As the manager holds responsible for economic result, they want to hurry on the work progress, of course without deviate of quality and other importance values, but still, work progress was of high importance. In order to control the work progress, the manager emphasized the importance of goals and deadlines to enhance performance. In an ongoing

project, the manager used set dates for the asphalt spreading as deadlines for finished surfaces. According to the manager, an undemanding environment advantured the performance at site. The fact that workers commonly were negative to the set dates and asked for longer time was refused. The disaffection of set dates can again be deduced to the quote *"it takes the time it takes"*. The manager was also familiar with my experience that workers as soon the manager left the site imprecated and shrink the manager's undertakings. My perception was however a conflict between managers which tried to implement tools, expedited activities and governed work at site on one side, and workers with another perception of reality on the other side. In addition, this battle took place at the construction site, which was perceived as workers home ground. Implementation of measurement could therefore be seen as a challenging task for managers.

Experiences at site did however indicate that workers were aware of the performance issue and self-evaluation occurred in some aspects. Unfortunately this was found in negative examples where workers stated that *"if he does not work more than that, I will not do more myself either"*. The quote origins from a worker who found a coworker out on an adjacent construction site visiting a friend. In principle, the incident was wrong since the worker should be performing the given task during working hours, but at same time a hello to a friend cannot be prohibited. Even if this specific event not were severe, the same worker had showed lacking commitment for working task for longer time. The quote was therefore a discontent directed against the worker. The ground to the displeasure was that in civil construction, all workers got the same salary regardless experience or performance. In this case, the one who uttered the quote was not willing to pay extra effort to put the work progress forward when the other not did. For the project outcome, it would have been more beneficial to report of episodes where workers realized they had to work harder and more efficient due to they have the same salary as their well performing coworkers, but unfortunately no such episode were met.

5 Discussion

In this chapter the result and chosen methodology will be analyzed and evaluated.

5.1 Performance measurement in construction

As clearly stated in theory, performance measurement is a managerial tool which should be used by managers to follow up performance, coordinate work, control work progress and improve certain aspects of activities (Elg, 2007). This is however not working in the proposed way in construction today and this thesis aims to explore why it is not working. The discussion about this will be divided in two separate parts; first the impact of construction characteristics will be discussed from a manager's perspective. This part takes its origin in the episodes collected on site and highlights the difficulties to measure and make use of measurement outcome. The second part deals with the issue regarding organizational structure and contradiction between workers and managers, which also influence measurement and the use of measurement outcome. The contradiction between workers and managers is clearly stated as problematic in the result.

5.1.1 The manager's perspective of performance measurement

During this examination regarding the use of performance measurement in construction, I have not found one single example where performance measurement is used as described in theory. The overall aim of measurement to improve performance and stay competitive on the market is not neglected, but due to construction characteristics the use of performance measurement takes other expressions than described in theory.

Construction industry is clearly influenced by its characteristics complexity, uncertainty and fragmentation. Aspects of these three characteristics can all be found in episodes described in the result, however the characteristics overlap and one, for example complexity, can easily lead to another, for example uncertainty. This can be found in section 4.1.6, Lying of setts, where the work progress deals with complexity in form of varied directions and height of stone slabs, which in turn result in uncertain duration of activity. Also in section 4.1.8, Spatial conflicts, can consequences of complexity and fragmentation on the construction site be traced to uncertainty of activity duration. In almost all episodes, uncertainty can be traced in some way, either directly in form of unpredictability to know what is hiding under land surface or in form of shifting weather, or indirect through complexity or fragmentation.

As already touched at in the result, these characteristics do not in itself obstruct measurement of performance, rather it affects performance outcome. Performance measurement should provide managers with information of ongoing processes (Phusavat et al, 2009), but in construction where complexity, uncertainty and fragmentation plays significant impact on performance outcome, the metric would rather provide information regarding how big impact these characteristics have in the ongoing processes than illustrating the actual performance of processes. The actual performance performed by workers is hard

to distinguish from the conditions as prerequisites change from one project to another. The view that complexity complicates the use of conventional systems developed to support managers, which performance measurement can be seen as, is shared by Baccarini (1996).

During circumstances where complexity, uncertainty and fragmentation affected performance, managers to a high degree made use of own interpretations of performance, in this thesis named performance assessment. Performance assessment is made in the eye of the observer, which in this case are the managers', and can thereby be seen as highly subjective. One of the main purposes of this procedure seemed to be able to finish the different activities on time, and by the subjective assessment of performance eventual need for more resources could be detected. The eventual need for extra resources can be traced to the mentioned characteristic uncertainty. Further, uncertainty can also be traced to the quote by the project manager drawn from the episode about grass rolling: *"well, there is a desired value, but it depends on several reasons, for example who is performing the task, ground conditions, slopes and as now, weather"*. In this case, weather and ground conditions can be categorized as uncertainties while the one who perform the task and slopes can be assumed to be knowable. Weather and ground conditions are however factors which can affect performance significantly. Also another of the mentioned characteristics, complexity, can be traced in the quote of the manager. Complexity is *"the consisting of many varied interrelated parts"* (Baccarini, 1996) and even though grass-rolling can be seen as one of the least complex processes at a construction site, interrelationships between performing actor, ground conditions, slopes and weather affects performance outcome.

Many management theories in construction derive from successful implementation in other industries, usually manufacturing. Performance assessment have most probably always been performed by responsible managers in all industries, but the interest for performance measurement which include monitoring, evaluation and benchmarking in order to improve performance was raised in the 1990's, particularly in manufacturing in the context of the Balanced Scorecard development (Norton and Kaplan, 1992). The different features of construction and manufacturing are perhaps most exposed in the absence of disturbing factors such as weather, shifting ground conditions and encounter of unexpected objects in manufacturing. In manufacturing, all production is performed covered by roof which directly reduces uncertainty. The repeating nature of manufacturing also simplifies the collection of metrics as well as use of it, even if not all manufacturing processes can be expected to be repeated in consisting and certain environment. Despite the differentiation between the industries, the concept and phenomenon performance measurement should be suitable also for construction. Today, the measurement is performed in separate ways of each manager with a subjective approach. The subjective approach of performance though forms some complicatedness of the usefulness outcome of the assessment.

First, the monitoring of performance over time is hampered since most assessment notes are never shared or written, they are mainly used in order to

make sure the activity is finished on time. Potential improvement of performance can only be judged by the same manager and this improvement is as well as the first assessment subjective. Potential improvements would however be hard to prove anyway, since prerequisites change from one time to another, also within projects. To be able to see and manage improvements, a performance metric which not is connected to prerequisites and spatial conditions is required.

Secondly, the coordination of work is complicated. The purpose of subjective assessment is to be able to coordinate work, and in ongoing activities it completes this purpose. But as the assessment of performance rarely is shared, similar activities in future projects will suffer data from earlier performed activities which will complicate planning of these projects. Southard and Parente (2007) lifts organizational learning and knowledge transfer as one benefit gained from performance measurement, this is anyhow based on that experiences are shared, which not is the case in the examined setting. Nevertheless, the same argument with shifting prerequisites and conditions can be used again, because since these factors change, performance in one activity necessarily not have to serve satisfactory as benchmark to another similar activity performed with shifting prerequisites and conditions at another project.

The subjective assessment of performance can therefore be stated to clearly missing beneficial outcomes of performance measurement as improvements over time, coordination of work and organizational learning. To overcome this, an objective performance metric which disregards the changing prerequisites and spatial conditions must be developed. Worth noticing is that performance measurement will never be simply objective as people for example chose what to measure and how to interpret the result (Elg, 2007), an issue also mentioned in section 4.1.6, Laying of setts.

One of the most debated issues in performance measurement is the need for active measurement in order to support decision making. As performance is assessed by responsible manager, it in most cases already allows active support in the decision making process. The subjective assessment does however open up for ambiguous interpretation of the reality at site and may change from one person to another as the performance is assessed in the eye of the observer and not supported by objective metrics. The support in decisions will nevertheless remain as long as the decisions are made by the same person making the assessment. Conversely to decision making performed by one single person stands empowerment, which is emphasized as beneficial outcome of performance measurement by Ukko et al (2007) and Smithers and Walker (2000). In fact, empowerment is lifted as a tool for enhanced motivation (Dai et al, 2009, De Vries, 2004 and Santos et al, 2002) which in turn is one possible reason to the increased performance of organizations which make use of performance measurement. Empowerment can therefore be argued to be an important aspect of performance measurement.

Today's procedure of performance assessment does however not open up for empowerment and interpretation of the metric for workers. Therefore, managers in construction need to be aware of quote "*the few watching the many*"

in the interest of the few" (Sewell et al, 2011) telling that metrics used only for the interest of the managers may create tension between workers and managers. In order to improve performance, measurement instead should be used for interaction with workers to improve motivation. Measurement should be "*the few watching the many in the interest of the many*", or translated to construction environment, managers watching workers in the interest of both workers and managers. If this is succeed or not is to a high degree determined in the chosen style of leadership. A right handled performance measurement can serve as a contributor for leadership taking empowerment and interaction with workers in mind, but can never alone serve as a changing factor for improvements of performance.

Construction is characterized by complexity, uncertainty and fragmentation, which definitely complicate the recording of metrics, but above all complicates the use of measurement outcome. Spatial conflicts, confusion regarding blueprints, unexpected encounters under surface and weather changes can all require extra effort to record do to shifting conditions, but most of all they affect performance outcome. According to managers, either the effort to record or to sort out useable parts from performance measurement is in proportion to the usage, wherefore no objective collecting of metrics is done. As the situation is now, the procedure of performance assessment allows active support of decision making, however with uncertainties regarding the subjective approach and disregarded beneficial outcomes such as benchmarking, improvements over time and empowerment.

5.1.2 Contradiction between workers and managers

As described in section 4.2 *Workers and managers as one team?* I perceived an otherness how workers and managers experienced performance in general. While managers, which usually stand responsible for the project outcome regarding cost, time and quality, strive for high performance, workers demonstrated discontent towards the term, which is manifested in the quote "*it takes the time it takes, not longer, not shorter*". The quote was rooted in uncertainty of duration which characterized the performed activity and made completion time unclear. The quote does also demonstrate that worker not want to be evaluated, at least not with time as basis in such uncertain environment. This thought is also supported by the fact that workers did not appreciate the idea of piece-work contracts in paving of stone slabs, which also contradicts to Ukko et al's (2007) proposal of incentives linked to performance measurement in order to enhance motivation. In short, the workers have realized that in uncertain environment activities' length and performance cannot be determined in advance, and therefore no valid benchmark to compare against exist.

The period of two month spent as worker the summer before this thesis was written gained me perspective also on how workers interpret performance. That perspective also made me doubtful regarding the purpose of performance assessment as it is formed today. As stated in the theory and discussed above, the benefits from performance measurement are follow up, work coordination, improve of certain aspect of activities and above all, a help in decision making by the use of active instead of re-active measurement. All these are managerial tools

performed of managers on subordinates. From the worker's perspective, the use of performance assessment tends to focus more on a form of control than empowering and motivating instrument mentioned by Bourne et al (2005) and Ukko et al (2007). Control of construction progress is considered as exceptional complex due to the characteristics of construction which require intensive flow of information (Chan and Chans, 2004), but should not be neglected for that reason. On the contrary, control should be emphasized as focal point in management and developed along with workers. Strategic control can be beneficial if it is used according to Beatham et al's (2004) four categorizes mentioned in the theory. These enable benchmarking and confirm where focus should be. If the intention of the strategic control only is monitoring of employees, hazards regarding work motivation and tension between workforces and workmates may occur, which is the opposed of intended outcome of performance measurement.

In the examined setting, a tension between workers and managers could be traced. As pointed in section 5.1.1, The manager's perspective of performance measurement, managers perform subjective performance assessment of the employees, and will probably always do in some manner, but the result is rarely spread to workers performing the activity. Workers on their side tend to underrate the work performed by managers and want to do in their own way. According to workers, they spend most time at site and therefore know procedures taking place best. Still managers' responsibilities include several issues affecting the working life at site, for example ordering of material, contact with stakeholders and planning of activities. Workers often claim managers to not be able to perform these tasks satisfying enough, but due to this division of duties workers and managers are interdependent of each other. The overall impression was that workers are a bit dissatisfied with the situation, which perhaps derives from the differences pointed at in section 4.2, Workers and managers as one team? Other potential shortcomings are the lacking empowerment and impact in decision making for workers. According to theory, performance measurement should support empowerment by constant analysis and interpretation of result along with workers in order for workers to understand what and why measurement takes place.

The tension perceived between workers and managers was clearly expressed when a manager told a worker to speed up in pipe installation, see section 4.2. As the worker answered by silence and anger, the reprimand hit a sore point. For me, this behavior is linked to the displeasure of workers for being evaluated on performance as base, and consensus regarding planned performance cannot be assumed to exist. The Hawthorne effect, which should enhance motivation and performance by the knowledge of being observed can contrary be perceived as surveillance if observation becomes too hard control, which in turn decrease motivation and thereby also the performance. The border between observing and surveillance is indistinct and probably changing from one worker to another. As mentioned in the result, for workers the construction site is their home ground while the managers according to workers most of the time sits at the office with arms folded and when a manager reprimands workers on their home ground, they intrude on workers territory and steps over the border of control. If

used in the wrong way, the strategic control risk to have inverse effect and enhance the tension between workers and managers, which are supposed to work as one team in the strive to reach the project's objectives.

If performance measurement is used in the right manner and workers agreed upon the purpose of measurement, the beneficial outcome of performance measurement most probably will increase. As the situation is now, measurement is done in order to control that activities are on schedule and with desired quality, but the objectives are set by managers and the contract for the project is beyond the control of workers. If workers get an opportunity to be part of decision making, a deeper understanding of why performance measurement have to be performed will be gained together with an insight that the work done by workers really matters. This is all what empowerment is about, to include the workers in decision making and thereby improve their motivation to perform better. Inclusion in decision making would also enable erasing of the barrier between workers and managers as the distinction between their duties would decrease. Still, workers should do what they do best, namely perform activities at site. Decision making does not interfere with this, rather it is connected to it in a high degree.

The workers do however practice performance assessment of each other when comparing one owns performance with other's. This spoke for that performance assessment is done by all people at site, and since the managers got the responsibility for project outcome, it would be strange if they not did speak out if things not take place in the planned way. It also spoke for that control is requested of workers, but then in the interest for the many, not only with the interest for the managers. The high level of interdependencies between activities and also workforces in-between also require control in order to finish on appointed time. If not, a chain reaction of late start and unfinished activities might hit the project. To get away from the situation where managers have to monitor workers higher trust is needed. Unfortunately construction is featured by low trust (Green et al, 2005), which can be argued enhance the need for monitoring. As high level of monitoring might result in surveillance behavior which can be argued to degrade trust, a vicious circle regarding the need for control is operating in the construction environment.

5.2 Reflections of chosen method

In order to be able to answer the research questions an ethnographic study was chosen. Ethnographic studies are still rarely seen in the construction environment and the use if it is controversial. The method takes its origin in the study of people and cultures, and even though construction industry is about completion of tangible properties, the people performing the construction are the industry's most valuable asset. The people also form the environment in a high degree, making them representative for the culture of construction industry.

As ethnographic studies still are unseen in construction, this thesis partly serve the purpose of examine the chosen method's application to the construction industry. Pink et al (2010) point out the ad hoc nature of construction as

appropriate for ethnographic studies and Raftery et al (1997) emphasize the use of ethnographic studies as complement to conventionally used methods. I would on the one hand agree with the mentioned strengths of the method as I believe ethnographic studies can bridge gaps not yet identified in construction research. On the other hand, as proved in this study, the construction industry is characterized of its fragmentation, and thereby I would argue the ethnographic research outcome might change depending on chosen setting. With that in mind, transferring or generalization of research result might not be advantageous but still an explanatory insight of why things appear as they do can be achieved.

The purpose of ethnographic studies is to be part of the examined environment by being a participant in activities and meetings at same time as observations are done of acting and behavior of other participants and thereby interpretation of the context to a degree that research questions will be able to answer (Phelps and Horman, 2010, Rooke et al, 2004). As Rooke et al (2004) state, I am not the one who should examine if I have adapt to the setting to the same extent as all other members, but from my point of view I would argue I did, with the exception I did not in real act as manager with the responsibility to make decisions and govern the construction progress. The acclimatization to become a manager is however long, and the ability to observe behavior from the "outside" would be reduced if also I would have had the responsibility as an employed manager.

The adaption to the environment was made easier because I already from the start somehow knew the organization from my time as intern the summer before. This time, I had my own assignment as all other managers at the office, making me one of them. Still, I had no responsibility for any of the business, but as people from several departments share the same office, I was not the only one not allied by that reason. In opposite, my point of view was often asked for when complications arose at site. In total, I spent four months at the office, which by some can be seen as short for ethnographic studies, but the scale of this thesis would not enable more time. Therefore the time as intern was of value as it shortens the time for adaption and episodes perceived then were in some extent used. The time spent as workers did also opened my eyes for the situation for the workers. During the time for the writing of this thesis, I have identified myself as a manager rather than worker, but still, the time spent together with the workers added value to the working progress as I easier could identify myself in their situation. The divided time where some spent as worker and now as manager, helped me interpret the context in different ways which was making a holistic view easier to posturize. Therefore, I would argue, my interpretation of the examined context justifies the requirements to be able to answer the research question in a responsible manner.

6 Concluding remarks

This study has intended to bridge the gap between theory and practice regarding performance measurement in construction. Two research questions were developed with intension to govern the research progress in right direction. The concluding remarks will below be presented by answering these questions.

- Why is performance measurement generally not used and working in construction industry?

Performance measurement faces several barriers in construction. Construction characteristics such as complexity, uncertainty and fragmentation make subjective assessment used instead of objective measurement when performance is determined. These factors make measurement hard to perform, but on the other hand they also require measurement in order to control time, quality and other factors which can create chain reactions of failures and delays at the construction site. The control aspect of performance measurement can also easily be breached and instead become surveillance of workers, which might enhance the tension between workers and managers. This tension is to some degree already existing in the examined environment.

The concept of performance measurement include more than the metric itself, e.g. follow up performance, coordinate work, improve certain aspects of activities and assistant in decision making. These parts are already performed by managers in the examined environment, wherefore performance measurement can be argued to exist. Measurement is however not performed in the suggested way according to theory. The barriers mentioned complicate the use of performance measurement, but improvements can still be achieved in form of more objective metrics and in the use of measurement outcomes.

- What should performance measurement contain in order to be successfully used in the construction industry?

The concept performance measurement includes more than the measurement itself and can rather be linked to management practices than a sole, own activity. Many of these management practices already take place in construction, although they can be improved to enhance performance and atmosphere at site. Examples of improvement are constant analysis and interaction of result along with workers and empowerment to get workers involved in the decision making. To promote these aspect and along with knowledge transfer and organizational learning, a more objective approach to measurement is required. Further the hierarchy and differentiation between managers and workers can influence measurement negative if it is used mainly as control, which it can be perceived to be today. Control in order to stay on schedule and perform processes with desired quality is needed due to the characteristics in construction, but the control still has to be understood and accepted by workers performing the processes.

Further research in performance measurement not influenced to spatial prerequisites and conditions at site is requested in order to gain objective measurement to operative construction processes. Construction projects are all unique with own spatial prerequisites, conditions and organizational set ups, wherefore performance measurement have to overlook these variables.

Generalization of results from this study should be avoided or done with caution. The chosen methodology examines one specific setting in the construction industry. As mentioned the construction industry is characterized by fragmentation, hence another setting perhaps would result in other outcome.

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