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Lean assessments: A case study of benefits and criteria for design and implementation

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Problem description

Lean literature has developed, from a focus on industrial production to including the whole organisation and different sectors. Also, an increasing number of companies develop their own corporate lean programs, designed to fit the organisation. However, these developments are not evident in literature on lean assessments. In this study, we map the potential benefits of evaluating lean implementation, or leanness. Further, we seek to find criteria in the lean assessment process that are important to achieve the desired benefits.

Preface

This paper is a diploma project, written as the concluding part of a master's degree in Industrial Economics and Technology Management at the Norwegian University of Science and Technology (NTNU). The study has taken place during the spring semester of 2015. The authors have specialization in Strategy and International Business Development, and technical backgrounds within Computer Science, and Energy and Environmental Engineering. Prior to this thesis a pre-diploma study in the form of a literature review of lean assessments was conducted (Loktu and Mathisen, 2014) during the fall semester of 2014.

We would like to thank the managers and employees at Jotun who have helped us during this project. We have been met with openness and friendliness throughout the company, and getting to know Jotun has been a rewarding experience. Further, we would like to thank our supervisor Torbjørn Netland for guiding us through the process and giving valuable feedback.

Executive summary

With the globalized, highly competitive, and rapidly changing markets of today, many organisations develop *corporate lean programs* with the goal of increasing performance and remaining competitive. However, lean implementation is a complex process and many lean initiatives fail. Thus, to help managers monitor lean implementation efforts, a multitude of *lean assessments* have been presented in literature. These assessments measure lean maturity – to what degree lean is implemented in the organisation.

Many authors argue that lean assessments hold an important role in guiding lean implementation. Yet, little research has been done on *how* lean assessments actually affect lean implementation, and it is not clear whether the existing lean assessments found in literature are facilitating lean implementation efforts in an optimal way. Further, lean assessment literature does not seem to keep up with recent trends within lean literature: While companies are increasingly making tailor-made corporate lean programs, studies on lean assessments have little focus on whether or not assessments should be adjusted to fit the organisation. Also, experience has shown that many attempts to implement evaluation tools such as lean assessments fail. An assessment is successfully implemented when it is conducted regularly and results are being used for decision-making in a way that adds value to the organisation.

In light of these issues, we have performed a single-case study of the paint and coatings manufacturer The Jotun Group – with the aim to investigate how assessments should be designed and conducted to ensure they contribute optimally to lean implementation. Further, we contribute to the research on how lean assessments can add value to the organisation by identifying potential benefits and drawbacks, and important criteria that affect the success of lean assessments.

Because of the limitations in lean assessment literature, the topic of lean assessments has been analysed based on a broad theoretical background. The different contributions from literature are discussed in the literature review (chapter 3). Further, given the nature of our research questions, the case study approach was considered appropriate for the study. Empirical data has been gathered mainly through interviews with managers from eight different subsidiaries in Jotun. Observations and documents have however supplemented the interview-data. In the discussion section (chapter 6), empirical findings are presented and discussed in light of findings from literature. To ensure practical validity for managers, the study is structured in a process-oriented way, covering the whole assessment process.

We have found that lean assessments can contribute to lean implementation in several ways: They allow organisations to recognize improvements, thus guiding lean implementation and providing motivation for sustained improvements. Further, lean assessments facilitate internal

communication and learning, such as showing top-management commitment to lean and making progress more visible for employees. However, some drawbacks have also been identified, that managers need to be aware of.

To ensure that lean assessments contribute optimally to the organisation, it is important to choose the right design. The main criteria to consider are lean maturity and resource use. These criteria affect how sophisticated the assessment should be, how the assessment should be conducted, and to what degree the assessment must be adapted to the organisation or even to each subsidiary.

An evaluation of different approaches shows that self-assessments, where each unit assesses itself, have the most potential in providing motivational and learning effects. This is because these effects are achieved not only from reviewing results of assessments, but also from conducting the assessment. However, self-assessments are subjective. Also, they need to be easy to conduct – thus limiting assessment complexity. Other approaches hold different benefits, and can also be appropriate for lean assessments.

Further, we have found that it can be beneficial to adapt the lean assessment to the organisation. The importance of using the right measures means that applying general lean assessments from literature might not be appropriate, as measures should be in line with organisational objectives. Moreover, existing lean assessments are simple in their form, to be applicable to many organisations. Thus, they are not sophisticated enough to add value for high-maturity organisations. Lastly, internal differences in maturity levels can cause a need to adapt lean assessments within the organisation.

However, choosing an appropriate lean assessment does not ensure success of the assessment. We have found that several factors affect to what degree lean assessments are successfully implemented. The main factors are *communication, involvement,* and *management commitment and follow-up.* Based on these factors, and the design-issues discussed above, a framework has been developed, to guide managers through the assessment process.

Expectedly, the framework can assist managers in developing more effective assessments. It specifies what is important in different phases, and how to ensure successful implementation. The identified benefits and drawbacks are also important for managers, to clarify what one can expect from lean assessments. Finally, we offer several contributions to lean assessment literature: First, we have found that generally applicable lean assessments are not very helpful to organisations who have achieved some higher level of leanness, and thus research should focus on how lean assessments should be adapted to fit the organisation. Second, we have also identified benefits of assessments that have not previously been mentioned in literature, and that should be studied further.

Sammendrag

Dagens markeder er preget av globalisering, stor konkurranse og raske endringer. Mange organisasjoner utvikler derfor *organisasjonsspesifikke lean programmer* for å forbedre resultater og forbli konkurransedyktige. Men, impementering av lean er en komplisert prosess, og mange mislykkes. For å hjelpe ledere med innføring av lean har det derfor i litteraturen blitt utviklet et stort antall verktøy for å evaluere *lean modenhet* – i hvor stor grad lean har blitt innført i organisasjonen. Disse målesystemene kalles *lean assessments.*

Flere forfattere argumenterer for at lean assessments spiller en viktig rolle for i å veilede implementasjon av lean. Likevel sier litteraturen lite om akkurat hvordan lean assessments påvirker implementasjon av lean, og det er uklart hvorvidt eksisterende lean assessments bidrar optimalt til implementering av lean. Videre later ikke dagens lean assessment-litteratur til å hodle følge med utviklingen i *lean litteratur*: Mens organisasjoner i større grad utvikler organisasjonsspesifikke programmer, har forskning på lean assessments lite fokus på om lean assessments bør tilpasses til organisasjonen. Videre viser forskning at mange initiativer til innføring av slike måle-verktøy mislykkes. En lean assessment anses som vellykket når den gjennomføres med jevne mellomrom og resultatene aktivt benyttes til beslutningstaking på en måte som tilfører verdi til organisasjonen.

I lys av disse manglene i litteraturen er det blitt gjennomført en case studie av malingsleverandøren Jotun, der målet har vært å undersøke hvordan lean assessments bør utformes og gjennomføres for å sikre at de bidrar optimalt til implementasjon av lean. Videre bidrar vi til forskning på hvordan lean assessments kan tilføre bedriften verdi ved å kartlegge fordeler og ulemper, samt viktige kriterier som påvirker suksess.

På grunn av svakhetene i litteraturen som dekker lean assessments, har vi benyttet et bredt teoretisk perspektiv for å analysere temaet. De ulike bidragene fra litteratur er diskutert i litteraturstudien (kapittel 3). Videre har vi valgt å benytte en *case study* for å belyse forskningsspørsmålene. Empiriske funn har i hovedsak blitt innsamlet gjennom intervjuer med ledere fra 8 ulike lokasjoner i malingsselskapet Jotun. Observasjoner og dokumentasjon har blitt benyttet som supplement til intervju-dataen. Empiriske funn blir diskutert i lys av litteratur i diskusjonskapittelet (kapittel 6). For å sikre praktisk verdi for ledere er oppgaven strukturert på en prosess-orientert måte, der vi følger måle-prosessen fra start til slutt.

Våre funn viser at lean aseessments kan bidra til implementering av lean på flere måter: Ved å tydeliggjøre hvilke forbedringer som er oppnådd, bidrar de til å lede lean innføring videre og skape motivasjon for å fortsette med forbedringer. Videre kan lean assessments bidra til intern kommunikasjon og læring, blant annet gjennom å vise topplede lsens engasjement til lean, og å

synliggjøre fremgang for ansatte. Det er imidlertid også funnet noen ulemper ved lean assessments som ledere bør være klar over.

Det er svært viktig å velge rett utforming på lean assessmenten for å sikre at den bidrar optimalt i organisasjonen. Hovedkriteriene å vurdere i denne sammenheng er lean modenhet og ressursbruk. Disse kriteriene påvirker hvor sofistikert lean assessmenten bør være, hvordan målingen skal gjennomføres, og i hvor stor grad den bør tilpasses organisasjonen eller avdelingene.

En vurdering av ulike typer viser at selvevaluering (self-assessment) har størst potensial for å bidra til økt motivasjon og læring. Dette skyldes at disse effektene oppnås ikke bare gjennom å evaluere måleresultater, men også ved å delta på selve gjennomføringen. Selvevalueringer har imidlertid stor grad av subjektivitet. Dessuten må selvevalueringer være enkle å gjennomføre, noe som begrenser kompleksiteten av lean assessmenten. Andre evalueringsformer har andre fordeler, og kan også passe for lean assessment.

Videre viser funnene at det i kan være fordelaktig å tilpasse lean assessmenten til organisasjonen. Viktigheten av å benytte riktige måleparametere medfører at det å benytte ferdigutviklede lean assessments fra litteraturen ikke alltid er tilstrekkelig, fordi parameterne bør være i samsvar med organisasjonens mål. Dessuten er de ferdigutviklede lean assessmentene enkle i formen, for å kunne anvendes av mange organisasjoner. Derfor er de ikke sofistikerte nok for organisasjoner med høy modenhet. I tillegg kan ulikheter i modenhet mellom avdelinger forårsake et behov for tilpasning av lean assessmenten innad i organisasjonen.

Likevel, å velge riktig type lean assessment er ikke nok for å sikre dens suksess. Vi har funnet flere faktorer som påvirker i hvilken grad implementering av lean assessments lykkes. De viktigste er *kommunikasjon, involvering*, og ledelsens *engasjement og oppfølging*. Med utgangspunkt i disse faktorene, og design-kriteriene diskutert over, har vi utviklet et rammeverk som kan veilede ledere gjennom en lean assessment-prosess.

Rammeverket kan assistere ledere til å utvikle bedre lean assessments for sin organisasjon. Det spesifiserer hva som er viktig i ulike faser, og hvordan man sikrer vellykket implementering. Videre er de identifiserte fordelene og ulempene også viktige for ledere, fordi de hjelper til å formidle hva man kan forvente fra lean assessments. Denne oppgaven bidrar også til lean assessment-litteratur på flere måter: Våre funn viser at de ferdigutviklede lean assessments tilfører liten verdi til organisasjoner som allerede har oppnådd en viss lean modenhet, og forskning bør derfor undersøke mer rundt hvordan lean assessments bør tilpasses organisasjoner. Videre har vi identifisert fordeler med lean assessments som ikke finnes i eksisterende litteratur som også bør forskes nærmere på.

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1. Introduction

With the globalized, highly competitive, and rapidly changing markets of today, many organisations develop *corporate lean programs* with the goal of increasing performance and remaining competitive (Netland and Ferdows, 2014, Doolen and Hacker, 2005). However, lean implementation is a complex process and many lean initiatives fail (Domingues et al., 2014, Bhasin, 2012). Thus, in order to monitor lean implementation efforts, a multitude of *lean assessments* have been presented in literature. These assessments evaluate leanness, or lean maturity – *to what degree lean is implemented in the organisation* – by assessing a number of measures related to lean principles. In this study we apply a broad definition of the term "lean assessment", and consider all kinds of evaluation tools that measure lean implementation to be lean assessments.

Many authors claim that lean assessments play an important role in lean implementation. Bhasin (2008) describes lean assessments as a necessary roadmap to guide an organisation towards successful implementation of corporate lean programs. Malmbrandt and Ahlström (2013) highlight how the high risk of failure and substantial investments associated with lean implementation necessitates the assessment of progress. Further, Netland and Ferdows (2014) state that managers seeking further implementation of corporate lean programs must adapt their actions to plant maturity and therefore "must establish a reliable process for measuring this maturity".

Yet, besides arguing the necessity of showing improvements in complex lean implementations, little research has been done on how lean assessments actually affect lean implementation. Thus, it is not clear whether existing lean assessments in literature are facilitating lean implementation efforts in an optimal way. Further, Bititci et al. (2015) argue that while it is clear that higher maturity leads to higher performance, the role of maturity assessments in enabling the positive relationship between maturity and performance is not well understood.

Critics of lean assessments argue that the assessments might hamper lean implementation by steering attention away from developing a culture of continuous improvement, as the main focus will be on obtaining good results on assessments (Rother, 2010, Jørgensen et al., 2007, Netland et al., 2015). In addition, evidence shows that most attempts to implement formal measurement systems fail (Bourne et al., 2002), and measuring requires much resources and attention.

In addition to lack of research on the role of lean assessments in lean implementation, lean assessment literature does not seem to keep up with recent trends within lean literature. Traditionally, lean literature has largely focused on single lean practices in manufacturing (shop floors). More recent contributions however emphasize the benefits of integrating all lean practices into one system, and applying a more comprehensive view of lean including the whole organisation (Jørgensen et al., 2007, Shah and Ward, 2003). Further, there has been a trend in lean literature from focusing mainly on the manufacturing industry towards including other sectors such as service organisations (Malmbrandt and Ahlström, 2013).

However, in a literature review of lean assessment tools (Loktu and Mathisen, 2014) none of these trends where observed. It would seem that while lean literature has developed beyond manufacturing, lean assessments have not (Malmbrandt and Ahlström, 2013). Further, while an increasing number of organisations formulate their own version of lean in corporate lean programs, the literature presenting lean assessment tools have little focus on whether or not assessments should be adjusted to fit the organisation.

Based on the above argumentation, there is a need to investigate how assessments should be designed and conducted to ensure they contribute optimally to lean implementation. In addition, further research on how lean assessments can add value to the organisation is useful in understanding the relationship between lean assessments and organisational improvement. This study will therefore seek to answer the following research questions:

RQ1: What are the benefits of lean assessments?

RQ2: How should lean assessments be designed?

RQ3: How can companies succeed with lean assessments?

The questions are interrelated. The design of lean assessments should be done to achieve as many benefits as possible. Design will also matter to the success of lean assessments. Lean assessments are successful when they are used correctly and frequently, and contribute to organisational improvement.

Structure of the study

To answer the research questions, findings from relevant literature has been complemented with a case study. The structure of the study is illustrated in figure 1 below. To give an overview of the literature, will present the streams of literature included in this study in the theoretical background. In the literature review the different contributions from literature are then discussed against each other. The following methodology chapter presents the methods used for data collection in the case study. Then, we give a brief introduction to the case company, Jotun. In the discussion, empirical findings are presented and discussed in light of findings from literature. The discussion culminates into a process-framework for lean assessments. Finally, the conclusion summarizes the answers to the research questions and suggests contributions to theory, managers and future research.

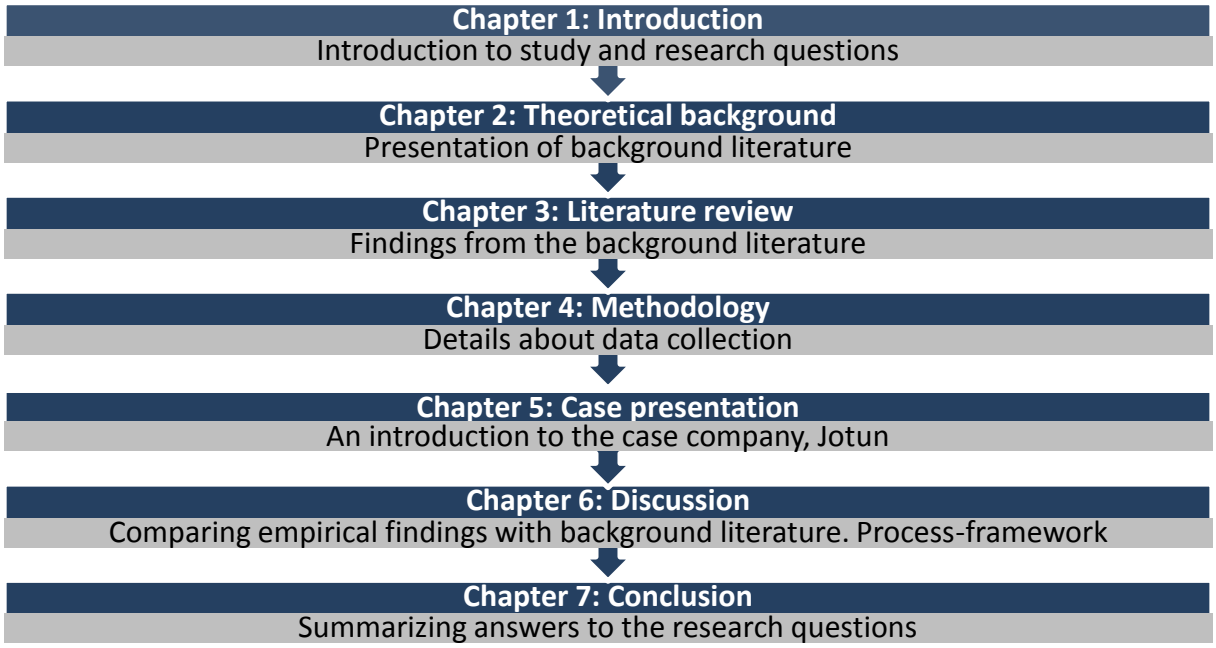

Figure 1: Structure of the study

2. Theoretical background

Literature suggests a multitude of different lean assessments meant to aid managers in monitoring progress of lean implementation. This literature is helpful to understand why lean assessments are important, and by providing examples of what lean assessments may encompass. However, it does not explain how lean assessments facilitate lean implementation, or how these assessments might be optimized. Thus, in order to further investigate these issues, we consider lean assessments in light of several streams of literature. This provides the opportunity for a multi-faceted discussion of lean assessments. An overview of the included literature is given in figure 2 below.

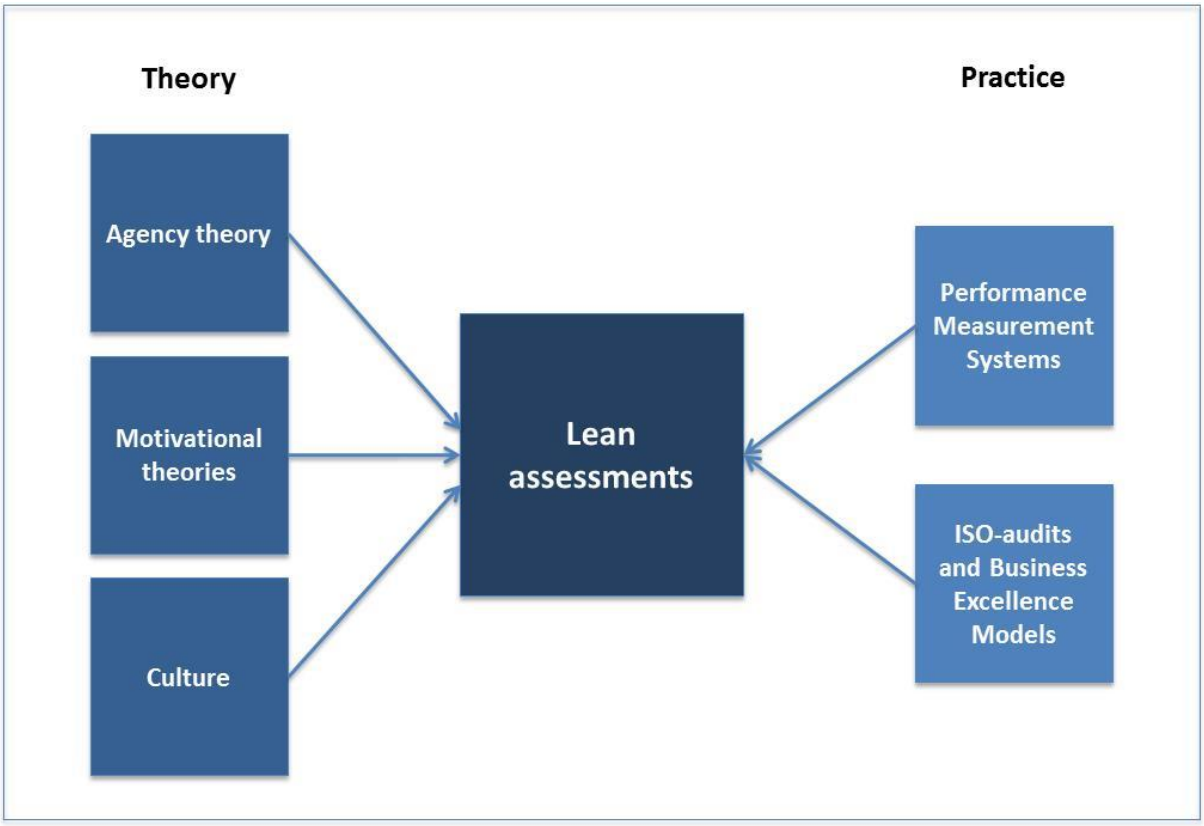

Figure 2: Overview of included literature

While literature on lean and lean assessments forms the foundation of the study, literature on other evaluation tools is also relevant. Some of these tools are even more used and discussed in literature than lean assessments. The similarities that these tools share with lean assessments mean that some aspects of them are largely applicable to the discussion of lean assessments. Therefore, literature related to *Performance Measurement Systems* (PMS), *ISO audits* and *Business excellence Models* (BEM) is also included in the study.

Because implementation of lean requires a change in corporate culture (Womack and Jones, 1996), the topics of human motivation and behaviour are arguably important. To address these issues, we have included *agency theory* and *motivational theory* in our research. While motivational theories seek to explain why people behave the way they do, agency theory suggest how to control agents (such as employees) based on certain assumptions about human behaviour. The two theoretical fields thus give insight to human behaviour at different conceptual levels. Using two partly opposing theories gives a broad insight, and can reveal different behavioural consequences of conducting lean assessments. Both theories are widely acknowledged, and receive great attention within organisational literature and education.

Lastly, we briefly consider cultural aspects of lean assessments. The case company in our study is a large multinational company with many subsidiaries spread across the world. Thus, the effect of national culture is relevant to consider because lean assessments will be conducted in different countries. Further, organisational culture should be considered because it can affect how lean assessments are perceived and received internally.

2.1. Lean, leanness, and lean assessments

Lean production is "an integrated socio-technical system whose main objective is to eliminate waste" (Shah and Ward, 2007). In the lean context, *waste* is any activity that does not add value to the product. Many of the buffers used in traditional mass production are deemed wasteful and should be eliminated, such as extra inventory, high-capacity equipment, or a many-tiered supplier base (Fullerton and Wempe, 2009).

Lean includes a number of different practices. Shah and Ward (2003) postulate four bundles of practices that together comprise lean: *Just-In-Time (JIT), Total Quality Management (TQM), Total Preventive Maintenance,* and *Human Resource Management (HRM)*. These practices are built upon the ground principles of lean, which include a strong focus on customer value, producing in accordance with customer demands (pull), and pursue perfection through continuous improvement (Womack and Jones, 1996).

Womack et al. (1990) claim that in comparison with traditional mass production, lean production requires less resources to create the same output. Further, the positive association between implementation of improvement programs, such as lean manufacturing and operational performance, has been well documented (Netland et al., 2015). The documented benefits of adopting lean principles are likely the reason why an increasing number of organisations are making their own corporate lean programs (Netland and Ferdows, 2014). Netland et al. (2015) argue that the primary question of interest is no longer whether lean can improve performance, but how to implement it with success. This supports the relevance of the research questions in our study.

Lean assessments evaluate to what degree lean is implemented in the organisation by measuring aspects related to lean principles and practices. The implementation level is commonly referred to as (lean) maturity level, or *leanness*. Maturity is associated with levels of sophistication achieved within a specific area and defines the level of formality, sophistication, and embeddedness of practices (Tortorella and Fogliatto, 2014, Bititci et al., 2015).

Leanness is not straightforward to measure however, and so lean assessments offer different solutions on how to do this (a review of lean assessments can be found in our pre-diploma study Loktu and Mathisen (2014)). Some lean assessment tools measure leanness simply by means of the number of lean practices implemented (Sânchez and Pérez, 2001, Gurumurthy and Kodali, 2009, Bhasin, 2008). Others evaluate the

implementation degree of each practice on a scale, for instance spanning from “no implementation” to “extensive implementation” (Shah and Ward, 2003).This allows for monitoring of improvement within each area. However, maturity levels can be difficult to assess correctly without a reference point, especially for companies who have just begun to adopt lean (Malmbrandt and Ahlström, 2013). Thus, instead of using a general scale, some lean assessments provide detailed descriptions of maturity levels to help managers assess correctly (Nightingale and Mize, 2002, Malmbrandt and Ahlström, 2013, Jørgensen et al., 2007).

Descriptions of maturity levels can be referred to as *maturity models*, and are usually defined on a scale from “ad-hoc” to “optimizing” (Bititci et al., 2015). To further explain such maturity scales, two examples of lean maturity levels are given in table 1.

Table 1: Examples of lean maturity levels

Level		Lean Capability Model (Jørgensen et al., 2007)	LESAT – process capability maturity levels (Nightingale and Mize, 2002)
Ad-hoc	**1**	Sporadic production optimization – pre-lean phase with only individual, unstructured improvement efforts.	Some awareness of lean practices – no adoption of lean. Occasional improvement activities may have been initiated in a few areas.
	2	Basic lean understanding and implementation – lean has been actively chosen as the basic manufacturing philosophy. Basic training has been given to the general workforce and managers, and pilot projects are initiated in isolated units of the organisation to experiment with the individual lean tools and methods.	General awareness – informal approach to improvements towards lean deployed in a few areas with varying degrees of effectiveness and sustainment. The organisation starts to search for appropriate tools and methods. Senior leaders adopt common vision of lean.
	3	Strategic lean interventions – lean is a part of the organisation's overall strategy and a part of HR-functions. Lean efforts are done according to an established plan.	Systematic approach – systematic methodology has been deployed in varying stages across most areas. The efforts are facilitated with metrics, and improvement gains are somewhat sustained. The lean vision is understood by most employees.
	4	Proactive lean culture – lean is a natural part of the daily work in the whole organisation as all members think and act lean, and continuous improvement is done by habit.	On-going refinement – there is continuous improvement across the enterprise, and gains from improvement are sustained. A common vision of lean is shared by the extended enterprise.
Opti-mizing	**5**	Lean in the EME (Extended Manufacturing Enterprise) – lean activities are no longer confined to the organisation, but include the whole value chain (referred to as EME).	Exceptional, well-defined and innovative approach – advanced level of lean deployed across the extended enterprise. Stakeholders are an active part in achieving the lean vision. The enterprise is recognized as having best practice.

From the descriptions of maturity levels, two observations can be made: Firstly, the lean vision seems to spread top-down, from managers to the rest of the organisation. Second, lean will first be implemented in parts of the organisation, before spreading throughout the whole organisation and even to stakeholders.

2.2. Other assessment tools

The ISO standards are a set of international standards providing requirements and guidelines within several sectors (ISO, 2015). Organisations that successfully implement the standard can be ISO certified – receive an official and externally validated certification that in some areas, such as quality, can be used to attest to the condition of the organisation. The certification is done by *ISO audits*. Literature on ISO standards is relevant to our study on lean assessments, because all organisations implementing certain standards are required to hold regular internal audits to secure sustained compliance with the standard. The ISO literature included in our study covers research on the effect of such internal audits. The ISO 9000 standards covers quality management (ISO, 2015), and are thus the ISO standard that is most closely related to lean implementation.

While the ISO standards give minimum requirements to be achieved, *business excellence models* (BEM) provide a standard of excellence, functioning as benchmarks organisations can compare themselves against. BEMs are used with the main purpose of identifying core strengths and improvement opportunities (Domingues et al., 2014). Examples are The Baldrige Excellence Program[1] and the European Foundation for Quality Management Excellence Model[2]. Their focus on improvements means that the underlying rationale behind BEM is similar to that of lean assessments – the main goal is improvement.

Performance measurement systems (PMS) is a field that is complementary to lean assessments. While lean assessments measure the existence of lean principles in the organisation, PMS measure changes in performance – which can be a consequence of lean implementation. PMS is an advancement of more traditional performance measurement based on accounting and financial measures (Bourne et al., 2000). A PMS can be defined as "the formal, information-based routines and procedures which managers use to maintain or alter patterns in organisational activities" with the goal to "steer the behaviour of people in the organisations towards achieving the results desired by the organisation" (de Waal, 2006). As with lean assessments, PMS are assumed to contribute to organisational improvement by providing precise data for decision-making and helping managers prioritize resource allocation; thereby improving production and efficiency (Ukko et al., 2007).

[1] http://www.nist.gov/baldrige/
[2] http://www.efqm.org/the-efqm-excellence-model

In addition to both lean assessments and PMS being focused on improvement measurement, there are other similarities between the two fields. An important similarity is in the background material used in literature. Several articles within both fields are based upon a balanced measurement approach, as described by Kaplan and Norton with their *Balanced Scorecard* (Kaplan and Norton, 1992, 1993). "The Balanced Scorecard" is designed to be a better alternative to traditional, accounting based performance measures, and formulates measures within financial, internal business, customer and innovation, and learning perspectives (Kaplan and Norton, 1992, 1993). Both PMS and lean assessment literature frequently emphasize the value of balancing traditional accounting-based measures with non-financial measures, referring to the work of Kaplan and Norton. On the basis of the strong similarities between PMS and lean assessment literature, findings in PMS literature should be largely applicable to our study on lean assessments.

However, the applicability of other assessment tools to our study of lean assessments is based on the assumption that people react similarly to different kinds of evaluations. Undoubtedly lean assessments share many similarities with PMS, ISO-audits and BEM, yet they are not exactly the same. Thus, generalizability needs to be considered when extracting findings from other evaluation tools to our study of lean assessments.

2.3. Agency theory

Agency theory addresses issues of cooperation and control in the relationship between a principal and an agent, where the agent is employed to act on the principal's behalf (Bergen et al., 1992). Such a principal-agent relationship can for instance be found between an employer and employee, or between an organisational headquarter and its subsidiaries. In the case of lean implementation, the principal's goal would be further implementation of the corporate lean program, a task that depends on the agent or subordinate's actions.

Agency theory is a branch of game theory, and applies methodology from economics to analyse principal-agent relationships (Kunz and Pfaff, 2002). Thus, the behaviour of the agent is explained by neo-classical assumptions about human behaviour as used in economic theories; self-interest, risk-aversion and bounded rationality (Bergen et al., 1992).

The major issue within agency theory is how the principal can ensure that the agent act as agreed, and so efficiency of the relationship is defined from the principal's point of view (Bergen et al., 1992). Because the agent is assumed to act out of self-interest, it is not given that the agent will behave in a way that is beneficial to the principal. An issue that can arise is *goal incongruence*, where the goals of the agent and principal are incompatible. Further, *information asymmetry* can give the agent to opportunity to shirk, as the principal does not have perfect information about the agent's actions and such information might be costly to obtain (Bergen et al., 1992, Kunz and Pfaff, 2002). Also, the agent is usually assumed to be risk-averse, while the principal is risk-neutral (Kunz and Pfaff, 2002). This difference in risk preferences lead to *the problem of risk-sharing*, causing the desired actions of the agent and principal to differ (Eisenhardt, 1989a).

When agents do not act in the interest of principals, *agency loss* occurs. The term describes the difference between the optimal outcome for the principal and the outcome resulting from the agent's actions (Eisenhardt, 1989a). Agency theory offers *two main mechanisms* to deal with agency loss:

- Either by co-alignment of goals by use of *outcome-based incentives*, where rewards are linked to outcomes,
- or by utilizing *information systems* so the principal can monitor what the agent is doing – thereby reducing the risk of opportunistic behaviour (Eisenhardt, 1989a).

Obtaining information about the agent by monitoring can be costly, especially if information is not easily available. However, using outcome-based incentives will transfer risk to the agent. As the agent is assumed to be risk-averse, transfer of risk might be costly as well. Thus, there is a trade-off between the cost of monitoring versus the cost of transferring risk to the agent by outcome-based incentives (Bergen et al., 1992).

Agency theory focuses on the optimal use of the two mechanisms to govern the principal-agent relationship. *Lean assessments* can represent an information system, providing the principal with information about the agent's progress in lean implementation. If the lean assessment is connected to a reward system, it can also be used as a basis for outcome-based incentives. Agency theory offers guidelines towards what mechanism one should chose, and it is clear that it can offer several insights to the field of lean assessments.

Although being widely applied both in management education and real life business, agency theory has often been criticized for its neo-classical assumptions about human behaviour (Kunz and Pfaff, 2002). The idea of rational humans acting strictly out of self-interest and maximizing own utility is seen as too harsh, and critics of agency theory argue that it fails to consider the concept of human motivation (Kunz and Pfaff, 2002). Still, as lean implementation is usually a top-down process, agency theory's focus on hierarchical relationships contributes to the discussion of how management can drive lean progress. Further, the motivational theories included in this study ensure that effects of human motivation have not been omitted.

2.4. Motivational theories

Motivational theories can be seen as a contrast to agency theory: Instead of making assumptions about human behaviour, motivational theories try to explain why people act the way they do. As lean assessments can be expected to affect performance by controlling behaviour, motivational theory is clearly relevant to this study. "Motivational theory" is a term used to cover several different theories about human motivation. For the topic of lean assessments and the effect on human behaviour we will apply some motivational theories commonly used to explain work motivation: *Maslow's hierarchy of needs, Herzberg's two-factor theory*, and *McGregor's Theory X and Theory Y*.

A famous and early contribution to motivational theory is *Maslow's hierarchy of needs*. It is a simple and intuitive model, and can be used to understand the foundations of employee motivation. Maslow suggests that human needs can be divided into a hierarchy with five levels of importance. Starting with the most basic, the levels are: *Physiological, safety, love, esteem and self-actualization* (Maslow, 1943). The first three levels represent basic needs. These basic needs have to be in place before higher levels of needs are pursued: As long as basic needs are unfulfilled, it is impossible for the human being to focus on achieving higher levels.

Further, *Herzberg's two-factor theory*, also called the motivation-hygiene theory, is one of the most replicated studies in the field of job attitudes (Herzberg, 1987). Herzberg differentiates between two types of factors in the workplace – hygiene and motivational factors. *Hygiene factors* are related to basic human needs and are necessary in order to avoid job dissatisfaction. Examples are working conditions and salary. However, Herzberg argues that these factors do not contribute to job motivation. This is because he claims that the opposite of "job dissatisfaction" is not "job satisfaction", but "*no* job

dissatisfaction". *Motivational factors*, on the other hand, have the power to improve employees' intrinsic motivation and job satisfaction. They concern humans' ability to experience psychological growth and fulfilment through personal and organisational achievements; and include recognition, achievement and advancement. The two types of factors are complementary: Hygiene factors need to be in place to avoid employee dissatisfaction, which is a necessary prerequisite for motivating workers through appropriate motivational factors.

Herzberg further emphasizes the importance of intrinsic motivation over extrinsic rewards. Intrinsic motivation is motivation independent of external factors, and can be triggered by utilizing motivational factors (Herzberg, 1987). This is contrary to extrinsic motivation, where employees act in a certain way to achieve some sort of explicit reward (for example a bonus), or to avoid penalties. Herzberg (1987) argues that while extrinsic motivation must be repeated to sustain change, only intrinsic motivation is truly motivational and can ensure continuous performance.

Douglas McGregor's Theory X and Theory Y (1960) is yet another important and recognized contribution to motivational theory. Theory X and Y represent two divergent and self-fulfilling sets of management philosophies (McGregor, 1960). *Theory X* characterizes an authoritarian management style and assumes that individuals have an inherent tendency to shirk and avoid work. Thus, there is a need to strictly control employees' actions (Carson, 2005). On the opposite side, *Theory Y* proposes a participative management style based on the idea that employees will do their best in order to reach organisational goals. It assumes that employees have self-control and direction, and that they seek responsibilities (Carson, 2005). Moreover, Theory Y assumes that working is the only way people can obtain their need for self-actualization and achievement.

McGregor (1960) argue that Theory X and Y is self-fulfilling, in the way that employees' behaviour are affected by how managers expect them to behave. Thus, the "Theory X kind of manager" is more likely to have workers with a negative work attitude, while the opposite is true for managers holding the Theory Y mindset.

Continuous improvement is a main principle within lean, and lean should be seen as a never ending journey, rather than a state to be reached (Karlsson and Ahlström, 1996). Thus, implementing lean in an organisation requires lasting changes not only in everyday practices, but also in organisational culture (Womack and Jones, 1996).

Applying the above motivational theories, it is clear that continuous improvement can only be sustained by having intrinsically motivated members in the organisation. Thus, lean assessment initiatives should be focused on yielding intrinsic motivation for improvement by satisfying workers' need for esteem and self-actualization. To maintain continuous improvement by extrinsic motivation will require the extrinsic reward to be provided repeatedly, which would be inefficient in the long run (Herzberg, 1987). Triggering intrinsic motivation would be a more sustainable and efficient solution.

Further, to avoid assessments being interpreted as a tool applied by distrusting managers to monitor subordinates' every move, it is of key importance to avoid the assessment being interpreted as a "Theory X kind of management tool", as it could hamper the desired outcomes of the assessment by damaging worker motivation.

It is important to note that motivational theories are simplifications of very complex and unpredictable aspects (Herzberg, 1987), merely human needs, psychology and behaviour. Every human is different, and making generalizations about human behaviour cannot be done accurately. However, motivational theories do not focus on the individual as much as how the behaviour of people in the organisation in general can be affected. The massive attention these theories have achieved in the management world, speak for their validity and relevance, and in this study they are valuable in providing balance to agency theory.

2.5. Culture

Culture can be defined as "the collective programming of the mind that distinguishes one group or category of people from another" (Hofstede, 2001). Thus, culture affects the way people behave and how they perceive things, and can cause people to react differently to the same information (de Waal, 2006). In the literature reviewed for this study, two types of culture are mentioned: *National and organisational culture*. While national culture refers to differences between national populations, organisational culture entails corporate values and ways of doing business.

Authors writing about multinational corporations often include *national culture* as a contextual variable in their studies. National culture is important to be aware of because it is "a central organizing principle of employees' understanding of work, their approach to it, and the way in which they expect to be treated" (Newman and Nollen, 1996). Globalization has led to an increase in multinational organisations, and encouraged

these organisations to seek competitive advantages through standardization and coordination (Busco et al., 2008). However, at the same time there is a need for flexibility and local responsiveness (Busco et al., 2008). Thus, a main issue is the balance between centralization across the organisation, and being responsive to local conditions. For multinational corporations conducting lean assessments, an issue might be whether or not to adapt the assessment to local culture and other conditions.

Organisational culture can also affect how lean assessments should be conducted. Organisational culture affects what people find important, and how they expect things to be done (Henri, 2006). Opposing these fundamental values and norms will likely raise resistance and negative reactions, and so organisational culture should be considered in assessment design and implementation. Further, from PMS literature it is found that organisational culture affect how assessments are used. Managers in firms representing values of *openness, adaptability* and *responsiveness* use PMS to focus attention, support strategic decision-making and legitimize actions to a larger degree than managers in firms where *predictability, stability* and *conformity* are fundamental values (Henri, 2006, Bititci et al., 2015). The use of maturity assessments is found to be more effective in firms representing the first type of values (Bititci et al., 2015). Thus, organisational culture affects both how lean assessments should be designed and conducted, and also how effective they are likely to be.

Both organisational and national culture appear frequently as important factors both within PMS and lean literature. This proves relevance of the topic, and it is too important to omit. However, a complete analysis of the effect of culture on lean assessments is a field to study in itself, and outside the scope of this study. Thus, culture is included as a contextual factor in certain parts of the analysis, but details about the effect of culture on lean assessment will not be discussed.

3. Literature review

In this section, we will present findings from the background literature. The first part of the literature review gives an introduction to audits and assessments: First, potential benefits and drawbacks with assessments are described. Second, different types of audits and assessments will be explained, to give an overview of what evaluation tools exist, and to clarify terminology. Third, we outline some special considerations that need to me made when measuring leanness, due to the distinct traits of the lean philosophy.

The final part of this section outlines the assessment process, from design and implementation to use and update. This process structure has been chosen to increase practical value to managers. The structure of the literature review is outlined in figure 3.

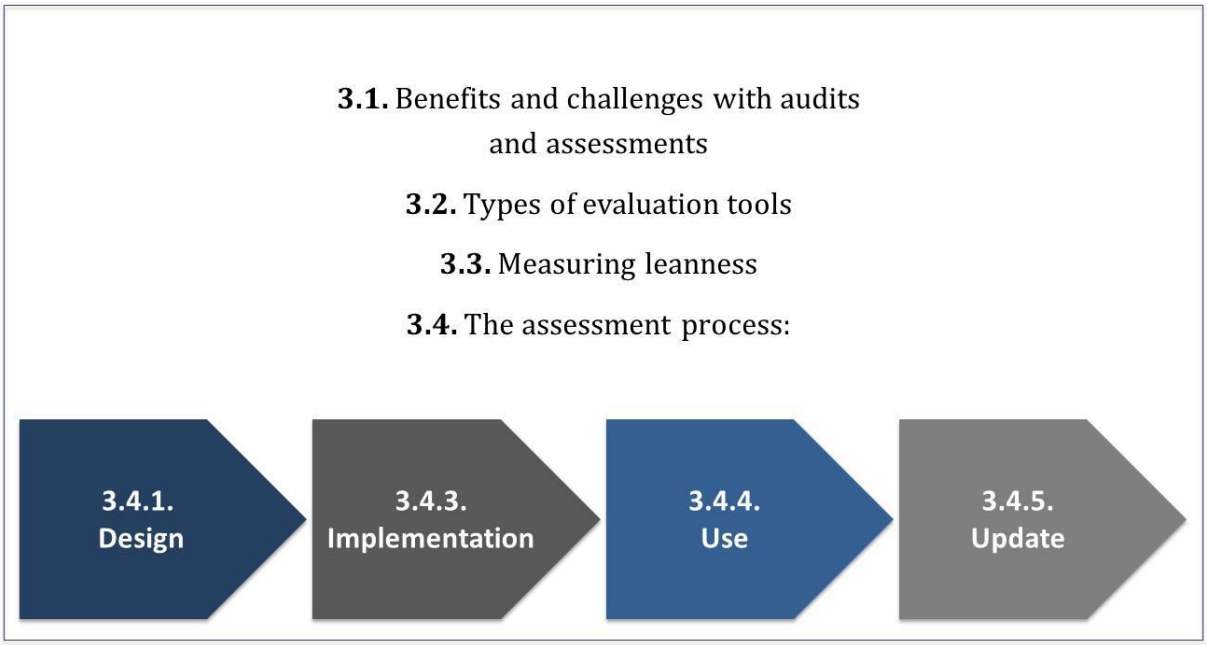

Figure 3: Structure of the literature review

3.1. Benefits and challenges with audits and assessments

Several studies highlight the importance of measuring progress in organisational improvement, such as progress in implementation of lean. The proponents of such measurement state that changes must be measured and evaluated if organisations are to recognize improvements (Karapetrovic and Willborn, 2001b), that monitoring which activities are going well is essential in sustaining continuous improvement (Williams et al., 2006), and that lean assessments act as a necessary roadmap to achieve successful implementation of lean (Bhasin, 2008).

Further, lean assessments can provide a foundation for managers to compare plants, facilitate organisational learning and transfer of expertise and practices, and have a symbolic value in showing company commitment to the corporate lean program (Netland and Ferdows, 2014, Netland et al., 2015, Bititci et al., 2015). Thus, assessments facilitate internal communication and learning in organisations. This is further confirmed by PMS literature, such as Ukko et al. (2007), who state that "Performance measurement can be seen as a way to *communicate the company's vision* to the whole organisation." Similarly, Busco et al. (2008) sees PMS as a set of practices that support processes of "strategic decision making, planning and control", and in addition, "carry organisational knowledge and rationales across organisations."

From an agency perspective, when implementing corporate lean programs there is a need for the principal (who wants to implement lean) to receive information about the progress of the implementation process to verify whether agents are acting as agreed (Bergen et al., 1992, Eisenhardt, 1989a). Lean assessments contribute to the success of the implementation efforts by allowing the principal to monitor the agent, and thus reducing the agent's opportunities to shirk, or avoid lean implementation.

Considering motivational theories, lean assessments can act as motivation for lean implementation by appealing to the human needs for achievement and self-fulfilment. Those performing the assessments gain deeper insight into the processes at hand, and become more aware of what progress has been made and where further improvement efforts should be directed. Over time, the use of lean assessments can potentially create intrinsic motivation for continuous improvement.

Evaluation can also help lower-level employees see progress more clear. Ukko et al. (2007) found that before PMS was used in their case companies, changes and

achievements were obvious to management, but employees did not see new routines as clearly. The use of PMS made progress clearer to all, as more information was available for everyone. They also found that the case companies experienced that PMS brought frames to the content of personnel development discussion, and that difficult issues were easier to handle with exact information: "The greater amount of more specific and exploitable information provide a more solid base for management-employee communication" (Ukko et al., 2007).

Applying the findings from literature to lean assessments, the benefits of assessments go beyond that of identifying improvements in lean implementation. However, while there are many proponents of the use of measurement tools, some criticism can also be found in literature.

The critics of lean assessments claim that assessments can obstruct the attention of the organisation, causing it to over-focus on assessment results and lose sight of what is really important (Jørgensen et al., 2007, Rother, 2010, Netland et al., 2015). Rother (2010) question the value of lean assessments and state that "Problems arise when awards are linked to completion or implementation of activities, which is easy to measure, rather than to attainment of a level of personal competency or of target conditions, which, admittedly, is more difficult to measure" (Rother, 2010, p. 257). This is supported by Jørgensen et al. (2007) who claims that too much focus on lean implementation actually hampers the development of a lean culture. A weakness of lean assessments is thus the difficulty of measuring changes in more abstract aspects, such as culture and human development.

Rother (2010) further argue that the use of metrics can only be an abstraction of reality, and by focusing on them managers lose track of reality and set incorrect targets based in incorrect assumptions. Also, the indirect and subsequent nature of lean assessments means that small problems can be overlooked, and results easily manipulated to give overly positive results (Rother, 2010). Thus, assessments can actually cause the organisation to miss out on opportunities for incremental improvements; improvements that could only have been identified by maintaining focus on details of the real situation in real time (Rother, 2010).

Still, a number of studies find evidence for the positive relationship between assessments and improved organisational performance. Camacho-Miñano et al. (2012) find that there is indeed a link between the use of lean assessments and the observation

of significant, positive impacts on financial results. Further, Evans (2004) concluded that organisations with more mature PMS reported better results in terms of customer, financial, and market performance – implying that the positive effect on performance increases with the sustained use of assessments. Thus, the use of evaluation tools positively affects performance. In the case of lean assessments, this effect will most likely be due to the assessments contributing to increased implementation of lean.

However, some studies find contradictions in the effect of measurement tools on organisational performance. Bourne et al. (2005) reviewed 99 papers on the impact of PMS on organisational performance. They concluded that the majority of papers found a positive relationship, however, further analysis revealed that the more rigorous the research method used, this positive impact was less likely to be found. Ukko et al. (2007) also observe some contradictions in research findings concerning the positive impact of balanced scorecards on financial performance. Further, Netland et al. (2015) finds no relation between lean implementation and internal audits initiated by factory management.

Bourne et al. (2005) consider the contradictory findings regarding the impact of performance measurement on organisational performance. Given that the effect of measurement on performance is so widely covered in literature, they argue that rather than discussing whether or not performance measurement is useful, a more relevant question is "under what circumstances does performance measurement positively impact organisational performance?" The case is similar for lean assessments. Although findings are not conclusive, empirical evidence in literature largely confirms that lean implementation positively affects performance, and that lean assessments facilitate lean implementation. Thus, *when* and *how* the positive effect of lean assessments on lean implementation can be optimized is a more relevant question than whether lean assessments affect lean implementation positively.

A final challenge of using measurement tools such as lean assessments is the resource use associated with conducting assessments. As proposed by agency theory, information is costly to obtain (Bergen et al., 1992, Kunz and Pfaff, 2002). The assessment might become expensive, both in terms of monetary costs and in applying additional workloads on whoever performs the assessment. With regards to lean implementation, such investments can be hard to justify, as benefits from lean assessments are not easily quantified in real-life situations (Bhasin, 2008). Thus, there is a trade-off between the efforts required to conduct the assessment, and the benefits realized by conducting it.

This trade-off is difficult to evaluate, as the investments made in lean projects are much more easily quantifiable than the associated benefits.

To summarize, there are many benefits with audits and assessments that can be found in literature, in addition to that of simply monitoring progress. However, some potential drawbacks are also found. The benefits and drawbacks are summarized in table 2.

Table 2: Benefits and drawbacks of evaluation found in literature

Benefits	Drawbacks
- Increased financial performance - Can help identify and recognize improvements: • Sustain continuous improvement • Guide improvement processes • Monitor employee efforts • Lead to increased motivation • Clarify improvement for employees • Communicate top management priorities - Show management commitment to the improvement program - Provide a foundation for comparing plants (benchmarking) - Facilitate learning and transfer of knowledge - Improve internal communication	- Can draw focus to assessment results, and away from development of lean culture - Employees can have fear of measurement - Distorted focus causes small issues to be over-looked - Difficult to measure important, abstract aspects of lean implementation - Assessment results is only an abstraction of reality and can lead managers to make wrong decisions - Potentially resource-demanding - Poor results can hinder further motivation for improvements

3.2. Types of evaluation tools

The background literature widely covers topics of evaluation and measurement within the organisational context. However, the terminology used to explain such topics is not clearly defined, and there seems to be a "terminology haze" (Bititci et al., 2015). Terms such as "audits", "assessments", and "maturity models" are used about quite similar matters; where the general goal is to identify gaps between the actual and ideal state of some aspect of the organisation. Thus, a discussion of different terms and types of evaluations is needed, to facilitate our further discussion of lean assessments. In this section we will therefore describe how we define and differentiate audits and improvement assessments.

The different types of evaluations that exist within an organisation can be differentiated by how the evaluation is done. Some evaluations focus on compliance with a set of criteria defined by a standard. We refer to such evaluations as *audits*, based on the definition made by Domingues et al. (2014): "[an audit is] *a systematic, independent and documented process aiming at the collection of evidence and assessment of a management system concerning the fulfilment, and to the extension of that fulfilment on the criteria defined by the standard.*" The results of audits will either be "compliance" or "non-compliance" (Karapetrovic and Willborn, 2001a).

Two kinds of audits can typically be found within organisations today. First, organisations are required by law to have certain audits; such as health, safety, and environment (HSE) audits and financial audits. Of course, the audits required depend on local legislation. In Norway, organisations are required to have internal HSE audits regularly, followed-up by external audits done by governmental bodies to ensure compliance[3]. These *legally required audits* are must haves and need to get high priority, as the consequences of non-compliance include fines and other penalties. The strictness associated with such audits means that the results are commonly given as a list of deviations that the organisation needs to solve within a given timeframe.

Second, organisations also do audits against certification standards, where compliance with the set standards results in formal certifications of the organisation. The most common standards used for this purpose are the ISO standards, such as ISO 9001 (quality management) and ISO14001 (environmental management) (ISO, 2015). The ISO standards are a set of international standards covering a variety of aspects, and

[3] http://www.arbeidstilsynet.no/artikkel.html?tid=78629#7

organisations can be audited against these standards in order to receive ISO certifications. Such *certification audits* are often done as a part of marketing. The use of these audits for external verification means the demand for documentation is comprehensive, to ensure reliability.

While audits give feedback in terms of "pass" or "fail", other evaluation tools seek to identify progress and improvement opportunities. We will refer to such tools as *improvement assessments*. These assessments are conducted for internal use only, and results are typically discussed at internal meetings or otherwise used in internal communication as part of improvement efforts. This category includes, among others, lean assessments and business excellence models (BEM). They differ from audits in that they are not based on external standards or legislation, but are completely voluntary. In addition, it is the organisation itself that sets out goals of the assessment and decides how and when to conduct it. The purpose of improvement assessments is also different from that of audits, as organisations do them to achieve internal improvement and not to provide assurance of compliance with some external norm (Karapetrovic and Willborn, 2001a).

Audits and improvement assessments have different advantages and drawbacks. Objectivity is a main benefit of audits (Karapetrovic and Willborn, 2001a), and is of key importance if results are to be communicated to external parties, or used to verify legal matters. However, the confirmation of compliance against minimum requirements gives little incentive for improvement beyond the standards. Thus, audits are less appropriate for improvement work. Once all requirements are met, no further improvement will be evident in the audit results. Still, studies show that the ISO 9001 internal audit can contribute to the achievement of business goals, and that it predominantly has a positive effect on organisational performance (Alic and Borut, 2010).

While the contribution of audits to organisational improvement is debated, the results of studies are less diverse with regards to the effect of improvement assessments, such as lean assessments and BEM (Karapetrovic and Willborn, 2001a). There seems to be agreement that these can contribute to improvement. Knowing the differences between audits and improvement assessments, it is logical that improvement assessments have more potential for contributing to improvement: While audits can only tell whether an organisation is doing "well", improvement assessments can show "*how* well".

A summary of the differences between audits and improvement assessments is given in table 3. It should be noted that this crude distinction between audits and improvement assessments is not absolute – improvement suggestions might very well be part of an HSE audit and a lean assessment might be in the form of a simple checklist.

Table 3: Definition of audits and improvement assessments

	Audits	Improvement assessments
Focus	Compliance with a set of criteria defined by some standard or law.	Evaluate and determine current status, identify achieved changes and improvement opportunities.
Results	Compliance or on-compliance, list of deviations.	Overview of achievements and future opportunities.
Motivation	Legal requirements, external validation.	Facilitate further improvement.
Typical examples	HSE audit, ISO audit, financial audit	Lean assessments, BEM

3.3. Measuring leanness

Lean production has special traits that must be considered when measuring leanness. The many principles and practices that lean comprise means that corporate lean programs are complex systems. Monitoring the implementation of any improvement program is a challenging task. Assessing a bundle of management systems, such as corporate lean programs, is even more challenging (Camacho-Miñano et al., 2012). Further, continuous improvement is a main principle within lean, and lean should be seen as a never ending journey rather than a state to be reached (Karlsson and Ahlström, 1996). Thus, one should evaluate progress in lean implementation by studying *changes* in the variables over a period of time, and not their actual values (Karlsson and Ahlström, 1996, Bhasin, 2012).

The importance of long-term thinking in lean implementation is enhanced by the fact that lean efforts can have none, or even negative effects on financial performance in the early stages (Karlsson and Ahlström, 1996, Netland and Ferdows, 2014). Thus, lean assessments need to uncover other aspects to reveal whether or not there has actually been any progress. These issues are discussed by Rother (2010) in his critique of lean assessments: “Levels should be awarded based on the student’s [organisation’s]

demonstrated capability or achievement of target conditions, not on how many courses or practices have been completed or tools implemented" (p. 257).

However, even though assessing leanness is challenging, the complexity and longitude of lean implementation can be used as an argument for lean assessments. As mentioned in chapter 2.3, agency theory applies "information systems" as one of two mechanisms principals can use to ensure agent compliance (Eisenhardt, 1989a). Lean assessments can be seen as such an information system, allowing the principal, or manager, to monitor progress in lean implementation. According to agency theory, the use of information systems is preferred over outcome-based incentives if (Eisenhardt, 1989a, Bergen et al., 1992):

- The relationship is long-term
- The goal conflict is small
- Outcome or environmental uncertainty is high, or outcomes are not easily measured
- The cost of transferring risk to the agent is high, or the costs of monitoring an agent's actions are low

Considering lean implementation in the light of these guidelines, lean assessments are more appropriate than linking rewards to improvements. First, the principal and agents in the implementation of a corporate lean program will likely be people within the same organisation, but at different hierarchical levels (e.g. executive and manager, or manager and shop floor employee). Thus, *the relationship between the parties is relatively long-term* – the principal and the agent are expected to be continuously interacting in the foreseeable future.

Second, one can assume that *outcome uncertainty is high* in lean implementation, especially if seen from the agent's point of view. The agent, whose lean efforts stem from the principal's wish to implement lean, is likely not certain about the payoffs of lean implementation. Thus, transferring risk to the agent by outcome-based incentives will be relatively expensive (Eisenhardt, 1989a). The high outcome uncertainty follows from the fact that *the outcomes of lean efforts are not easily measured* (Netland et al., 2015). The benefits of implementing lean must be measured over a long period of time to be observable (Karlsson and Ahlström, 1996, Netland and Ferdows, 2014), and causalities between measures and results are difficult to establish with certainty. Thus, measuring leanness is a complex process, and improvements can be difficult to measure accurately (Netland et al., 2015).

Finally, assuming that all members of the organisation are better off if the organisation is performing better, *the goal conflict is likely relatively small*. However, this assumption might not be valid in all cases. Although improving performance could increase job security for the employees by making the organisation less vulnerable, becoming leaner can also reduce the need for staff, thus enabling organisations to reduce the workforce. Of such, the assumption that goal conflicts in lean implementation are small is conditional and depends on organisational context. Still, from an agency perspective the characteristics of lean suggest that outcome-based incentives are not appropriate in driving lean implementation, and executives should rather rely on information systems such as lean assessments.

The conclusions based on agency theory are in congruence with arguments from motivational theory. Applying the motivational theories, it is clear that continuous improvement can only be achieved by having intrinsically motivated members in the organisation. To maintain continuous improvement by extrinsic motivation will require the extrinsic reward to be provided repeatedly, which is inefficient in the long run (Herzberg, 1987). Triggering intrinsic motivation would be a more sustainable and efficient solution. Thus, lean assessment initiatives should be focused on yielding intrinsic motivation for improvement by satisfying workers' need for esteem and self-actualization. As outcome-based incentives are a prime example of extrinsic motivation, this emphasis on intrinsic over extrinsic motivation is in congruence with agency theory.

Agency and motivational theories support that lean assessments in general are an appropriate way to facilitate lean implementation, given the characteristics of the lean philosophy. However, there are many ways to assess leanness, and different lean assessments will be applicable to different organisations and situations. In our pre-diploma project (Loktu and Mathisen, 2014), we reviewed 22 articles outlining lean assessment tools, and found that the assessments differ in their *complexity of measurement* and *efforts needed to conduct* them. Thus, the *leanness* of the organisation and *resource use* was found to be the two most important criteria when selecting which type of assessment to use. This is in agreement with Almomani et al. (2014), who argue that existing lean assessment tools are different in terms of their easiness and cost to use, level of detail, and their ability to generate metrics.

Organisations with higher levels of leanness require more sophisticated lean assessments than those who have low lean maturity (Loktu and Mathisen, 2014). Further, organisational leanness is not only associated with how complex the lean

assessment should be, but also how large part of the organisation needs to be assessed. Jørgensen et al. (2007) emphasize that initial lean efforts will usually be directed towards production processes, but as the organisation achieves higher degrees of leanness the lean focus spreads out to include an increasing share of the organisation, such as sales departments and human resources. Therefore, more mature organisations have to assess larger parts of the organisation if they want to identify all progress, thus adding to the cost of the assessment.

In summary, even though lean assessments can be challenging, they are a better option than outcome-based financial rewards when it comes to driving progress in lean implementation. This is mainly due to the complexity and longitude associated with lean implementation. Also, there are different kinds of lean assessments, and the main selection criteria when finding an appropriate lean assessment are lean maturity and resource-use.

3.4. The assessment process

Thus far in the literature review we have outlined benefits and drawbacks associated with audits and assessments, explained evaluation terminology, and presented important aspects of measuring leanness. To ensure that the results of our study can be of practical value to managers, the remaining part of the literature review will be represented in a process-oriented way. We follow the structure of Bourne et al. (2000) who divides the development of assessments into the phases *design, implementation, use,* and *update*, as illustrated in figure 4. The different phases require different approaches.

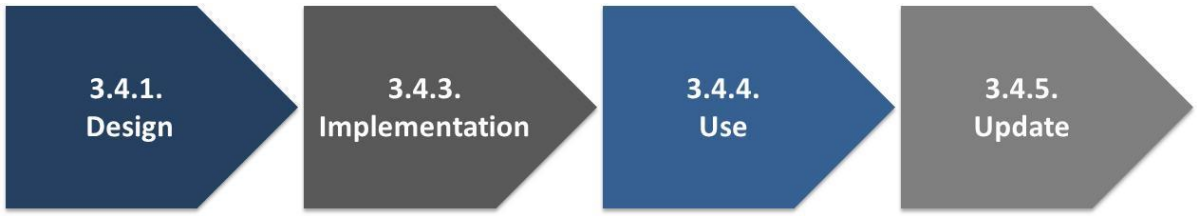

Figure 4: The assessment process (as defined by Bourne et al. (2000))

3.4.1. Design

A key issue in measurement is that that poorly designed measures can result in dysfunctional behaviour, hampering improvement rather than enhancing it as they encourage individuals to pursue inappropriate courses of action (Neely et al., 1997, Bhasin, 2008). To ensure positive assessment results, people will modify their behaviour – even if this means deviating from the correct courses of action. It is therefore important not only to select the right measures, but also to understand the potential effects they have on behaviour (Neely et al., 1996). Hence, the design phase is of great importance for successful lean assessments.

The purpose of measuring

The perceived purpose of assessments affects what benefits managers expect to achieve from them, and also how assessments are received in the organisation. Thus, before commencing lean assessments, one need to decide what the purpose of the assessment will be.

From an agency theory perspective, the purpose of assessments is to control and monitor subordinates – to reduce the opportunities to shirk (Eisenhardt, 1989a).

However, motivational theory suggests that proclaiming such a distrusting management style will only have a negative effect on subordinates' efforts (McGregor, 1960). Thus, the purpose of an assessment should be communicated in terms that appeal to the higher human needs of achievement and self-fulfilment, so that people in the organisation become intrinsically motivated to conduct the assessment.

The arguments based on motivational theory are strongly supported by PMS literature. For instance, Bititci et al. (2015) argue that the main purpose of PMS should be learning rather than control. It is further emphasized that the communicated purpose of the PMS needs to be carefully formulated. Bourne et al. (2002) find that *how* the purpose of the new PMS is communicated has an effect on the success of implementing the PMS. Unsuccessful companies communicated the purpose in terms of improving on the performance measures. The successful companies, on the other hand, communicated the purpose in terms of managing the business better: They "clearly saw performance measurement as a technique for moving the business forward" and thus had better reason to implement the PMS (Bourne et. al, 2002). Therefore, the formulation of the purpose of an assessment matters to whether or not the assessment will be used by the organisation.

Regarding improvement assessments such as lean assessments, the purpose will differ from that of for instance HMS audits, as organisations do lean assessments mainly to achieve internal improvement, and not as a result of external regulations and pressure. de Waal (2006) found that measures meant for internal and external use should be divided into separate measurement systems. The reasoning is that the conflicting purposes of external adherence and internal improvement should not be within the same performance measurement system, because empirical findings show this has a negative effect on the accomplishment of the system (de Waal, 2006). In addition, a dual purpose can make the assessment more extensive, causing it to be perceived as an elaborate, formal, and over-detailed process where the efforts do not match the benefits (de Waal, 2006). This implies that lean assessments should be kept separate from assessments done for external reporting purposes.

Consequently, the purpose of the lean assessment must be carefully considered, as the successful implementation of the assessment depends on it. Thus, formulation of purpose becomes the first step of designing lean assessments.

External, internal and self-assessment

Who should conduct the assessment is another important decision in the design phase. Evaluations can be done by external experts, or by the organisation itself. If the organisation does the evaluation itself, it can either be done as a self-assessment where someone assesses his or her own unit; or as an internal assessment where someone from another part of the organisation does the assessment (Karapetrovic and Willborn, 2001a). The different approaches have different benefits and drawbacks. While audits are usually conducted as external and/or internal assessments, improvement assessments are more likely to be done as self-assessments or internal assessments (Karapetrovic and Willborn, 2001a).

Table 4: Different approaches to evaluations, and relation to evaluation type

	External	Internal	Self-assessment
Who performs the assessment?	Someone from outside the organisation.	Someone from within the organisation, but external to the unit being assessed.	Someone from within the unit being assessed.
Examples of auditor	Consultant or researcher/expert.	Representatives from headquarters or managers from other sites.	Plant manager, employees/operators.
Typical type of evaluation	Audit.	Audit, improvement assessment.	Improvement assessment.

With regards to optimizing the contribution of assessments to organisational improvements, literature widely supports self-assessments as the preferred option (Karapetrovic and Willborn, 2001a). Motivational theory proves that all levels of the organisation should be included in the lean assessments to ensure maximization of the potential motivational effect. Further, the motivational effect of lean assessments on participants can be seen in two ways. First, assessments may motivate those being assessed by identifying improvements and opportunities. Second, in addition to the main assessment results, the discussion during the assessment is beneficial (Bititci et al., 2015). Managers performing the assessments gain deeper insight into the processes at hand, and become more aware of what progress has been made and where further improvement efforts should be directed. This is supported by Malmbrandt and Ahlström (2013) who argue the use of self-assessments over external consultants to assess leanness and states “while answering a questionnaire and getting feedback may prompt

reflection in the respondent, self-assessments are more useful for individual companies". Thus, the dual opportunities for motivation represented by lean assessments can be used as an argument for self-assessments.

Further, self-assessments result in greater ownership of results than external assessments (Bititci et al., 2015). Assessments performed by an external auditor may easily be perceived as unfair, with conclusions being made on the wrong basis because the auditor does not have sufficient insight into the organisation. The use of resources can also be used as an argument for self-assessment. As we know from agency theory, information is costly to obtain (Bergen et al., 1992, Kunz and Pfaff, 2002), and complex lean assessments potentially even more so. In many cases, using a self-assessment would be less expensive than the other options, as no additional experts are hired to do the assessment.

However, there are also advantages of external and internal assessments. A potential limitation of self-assessments is that managers might rate their own unit more favourably than an objective external party (de Waal, 2006). Having a person from outside of the organisation or subdivision come do the assessment means assessment results will be more objective (Karapetrovic and Willborn, 2001a). This objectivity might be valuable to convince people about the usefulness of the results. Further, as the person being assigned to do the assessment most often will be an expert, the external and internal assessments facilitate more transfer of expertise than self-assessments, and they can provide new insights. In addition, internal assessments will often be conducted by the same people in several units across the organisation. This can facilitate cross-organisational transfer of expertise between the units being assessed.

Although there are different advantages with all approaches, *how a lean assessment should be conducted* to a large degree depends on the maturity of the organisation (Karapetrovic and Willborn, 2001a). In order to obtain valid results from a self-assessment, the people conducting the assessment need to have sufficient knowledge about the issues they are assessing. Thus, to do a self-lean assessment requires people in the organisation to have certain knowledge of lean principles. This implies that self-assessments are more appropriate for organisations that have reached a certain level of leanness, than for organisations that are yet to obtain sufficient knowledge about lean.

This relationship, between type of assessment and maturity, is evident in the ISO 9000 standards (Young-Ha et al., 2012). The ISO 9001 standard sets out the requirements for

a quality management system, and certification is done by external or internal audits. However, ISO 9004 focuses on improving the quality management systems beyond the standards, to pursue continuous improvement in performance (Young-Ha et al., 2012). To achieve this, ISO 9004 recommends the use of self-assessments. Thus, internal audits are recommended for obtaining objective evidence for compliance with the standards, while self-assessments are recommended for organisations that wish to improve beyond the standards. Going beyond the standards represents a higher level of maturity, and thus ISO 9000 recommends self-assessments for more mature organisations.

In addition to subjectivity, a drawback of self-assessments is that one must potentially train many employees in conducting the assessment. The assessment must also be formulated in a way that enables accurate self-assessment. Therefore, the self-assessment approach puts constraints on how complex the lean assessment can be. To deal with this, a method applied in some case studies is that the researchers conducting the study facilitate the first assessment and then have the case companies repeat the assessments themselves after some time (Bititci et al., 2015). Thus, having experts facilitate in the early phases of assessment implementation can be an option for organisations wishing to use self-assessments. The main benefits and drawbacks of the different evaluation approaches are summarized in table 5.

Table 5: Benefits and drawbacks of external, internal and self-assessments

	External	Internal	Self-assessment
Benefits	• Objectivity • Appropriate for external validation • Input from external expert	• Auditor knows the organisation • Facilitates cross-organisational transfer of expertise	• Participation facilitates learning within each unit • Increases ownership of results • Auditors have deep insight into the unit being assessed
Drawbacks	• Auditor does not know the organisation • Less local ownership of results • High cost of hiring external auditor	• Somewhat prone to subjectivity • Expenses of hiring an internal auditor	• Subjectivity • Requires skilled personnel and a certain level of leanness • Potential expenses for training • Restrictions to assessment's complexity

Standardization versus adaptation – adapting to the organisation

A major decision to make in the design phase is the degree to which one should standardize or adapt the assessment. The organisation has a choice of simply adopting an existing lean assessment, or designing a company-specific lean assessment that is adapted to the organisation. Further, one must consider whether it is possible to have a standardized lean assessment across the entire organisation, or if local variations cause a need to adapt the assessment to subsidiaries. These issues will now be discussed to identify what factors should be considered when deciding between standardization and adaption. Different levels of standardization and adaptation is illustrated in figure 5.

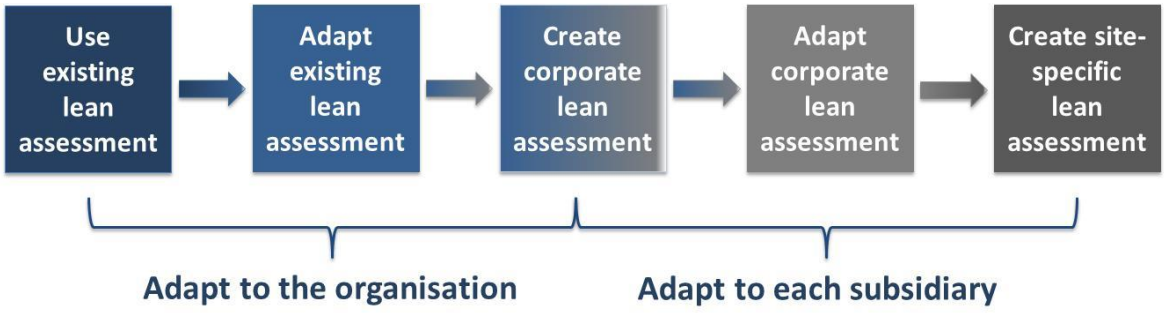

Figure 5: Levels of standardization and adaptation of lean assessments

When initiating the use of lean assessments in an organisation, one can choose to use a *readily developed lean assessment* from literature, or to develop an assessment that is tailor-made to fit the organisation's needs – a *corporate lean assessment*. Of course, when developing a corporate lean assessment the lean assessments given in literature will be a good starting point. However, since both corporate lean programs and lean assessments are built upon fundamental lean principles, it can be questioned whether there indeed is a need to adapt lean assessments to the organisation. The authors designing lean assessments certainly argue that their tools to a large degree are widely applicable. If one assumes that the same lean principles are applied everywhere, any lean assessment should be suitable for any organisation.

However, a consequence of current trends, where organisations increasingly make their own corporate lean programs, is that general lean assessment tools might not be directly applicable or comprehensive enough. As using the wrong measures can hamper performance, the uncritical adoption of existing lean assessments can become costly.

While literature on lean assessment tools generally seeks to provide some optimal and widely applicable assessment, PMS literature argues that all measures should be

designed in congruence with organisational context and strategy. Thus, an inherent recommendation from PMS literature is that each organisation tailors their measures, so that the evaluation tool is custom-made to fit the organisation. Therefore, in contrast to lean assessment literature, PMS literature offers no readily developed measures but provides frameworks for an *optimal design process of measures* (Neely et al., 1996, 1997, Bourne et al., 2000).

Neely et. al (1996) argue that a key issue in designing measures is matching them to the organisational context. Further, several authors within PMS literature focus on the importance of measures being related to organisational objectives. After a review of PMS literature, Bourne et. al (2000) conclude that "there is now a strong consensus among authors that measures should be derived from strategy". The importance of adapting measures to organisational objectives is also emphasized in the ISO-standards: ISO 9004 recommend that the range and depth of self-assessments for quality improvements should be planned with consideration to the organisation's objectives and priorities (Young-Ha et al., 2012). Thus, literature in fields closely related to lean assessments strongly argues that assessments should be adapted to the organisation.

Neely et. al (1997) state that "one of the golden rules of performance measurement is that there is no point in measuring someone on something over which they have no control", and PMS literature provides much advice on how to design appropriate measures. Bourne et. al (2000) postulates a design process where the goal is to translate customer and stakeholder needs into business objectives and subsequent performance measures. Thus, the process begins with a systematic review of customer and stakeholder needs. Further, Neely et. al (1997) list several elements that should be defined when developing a measure such as; *the purpose of the measure and what organisational objectives it relates to, who are responsible for the measure and who acts on the information, frequencies of measurement and reporting,* and *how the measure is to be measured.* The point of a structured design process is to guide managers towards the most appropriate measures. In their case studies, Bourne et al. (2002) apply such a structured design process. They found that, even though some problems with the implementation of the PMS were still encountered, many of the commonly mentioned problems from literature were avoided. This proves the advantages of using a structured approach in designing performance measures.

Even though many authors argue the importance of adapting assessments to the organisation, the development of a corporate lean assessment can be costly for the

organisation. Each measure requires due consideration, and the organisation will likely have to go through several iterations before an efficient set of measures is identified. Further, low-maturity organisations have less experience with lean and designing a corporate lean assessment can therefore prove difficult. Also, low maturity implies that there are still easily identifiable improvement opportunities in the organisation. Thus, as opposed to in high-maturity organisations, there is no need for very sophisticated assessments to uncover incremental improvement opportunities. Consequently, pre-designed lean assessments and even ISO standards can be sufficient for low-maturity organisations in pointing out the right direction towards lean implementation.

However, to ensure wide applicability these tools are relatively simple. High-maturity organisations need more sophisticated assessment tools (Karapetrovic and Willborn, 2001a) and should develop their own rather than relying on general ones (Williams et al., 2006). This is further supported by findings from our pre-diploma project (Loktu and Mathisen, 2014), where lean maturity and available resources was found to be the two most important criteria when selecting which type of assessment to use. Thus, directly applying pre-designed lean assessments is less appropriate for high-maturity organisations. However, the ground principles of lean are the same even in the case of customized corporate lean programs, and the lean assessments found in literature should provide a sound basis for developing efficient corporate lean assessments.

Organisational culture is another factor that can affect the need to adapt measures to the organisation. Henri (2006) argue that managers should be aware of the values on which their organisation relies before trying to use PMS in a specific way or adapt organisational processes to foster specific use. This is important because organisational culture and management styles have an impact on the success and failure of PMS efforts, by affecting how the PMS is used (Bititci et al., 2006, Henri, 2006, Bititci et al., 2015). Thus, organisational culture should be considered in lean assessment design choices.

Standardization versus adaptation – adapting within the organisation

In addition to adapting the assessment to organisational context, there might be a need to *adapt the assessment within the organisation*. This is especially relevant for organisations consisting of several subsidiaries, as there will likely be different levels of lean maturity among the subsidiaries. This means that within the organisation there will be different needs for levels of sophistication in assessments. However, the use of resources needed to develop and adapt a lean assessment will cause organisations to seek as much standardization as possible.

For multi-national corporations, differences in culture can also affect the opportunity for standardization. National culture affects the performance-driven behaviour of people by influencing the use of assessment (de Waal, 2006). Further, a better fit between management practices and national culture have been seen to have positive effects on financial performance, because employees are likely to feel dissatisfied, uncomfortable, and uncommitted when management practices are inconsistent with the deeply held values of local culture (Newman and Nollen, 1996). Newman and Nollen (1996) argue that no single management practice is superior to another with regards to performance outcomes, and what work well in one country might have the opposite effect in another. Thus, national culture can cause variations in the efficiency of assessments designed to be standardized across the organisation. This is confirmed by Dossi and Patelli (2008), who find that subsidiaries' economic performance seem to be penalized when measurement systems implemented by headquarters are perceived as an inadequate device to manage local operations. They further observe that headquarters' cultural tolerance for uncertainty is positively linked to the subsidiaries' use of measurement systems imposed by headquarters in decision-making (Dossi and Patelli, 2008). Thus, it is not only the culture of the subsidiaries' locations that matters, but also the local culture of headquarters.

However, even though global operations is the reason many companies must consider differences in national culture, the high level of globalization in the business world today seem to dampen the differences between countries. Organisational culture seems to be converging in many countries, making national culture less important (de Waal, 2006). Further, strong organisational cultures can weaken differences among subsidiaries, thus reducing the potential earnings of adapting to local culture (Newman and Nollen, 1996). Thus, inter-organisational differences in maturity levels seem to be the most important

factor that can impede the opportunity to apply the same assessment across the whole organisation.

An argument for applying the same lean assessment across different subsidiaries is that the results can then be used for benchmarking between them, an opportunity that is lost if the assessment is altered too much between subsidiaries. The best results are then used as benchmarks for the others to compare themselves against, or the benchmark can be some standard of excellence. However, benchmarking can only be done on measures that are reasonable to compare across subsidiaries. Differences between the subsidiaries can cause assessment results not to be comparable. Thus, benchmarking must be done with caution, considering what contextual factors could have affected different results between subsidiaries.

In summary, while the arguments for adapting assessments to the organisation as a whole are many, internal differences in maturity seem to be the most important issue to consider when designing one standardized assessment for the whole organisation. The main points of the above discussion on standardization versus adaptation are summarized in figure 6.

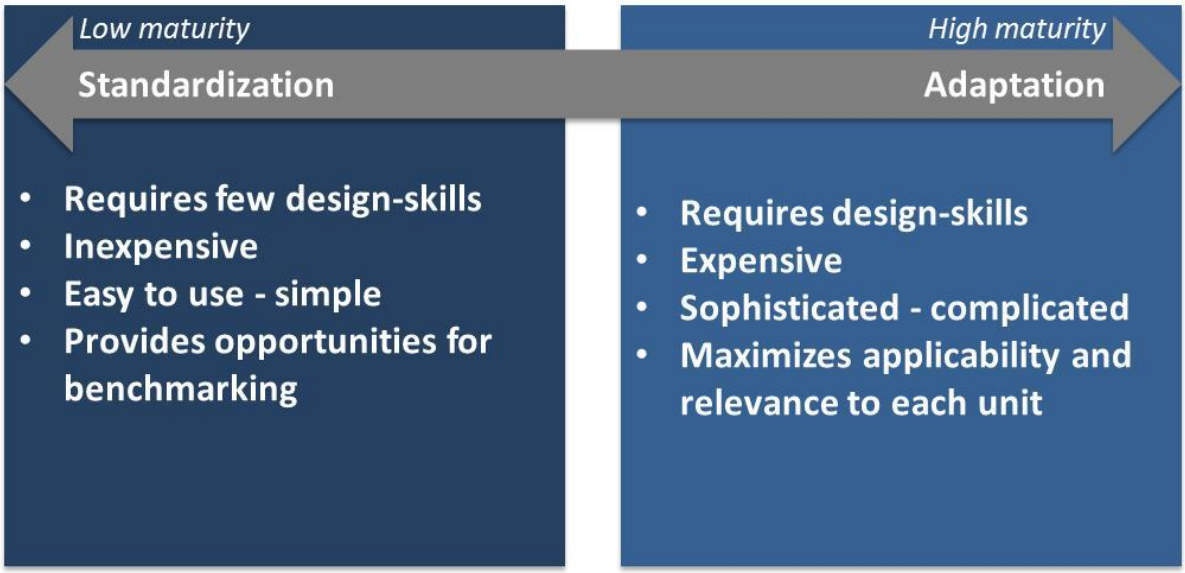

Figure 6: Standardization versus adaptation, summary

3.4.2. Implementation

After designing a lean assessment it needs to be implemented into the organisation. This is the phase where systems and procedures are put into place to enable regular collection and processing of data (Bourne et al., 2000). It is considered a successful implementation when *the majority of the measures are used on a regular basis in managing the business*, *and people see the value of using the assessment* (Bourne et al., 2002, 2005, Bititci et al., 2006). Even though implementation is mainly a mechanistic exercise that can be appropriately managed by classic project management tools (Bourne et al., 2000), literature points out that implementing evaluation tools can be a challenge (Bourne et al., 2005, de Waal, 2006).

PMS literature provides several explanations as to why some implementation efforts of evaluation tools succeed, while others do not. Bourne et. al (2000) facilitated the design and implementation of PMS in several case companies, and found that a reported reason for failed PMS implementation was that managers did not realize how long time the implementation phase took. As a result of the prolonged implementation one of the main obstacles to PMS implementation was top management commitment being distracted during this phase, causing implementation efforts to stop (Bourne et al., 2000, 2002). In one of the cases implementation was only resumed after the researchers contacted managers to request more data. With the long implementation time it obviously takes much time from the initiation of a performance assessment project until achieved benefits are observed, and maintaining top-management commitment will be a challenge (Bourne et al., 2002).

However, long-term thinking is key when implementing evaluation tools. Evidence shows that the positive impact of assessments on performance increases as the assessment has been implemented for a while (Ukko et al., 2007, Evans, 2004). Thus, lean assessments can be expected to contribute more to organisational performance over time, as they mature within the organisation. This effect can be caused by the assessment leading managers to reflect, and thus being more critical of their own organisation during follow-up assessments than they were the first time around (Bititci et al., 2015). However, the fact that contributions can be expected to be small in the beginning poses additional challenges to prolonged top-management commitment.

How managers perceive the benefits of implementing PMS in relation to the efforts needed for implementation also proves to be of key importance for successful implementation, along with top-management commitment. Bourne et al. (2002) found

that those companies who were successful in implementing performance measurement "clearly saw performance measurement as a technique for moving the business forward" and thus had better reason to implement the PMS. Transferring this to lean assessments, it is important that managers see the benefits of lean implementation and believe in lean assessments as a way to become leaner.

Introducing the assessment

A reported obstacle to implementation of evaluation tools is resistance towards measurement (Bourne et al., 2000). Individuals or groups who do not see the new assessment as being in their best interest may actively or passively hamper the implementation (Bourne et. al, 2000). Resistance might also stem from situations where those being measured fear measurement (Bourne et al., 2002).

Relating fear of measurement to motivational theory, lean assessments can easily be perceived as a "Theory X kind of tool" – where distrusting managers want to monitor subordinates' every move. If the purpose of the lean assessment is misinterpreted it could hinder the desired outcomes of the assessment, and damage worker motivation. Thus, it is important not only to formulate the purpose of the assessment in the correct way (as discussed in chapter 3.4.1), but also to communicate this purpose to the organisation before commencing implementation.

This is further supported by PMS literature. Ukko et al. (2007) found that poor and delayed distribution of information about upcoming PMS, in addition to lack of measurement training, impeded employee commitment. They also state that "It is most important for the employees to understand why something is or is not measured" (Ukko et al., 2007). Early information and marketing of the new evaluation tool, combined with training of employees, increases employee commitment to implement the tool and can reduce resistance and fear of measurement (Ukko et al., 2007, de Waal, 2006). Thus, not only the purpose of assessment but also the assessment itself should be presented before performing it. de Waal (2006) argues that training should include communication of the main purpose of PMS, in addition to explaining the system itself. According to Ukko et al. (2007) training is more important if employee education is at a lower level.

Thus, before implementing lean assessments, they need to be introduced to the organisation. Both the purpose of the assessment and the specific measures should be explained in order to increase employee commitment to implementing the tool, and reduce resistance and fear of measurement.

The importance of involvement

Motivational theory emphasizes the importance of intrinsic motivation in continuous improvement (Herzberg, 1987). Further, it shows that lean assessments hold the potential of facilitating intrinsic motivation – if it is conducted in the right way; supporting the human need for esteem and self-actualization. However, to be motivated by a lean assessment one needs to be involved in the assessment, which was also an argument for using self-assessments. Involving subordinates in the process creates trust, and will reduce the risk of the assessment being interpreted as a surveillance tool. Further, increased involvement gives a greater feeling of ownership to assessment results (Bititci et al., 2015). Thus, the involvement of both managers and subordinates in the assessment process matters to the successful implementation of performance assessments.

Herzberg (1987) suggests some ways to trigger intrinsic motivation in workers. Employee empowerment can give a feeling of responsibility, achievement and recognition – all motivational factors. This implies that employees at lower levels to some degree should be accountable for the results of lean assessments, and not only managers.

The importance of involvement is also found in PMS literature. An important use of performance assessments is to gain information that can support decision-making (Busco et al., 2008, Henri, 2006). However, empirical findings show that if assessments are to be used for decision-making, the decision makers need to be involved in the whole assessment process, including design. Dossi and Patelli (2008) investigate how PMS imposed by headquarters on subsidiaries affect subsidiaries' decision-making. They found that the PMS had a greater influence on subsidiaries' decisions in cases of higher subsidiary participation in PMS design. An explanation may be that assessments initiated by top-management steer attention towards disagreements about assessment design and scoring systems (Netland et al., 2015). Thus, improvement assessment should not be a pure top-down process, and subsidiaries and employees should be involved in the whole process, even design.

That lean assessments should not be a top-down process is further supported by Netland et al. (2015). In this study, no relation was found between increased lean implementation and the use of management-initiated internal audits; where management do routine audits and then communicate results through a performance

report. However, a clear positive relation to implementation was found for the use of bottom-up, lean-focused performance reports; where the reporting process begins at the shop floor with employees reporting and reviewing detailed, locally collected performance measures. This implies that employee participation in the assessment process actually is necessary for the assessment to have an effect on lean implementation.

As discussed earlier, the complexity associated with lean means that the outcome-uncertainty is high in lean implementation, and outcomes are not easily measured. This contributes to the importance of involving the organisation in the assessment process, as it is impossible for outsiders to fully comprehend the relation between assessment and performance. In summary, it is clear that involvement is of key importance to the success of lean assessments.

3.4.3. Use

PMS literature argues that implementation of measures does not create a measurement system, as measuring is only the first step in using the measures (Bourne et al., 2000). Empirical evidence shows that even if the assessment is successfully implemented (e.g. being used in managing the business), the way the data is used matters to the performance of the assessment (Bourne et al., 2005, Ukko et al., 2007). More specifically, how performance assessments are used in communication proves to be of importance to the efficiency of the measurement system.

Ukko et al. (2007) find that the increased amount of dialogue between management and employees following the use of a PMS leads to higher performance. This is supported by Bourne et al. (2005) who find that "The intensity of engagement and interaction with the performance measurement processes has a greater impact than what would be suggested from most of the measurement literature", with increased intensity being associated with higher performance. Further, Netland et al. (2015) find that factories with higher levels of lean maturity use and discuss key performance indicators on a more frequent basis. This is said to help keep up the pace and motivation of improvement work (Netland et al., 2015).

Thus, the increased amount of communication related to assessments yields better performance, and the measures and results should be used in the everyday work, in addition to being discussed at regular meetings. The intensity of communication,

frequency, level of detail of the content, and the time spent discussing performance, differentiates high-performing businesses from others (Bourne et al., 2005).

Drawing from motivational theory, the way assessment results are communicated matters to how the assessment will affect behaviour. The assessment should have an overall positive approach. Thus, the results of an assessment need to focus on what has been achieved and how to move towards becoming leaner, thus fulfilling human needs for esteem and achievement, and fostering intrinsic motivation. Providing feedback in terms of lack of progress towards achieving goals could hamper motivation. Herzberg (1987) further highlights the importance of communicating performance results to everyone, to give employees a sense of internal recognition. Thus, lean assessment results are not only useful for top management, but should be communicated throughout the organisation.

3.4.4. Update

As external factors change, so will the strategy and goals of the organisation. Further, changes might necessitate a review of the assumption on which the organisational strategy and objectives are built upon. PMS literature argues that to avoid a natural divergence of the PMS away from strategy, the PMS needs to be reviewed and updated over time (Bourne et al., 2000). Thus, assessments should include a process for updating and developing measures as circumstances change to keep alignment with objectives. The need for updating and reviewing might also appear during design and implementation phases, and so the process of design, implementation, use and update is not linear (Bourne et al., 2000). Further, as the organisation achieves higher levels of leanness, the lean assessment must be developed to become more sophisticated.

When updating measures, one should investigate if subunits within the organisation have developed their own measures besides those included in the formal lean assessment. For instance, Dossi and Patelli (2008) found that several subsidiaries in their case company had developed local measurement systems that were used in addition to the system imposed by headquarters. Similarly, Bourne et al. (2005) found that in their high-performing business units, managers used their own measures to manage business, developed from experience and insight into the true drivers of business unit performance. Such information about currently used measures is valuable as input to the design and update processes, but also to ensure that individual business units do not use measures that overlap or counteract with the formal lean assessment.

4. Methodology

This chapter describes the methodology used to answer the proposed research questions. The first subsection addresses the research design, and explains the choice of design and case. Next, the applied research methods are described. Finally, we discuss limitations and weaknesses of the chosen methodology, and actions applied to reduce the impact of these.

4.1. Research design

A *research design* is a plan that logically relates the proposed research questions to the data that is to be collected, analyzed and interpreted (Yin, 2014). It is a framework for how the study will be executed, and helps ensure that the researchers collect and analyze the right kind of information, stay on topic, and avoid situations where data does not contribute to answering the research questions (Yin, 2014). A number of different research designs are available: Case studies, cross-sectional, experimental, longitudinal, comparative, and mixed-method design (Bryman and Bell, 2011). In this section we will explain the choice of research design and case.

4.1.1. Choice of research design

It is common to differentiate between *quantitative* and *qualitative* research when investigating social and individual world phenomena. Quantitative research uses statistics and other mathematical methods to analyze numerical data. Qualitative research, however, is an *emergent, inductive, interpretive and naturalistic approach to the study of people, cases, phenomena, social situations and processes in their natural settings* (Yilmaz, 2013). The latter allows the researchers to go deeper into underlying determinants of the investigated phenomena. The most appropriate research design depends on the type of questions to be investigated (Yin, 2014).

The research questions in this study are complex, and likely to be affected by many interacting variables. Further, they regard contemporary events over which the researchers have little or no control. Thus, due to the nature of the research questions, and based on recommendations from theory, we have chosen to use a qualitative approach – more specifically – a case study.

4.1.2. The choice of case

Important choices when using the case study design are *which* and *how many cases* to include. One can choose between single and multiple cases, and even multiple embedded units within each of these types. Cases can take on many forms, and may for instance be an organisation, individuals, events, or decisions (Yin, 2014).

Literature highlights several benefits of using a multiple-case design rather than a single-case design (Yin, 2014, Bryman and Bell, 2011). The most important is the analytical advantages: A multiple-case design does not exclusively rely on evidence from one case, and is thus less vulnerable. Further, the opportunity to compare and contrast data from several cases allows for identification of replication logic (Yin, 2014). All these advantages can help strengthen validity of the results (Yin, 2014, Bryman and Bell, 2011).

However, the resources needed for data gathering and analysis increases with each case, and multiple-case studies can therefore be very resource-intensive. Further, the methods used in qualitative research are generally rich in detail, but they do not allow for investigation of several cases simultaneously. Thus, when facing cost and time limitations, the number of cases must often be limited.

In this study, practical considerations such as travel expenses and time constraints have posed restrictions to the number of cases, and we have therefore used one case company; the Jotun Group. This company has been working with lean implementation efforts for several years, and already has some disperse experience with lean assessments, in addition to vast experience with other evaluation tools. Now, the company is genuinely interested in learning more about how they can facilitate further lean progress. All these factors make Jotun a promising case company to our research.

Because we have only used one case organisation and our unit of analysis has been Jotun as a whole and not the individual subsidiaries, this research is considered a single-case study (Yin, 2014). Thus, we have not differentiated between subsidiaries in analysis and conclusions. However, since data has been gathered from eight different subsidiaries, many of the benefits emphasized with multiple-case studies are still applicable. Including multiple subsidiaries allows us to observe differences across the organisation, and it helps ensure robustness of the results. However, using only one organisation limits transferability of results to other organisations and sectors.

4.2. Research method

According to Bryman & Bell (2011), a *research method* is a technique used to collect information. In case study research, there are six main types of research methods: Documentation, archival records, interviews, direct observations, participant observation, and physical artefacts (Yin, 2014).

The possibility to use multiple data sources is a particular strength of the case study approach. Mixed sources of information allow researchers to address complicated research questions, investigate behavioral issues, and include both temporary and historical data. Thus, they help provide a thorough understanding of the research questions, and secure construct validity (Yin, 2014). In addition, mixed sources open for a richer and stronger array of evidence than cannot be accomplished by any single source alone (Yin, 2014).

Further, using several sources allows for data triangulation (Eisenhardt, 1989b). This can strengthen the study's construct validity (Yin, 2014), since more than one source of data in the study of a social phenomenon allow the findings to be cross-checked (Bryman and Bell, 2011). However, compared to only using single sourcing, multiple sources of data demand more from the researchers and additional recourses (Yin, 2014).

In this study, we have used mixed sources of information to map managers' perceptions and experiences with assessments. Information has mainly been collected through interviews, as this was considered the most efficient method. However, data from direct observation, documentation, and archival records have also been used to support findings from the interviews.

Further, to ensure reliability and validity of the study, and in agreement with the recommendations of Yin (2014), a *case study protocol* has been developed to guide the researchers in the data-collection process. This protocol is presented in Appendix A. The following subsections describe the applied data-collection methods.

4.2.1. Interviews

The *interview* is a widely employed method within qualitative research that can be targeted to focus on relevant topics, and provide both explanations and the personal insight of the interviewee (Yin, 2014). This allows for a deeper and more thorough discussion of how multiple factors affect the assessment process, and also how such factors may interact. According to Bryman & Bell (2011), interviews can take many

forms, including *structured, semi-structured, unstructured, focus groups*, and *group interviews*. We conducted both unstructured and semi-structured interviews in this study.

Due to the complexity of the research questions, it was considered preferable to do most interviews in-person. However, the vast geographical spread of Jotun's subsidiaries restricted how many managers it was possible to meet in person. Thus, interviews were limited to one visit at Jotun's headquarter in Sandefjord (Norway), and a regional supply chain meeting in Greece. To complement this data, short interviews were also distributed by e-mail to a few managers not participating at the meeting in Greece.

Unstructured interviews

The unstructured interviews were held during our visit to Sandefjord in February. The intention of this trip was primarily to get to know the company and its operations better, to help decide what the exact focus of the research should be. Initially, we had scheduled two interviews, and formulated a brief list of topics to guide these. However, as people in Jotun became aware of our presence, additional interview opportunities emerged. Most of the unstructured interviews were thus held spontaneously, and carried out before the actual research questions had been decided upon. Therefore, they did not follow any interview-guide. However, being flexible and opportunistic in data collection allows researchers to take advantage of emergent themes and may give deeper insight into unique case features (Eisenhardt, 1989b).

In *unstructured interviews*, the researcher at most has a list of topics to guide the conversation. This type of interview is similar to regular conversations (Bryman and Bell, 2011). In our case, we initiated the talk by explaining our research topic and let conversation flow mostly freely from there. In total, we conducted eight unstructured interviews during our visit in Sandefjord. They were spread over three days and each lasted for 30-60 minutes. Notes were taken during each session and both researchers were present during all interviews. Summaries based on the notes were written within two days, while we still had the conversations fresh in memory.

Initially, we thought the unstructured interviews would only be used for background information – as a guide to help narrow the focus of our research. However, some of them proved to be so rich and relevant to the topic that they have been included as empirical data together with the semi-structured interviews described below.

Semi-structured interviews

The *semi-structured interviews* form the main empirical data of this research. It is a flexible process where the researcher follows an interview-guide with a list of topics, but still allows the conversation to develop according to the circumstances (Bryman & Bell, 2011). Because our research concerns behavioral aspects, the semi-structured interview was considered more appropriate than a stricter, more formal approach. Further, the semi-structured approach keeps the conversation on topic, but still allows for a natural and trusting dialogue, which potentially could help us go deeper into root causes. Also, not all questions were relevant to all interviewees, as they have different levels of experience with lean and lean assessments. Thus, it was necessary to use an adaptive approach and focus each interview on appropriate topics.

However, using the same interview structure for all interviews improves comparability of the data (Bryman and Bell, 2011) and improves validity of the study (Yin, 2014). Therefore, it was important that all topics were covered in each interview, and asked in similar wording each time. In addition, to avoid misunderstandings or response bias, it was vital that the questions were formulated in a clear and neutral way. To help with these issues, we created an *interview-guide*; a tool developed on the basis of the research questions to increase the validity of the results. This is included in the case study protocol.

The main intention of the interviews was to investigate managers' opinions and thoughts about using lean assessments as tools to facilitate lean implementation. Thus, operations and warehouse managers were chosen as appropriate interviewees because of their familiarity with each subsidiary and knowledge of lean principles.

The semi-structured interviews were conducted during a regional supply chain meeting in Greece. They were held with managers from four different European locations: *Vindal (Norway), Flixborough (UK), Barcelona (Spain),* and *Glyfada (Greece)*. The interviews were held either during lunch breaks, or in the hours between work and dinner. Each lasted for 30 to 60 minutes. In total, five interviews were conducted with a total of six managers. Since this was considered the most important part of the data-collection process, all interviews were recorded and transcribed to ensure accuracy and allow for extensive and detailed analysis of the data.

Some technical issues limit the accuracy of the gathered information; during the transcription, smaller parts of the recordings proved to be too unclear for the exact

words to be made out. In these cases, the researchers had to remember or guess the content. However, as both researchers were present at all interviews and transcription was done shortly after the interviews, this is considered a minimal limitation.

Finally, because some managers could not participate on the meeting, we collected additional responses to a condensed version of the semi-structured interviews per e-mail. This way, subsidiaries in *Saudi-Arabia, the Check Republic, United Arab Emirates,* and *Turkey* were also represented in the study. This additional data help shed further light on the central issues of the study, and increase quality of the results. To ensure reliability, the line of inquiry from these e-mails is also documented in the case study protocol.

4.2.2. Documentation and archival records

Documentation and archival records have been used to supplement interview data, and as a source for background information about Jotun. They have been necessary in order to get an overview of current and formerly used evaluation tools, which has been used to help consider what aspects may be appropriate to transfer into a lean assessment. Documents have also guided further inquiries after data collection was started: Both by supporting already collected data, and by highlighting inconsistent data or topics that needed more thorough investigation. The most important records were Jotun's annual report (Jotun, 2014b), and current and previous audits and assessments (presented in chapter 5.3).

Literature emphasizes that data from documentation and archival records should be applied with caution, because they may be subject to author or researcher bias. It is therefore recommended to avoid overreliance on their content (Yin, 2014). Since these sources have been used mainly as supplementary data, this is not regarded an issue for our study.

4.2.3. Direct observation

Direct observation is a method that can provide additional information to the study, for instance about the organisation's contextual factors (Yin, 2014). Observing the natural working environment and how work is performed in real life and real time is an important way to gain a complete view of operations. Direct observation can be performed in a more or less formal way (Yin, 2014), and the researcher can assume different levels of participation (Bryman and Bell, 2011).

Observations constitute a rather small part of this research, as we only visited two subsidiaries. However, observations made during these visits have been used to better understand the content of, and coherence between other types of data. We have mainly used a casual approach, meaning limited researcher participation. Observations stem from walking around on the premises, observing meetings, talking to operators and managers as we met them, and observing the interviewees during our conversations. This less formal method can help reduce reflexivity; situations where people act differently because they know they are being observed (Yin, 2014).

However, direct observation with higher degrees of researcher participation has also been used. During a visit to the warehouse in Greece, we got to participate and contribute to a warehouse review. In addition, we have partaken in a Gemba walk at Vindal. These experiences have provided further insight into lean practices in the case company, and have helped us obtain a more holistic view of the organisation.

In hindsight, it could have been beneficial to visit more subsidiaries than we did. More extensive and structured use of observation could have been used for comparison of observational data with data obtained from interviews, and to put empirical findings better into perspective. However, this is not considered a critical limitation to this study, as observation is not the main source of data.

4.3. Analysis of empirical data

After collecting all data, the notes from the unstructured interviews, transcriptions from semi-structured interviews, and replies from e-mail interviews were reviewed several times by both researchers in an iterative process. After comparing the reviewed data with findings from literature, a number of important topics were identified. These topics formed the basis of an early disposition of the discussion part of this study. Thereafter, both researchers searched through all data again, to collect information relating to each of the topics in the disposition.

Dividing the data between the two researchers could have saved time in the analysis phase. However, having both researchers go through parallel analysis-processes with all data ensures that no conclusions depend on the apprehension and interpretation of only one person, thus ensuring validity of the analysis.

4.4. Discussion of the research design

This section discusses limitations and weaknesses of the proposed methodology. First, challenges inherent to the research design will be discussed. Then, limitations due to resource constraints will be presented, followed by limitations related to practicalities. The chapter concludes with a table summarizing the case study tactics applied to limit the impact of weaknesses and increase quality of the research design.

4.4.1. Limitations inherent to the research design

Qualitative studies are subject to several challenges inherent to their research design, such as *replication issues, researcher subjectivity, limited generalization*, and *low transparency* (Bryman and Bell, 2011). All these issues have the potential to affect the reliability of results negatively, and are discussed below.

Troubles with replication

There is no certain "best way" of performing case studies. Each must be designed to fit the study in question, and data-collection methods should be chosen based on how they can contribute to the research. However, due to the often very complex research questions one does not always know beforehand what the best methods are, and adjustments must be made along the way. Unstructured data gathering is therefore common, which means that quality of the process relies strongly on the researchers. Lack of clarity with applied methods obviously poses challenges for replication (Bryman and Bell, 2011).

In this study the main source of data, interviews, have been either unstructured or semi-structured. The latter follows a fairly specific interview-guide, but the conversations were still allowed to flow freely within its boundaries. Thus, it is impossible for others to replicate the interviews exactly. Though, we have taken certain precautions to increase the replicability of our study:

First, not using a structured approach requires the researchers to be extremely thorough during interviews, as lack of thoroughness and rigor are known concerns in case studies (Yin, 2014). It also increases the need for transparency, to ensure others are able to establish what the researchers actually did and how they arrived at the study's conclusions. Therefore, we have intentionally tried to document the process thoroughly, so that links between research questions, choice of theory, empirical data, analysis and discussion, and conclusions are logical and easy to follow. We have created a case study

protocol, containing rules for how data should be collected. The protocol is presented in Appendix A and includes a list of topics discussed in the unstructured interviews, the interview-guide developed for the semi-structured interviews, and the interview that was distributed by e-mail. Finally, all collected raw data is gathered in a research database.

Subjectivity

Subjectivity can impact the reliability of the study. Selection of topic and research questions, data-collection, and analysis of findings all depend on the researchers' interpretations. Thus, subjectivity of the researchers is a challenge when using a qualitative research design, and several methods have been applied throughout the study to reduce this impact.

To ensure originality and usefulness of the study's contributions, exclude topics already covered in literature, and help reduce impacts of subjectivity in the data-collection process, a thorough literature review of relevant theory and existing literature was conducted *before* the final research questions were formulated and data was gathered (see chapters 2 and 3 in this study, and our pre-diploma work Loktu and Mathisen (2014)). However, since the selection of literature and theories is based on subjective judgement, this still proposes a weakness to the study. Therefore, external guidance from our supervisor and representatives from the case company have also been valuable in ensuring the quality of our findings. Such external validation reduces the potential subjectivity of the study.

To limit the impact of subjectivity when *analysing* empirical data, multiple tactics have been applied. First, to ensure accuracy of the data, notes from the unstructured interviews were reviewed and completed within two days, and the semi-structured interviews were recorded and later transcribed. Further, both researchers were present at all interviews, and both researchers participated in the following data-analysis; meaning that no interpretations are based on the perceptions of only one person. Nevertheless, in spite of these tactics, personal interpretations will always be present when conducting a qualitative case study and subjectivity can therefore be considered a limitation of the study.

Researcher bias

Researcher bias occurs when researchers misinterpret data. Biases can arise in several ways, such as misjudging a single event as generally representative, or failing to consider the volatility of easily variable data (Voss et al., 2002). Further, interviews might be biased by leading questions, occurring if the researcher wishes to obtain certain answers.

According to Yin (2014), a test of bias is the degree to which one is open to contrary evidence. To ensure a rich discussion and knowledge of different views, we have made sure to include arguments both for and against lean assessments from theory. As a part of preparations for the interviews, the topic of question formulation was carefully studied and discussed among the researchers before the interview-process began. Further, to avoid bias by leading questions, special care has been taken in formulating the semi-structured interview.

During the whole process, we have cooperated closely with the case company, and received valuable support to our research. Thus, it was important to us to also include them in the finishing part of the study, to validate that our understandings and conclusions were fair. Therefore, we presented our preliminary findings to a group of managers at a meeting in Trondheim, early May. During this presentation, we had an open dialogue where we got valuable input to guide the final phase of the study. Further, final findings were presented to Jotun in early June, before finishing the study. This practice, called member validation, is known to help increase the credibility of qualitative studies (Bryman and Bell, 2011).

Problems with generalization

When findings are based on only one or a few case studies, the extent to which conclusions are generalizable to other contexts is limited (Bryman and Bell, 2011) However, the purpose of a case study is not *statistical generalization*, but rather *analytical generalization* – using the understandings obtained from analysis of gathered evidence to develop new theory (Yin, 2014).

Our study uses eight subsidiaries within one case company to investigate the impacts of lean assessments in a lean implementation process. Using data from several subsidiaries increases generalizability, because information is gathered from people with different experiences and backgrounds. However, as all subsidiaries are within the same

company, results might be affected by organisational context. Thus, the conclusions from this research should be supported by broader studies including more companies, to be generalizable to larger populations. However, our findings still contribute to clarify the usefulness of lean assessments, especially for companies sharing similarities with the case company.

Amount of data

The large amount of data obtained, combined with manual methods of analysis, poses a challenge to the accuracy of the results. Important information and convergence or divergence on key issues might have been overlooked. To avoid this, analysis of empirical data has been conducted as an iterative process, with both researchers probing the data several times.

4.4.2. Limitations due to resource constraints

Time, cost, and amount of theory are considered to be the most important resource constraints posing limitations to this study. They are discussed further below.

Time and costs

As the subsidiaries used in this study are spread geographically, travelling to each location to conduct interviews would have required a considerable amount of time and resources. Therefore, the number of represented locations and interviews has been somewhat limited. Case interviews were mainly confined to a few days – due to the convenient opportunity of interviewing several managers from around Europe when they gathered at one location for a regional meeting. However, there were fewer interviewees present at the meeting than planned. Thus, resource constraints and availability have put limitations on the number of cases available for conducting interviews in person.

Further, managers present at the regional meeting were on a very tight schedule, which put limits on the time available to do interviews. This resulted in strict prioritizing of questions, to limit the length of the interviews. In order to manage the narrow time frames, due preparation was done before the interviews to ensure optimal utilization of interview time. Thus, all topics of key importance were covered. Further, contact information was gathered from all interviewees in case it was necessary to request additional information.

The amount of theory

This study adopts an approach of including several theoretical perspectives, to present a broad view on assessments. However, time constraints apply, and including a larger number of topics naturally limits the amount of information collected within each topic. Thus, a limitation of this study is that each theoretical perspective has not been investigated as thoroughly as one would have been able to if adopting a single perspective. However, we consider the benefits of obtaining multiple perspectives to outweigh the drawbacks.

4.4.3. Limitations due to practicalities

This section discusses limitations due to practical considerations during collection of empirical data.

Limited access

Interviews, documents, and direct observations constituted our sources of data. Therefore, we have had to rely on Jotun for full access to necessary information. Even though we have received much help and collaboration, we have no way to be sure whether we have been presented with *all* relevant data. Considering the great amount of documents stored internally, there is a possibility that some documentation might have been neglected or wrongly judged irrelevant. Thus, not having control or complete access to all information can be a potential weakness to the study. Further, because of cost restraints, we had to limit the number of interview-objects. Except from Vindal and Barcelona, we were only able to interview one representative from each of the plants. These representatives were however considered to have great overview of the relevant topics. Nevertheless, relying on only a few individual's interpretations may be a limitation of the study.

Distribution and number of interviews

To ensure a broad perspective of Jotun in our case study, we have prioritised to cover many geographically diverse sites, instead of conducting multiple interviews within each site. This means that our findings are less dependent upon local factors at each site, and increases applicability of our study to Jotun as a whole. However, as we mostly have conducted only one interview per subsidiary, it has not been possible to compare and contrast the subsidiaries against each other. This means that our study does not include an analysis on how differences between subsidiaries affect our findings.

Language barriers

During the conference in Greece, we interviewed operations managers from four different countries, and interviews were held in English or Norwegian. Even though all interview-objects were proficient in English, misunderstandings could occur from poorly articulated questions, or simply lack of understanding. To avoid this, we spent a lot of time preparing the interviews. Every question had been formulated in at least two different ways so that we could express the question in an alternative way in cases where the interviewees were not familiar with the phrases or expressions used. Our opinion is that language has not impacted the result of this study and should not be considered a major weakness of the study. Table 6 summarizes applied research tactics and their impacts on research quality.

Table 6: Case study tactics (adapted from Yin (2014), p.45)

Employed research tactic	Impact on research quality
- Development of a research database including the empirical findings of the study - The use of a case study protocol and interview guides	*Improves reliability*
- Use of multiple sources of evidence - Use of member validation	*Improves construct validity*
- Use of prior theories within the field - Some use of replication logic (interviews) - Use of multiple theoretical perspectives to address rival explanations	*Improves internal/external validity*

5. Case presentation

The Jotun Group is a world-leading supplier of paints and powder coatings with headquarters in Sandefjord, Norway. Since being established in 1926, the company has grown to become a multinational corporation through several expansions and mergers. Today, Jotun has 33 production facilities and 68 companies in 43 countries, and is in total represented in more than 90 countries worldwide (Jotun, 2014a). With more than 9600 employees worldwide, and a total operating revenue of NOK 17.542 billion in 2014 (Jotun, 2014a), the company is a major player in the paints and coatings industry. Jotun is a matrix organisation divided into seven regions responsible for sale of *Decorative paints and Marine*, *Protective* and *Powder Coatings*.

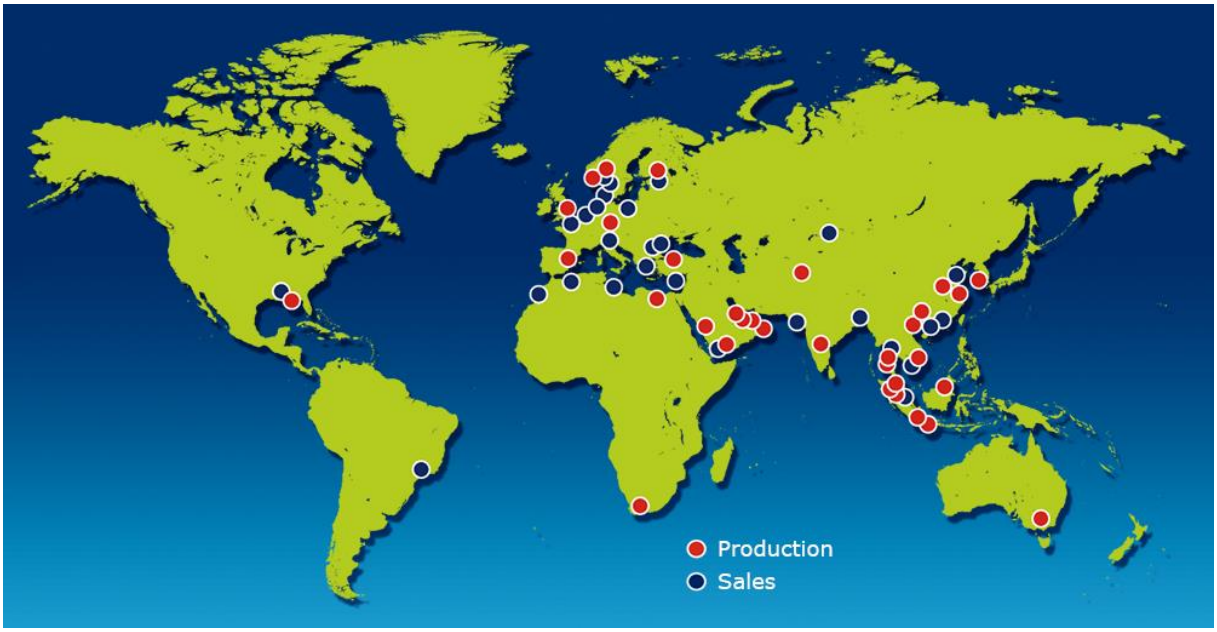

Figure 7: Jotun's production and sales facilities globally (Jotun, 2014a)

Jotun's vision is "Jotun Protects Property"(Jotun, 2014a). Jotun takes great pride in their strong corporate culture, which is considered an important factor to their success. It is built upon the four values *loyalty, care, respect* and *boldness* (Jotun, 2014a). They form the core of the company's identity, called "the Penguin Spirit", and permeate the whole organisation. Employees that embody these values are called "true penguins".

Business is built upon the three main components of Jotun's core strategy: *Organic growth, segment diversity*, and *adopting a differentiated approach to markets and regions* (Jotun, 2014a). Jotun apply a rather decentralized business model, and when expanding to other nations, they have been successful in using local managers. Thus, *Jotun has a*

global view with a regional and local focus (Jotun, 2014a). However, to transfer values and practices between subsidiary units, Jotun actively hire managers that comply with the Penguin Spirit. Locations of foreign plants are based upon factors like proximity to attractive markets, access to skills and knowledge and socio-political factors[4].

Jotun's subsidiaries are spread across the world, and differ greatly in size and complexity: Spanning from 1200 employees in total in China, to 9 employees in the warehouse in Amsterdam (Netherlands); producing 90 million litres of wet paint in Zhangjiagang (China), to 2-3 million litres in New Orleans (USA); providing 1800 different products in Vindal (Norway), to only 56 different products in Lahore (Pakistan)[5].

In alignment with Jotun's values and vision, HSE is an important focus area to the organisation. In 2014 they began a company-wide campaign called "I Care" that is supposed to raise awareness and reduce the number of unwanted incidents and accidents (Jotun, 2014c). Another example of their vision put into action is their focus on "acting responsibly" within all areas. According to the annual report (Jotun, 2014b), Jotun does this both because it is the right thing to do, but also because it enables the company to "thrive in a world facing both political and economic challenges".

Jotun is today investing significant resources in internal and external growth by expanding and modernizing the business. However, balancing cost development with future growth is an important current challenge, and controlling costs is a great focus area of the company (Jotun, 2014b).

5.1. Jotun's lean journey

Jotun has developed from being a small entrepreneurial start-up into becoming a global company. According to Jotun's managers, growth has been especially rapid during the last 15 years, due to establishment of many new facilities and a significant increase in sales volume. However, in spite of this progress, they experienced problems with too large stocks and poor delivering service between the years of 2000-2005. They also faced challenges with health and safety during this period.

As a result of these emerging issues, a number of improvement initiatives transpired within Jotun. Management initiated more training and education within operations, and

[4] Fredrik Urdahl, Group Technical Director GOI and Group Supply Chain (e-mail, 8 June 2015)
[5] Tore Riise, Project Manager Groups Operations Improvement (e-mail, 11 May 2015)

in addition the Group Operations Improvement (GOI) was formally created in 2006. GOI is a small in-house consultant department that visits factories to work with improvements. Further, the work of developing a lean assessment called Jotun Operations Production Survey (JOPS) began.

JOPS was based on the methodology of a previously used evaluation adopted from Orkla, and intended to help with training and function as a survey tool to measure leanness in production facilities. JOPS was actively used between the years of 2007-2010, where almost all production facilities were visited and graded at least once. Some were even visited twice, and these showed great improvement during the period. However, after some years, it was decided to scratch the original survey methodology. This decision was partly a result of large changes within GOI's management and staff, resulting in lack of experience in conducting the assessment. Further, there was an emerging need to first develop concrete best practices the assessment could measure, as well as improving it and potentially simplifying it so that it could be used as a self-assessment.

This was the starting point of what is now called "Jotun Operation System" (JOS), also called "the Jotun house". The system describes the current best practices within Jotun, and its intention is to standardize and define how production should be conducted. JOS is built upon the lean philosophy and is inspired by the Toyota Production System in particular. Further, because of Jotun's strong corporate culture, it is also designed to be in accordance with the "Penguin Spirit" and support the group's values. JOS is displayed through the company's intranet, JOIN.

JOS was first introduced to managers at a global operations meeting in Dubai in 2012. Here, the subsidiaries were encouraged to start using the system, and upload best practices to JOIN. However, since this presentation most subsidiaries have received very little follow-up, and the potential benefits of the system has not been fully achieved.

In order to regain momentum and achieve a more lasting focus on JOS, GOI is now considering whether developing a company-specific JOS assessment could help. Therefore, they are collaborating with us in this case study of lean assessments.

5.2. Current audits and assessments

In this section, a brief overview of the most important audits and assessments currently used in the case company is presented. These include the *HMS audit, maintenance review, warehouse review, operations review*, and *ISO audits*. In addition to the

evaluations described below, various local audits and assessments are also applied throughout the organisation, but they will not be covered here.

Table 7: Current audits and assessments in Jotun

Evaluation tool	Description	Type of feedback	Comment
HSE audit	- Auditors visit plants and perform evaluations over the course of 3-5 days - Uses pre-defined standards defined by Jotun or local governments to find number of deviances - Assessment comprises the whole organisation - Usually done every 2-3 years, but more often at plants with poor assessment results	- Organisation is given an overall score, in the form of the colours red (poor), yellow (medium), or green (good) - A report listing deviations is also generated	- Considered the most important audit - Currently being adapted to become more improvement-focused
Maintenance review	- Reviews do not follow any regular schedule - Often done as post-evaluations when finishing projects and followed up some of years later - Uses internally developed templates to assess production effectiveness - *Faciliworks, a* globally implemented computer management maintenance system, supports the process	- "Belt-program" that assigns a colour (white, yellow, green, brown, or black), based on current levels - Plants can be rated up or down after each audit	
Warehouse review	- Representatives from Group Supply Chain and local managers walk around the warehouse to check whether the warehouse comply with Jotun's internal standards	- Potential issues are noted, and the warehouse receives recommendations for improvements immediately after the review	- Usually conducted in combination with other evaluations or meetings, to save resources
Operations review	Similar to warehouse review, but done in factories		- Have not been used the last couple of years
JOPS (and the Orkla audit)	- Internal assessment done by GOI to evaluate lean maturity	- Leanness scores, with the colours red (poor), yellow (medium), or green (good)	- Not in use today
ISO audits	- Checks compliance with ISO standards - Conducted locally	- Compliance (gives certification) or non-compliance	

6. Discussion

In this chapter, empirical data from the case study will be discussed against findings from the theoretical background. The discussion is divided into the following three parts in accordance with the research questions:

- *Benefits and drawbacks with assessments*
- *How lean assessments should be designed*
- *Criteria for successful lean assessments*

6.1. Benefits and drawbacks with assessments

In this introductory part of the discussion, we will discuss the potential benefits and drawbacks with audits and assessments.

Benefits

During case study interviews, one of the goals was to map managers' attitudes towards evaluation tools. We found that managers in Jotun clearly saw assessments as useful in improvement work, and that they see the need for a lean assessment:

> *"I still struggle to understand or evaluate in a scientific way if we are moving forward to become a more lean company." (Managing director, Saudi Arabia)*

> *"Any assessment is helpful and a lean assessment would be one of the best." (Operations manager, Czech Republic)*

Just as in literature, there is agreement between managers that measuring is essential in sustaining improvements, and that assessments can be helpful. This is obvious from statements such as:

> *"…[Assessments] ensure you take time to examine what you are doing and then create action plans to improve." (Managing director, Saudi Arabia)*

> *"It improves awareness on all layers, help eliminate blindness and share best practises between units." (Operations manager, Turkey)*

Further, managers in Jotun highlight the importance of making achieved improvements and improvement opportunities *visible*. This is agreement with literature, which states that changes must be measured and evaluated if organisations are to recognize improvements.

> *"To do lean work we need to measure to make sure what we are doing is supporting the business and that we are doing something better." (Head of operations, United Kingdom)*

> *"If you are not able to measure, it will probably be difficult to improve." (Deputy Supply Chain Manager, Western Europe)*

Managers also emphasize the role of assessments in providing a *starting point* for improvements. This is not explicitly mentioned in the reviewed literature, but is closely related to the argument above of showing improvements.

> *"When you start a continuous improvement project, you have to establish a baseline, to have a starting point. So you have to have an assessment." (Regional Supply Chain Manager, Western Europe)*

Thus, the managers agree that measuring and making improvements visible is beneficial. However, the interviews further revealed additional reasons why assessments are helpful. For instance, several managers mentioned benefits that come from having external people doing assessments. They have experienced that people from outside the site can detect issues not obvious to those who are at the location on a daily basis.

> *"A fresh pair of eyes can see things and pick up on things that we don't necessarily see, as we are sometimes too involved in the day to day business." (Operations manager, United Arab Emirates)*

> *"It is always helpful to have an extra pair of eyes." (Logistics manager, Greece)*

The value of having a "*fresh pair of eyes*" can be associated with the aspect of *knowledge-transfer* of assessments. As mentioned in the theoretical background, assessments facilitate transfer of expertise and practices. Thus, there seems to be an agreement among managers in Jotun and literature that assessments can facilitate transfer of knowledge. The person doing the assessment can contribute with his or her personal expertise, and also provide a different perspective than those going about their everyday work. Further, assessments can facilitate sharing of best practices. They can both be used to identify best practices, and to spread these practices within the organisation.

In addition to facilitating knowledge-transfer, literature claims that assessments communicate top-management priorities by the symbolic value they hold in showing company commitment to the improvement program. Jotun managers agree that practices or procedures being measured are perceived as more important to top-management. Further, one manager says that it is only natural to focus more on what is believed to be important to top-management:

> *"So then why would I not maintain that if I know it is really important to the business? And why is it really important to the business? Well, actually it is not only Northern European strategy, but also Jotun strategy." (Head of operations, United Kingdom)*

Clearly, managers in Jotun to a large degree agree with literature on what benefits can be achieved by assessments. However, managers also mention benefits beyond those covered in literature. One aspect mentioned by managers that was not covered in theory is a *feeling of receiving attention from top-management when being assessed*. The manager of a small and relatively isolated warehouse highlighted this:

> *"Anyone coming here just to say "good morning" and perhaps make a suggestion on how things could be done better, makes us feel closer to the whole team. So we need people." (Logistics manager, Greece)*

Thus, assessments can have an integrative effect by making subsidiaries feel closer to headquarters and the rest of the organisation. In literature, this integrative effect is not mentioned. Another potential benefit not mentioned in literature is the fact that someone coming to do an assessment can encourage the staff to contribute with their own ideas, because they see that something is going on. Actually, Jotun's management has expressed a wish to receive more improvement suggestions from employees.

> *"How can we get that culture where it is "cool" to contribute with improvement suggestions?" (Project Manager, Group Operations Improvement)*

> *"…You see that someone might share an idea after 15 years of working here. Because now they see movement." (Logistics manager, Greece)*

This implies that assessments not only communicate top-management commitment to improvement work, but also sends a signal to lower levels that management is open for improvement suggestions. Thus, assessments can also trigger contribution of improvement suggestions, as it makes people reflect upon the matters being assessed.

In summary, both literature and managers see many benefits of lean assessments. There is some overlap, and some benefits that are mentioned solely by either literature or managers, see table 8.

Table 8: Summary, benefits of evaluation

Theory	Managers
- Increased financial performance	- *(Not mentioned)*
- Can help identify and recognize improvements: • Sustain continuous improvement • Guide improvement processes • Monitor employee efforts • Lead to increased motivation • Clarify improvement for employees • Communicate top management priorities	- Can help identify and recognize improvements: • Sustain continuous improvement • Guide improvement processes • Monitor employee efforts • Lead to increased motivation • Clarify improvement for employees • Communicate top management priorities
- Show management commitment to the improvement program	- Show management commitment to the improvement program
- Provide a foundation for comparing plants (benchmarking)	- Provide a foundation for comparing plants (benchmarking)
- Facilitate learning and transfer of knowledge	- Facilitate learning and transfer of knowledge
- Improve internal communication	- Improve internal communication
- *(Not mentioned)*	- Provide a baseline
- *(Not mentioned)*	- Subsidiaries receive top-management
- *(Not mentioned)*	- Encourage and trigger new improvement ideas

The fact that not all benefits from literature were mentioned by managers does not imply that these benefits are less valid. The form of the interviews was semi-structured, and so managers did not have a list of benefits from literature to comment on. The benefits they mentioned are thus simply the ones that came to mind during the conversation.

Drawbacks

In the theoretical background we found some critiques of lean assessments. However, managers in Jotun are largely positive to assessments (they were more focused on negative experiences with the behaviour of the person doing the assessment, as discussed in chapter 6.3.4). They did however emphasize the importance of measuring the right things, which can be associated with the main negative aspect mentioned in literature; assessments hampering improvement by distorting focus, or focusing on the wrong measures.

> *"Depending on what you want to achieve, you need to choose the right KPIs. This is very important because if you are measuring the wrong things you will not know if you are improving or not." (Regional Supply Chain Manager, Western Europe)*

One of the drawbacks from motivational theory is that results should be given in a positive manner, or else they can hinder further motivation for improvements. This is in contrast with statements from managers in Jotun. Although many emphasize that those conducting the assessment need to act in a polite and friendly manner, no one sees poor assessment results as creating negative attitudes. On the contrary, poor assessment results are considered a good motivation to initiate improvement efforts:

> *"If you have very bad results, you have more opportunities for improvement. It is very easy to improve from zero. If you are at a 9 it will be very difficult to achieve a 10. But, if you are at level 1 you have lots of opportunities to improve. It is a challenge, which is good". (Regional Supply Chain Manager, Western Europe)*

> *"If I was getting a good review I would not improve. (…) We would like to hear that we have improved – that makes us feel good. But to say that everything is perfect – what does it mean? If you are perfect you lean back and you later deteriorate. We don't want that!" (Logistics manager, Greece)*

Thus, compared to our empirical findings, it seems that motivational theory exaggerates the importance of communicating results in a positive manner. Managers are able to themselves perceive poor assessment results as possibilities for improvement, and so there is no need to formulate poor results in a positive manner. Another point that is made in this regard is that the assessment results should not come as a large surprise to those involved, as one usually knows whether one has improved or not:

> *"You know, if it is something we can measure, that is very clear, then it shouldn't really be a surprise to anyone on the site that you haven't improved. But also it probably means that somebody like me haven't been focusing on it either." (Head of operations, United Kingdom)*

The very positive attitude of Jotun's managers towards measurement indicates that Jotun already are doing a good job of communicating assessments as a tool to help with improvement, and not to control subsidiaries. Overall, Jotun's managers show very little concern about negative consequences of assessments. Another reason for this positive attitude can be that managers in Jotun are used to having to deal with a multitude of different audits and assessments.

The relaxed attitude towards bad assessment results could further be associated with the management style in Jotun. From theory on organisational culture, we find that firms encompassing values of openness, empowerment and flexibility are more likely to succeed with assessments than firms emphasizing control and conformity. Jotun clearly falls into the first category, with managers emphasizing the value of transparency, communication and involvement of all levels on all matters. Further, we observed that successful improvement efforts had been developed through a process of trial and error, proving that Jotun holds values of flexibility. Jotun managers also emphasized that there has to be room to make mistakes.

> *"…There can be many reasons why one does not achieve improvements. Maybe you have tried something new that didn't work, and you have to take a step back. We need to have a culture where it is OK to make some mistakes. Of course, we always want success, but it has to be allowed to try something new. Sometimes it might not work, and then you have to think: Ok, we tried, it didn't work – now we need to try something else." (Group Supply Chain Manager)*

It seems that the organisational culture in Jotun can be one of the underlying reasons why managers have such positive preconceptions of assessments. Therefore it is also natural that, as opposed to literature, there was little talk during interviews about resistance to measurement. However, one manager had experienced this:

> *"When we started [measuring] in the warehouse, there were a few people not too happy about it. (…) People sometimes think "I don't like being measured, I've been doing this for so many years, I am quite happy doing this". So there is a bit of fear of the unknown. And some people think that the lean program "is not ours", but there to reduce costs and reduce heads." (Head of operations, United Kingdom)*

We see that resistance to measurement can partly stem from negative associations to the word "lean", and partly from fear of the unknown. Fear of the unknown is also mentioned by the union leader:

> *"Being measured is very individual. Those feeling confident in lean will consider it as something positive. Those who are insecure will not." (Head employee representative, Vindal, Norway)*

This point can be related to "the golden rule of measurement" as formulated in PMS literature by Neely et al. (1997): "There is no point in measuring someone on something over which they have no control". Apparently, there is no point in measuring someone on something over which they *feel* they have no control either. This proves the role of training and communication in reducing resistance to measurement, as will be discussed later.

In summary, there seems to be few explicit drawbacks with using assessments. However, it is important to keep in mind that these findings are based on empirical evidence form a company that has not had many bad experiences in this area. Also, the theory reviewed mostly focuses on the benefits of assessments, and less on potential drawbacks. The comparison of the drawbacks mentioned in theory and by managers is presented in the table 9.

Table 9: Summary, drawbacks of evaluation

Theory	Managers
- Can draw focus to assessment results, and away from development of lean culture	- Can draw focus to assessment results, and away from development of lean culture
- Employees can have fear of measurement	- Employees can have fear of measurement
- Distorted focus causes small issues to be over-looked	- *(Not mentioned)*
- Difficult to measure important, abstract aspects of lean implementation	- *(Not mentioned)*
- Assessment results is only an abstraction of reality and can lead managers to make wrong decisions	- *(Not mentioned)*
- Potentially resource-demanding	- *(Not mentioned)*
- Poor results can hinder further motivation for improvements	- Managers in Jotun disagree with this argument

6.2. How lean assessments should be designed

In this section we focus on various decisions that have to be made early on in the lean assessment process. First, we will highlight an important observation regarding the use of terminology. Second, we present and discuss managers' experiences and opinions about current and previous audits in Jotun. This is done to decide what could be learned and possibly carried over from these audits to a lean assessment. Third, we will highlight differences and advantages with external, internal, and self-assessments. Finally, we will discuss whether and when there is a need to adapt assessments to the organisation, and to each subsidiary.

6.2.1. The term "audit"

Words like *audits, assessments, surveys*, and *measurement systems* have been used interchangeably during the case study of Jotun. Even though they are not exactly the same, they all represent some sort of measurement tool. We have therefore not always been careful to differentiate between the terms. However, a recurring observation made throughout both interviews and informal conversations, is that many react negatively when we use the word "audit". Several have expressed they associate audits with a very strict and controlling type of measurement tool that is not particularly helpful for anything but pointing out deviances. One of the managers, who played a central part in the formal implementation of lean in Jotun, specifically expressed that:

> *"I think it will be smart to name the tool something that invites to openness and cooperation. In that regard I think "survey" is a better word than "audit"."*
> *(Managing Director, UK and Ireland)*

Audits are often affiliated with a strict check for compliance to a set of standards, potentially followed by penalties if one does not comply. The results are usually given as a list of deviations, without much focus on suggestions for improvement. Based on the strong negative reactions we experienced, it therefore seems that it is important to consider what terminology to use when measuring leanness: The term "audit" is inappropriate, when focus is on improvement and involvement. Terms like "assessment", "survey" and "review" were received more positively by the interviewees, and are better alternatives, as they appear to convey a more positive and including approach. However, when discussing this issue with academics, they argue that the term "survey" can be confusing, as it also refers to the distribution of questionnaires in research.

6.2.2. Experience with current and previous audits and assessments

In multinational companies like Jotun, it is common to have a multitude of audits and assessments, measuring all parts of the business. Some of them are required by law, while others have been initiated based on organisational needs. Even though these measurement tools are very different, some of them share similarities to lean assessments. Therefore, to uncover what we can learn, and potentially carry over to a lean assessment, we have investigated managers' experiences with other evaluation tools in Jotun.

The evaluations that were most commonly mentioned in interviews, and therefore included in this study, comprise: *HSE audits*, *ISO audits*, *locally developed quality audits,* and a lean assessment adopted from Orkla (the *"Orkla audit"*) (see table 7 for descriptions of the audits). In addition, some general comments regarding problems with current measurement tools will be briefly discussed.

Health, environment and safety-audit (HSE audit)

The most important audit in Jotun is the HSE audit. This is a legally required audit, and consequences for non-compliance are severe. Because of their serious nature, HSE audits are very rigid with little room for deviations. As Jotun have chemical factories that handle dangerous substances on a daily basis, managers express understanding for the high priority these audits receive:

> *"I guess the most important audit if you are talking about a pure audit is the HSE audit. We are a chemical factory, and we are handling dangerous goods. It is extremely important that HSE is a priority for everyone. We need to meet the rules, and we need to continuously improve over the HSE standards." (Regional Supply Chain Manager, Western Europe)*

In relation to lean assessments, HSE audits seem to be too strict and rule-bound. Typically, HSE audits only provide managers with a list of errors that need to be corrected. This approach will be inappropriate in a lean perspective for several reasons. First, the HSE standards are something that you either comply with or not. In lean, there are less distinctions of what is "right" or "wrong", and there is no one right solution. Thus, comprising a list of deviations does not make much sense. Also, according to managers, listing errors does not add much to motivation:

> *"The way we do it in Jotun is that we only look for deviations, it is pretty demotivating." (Vice President Supply Chain)*

Further, HSE audits have, historically, not been very including or transparent, with auditors doing the audits by themselves and thereafter presenting the results. Because of lean principles somewhat diffuse nature, implementation of them will be more difficult for an auditor to observe, than breaches in well-defined HSE regulations. Thus, lean assessments should involve people at the site to ensure that all issues are revealed.

Both theory and empirical evidence emphasize the importance of involving all levels of the organisation when conducting a lean assessment. This is different from the traditional HSE audit approach, where a few persons do the audit and then present a list of errors. However, in recent years, there have been changes in how HSE audits have been conducted, and they now involve local managers and workers to a greater extent. This "modern" approach is more in line with what one assumes to be appropriate for a lean assessment:

> *"That is how the HSE audits have changed over the past 10-12 years: In the past auditors used to arrive on site, walk around by themselves for three days, and then come and tell us where we were by showing us 200 photos of errors. But now, we all spend three days together. We go around and either fix the issues there and then, or we discuss potential solutions. So actually we form the improvement plan as we go along. It is very transparent throughout the whole three days. – And that's maybe*

how it should be in a lean assessment as well. You do it together." (Head of operations, United Kingdom)

According to one of the HSE directors in Jotun, these changes in the audits have been made in an effort to ensure they contribute more to improvements within HSE. Thus, Jotun have experienced that higher levels of involvement in the audit process is beneficial for improvements, even when it comes to strict legally required audits such as HSE audits.

ISO audits

In addition to the HSE audit, ISO audits are important to Jotun. The ISO certifications signal a certain standard to customers, competitors and other stakeholders. Since these audits are mainly used for external verification, demand for documentation is comprehensive. Some managers have critiqued ISO audits to be too focused on written documentation, instead of focusing on the processes going on in the organisation. All this documentation is not considered very value-adding to Jotun, and it is pointed out that it is not in line with the lean philosophy either:

"I think right now audits are not helping us become leaner. This is my opinion. (…) They are forcing us to be less lean! Because normally they ask for more documents and more non-value adding jobs and things to do." (Deputy Supply Chain Manager, Western Europe)

Contrary to ISO audits, lean assessments are meant for internal use and not for external verification. Thus, even though one must still ensure that the results are useful and valid, there is no need for comprehensive documentation to prove the correctness of lean assessment results. The above quote however brings about an important point: Lean assessments must be resource-efficient to conduct, or else they will actually contribute to making the organisation less lean.

Finally, certification audits often just compare the organisation towards some pre-defined list of standards, to check whether they comply or not. Regular internal audits are done to ensure that the organisation is still in line with the standards, but do not evaluate whether there has been any improvements since the last audit. Thus, ISO audits do not help the organisation improve beyond the standards. This is not in line with the lean philosophy, where continuous improvement should be a never-ending journey.

Local quality audits and assessments

In addition to formal quality audits like the ISOs, there also exist a multitude of internal quality audits and assessments within Jotun. In addition, several sites have developed their own, internal evaluations to keep track of local challenges. One example is the factory in UK, where they have started a project involving what they call "mini business areas" to improve operations.

Since these local evaluations are not mandatory or required by law or headquarters, they do not require large amounts of documentation or other formalities. One manager described the advantages of the local internal audits (meaning the less formal types of evaluations) over the ISO audits like this:

> *"Just when talking about the internal audits: We are very clever, very focused. We are not spending too much time on documents and paper. We are more focused on how we can do things in the right way. (…) Compared to ISOs and these kinds of audits, we are more focused on the process and less on documentation and papers." (Deputy Supply Chain Manager, Western Europe)*

Clearly, managers have positive perceptions of the local internal evaluations. A benefit of local initiatives is that they can be very specific, focusing on the issues that need to be solved at that particular location. However, use of resources on developing decentralized improvement projects and tools is not very effective, especially in cases where several factories struggle with the same issues, as seem to be the case in Jotun:

> *"There is not a large difference between the factories – they have the same problems." (Project Manager, Group Operations Improvement)*

A downside with several subsidiaries developing their own way to measure or track the same problems is that one continuously "reinvents the wheel". In such cases, it would be more effective to work together on creating company-wide procedures.

Finally we will address previous lean evaluations that have been held in Jotun. In beginning of Jotun's lean journey they used the "Orkla audit". This is a lean evaluation that was adopted from the company Orkla, one of Jotun's major owners. This measurement tool is very general in its design, meaning it is applicable to other organisations without severe modification. Thus, it was used in its original form in Jotun, after having a manager from Orkla guiding and supervising the first evaluation.

According to Jotun's managers, benefits of the "Orkla audit" were that it could be done as a self-assessment, and that it gave balanced feedback, containing both praise and criticism.

The Orkla audit was in use for several years, and is considered to have contributed greatly to lean implementation in Jotun. However, at some point it was no longer considered appropriate to Jotun. This was mostly because Jotun wanted to aim higher, and develop a specific assessment more in line with Jotun's own strategies. Thus, the JOPS assessment was developed based on the Orkla audit. JOPS assessments were conducted as internal assessments, with GOI as auditors. However, after having used JOPS for a few years, attention turned towards development of a new corporate lean program, JOS, and away from lean assessments. The loss of focus on lean assessment was largely due to a wish to develop a better assessment than JOPS, and one that was simple enough to be used for self-assessment. Thus, there is still a need to develop a corporate lean assessment for Jotun and JOS.

Additional challenges with Jotun's measurement tools

Current and previous measurement tools in Jotun all have their distinct benefits and drawbacks. In addition to the characteristics discussed above, managers highlighted a few other challenges that should be considered with regards to lean assessments. These will now be discussed in turn.

One manager expressed that some audits are too crude; meaning that the grading scale of the assessment is too narrow. For instance, in the HSE audit, subsidiaries are classified as red, yellow, or green. This crude scale may be sufficient with regards to HSE, where there are clear rules and distinctions between poor and good results. However, in a lean assessment, it is beneficial to include a wider scale, to better distinguish between maturity levels and show improvements at a more detailed level.

Another manager emphasized importance of communicating what was required by the subsidiary to achieve the different levels, and making sure everybody had a clear understanding of this:

> *"Most assessments conclude the findings in a final report and give the company a grading based on this. This is OK if you know the conditions of the grading before the assessment is done. Sometimes requirements are changed and it causes surprises." (Operations manager, Czech Republic)*

Managers also focused on the fact that assessment results are sometimes used to compare plants, which can be problematic if one does not take into account local conditions and other relevant factors affecting results. Another issue was that audits sometimes are too subjective and not thorough enough. However, a standard set of questions was still believed to be a good approach to ensure site consistency, even if this limited specificity of the questions. A final remark was based on negative experiences with lack of training. It was stated that that "being an expert in your field does not necessarily make you a capable auditor". Thus, if the lean assessment is to be done internally, one has to ensure auditors get enough training in their tasks.

The most important observations about Jotun's audits and assessments, in relation to a lean assessment, are summarized in table 10.

Table 10: Lessons learned from current and previous evaluations in Jotun

Evaluation	Lessons learned
HSE audit	Lean assessments do not need to be as strict and rule-bound as HSE audits. Involvement is important. Dividing results into three levels is too crude.
ISO audit	Lean assessments should not require extensive documentation. Focus should be on improvements, and not on achieving a certain level (standard).
Local quality audits	Lean assessments should focus on processes and results, and not on documentation. Adapting assessments to local challenges has advantages. Decentralized initiatives can be a waste of resources if subsidiaries meet the same challenges.
Previous lean assessments	Assessments should give balanced feedback. Lean assessments need to be updated to keep adding value to the business.

6.2.3. External, internal, and self-assessments

Another central decision to make when designing and starting to use a new assessment tool, is whether the evaluation should be done as an external, internal, or self-assessment (for descriptions of the categories, see table 4). The approaches have various advantages, and are suitable in different situations. Both organisational factors, such as *lean maturity*, and the intended use of the assessment impact what type one should use. As discussed in the theoretical background, the three approaches also differ in terms of resource demand. We will in this section discuss their main advantages and disadvantages and consider what type would be most appropriate as a lean assessment in Jotun.

Managers in Jotun have experience with all the assessment types. Examples of external audits in Jotun are legally required audits, like HSE audits, or certification audits. Typical examples of internal audits and assessments are maintenance assessments, quality audits, and warehouse reviews. Lastly, many locally developed assessments are done as self-assessments. In addition, Jotun uses several intermediate HSE-, quality-, and maintenance self-assessments to keep track of the situation between formal assessments.

Lean assessments are typical "improvement assessments", and not subject to any formal or external requirements. Thus, there is no need for external validation or hiring of external people to do the assessment. The self-assessment is considered the least expensive overall; since one does not need to hire external auditors, or have people from other areas of the organisation perform it. However, resource-use will increase if training is required to conduct the assessment.

In Jotun, resources allocated to lean work are very limited. One of their greatest challenges is how to allocate these resources, to drive progress in lean implementation in the best possible way. Having representatives from the lean improvement group (GOI) travel to each site to perform the lean assessments can provide better individual follow-up, but it might not be a good way to spend limited resources. On this subject, managers in Jotun are somewhat divided. While some factory managers express a need for an internal assessment, with GOI coming to do the assessment, top-management stress that this is not a feasible solution:

> *"If you are going to have a lean assessment and use as few resources as possible – and not be dependent upon a small department like GOI – you have to make some kind of survey that you can do on site, and that is easily understandable. GOI cannot travel all over the world to perform assessments. That would not be resources well spent." (Group Supply Chain Manager)*

Thus, finding a solution that can satisfy local managers' need for closer follow-up within the resource restrains is a challenge for Jotun. Although factory managers seem to find internal assessments as being the best solution, a self-assessment might be the only feasible solution for Jotun.

Another aspect to consider when selecting between approaches is the need for *objectivity*. When results are important to parties outside the organisation, external assessments are a good choice; to ensure that findings are reliable, validated, and not compromised by subjectivity. This will help convince people about the usefulness of the results. Subjectivity is a challenge with internal assessments and even more so with self-assessments. People within the organisation can be affected by their expectations and wish to obtain good results when performing the assessment, potentially ignoring errors or deviances. One manager gave an example of this, and described how Jotun's attempt to have self-assessments in maintenance resulted in all units achieving good scores on everything. However, another manager does not consider subjectivity an issue in self-assessments, if they are conducted by capable managers:

> *"If the manager is good, then honesty is not a problem" (Senior Supply Chain Specialist)*

Subjectivity is not the same as dishonesty, but results of a self-assessment will be affected by the people performing it. Another issue with self-assessments is that people present at the site on a daily basis conduct them. Even though those who work at the site has the most knowledge about what problems are encountered there, local managers or workers are so used to being in the environment that they can sometimes overlook issues that need to be improved. This challenge was highlighted by several managers, who generally seamed very open and excited about the idea of being assessed by someone from outside of their own subsidiary:

> *"Love to have fresh pair of eyes in the factory, I would be more than happy with that." (Head of operations, United Kingdom)*

A warehouse manager who had recently moved to a different position in Jotun also experienced how he gained new insights from being away from the warehouse:

> *"Now that I am a bit away from the warehouse, I can contribute with a different look. I might see something that I could not see for the last 7 ½ years." (Logistics manager, Greece)*

A benefit with internal and self-assessments over external ones is that people performing the evaluation have greater organisational knowledge. External parties evaluating a site can sometimes experience not being taken seriously, because people doubt their ability to understand the organisational context and thus evaluate unfairly. One manager emphasized that having internal people do the assessment could also help sharing of best practices within Jotun:

> *"Assessments should be done by experienced people from operations. This will ensure good and relevant feedback, and can help share best practices. It will help us see what we are good at and what areas should be in focus." (Operations manager, Czech Republic)*

As also highlighted by the statement above, it is important that those doing the assessments are *experienced* in their tasks. They need to have sufficient knowledge about the issues they are assessing. The auditor must therefore be *trained* in order to achieve reliable and usable results. In the case of external assessments, lack of knowledge is not an issue, as the auditor will usually be an expert. Thus, one can assume results to be of high quality. With internal and self-assessments, it is up to the organisation to provide appropriate training.

However, while external assessments eliminate the need for training of auditors, the gain of organisational learning will be much less compared to the other approaches. This is due to the considerable learning potential from doing the assessment, as mentioned in theory and also confirmed by managers:

> *"Most of the learning probably takes place during the discussion and work that is done when you meet on site." (Managing Director, UK and Ireland)*

Thus, not only can the results of a lean assessment help drive lean initiatives further along, the assessment process itself will also contribute to organisational improvement. The considerable learning that can be achieved by doing the assessment is an argument

for self-assessments. By self-assessments each site can learn how to improve itself. However, while self-assessments facilitate the most learning within each site, internal assessments facilitate transfer of knowledge across the organisation. This is because the person conducting the internal assessment will have expertise in the field, and knowledge from assessing other sites. When the same people do assessments on several sites, best practices and experience will spread through the organisation by means of the auditors.

Managers in Jotun, when asked whether they thought they could perform a lean assessment themselves, expressed a need for more coaching. This is in line with theory, which states that people in the organisation need to have certain knowledge of lean principles in order to do a self-assessment. Also, self-assessments are considered more appropriate for organisations that have reached a certain level of leanness, so the lean maturity should be considered before selecting the self-assessment. However, regardless of the assessment being internal or self-assessment, one must take training into consideration in both the design and implementation phase.

A final note on the differences between the three approaches of doing assessments is *involvement*. Both theory and empirical evidence shows that this is a central part of any assessment. Motivational theory shows that all levels of the organisation should be included in the lean assessments to ensure maximization of the potential motivational effect. Managers seemed to agree strongly with this argument. Thus, internal and self-assessments are better options than external assessments, to ensure maximum involvement.

Managers in Jotun expressed that doing a lean assessment as a self-assessment should be achievable as long as it was easy to understand, and that requirements were well communicated beforehand:

> *"This evaluation should be designed so that you can use it yourself, and so self-explanatory that you know what to look for, and what requirements you need to fulfil." (Group Supply Chain Manager)*

Developing a survey or an assessment that factories and warehouses can do themselves, after receiving appropriate training and assistance, would be a sustainable and resource effective approach. Considering the limited resources available for lean initiatives in

Jotun, a lean self-assessment stands out as the current best alternative to the case company.

In summary, managers emphasize some, but not all benefits and drawbacks that were found in literature. Because objectivity is not important, external assessments are not considered the best choice for lean assessment. The above discussion leaves us with a condensed version of the benefits and drawbacks from literature. In table 11, the most important issues to consider according to managers are written in black, while issues that were not mentioned are in grey.

Table 11: Benefits and drawbacks of assessment approaches highlighted by managers

	External	Internal	Self-assessment
Benefits	• Objectivity • Appropriate for external validation • Input from external expert	• Auditor knows the organisation • **Facilitates cross-organisational transfer of expertise**	• **Participation facilitates learning within each unit** • Increases ownership of results • Auditors have deep insight into the unit being assessed • **Low use of resources**
Drawbacks	• Auditor does not know the organisation • Less local ownership of results • High cost of hiring external auditor	• Somewhat prone to subjectivity • **Expenses of hiring an internal auditor**	• Subjectivity • **Requires skilled personnel** and a certain level of leanness • Potential expenses for training • Restrictions to assessment's complexity

6.2.4. Standardization versus adaptation

The last design issue to be discussed is how much a lean assessment should be standardized or adapted. The issue can be divided into two levels. First, the assessment might be adapted to fit the organisation at hand. Second, it might be necessary to adapt the assessment within the organisation as well. Both issues are discussed below.

Adapting the assessment to the organisation

As discussed in theory, literature on lean assessments generally seeks to provide readily designed lean assessments. This is in contrast to PMS literature arguing that all measures should be designed in line with organisational context and strategy. While using existing lean assessments directly requires fewer resources than designing own measures, it can be difficult to find an existing assessment that is a perfect match to the organisation. Thus, a tailor-made assessment can therefore be more efficient and have more practical value to the subsidiaries.

The need to adapt lean assessments to the organisation was not much discussed during our interviews with Jotun's managers. Most interviewees seemed to have the preconception that a lean assessment in Jotun would be developed internally by GOI. Thus, it seemed like they, by default, found it natural that Jotun develops its own assessment. The reason for this might be that managers did not have any examples of existing lean assessments at hand, and thus it was not logical to discuss the option of using an existing assessment. Still, based on observations, interviews, and theory, we will discuss whether Jotun should develop a corporate lean assessment, or simply use an existing one.

The *lean maturity* of the organisation is a main issue to consider in the choice of lean assessment. Literature argues that existing lean assessments might be too simple for a high-maturity organisation. However, low maturity organisations only need simple assessments, and thus have less need to design their own measures. Further, low-maturity organisations are less experienced with lean and might not have the skills required to be able to design a corporate lean assessment. The key role of maturity was confirmed by one of the managers:

> *"…As units implement lean and get better, the assessment has to become more sophisticated to better define the culture of the business, rather than the implementation of tools." (Managing director, Saudi Arabia)*

Jotun's managers have different impressions of Jotun's lean maturity. Some managers argue that Jotun still has a long way to go towards becoming lean, giving the impression that Jotun is a company with low lean maturity.

> *"I will say that many factories are more or less on the same level. (…) We are good in some things, worse in others, but on average we are more or less doing the same. But still, there is a long, long, long way to go before we can call Jotun lean." (Regional Supply Chain Manager, Western Europe)*

Yet others argue that even though there is still a lot of potential, Jotun has been working with lean for many years and improvement work even longer, and that there is good knowledge of lean within the organisation.

> *"We have a good knowledge of lean, everybody. We are in a company where most, at least at the level of managers, has been taught about lean." (Deputy Supply Chain Manager, Western Europe)*

> *"For as long as I have been in Jotun (40 years) there has been continuous improvement. So if anyone tries to say that it's something new that is wrong. The difference is that we now have begun calling it lean." (Senior Supply Chain Specialist)*

From interviews and observation of management meetings and factory visits, it is clear that managers in Jotun have good knowledge of lean principles, and the use of lean tools. Thus, Jotun as a whole can be said to be at an intermediate leanness level, and should have enough qualified people to be able to design a corporate lean assessment.

However, the resources needed to design a new assessment, or adapt an existing one to better fit the organisation, are much larger than if one simply selects an appropriate assessment from literature. This can be a challenge in Jotun, since resources allocated to lean work are rather scarce. Further, most existing lean assessments are developed for the manufacturing sector, which Jotun is a part of. This speaks in favour of the possibility of applying an existing lean assessment tool with success.

Still, using the wrong measures can have negative impacts on organisational performance. Thus, in the long run, the organisation might be better off investing resources into making a lean assessment that is a better fit with their corporate lean strategies and organisational objectives. In addition, it has been observed that Jotun

holds a strong corporate culture, which can enhance the need to adapt measures. Following PMS literature, strong organisational cultures should be given special consideration with regards to how measures will affect behaviour.

Furthermore, Jotun are not seeking to assess leanness in general, but the implementation of their company-specific corporate lean program, JOS. As this program includes management principles beyond lean fundamentals, general lean assessments are most likely not comprehensive enough to cover all aspects relevant to Jotun.

In summary, there is a trade-off between efforts required to design company-specific lean assessments, and the potential benefits that can be obtained from having a better fit between assessment and organisation. The benefit of adapting assessments to the organisation increases with organisational lean maturity. In the case of Jotun, the intermediate lean maturity level combined with the use of a company-specific corporate lean program implies that Jotun should develop a lean assessment that is tailor-made to the organisation. The strong corporate culture adds to the importance of considering measures in an organisational context.

Adapting the assessment to subsidiaries

The above analysis suggests that Jotun should design a lean assessment that is tailor-made for their organisation. However, there might also be a need to adapt lean assessments internally in the organisation. Depending on differences in characteristics within the organisation, making a *standardized lean assessment* – one that is applicable and relevant to all subsidiaries – can prove challenging. In this section we therefore seek to identify what factors can cause a need to adapt assessments within the organisation.

Jotun's subsidiaries are spread across the world, and differ greatly in size and complexity, as described in the case presentation (chapter 5.1). There are also large differences in plant age and levels of automation. Such differences between subsidiaries can represent a challenge when trying to design a lean assessment that is to be standardized across the organisation. The lean assessment needs to be relevant and applicable to all subsidiaries, and at the same time be detailed enough to give valuable feedback on lean implementation progress.

Like in the case of adapting assessments to the organisation as a whole, adaptation to fit each subsidiary will be costly. This would have been less of an issue for a company with fewer subsidiaries. However, with Jotun's many subsidiaries the costs of having each

subsidiary design an individual lean assessment will be considerable. In addition, using different lean assessments eliminate the opportunity to compare subsidiaries against each other (benchmarking is further discussed below). One of the managers reflects upon these issues when asked about whether one should make a standardized assessment or not:

> *"It depends what we are going to use the assessment for. If we are benchmarking against other sites, we should use the same one. Although it might be more value-adding to have a quite specific one for each plant. I suppose that would create a lot more work, because we are all different." (Head of operations, United Kingdom)*

One of the managers interviewed clearly saw organisation-wide standardization as being the best option, both with regards to resource use and the opportunity to benchmark:

> *"I wish GOI could help the organisation make standardized templates. Make suggestions to how things should look like. (…) So there was a toolbox where one could go and find solutions. Instead of each factory making this for themselves, because that is a waste of time in my world." (Group Supply Chain Manager)*

Further, others pointed out that lean principles remain the same regardless of where you are, and thus it should be possible to have a standardized lean assessment for the whole organisation:

> *"Lean is lean everywhere. (…) Even if your factory is big or small, or if you are in India or Japan. So you can probably have one standard. Like all the tools we use in Jotun: 5 whys, the 5S in cleaning, the SMEDs… This is applicable everywhere." (Deputy Supply Chain Manager, Western Europe)*

> *"We are looking for standardization. We all do the same. If we are looking to be lean – there is only one lean. (…) The standard should be the same. We are all making paint, the same paint. All the factories are making the same products. So we need to go for a standard process." (Regional Supply Chain Manager, Western Europe)*

Thus, managers see the need for standardization of lean assessments, both to avoid waste of resources and to be able to benchmark between subsidiaries. They also think it should be possible to make one worldwide assessment, because of the common lean

foundation that all subsidiaries share. However, some managers emphasize the large differences within Jotun, and argue a lean assessment adapted to local factors might be more useful:

> *"So, I think from a business point of view, an overall audit will help us compare who is leaner and creating more value site by site. But actually what would help the site more, is probably a more of an individual one." (Head of operations, United Kingdom)*

Thus, while managers in Jotun think it would be good to have a standardized assessment for Jotun, they are not sure whether it is actually a good solution. This insecurity stems from the perceived vast differences between subsidiaries, and that assessments need to be relevant to each subsidiary to be of value. Differences in size and complexity of subsidiaries are mentioned by managers as key factors that can make it challenging to formulate a standardized lean assessment for Jotun. Complexity relates to the number of products being produced on one site, and is mostly relevant for production facilities. Differences in automation levels are also mentioned as a key difference. For instance, the warehouse in Flixborough is both much larger and more automated than the one in Athens:

> *"Flixborough is a huge warehouse with seven layers of racking while we are much smaller. So although the concept is the same we have a totally different way of working. You need to adapt to these." (Logistics manager, Greece)*

Differences in *size, complexity and automation* need to be considered when designing a standard lean assessment, because they are structural factors that should not affect how good assessment results are achieved. Thus, one need to ensure that such factors are taken into consideration when assessing results, or make sure the assessment is done in such a way that these structural factors does not affect results. For example, one of the members of GOI emphasize that the assessment results need to be independent of automation levels, to avoid that good results are only achievable for subsidiaries with new machinery. However, lean assessments consider the quality of processes, not physical factors. Size, complexity and automation levels are easily quantified, and should be unproblematic to include as contextual factors in an assessment. Although these factors need to be taken into consideration in assessment design, we do not consider such structural factors to obstruct the possibility of making a standardized assessment for Jotun.

Another issue to consider with regards to standardization is differences in national culture, as Jotun's subsidiaries are spread across different countries. However, Jotun is well established as a multi-national company and has much experience with handling cultural differences. Thus, although managers mention cultural differences, it is not seen as a pressing issue:

> *"There are cultural differences. People working in Spain and people working in China or Turkey are different. Culturally we are different. We need to manage this variety, but you are going to produce paint the same anyways." (Regional Supply Chain Manager, Western Europe)*

Furthermore, Jotun has a strong organisational culture. Although some studies find that management practices should be adapted to national culture to achieve optimal outcomes, others argue that strong organisational cultures dilute the effect of cultural differences across nations. A previous operations manager in China confirms that Jotun's strong organisational culture affect people worldwide:

> *"We have a strong culture – it does something with everyone who has been working here for a while." (Senior Project Manager)*

Cultural differences are important to be aware of for all multinationals. Managers in Jotun have experience with this, which is confirmed by stories such as how they had to change their logo from black to blue in the Middle East, because black birds are seen as a symbol of death. However, the strong organisational culture in Jotun lessens the effect of differences in national culture. Although cultural differences should not be forgotten, it is not seen as an issue that affects the opportunity to standardize lean assessments. Thus, cultural and structural factors are important to consider if a company wants to design a standardized lean assessment that is applicable and relevant to all subsidiaries in the organisation. However, these factors are manageable and it should be achievable to design a lean assessment that can deal with these varieties.

With the above issues being considered as manageable in attempting standardization, we are left with one main factor that can obstruct the opportunity to standardize lean assessments across the organisation: *Differences in leanness*. This is in accordance with the theoretical background, where we find that inter-organisational differences in lean maturity levels seem to be the most important factor that can impede the opportunity to apply the same assessment across the whole organisation.

Our observations from the case study suggest that there exist different levels of leanness within Jotun. However, managers' impressions are divided:

> *"I will say that most factories are more or less on the same level." (Regional Supply Chain Manager, Western Europe)*

> *"I think that different sites will be at different levels of lean implementation and the use of lean tools." (Operations manager, United Arab Emirates)*

Further, the leader of GOI states that there are differences between the factories, but that some factories are doing well even if they are not focusing on lean. He highlights Saudi as a site where there has been a continuous focus on lean over time, and Dubai and UK as sites that are currently improving fast.

Based on our empirical data, it seems that Jotun has many subsidiaries that are somewhat lean, and only a few that stands out as having higher leanness levels. Thus, subsidiaries within Jotun cover a range of different leanness levels, from low to relatively high maturity. Differences in leanness is a barrier to standardizing lean assessments, because higher levels of maturity requires more sophisticated lean assessments to uncover incremental improvements, while low-maturity units need simple assessments that are easy to comprehend. Consequently, different lean assessment measures will be relevant at different maturity levels. This issue could potentially be omitted by designing an assessment that consists of many different levels, as was also suggested by some of the managers.

However, an assessment that covers different maturity levels will necessarily be more complicated than one that is focused on either higher or lower levels, and design cost are likely to run higher. Further, as one does not know a unit's maturity level until *after* the assessment, it is difficult to know beforehand which parts of a multi-level assessment one should use. Again, this problem might be solved by detailed descriptions of maturity levels, but formulating detailed descriptions of maturity levels that are appropriate and understandable to the whole organisation is most likely very challenging.

Actually, it seems that higher lean maturity within subsidiaries means it is more difficult to make one common lean assessment. From the theoretical background one can draw that standardized assessments are less likely to be applicable to higher maturity units. Thus, the need to adapt an assessment to a subsidiary increases with subsidiary leanness. Further, high-maturity subsidiaries are more likely to develop their own

measures which are used in parallel with the assessment provided by headquarters. The need and tendency for subsidiaries to develop own measures is also evident in Jotun, as several of the leaner subsidiaries are already developing systems similar to lean assessments.

In summary, high-maturity units need highly sophisticated lean assessments. Also, they are capable of developing their own measures – and most likely will. Further, although maintaining the lean focus is important in high-maturity subsidiaries, pay-offs from improvements will be higher in low-maturity ones. This implies that if making a lean assessment that is to be standardized across the organisation, it could be more fruitful to focus on lower and intermediate levels of lean maturity. In the case of Jotun this should cover most of the subsidiaries.

Finally, applying a standardized lean assessment requires the subsidiaries to see the usefulness of the assessment. Standardized tools can easily be seen as not being "applicable to us, here". Even if one makes a lean assessment that is applicable to all subsidiaries, they might try to adapt it for themselves anyhow. This might be especially true in Jotun, where each subsidiary has a relatively large autonomy and is free to develop their way to improve. This can for example be seen from what happened when an improvement process that had been used with good results in Flixborough was introduced in Barcelona: The tool has still not been implemented in Barcelona, partly because they do not perceive the tool as being readily applicable to their location:

> *"…We haven't really done much with it in Spain, and we saw and heard why this morning: The number of batches going through. But I also know they are looking to change it, to sort of mold it for themselves. But actually, it is a system that just works. So, get some wins with it first, and then try and adapt it to your own business. But use it to know it works first." (Head of operations, United Kingdom)*

Clearly, if subsidiaries are to use a standardized lean assessment they have to trust that it is applicable to them. This shows the importance of involvement and communication throughout the assessment process. Considering how Jotun's subsidiaries have a large degree of autonomy and perceive themselves as very different from one another, partial standardization could also be an appropriate solution, as suggested by this manager:

> *"Assessments should be standardized in main parameters on what is expected from the unit with respect to JOS, yet flexible enough to cover local conditions." (Operations manager, Czech Republic)*

Developing a template to cover the most important lean aspects, while leaving room for each subsidiary to adapt the assessment locally, could provide for a balanced solution – combining the need for standardization with the benefits of adaptation.

A last issue to consider is what departments one wants to conduct lean assessments in. During our participation in management meetings in Jotun, we learned that lean initiatives are used in other parts than merely production, such as in warehouses and sales departments. Thus, it is relevant for Jotun to have lean assessments in more units than production:

> *"…We tend to focus on operations. If we are having assessments we might want to think about purchasing as well. Because we are no better than our weakest link. (…) We need to consider the whole supply chain." (Group Supply Chain Manager)*

Most existing lean assessments are focused on manufacturing, while a few are designed for service-organisations and the like. The division of existing lean assessments into sectors imply that formulating a lean assessment that can be used in different departments, such as both production and sales, might be too challenging. This is also mentioned by a warehouse manager:

> *"If you have a survey for a factory, I don't know how much it would apply here [in the warehouse]." (Logistics manager, Greece)*

Thus, it could be necessary for Jotun to have different lean assessments for different departments.

Benchmarking

Several managers see the opportunity for benchmarking as an important reason for using a standardized lean assessment:

> *"I think that, if you are going to have such an improvement survey, then you can have some suggestions for KPIs that are relevant to that area. So that we might be able to benchmark each other." (Group Supply Chain Manager)*

However, we have also found that Jotun's subsidiaries are very different. While most local factors, such as complexity and culture, are found not to hinder the opportunity to apply a standardized assessment across all subsidiaries, they can impact the appropriateness of benchmarking. Actually, many managers in Jotun brought up how benchmarking between subsidiaries may not be appropriate:

> *"Just don't make the mistake of thinking you can compare the different parameters. Because it can be very different depending on what equipment you have, assortment, volume of the different products… So, it's like comparing apples to pears and bananas." (Senior Supply Chain Specialist)*

> *"So sometimes, benchmarking between two factories is not right because there are things you need to take into consideration. So the best benchmarking is against yourself." (Regional Supply Chain Manager, Western Europe)*

> *"You have the factory in Vindal that produces large batches, and everything happens automatically and with few employees. And then you have Spain, which has 2000 different products and small batches. Well, you cannot compare those two, so benchmarking must really be done against themselves." (Group Supply Chain Manager)*

It is clear that benchmarking can be a challenge for a company that consists of many very different subsidiaries. However, except for culture all the factors pointed out by managers as obstacles for benchmarking have to do with characteristics in production. As discussed, complexity, volume and local levels of automation are contextual factors that are relatively easy to measure and compare, and thus should be easy to include in benchmarking as moderating factors. If these factors are correctly taken into consideration, it should be possible to make a fair comparison of lean maturity levels across subsidiaries.

Still, it can be difficult to decide how much contextual factors should be taken into consideration. A high-complexity subsidiary will likely put more emphasis on the importance of complexity than a low-complexity one, because it is a factor that affects their performance more. Further, one can never be sure that all relevant factors are considered. Thus, benchmarking between subsidiaries can easily be perceived as unfair, and benchmarks be seen as inappropriate goals. This is especially true in companies such as Jotun; where subsidiaries see themselves as being very different. Therefore, having each subsidiary benchmarked against itself – as suggested by Jotun managers – could be more efficient in driving organisational improvement.

If benchmarking across the organisation indeed is of low value, this relaxes the demand to use exactly the same assessment in all subsidiaries. One opportunity could then be to have a fairly standardized assessment, but formulate individual goals for each subsidiary.

6.2.5. Utilizing existing initiatives

As mentioned in theory, subsidiaries will often develop own measures, and these measures should be utilized as input in assessment design. In the case of Jotun, some subsidiaries have already begun to use lean assessments or similar tools locally. For instance, in Saudi, they do yearly assessments using the old lean assessment JOPS, even though this is not required by headquarters. They also use the "Orkla audit". In Turkey, they are using a system they call Business Operations System (BOS), which was developed by their current operations manager. This is a performance measurement system that covers the whole production process, and results are discussed in frequent meetings.

There is no doubt Jotun should learn from existing lean (or JOS) assessments and similar projects, as they have already been tested in the organisation. This could save considerable amounts of time in the design of a lean assessment. Such information must however be requested – subsidiaries do not necessarily share their successes with the rest of the organisation, as the main goal for each subsidiary is to improve internally. Managers have also emphasized importance of not doing overlapping work and encouraging sharing of experiences:

> *"But we are not very good at selling ourselves… I think we do some really good stuff, but we obviously aren't great at sharing that. So we need to make sure we don't have to reinvent the wheel." (Head of operations, United Kingdom)*

It is clear that many of Jotun's subsidiaries have conducted successful improvement projects, and that increased transfer of knowledge across the organisation will be beneficial – both to avoid resource waste by doing things twice and to drive the whole organisation towards best practice. This is also true for lean assessments.

6.3. Criteria for successful lean assessments

Combining findings from literature with empirical findings, we have identified a number of criteria that are important to succeed with lean assessments – meaning that the assessment is conducted regularly and results are being used for decision-making in a way that adds value to the organisation. These criteria will now be discussed in turn.

6.3.1. Communication

From literature, it is clear that communication is of key importance in improvement assessments. How assessments are communicated to the organisation, and how assessment results are used in communication, proves to be vital for the success of assessments. Jotun's managers also emphasize the importance of communication, as will be discussed now.

Pre-assessment communication

In the literature review we found that the purpose of the assessment should be communicated early in the process. Further, the specific measures should be explained before the assessment is performed. It is important that employees understand *why* it is necessary to use a lean assessment before it is implemented. This will increase employee commitment to implementing the tool, and reduce resistance and fear of measurement caused by the assessment being perceived in the wrong way. Managers in Jotun also stressed the importance of early communication:

> *"We need to be very clear in the scope of the project. You cannot go and say "come on guys, we are going to be more lean!" You need to really explain what you want to achieve." (Regional Supply Chain Manager, Western Europe)*

> *"But GOI probably needs to share the audit with the operators at some point as well – because it is the right thing to do. I am happy to be audited, because it will help me improve. But, share with each factory that you are coming to audit." (Head of operations, United Kingdom)*

Further, PMS literature argues that the purpose of assessments needs to be carefully formulated, and that *how* it is communicated matters: Successful companies focus on how assessments can help manage the business better and moving it forward, as opposed to just improving performance measures. Jotun's managers agree that communication should focus on the improvements that can be achieved:

> *"We try to show the benefits before we start a project: Where is the starting point, where do we want to go, and what are the benefits of making these improvements? It is important that everyone understands that." (Deputy Supply Chain Manager, Western Europe)*

It seems that communicating purpose and goals before commencing improvement projects is already common practice in Jotun. An important argument for pre-assessment communication is to minimize fear of measurement. As one manager expressed it:

> *"There is a bit of fear of the unknown there as well, I think." (Head of operations, United Kingdom)*

Thus, pre-assessment communication should be focused on making the lean assessment known to all affected employees. This can help avoid lean assessments being perceived as an uncomfortable way for management to control employee's behaviour. If the purpose is misinterpreted, it hampers the implementation of the assessment. Communicating the lean assessment and its purpose clearly, before the assessment is performed, will remove uncertainty and prepare the organisation for the assessment.

Challenges with measuring people were highlighted by some managers. They said that, in their experience, it was important workers understood the assessments were meant as a tool to help them in their daily work. It was also important that they understood the assessment was not there to control them as individuals, but to enhance overall organisational performance through improving every part of the business:

> *"It is not about you. It is about the system. It is about the business. It is "how can we help you always have really good days?" Because you have really good days, and you have really low days. So understanding how you got that high day and low day. (…) It is about "what more can we do?" to support our business. And that is the really important bit." (Head of operations, United Kingdom)*

From the interviews it is clear that while managers see assessments as being helpful, employees can be sceptical and feel uncomfortable with measurement. Thus, communicating the purpose of the assessment, and ensuring everyone understands the real intentions with the lean assessment before it is conducted, is crucial to its success.

However, it is important that the information given is comprehensible and relevant to those receiving it. One manager explained that in a recent project, they had tried sharing "everything" with a selection of operatives in their factory, to test how complicated information was received and understood:

> *"It is important for the operatives to understand why we make the conclusions, but actually, going through all those documents… It is not really necessary for the factory workers. (…) We picked the best workers, to be fair. And they loved it, but they did say that they didn't have a clue what was going on." (Head of operations, United Kingdom)*

Another manager had experienced that management, when communicating with employees, used terms whose meanings were not clear to the employees (using the term "working capital" as an example). Thus, while sharing information is important to the success of lean assessments, one must make sure the distributed information is relevant and understandable to those receiving it.

Use of results in communication and feedback

Another aspect of importance is how the results from the assessments are used in communication. In the literature review we found that whether results are used on a daily basis is important to the assessment's overall success. It is important that people see the benefits from having the assessments themselves. Displaying and using results actively is an effective way to communicate this, and it also shows importance of the assessment. However, showing benefits of lean assessments can be challenging in the beginning before one has achieved any tangible evidence. This was confirmed by one of the managers, who stressed that it got easier after a while, and that achieving results had a motivational effect on workers:

> *"Now it is easier because you can see the results. Now we are talking about something tangible. And you can stop, you know, x months later and say: "Hey guys, do you remember how we used to be? This is a good improvement!" Once you achieve results you can see, then it is very easy to show the people. And that is very motivating." (Regional Supply Chain Manager, Western Europe)*

Further, motivational theory also emphasizes that one should communicate results to everyone, in order to give employees a sense of internal recognition. Jotun has great

focus on sharing results with everyone in a timely manner. In factories, they use whiteboards and the like to display relevant information, updated on a daily or weekly basis. With regards to assessments and audits, feedback is often given to local managers through a presentation, and results are then shared with workers in an appropriate ways. This approach is in line with theory, which says the amount of dialogue about performance, differentiates high-performing businesses form others. As an example, in the warehouse in Greece, they display results from their latest warehouse review on a board in the common area. When asked why they did this, the manager said:

> *"Because if they cannot see, how will they know what to improve? If they are responsible for it, they will do the work. (…) They need to know how and why. The more they know, the more they become a part of it, and the more responsible they become for it. They start to own it." (Logistics manager, Greece)*

However, some managers did not agree feedback should be given to all employees:

> *"It is too complicated to give feedback to all employees. The feedback should be given to the management team, line managers, and representatives from operators." (Operations manager, Czech Republic)*

Over all, most managers thought relevant results should be displayed so that everyone interested could see them. This would signal importance of the lean assessment, show current status, and motivate employees to further use.

Further, the way assessment results are communicated matters to how they will affect behaviour. Motivational theory advices a positive approach, focusing on what have been achieved and what one can do to move forward. This is to help foster intrinsic motivation, esteem, and feelings of achievement. As discussed in chapter 6.1, managers do not see poor assessment results as something negative. Still, assessments should not have an overall negative focus. One manager in Jotun, when asked about appropriate reactions to assessment results stated that:

> *"I prefer to focus on positive reinforcement over penalty. I do not believe in punishment. But it is true that people need to believe in the improvement; they need to find a reason to change. Human behaviour is reluctant to change, and they will not change because I tell them. They have to find a reason to change for it to be sustainable. And the reason needs to be powerful." (Regional Supply Chain Manager, Western Europe)*

On a final note, even though it is important that management informs employees well during the process, communication is a two-way process. Employees have unique experience in their fields, and it will be beneficial for the organisation to use this knowledge. Further, the amount of dialogue about improvements is found to be beneficial for organisational performance. Thus, initiating dialogue where management opens for suggestions and advice from lower levels can be an effective way to exploit resources, and to facilitate further progress. This is also a matter of involvement, which brings us over to next topic of this discussion.

6.3.2. Involvement

Motivational theories stress the importance of involvement during the whole assessment process. They claim that lean assessments have the potential to facilitate intrinsic motivation, if they are conducted in the right way – supporting human needs for esteem and self-actualization. However, to maximize the motivational effect of measurement, it is emphasized that all levels of the organisation should be involved. Managers in Jotun agree with this. They claim that involvement of everybody, during the whole assessment process, is a criterion to succeed with lean assessments:

> *"From operators to top management: All levels must be involved. Operators must feel support from management, and management must allow operators to change." (Operations manager, Turkey)*

> *"This should be teamwork, and people from different positions should be included." (Operations manager, Czech Republic)*

One reason why managers focus on involvement is that they believe in creating ownership to the process as being essential in order to make the initiative more lasting, because this will increase interest and feeling of responsibility.

> *"It is important that the people working there every day feel ownership to the process. It is only when they fell ownership they will be interested in taking it further." (Senior Supply Chain Specialist)*

> *"It is about engaging or teams. It is not about one or two people driving operations forward. If everybody is doing it, you will make a really big impact. And also, it will be more sustainable." (Head of operations, United Kingdom)*

Theory suggests that triggering intrinsic motivation through involvement is a sustainable and efficient solution in the long run. According to Hertzberg (1987), intrinsic motivation can be achieved in several ways. Empowerment can give a feeling of responsibility, achievement, and recognition, which all are motivational factors. Thus, involvement by delegation of responsibility and making employees accountable for results could be a way to increase intrinsic motivation. However, some managers in Jotun did not fully agree, because they think responsibility for results should be on managers, not subordinates.

However, regardless of responsibility for results, several managers argued the importance of including operatives in the actual work of improving procedures and practices. It was claimed that the best people to improve a practice were the ones actually doing it. They are the ones facing the machines on a daily basis, and thus, the true experts.

> *"Operators have a lot of things to say. This is not only for management; it is mainly for the operators. Because they are there every day, fighting the machines and the process." (Regional Supply Chain Manager, Western Europe)*

> *"Because the best person to improve a practice is the one practicing it." (Logistics manager, Greece)*

> *"Operators make stuff happen, and they know the machines and the processes best." (Operations manager, Czech Republic)*

Finally, managers expressed that approaching the assessment task as teamwork would create engagement in the process, and thus foster motivation. This is in agreement with theory, which also argues that involvement of both managers and subordinates in the lean assessment can create an arena for cooperation and communication. Further, it can

create trust among employees, and reduce risks of assessments being interpreted as management distrust.

> *"I definitely think we should involve internal people from all levels. All of us should do it together. (…) Transparency, share the results, and then create the action-plan together."* (*Head of operations, United Kingdom*)

> *"I think it is a teamwork. You need to create a team and together decide what you are going to do."* (*Regional Supply Chain Manager, Western Europe*)

Teamwork was also emphasized as important when improving the procedures after the assessment has been conducted:

> *"We, together, need to agree where we should be next year. The target has to be SMART; it has to take some effort to get there, but still be achievable. So I think it needs to be a consensus between the whole team." (Regional Supply Chain Manager, Western Europe)*

Empirical evidence in literature has shown that in order to achieve the most benefits from improvement assessments, design and implementation should not be pure top-down processes. According to some managers, this can be a challenge in Jotun because it is a very top-heavy organisation:

> *"In improvement work, it is important to create ownership and interest among those performing the tasks on a daily basis. In Jotun, we are too focused on management, and that managers need to be involved in everything. Leadership is to achieve result through others, and you need to trust your employees. Also, you need ability to delegate work." (Group Supply Chain Manager)*

> *"An improvement agent cannot do everything by himself. You need to cooperate with the organisation or team you are working with. Otherwise, you will not achieve any results at all." (Group Supply Chain Manager)*

Finally, another argument for involvement is the complexity associated with measuring lean implementation. As lean has to do with processes and ways of working, it can be impossible to measure correctly without including all levels of the organisation in the

assessment. As discussed previously, this is opposed to for instance HSE audits, were measures are more easily observable for an auditor.

6.3.3. Management commitment and follow-up of lean initiatives

In Jotun, implementing lean has been, and still is, a slow process. Of course, lean implementation takes a long time, and is a task one never really finishes. But still, considering that Jotun has had a lean focus for many years, it could be expected that they have come longer than what is the case. One manager explained that *poor follow-up* from headquarters was the reason his site had not worked very much on implementing the corporate lean program. As mentioned, the corporate lean program JOS was originally introduced to managers during a meeting in Dubai in 2013, but after this presentation, some of the sites did not hear much more about it:

> *"It was presented to us at a Global Operations meeting in Dubai in October 2013. I think the presentation was about 40-45 minutes with "this is JOS". They said we should upload our best practice on the internal network. But that's it. There were no more follow-ups. So we haven't done much more to it." (Head of operations, United Kingdom)*

Resources allocated to implementation of lean in Jotun are limited, and this poses challenges with regard to comprehensive follow-up of each site. However, some managers argue that lack of results within lean is mostly a result of local managers not prioritizing it. This could both be because they do not consider it important enough, or because they don't fully understand what is expected from them. An assessment could be an effective way for headquarters both to signal *that* lean is important and to specify details about *what* is important to subsidiaries:

> *"It is to maintain our focus, and it signals importance. And they need to show us that: Present it to us and show us that it is important to the business. Because, why wouldn't I maintain that, if I know it is important?" (Head of operations, United Kingdom)*

As with lean itself, lean assessments are challenging to implement. According to theory, some systems are never really used, because they lose momentum after they have been designed. This poses a special responsibility on top management; they need to *demand results* from the subsidiaries in order to keep momentum on the assessments. This will signal that the assessments are important to the organisation. In the case of self-

assessments, this could be essential in order to motivate sites to conduct assessments as requested.

Managers representing headquarters in Jotun agreed with these arguments, as they expressed it is essential managers demand results in order to achieve progress and focus on use of assessments:

> *"Managers don't necessarily need to take part in everything, but they need to show interest and demand results. Otherwise, nothing will happen." (Group Supply Chain Manager)*

Further, importance of management engagement in daily lean work was also emphasized:

> *"To be a good manager concerned with improvement, you need to spend a lot of time on the floor. You need to observe, talk to the operators, and build relations with them. (…) Managers must be visible." (Group Supply Chain Manager)*

Thus, to succeed with implementation of lean, management commitment is extremely important. However, for an organisation with many sites, continuous follow-up from headquarters can be a challenge when resources are scarce. Lean assessments can then be an effective tool for headquarters to signal importance, and both motivate and guide sites in the right direction.

It is found that showing commitment to lean is especially crucial when management changes. During our case study of Jotun, we have heard several stories about how lean projects have been initiated by managers and successfully carried out, but when the initiating manager moves on to a different job, lean focus is completely lost and progress seizes. The leader of GOI confirmed this:

> *"The degree of lean focus is completely driven by management, and will vary within the same site with changes in management." (Group Technical Director, Group Operations Improvement and Supply Chain Management)*

According to a manager who has been known as a lean initiator at the factory in Vindal, coaching was given to the other leaders before she moved on. Yet, the lean initiatives were not sustained. As earnings from investments in lean take time to realize, initiating lean projects and then abandoning them shortly after is doubtless a waste of resources.

The current operations manager at the site says that after the initiator left, no one was asking for lean improvements anymore, and lean projects lost focus. He acknowledges the high dependency on individuals:

> *"My goal is that the process shall continue independently of individuals. (…) We have probably started with too many things at once." (Factory manager, Vindal, Norway)*

Prolonged top-management commitment is a key success factor for implementation of lean. Thus, it is not unexpected that projects lose momentum when there are changes in management. Applying this to lean assessments, special attention must be made to make sure they are sustained over time and despite changes in management.

6.3.4. Behaviour during assessments

Another matter important to managers was how auditors behave when they do assessments. This is mostly relevant in cases of external and internal assessments, where people from outside the site come to evaluate. One manager expressed he was positive to external help, but his fist concern was to take care of his team:

> *"I am more than happy for someone external to the factory to come and do it, but they need to make sure they are presenting themselves in the right way. I am looking after my team, and I don't really want somebody coming and telling them "that's rubbish, you are not doing very well."" (Head of operations, United Kingdom)*

Another manager, experienced with performing multiple types of audits, also emphasized importance of behaviour. He stressed a positive approach:

> *"It is all about how you behave. You need to talk in a way so that they feel you are there to help, and not to shoot them down. We had some examples a few years ago, where people were afraid of being audited. And you are not supposed to be scared of the results, you are supposed to feel you are being helped further along. One should never point out errors without suggesting a solution" (Senior Supply Chain Specialist)*

Managers also highlighted that, as a visitor at a site, one should take on a humble approach, and be careful to ask enough questions before concluding. Also, trying to understand how the people being evaluated felt was considered important:

> *"In a process like this, it is important to think: "How would I have felt if I was the operator? What would I have appreciated?" It isn't harder than that – but you need the ability to consider how others might think and feel" (Senior Supply Chain Specialist)*

> *"You need to have an open mind. Because when you arrive at a site as a guest, you don't know their whole story. You only get a picture of the current situation. You should be humble, ask questions to see if potential errors are regular practice or just a coincidence." (Group Supply Chain Manager)*

Thus, managers in Jotun think it is important that those coming to site to perform assessments behave in a way that is considerate and cooperative. This is in accordance with findings from motivational theory that emphasizes the importance of assessments being perceived in a positive way, if they are to contribute to motivation. However, as explained in chapter 6.1 managers did not think that one had to be cautious in presenting poor results. Thus, the findings from motivational theory about having a "positive approach" should not be interpreted in the direction that one must be careful when communicating negative assessment results. Rather, the importance of applying "a positive approach" relates to management and auditor behaviour during the assessment process.

On a final note, there was some disagreement among the managers interviewed regarding the behaviour GOI after improvement projects. Site managers from Southern-Europe expressed they were very satisfied with how the improvement group had come to their factory and helped them with their lean work. However, managers from Norway questioned the way GOI sometimes took too much credit for the work that had been done. This was, according to them, something also workers had reacted negatively about. They stressed the importance of making the workers, and not the improvement agents, "heroes":

> *"(…) Some subsidiaries have told me they don't think it is OK. After all, they have helped them, but it is better to say: "We, the organisation, have achieved…" – instead of taking the credit for themselves. We need to make those on the floor the heroes, not the improvement agents" (Group Supply Chain Manager)*

6.4. A guide to the assessment process

To summarize our study, we have developed a guide to the assessment process – from the early design stage to updating the assessment. Figure 8 shows the phases of the assessment process. To accentuate the importance of communication and involvement we have added two more steps to the process, compared to the process presented in the literature review (figure 4): "Pre-design" and "Assessment communication". Table 12 outlines important steps to be taken in each of the phases. This list is based on findings both from literature and empirical data, and is only a suggestion of how the assessment process should be handled. Not all points are relevant to all organisations. For instance, if deciding to adopt a readily developed lean assessment from literature, most of the points in the design-stage become obsolete.

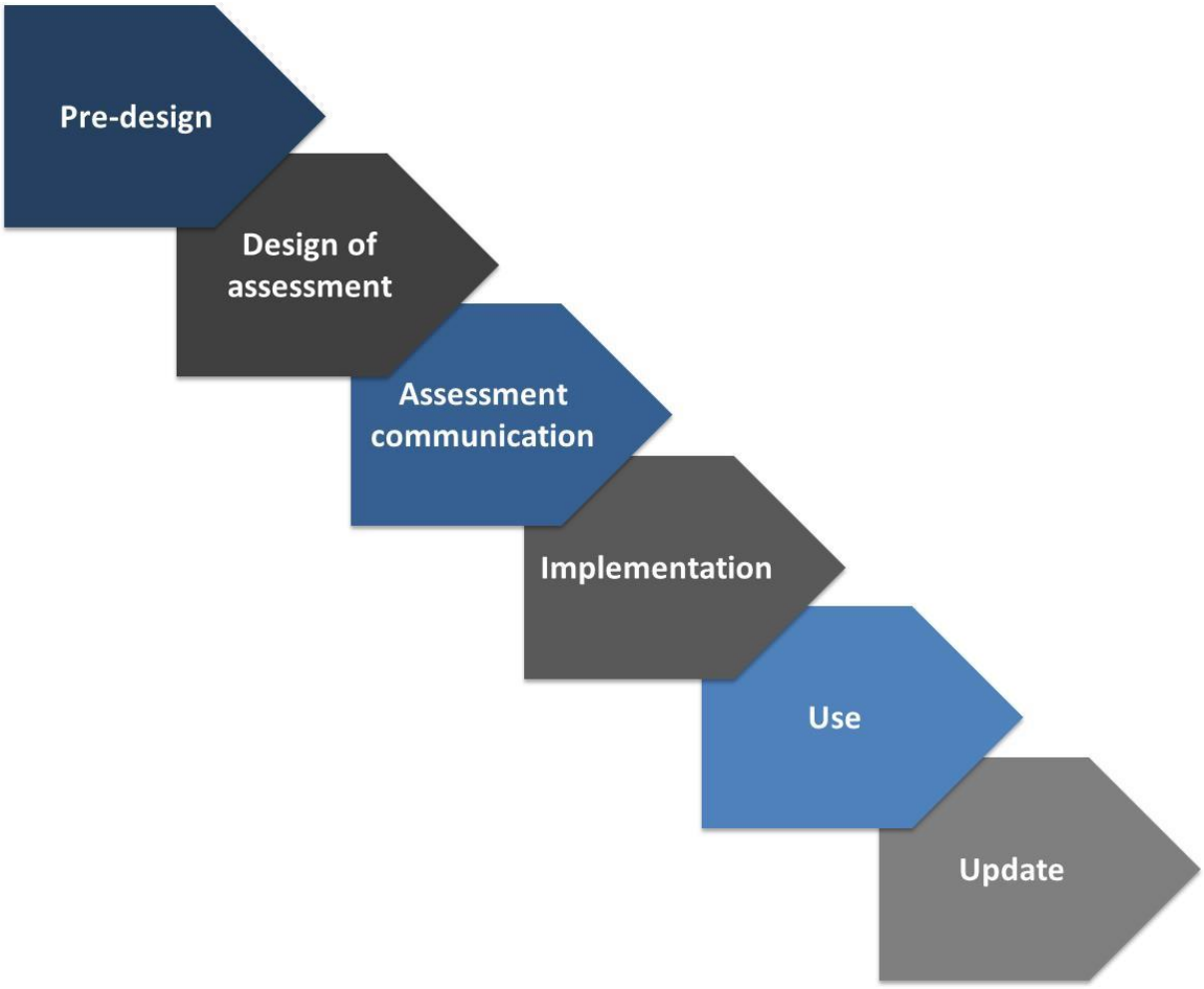

Figure 8: The assessment process

Table 12: A guide to the assessment process

Phase	Steps	Comment
Pre-design	1. Readiness	*Evaluate whether the organisation is mature enough* for a lean assessment to yield results.
	2. Formulate purpose and goals of the lean assessment	*The purpose (why are we doing this) and goals (what do we hope to achieve) should be identified at an early stage in the process,* to ensure a lean assessment will contribute to organisational improvement. Purpose and goals must be in line with organisational objectives.
	3. Share information	*The plans to have a lean assessment should be shared with all levels of the organisation,* to give a feeling of involvement. This step also opens for suggestions regarding the assessment design.
Design of assessment	4. Select type of assessment	*Decide what type of assessment is most appropriate*. Main selection criteria to consider are *lean maturity and available resources*. Important choices to be made are: - External, internal or self-assessment (chapters 3.4.1 and 6.2.3) - Adopt an existing lean assessment, or make a corporate one (chapters 3.4.1 and 6.2.4) - Standardize assessment across organisation, or adapt to subsidiaries (chapters 3.4.1 and 6.2.4)
	5. Investigate if there exists similar assessment projects in the organisation	Any *on-going initiatives similar to lean assessments should be identified and reviewed*. This is because other initiatives can work as input to the design process, to avoid the existence of competing measures, and duplicated work.
	6. Develop lean assessment	*Design measures*. Regardless of whether the organisation chooses to adopt an existing lean assessment or develop a corporate assessment, all measures should be: - Justified: Identify how the measure contributes to organisational improvement or objectives - Specified: Specify how the measures should be measured - Quality checked: Ensure the assessment contains measures that can be controlled by those accountable for the measure. Consider potential effects of measures on behaviour.

Phase	Steps	Comment
Pre-assessment communication	7. Introduction	*Present the assessment to all relevant stakeholders*. Clearly communicate purpose in terms of improving business and expected benefits. Specify how the assessment and its results will be used. This is to reduce resistance to measurement. Clarify expected implementation time – prepare those involved on a prolonged process.
Implementation of assessment	8. Training	*Train all relevant personnel in use of the assessment*.
	9. Perform the assessment	*Perform the assessment*. Keep in mind the importance of auditor behaviour, as it is important to ensure motivational effects of assessment (see chapter 6.3.4.).
	10. Follow-up	*Top-management must ensure continued use of the assessment*. This is especially important if high turnover in management.
Use	11. Communicate results	*Results should be communicated to all levels*, to maximize improvement progress.
	12. Ensure results are used	*Encourage managers and employees to use assessment results in everyday communication*, to optimize achieved benefits from assessments.
Update	13. Update assessment	As the situation and organisation changes, *the lean assessment might have to be adapted*. In particular, changes in lean maturity will affect the need to update the assessment.

7. Conclusion

In this study we have investigated how assessments should be designed and conducted to ensure they contribute optimally to lean implementation. We describe how lean assessments can add value to the organisation by identifying potential benefits and drawbacks, and have also found important criteria that affect the success of lean assessments. To increase practical value of our study to managers, findings have been summarized in a process-oriented framework, meant to guide managers through the assessment process.

Our findings are based on a single-case study of the paint and coatings manufacturer the Jotun Group. We have applied a broad theoretical background, including several streams of literature to allow for a multi-faceted discussion of lean assessments.

In this last section, we will summarize our answers to the research questions based on findings discussed in the previous chapter. Contributions to theory, implications for managers, and suggestions for future research will also be presented.

RQ1: What are the benefits of lean assessments?

The potential benefits of lean assessments goes beyond that of simply identifying progress in lean implementation; they can also contribute to facilitate lean implementation in several ways. First, lean assessments can help show if and what improvements have been made. Seeing that efforts have actually paid off is motivating, and encourages further lean work. Second, people are more focused on things they are being measured on. Thus, if lean assessments contain the right measures, they can contribute to making lean implementation a priority. Third, the content of lean assessments act as a guide to the organisation on how they can become leaner. As the contents of lean assessments are diffused throughout the organisation, the assessments contribute to increased knowledge of lean. Further, people perceive assessments as a signal of top-management's priorities. This means that having a lean assessment shows top-management commitment to lean. Managers in the case company largely agreed with the main benefits of assessments that were found in the reviewed literature. In addition to those benefits mentioned in literature however, managers see assessments as a necessary starting point in improvement work since results provide a baseline to improve from. Further, manages describe how assessments can give a feeling of

receiving attention from top-management, leading to an increased feeling of inclusion. Also, they have experienced how assessments can trigger the contribution of new ideas for improvement because people are inspired when they see movement.

However, if one is to achieve desired benefits, both literature and managers emphasize the importance of using appropriate measures. A drawback of assessments is that they can hamper improvement, rather than contribute to it, if it contains the wrong measures. Thus, one must take care that measures support organisational objectives.

Further, motivational theories argue that results must be communicated in a positive manner, focusing on achievements, because poor results can be demotivating. However, managers in Jotun disagree with this, and see negative results as an opportunity for improvement. Even though managers still wish that specific improvement suggestions could be part of assessment results, it seems motivational theory over-emphasize the importance of how poor results are communicated. In general, negative aspects of assessments that are discussed in literature were given very little attention by managers.

Table 13 summarizes the main benefits and drawbacks of lean assessments identified from both literature and empirical findings.

Table 13: Summary of benefits and drawbacks of audits and assessments

Benefits	Drawbacks
- Increased financial performance - Can help identify and recognize improvements: • Sustain continuous improvement • Guide improvement processes • Monitor employee efforts • Lead to increased motivation • Clarify improvement for employees • Communicate top management priorities - Show management commitment to the improvement program - Provide a foundation for comparing plants (benchmarking) - Facilitate learning and transfer of knowledge - Improve internal communication - Provide a baseline - Subsidiaries receive top-management attention - Encourage and trigger new improvement ideas	- Can draw focus to assessment results, and away from development of lean culture - Employees can have fear of measurement - Distorted focus causes small issues to be over-looked - Difficult to measure important, abstract aspects of lean implementation - Assessment results is only an abstraction of reality and can lead managers to make wrong decisions - Potentially resource-demanding

RQ2: How should lean assessments be designed?

Special characteristics of lean mean that certain configurations are more appropriate than others in lean assessments. The central role of continuous improvement, and the long-term nature of lean implementation especially differentiate lean assessments from other evaluation tools.

Asking managers in Jotun about their experiences with other measurement tools helped decide what approaches or traits could, or could not, be transferred to lean assessments. Firstly, HSE audits are very strict and rule-bound. This is not appropriate in a lean assessment because definitions of "good and bad" results are much more diffuse within lean. Second, ISO audits are used for external verification, meaning that the audits require heavy documentation. Lean assessments are to be used for internal improvement work, and there is no need for such thorough documentation or validation of results.

When deciding how to design and conduct lean assessments, *lean maturity* and *use of resources* are found to be central factors. These factors are important both when deciding who should do the assessment, whether or not one should design a company-specific lean assessment, and to what degree the lean assessment should be standardized across the organisation.

Regarding who should perform the assessment there are three options: External assessment, internal assessment and self-assessment. The different types all have distinct advantages and drawbacks, which must be carefully evaluated before an organisation selects its approach (see table 5). The external assessment is the most formal, and usually used in cases where there are strict requirements that have to be complied to (such as HSE audits), or when the evaluation is supposed to be used for external communication (such as ISO audits). The internal assessment is often chosen for quality assessments. Managers largely prefer the internal approach, as it provides the benefit of an objective view of the unit being assessed. However, it requires the organisation to have resources available to send a person or group to conduct the assessment. Finally, the self-assessment is considered the most resource-efficient. A drawback with self-assessments is that one loses the view from someone external to the unit being assessed, and possibly opportunities for new insights. Further, it requires that local managers have knowledge about lean and skills to perform evaluations.

To the case company Jotun, the self-assessment stands out as the best option. This is mainly due to the limited resources available for lean work, but also because it seems to be the most efficient choice considering Jotun's many locations. In addition, as most managers in the organisation have a good knowledge of lean, it is assumed that conducting a lean self-assessment will be easily accomplishable. A self-assessment also provides the opportunity to do evaluations more often, which is beneficial when one works with continuous improvement.

Another design issue is the need to adapt the lean assessment to the organisation, or even within the organisation. Organisations with low lean maturity could adopt an existing lean assessment from literature. Using a readily designed lean assessment requires little use of resources, compared to adapting lean assessments to fit the organisation. However, the existing assessments have limited applicability, and might

not contribute to value creation in an optimal way. Thus, as managers gain sufficient knowledge of lean principles, it is recommended that the organisation make a corporate lean assessment to ensure that measures support organisational objectives.

Organisations having several subsidiaries benefit from having a standardized lean assessment that is applicable across the organisation. This is both to uphold opportunities to compare subsidiaries, and because adaptation of the assessment to fit subsidiaries will be costly. We have found that the need to adapt lean assessments across the organisation largely depends on differences in lean maturity between the subsidiaries. Other factors also affect how much of a challenge it is to make a standardized assessment that is valid and applicable to all subsidiaries, but only large differences in leanness is a real obstacle to standardization.

Differences in lean maturity can be dealt with by having an assessment that can be adapted to different levels of leanness, or by focusing the assessment on units with either lower or higher maturity levels. If the organisation chooses the latter approach, it should focus the lean assessment on units with lower maturity levels. This is both because low-maturity units need more guidance, and that potential earnings of improvements are largest there. Further, high-maturity units are likely to make their own measures and adapt lean assessments to their needs regardless of which measures are imposed by headquarters.

The opportunity for benchmarking is a much used argument for standardized lean assessments. However, even though one makes a standardized lean assessment for the organisation, benchmarking between subsidiaries might not be appropriate. Especially if subsidiaries perceive themselves as being very different, they are unlikely to put any emphasis on benchmarking results. In the case company, managers perceive contextual factors such as plant size, complexity, automation level, and culture to be factors that hamper subsidiary comparability.

RQ3: What criteria are important to succeed with lean assessments?

Certain criteria have been identified as especially important in order to achieve full benefits of lean assessments. The criteria are; communication, involvement, management commitment and follow-up, and behaviour during assessments.

First, *communication* – before, during and after the assessment – have stood out as one of the most important criteria. In order to motivate employees, create understanding, and get everyone on-board, it is essential that purpose and benefits with the assessment is properly communicated to the organisation before the assessment is conducted. To reduce fear of the unknown and ease the implementation, the content of the assessment should also be presented before it is performed. Further, to maintain momentum, it is important that results are visible and used on a daily basis. This will signal importance of the assessment and help make it part of the organisational system. Thus, by making it a natural part of daily work, the assessment will be more sustainable, and less dependent on individuals that might leave the organisation. We have also found that it is important to consider what terminology is used in communication, as many have negative associations with the word "audit". Thus, one should rather use terms such as "assessment" or "review", because they appear to convey a more positive and including approach. Finally, feedback should be communicated to all employees, not only managers. This is important in order to clarify current status and what is expected, but also, it is a way to involve all organisational levels in the assessment. As lean work emphasize the importance of teamwork, feeling of inclusion is significant.

This leads us to the second, very important criterion – *involvement*. Both managers and theory agree that involvement of all levels in the organisation, during the whole assessment process, is decisive to succeed with a lean assessment. This is a source to create a feeling of ownership to the process, which again can lead to intrinsic motivation. Further, involvement is a mean to increase competence in the organisation. Those participating in the assessment will learn how to conduct the assessment, but they will also obtain greater knowledge of what is important and required to succeed with lean. Also, managers in Jotun argue that employees (operators) must be involved in all improvement processes, because employees are eventually the ones performing changes. Involving people in the assessment is also a means to make it more sustainable, as it becomes less dependent on individuals.

Third, the criteria *management commitment and follow-up* are important in several ways. First, top-management commitment and follow-up is important in order ensure subsidiaries focus on lean and the lean assessment. When this commitment is missing, sites will likely down-prioritize the initiative, because it is seen as less important. This effect is obvious in Jotun, where the focus of lean initiatives per site is completely dependent on managers, and varies with turnover in management. We have found that it takes time before lean assessments are successfully implemented in organisations. Thus, prolonged management commitment is important to make the lean assessment sustainable. It has to be anchored in the organisation, to avoid it being dependent upon certain individuals. Thus, there needs to be a transfer of experience with lean assessments when there are changes in management. Experience from Jotun shows that such transfer of experience must be ensured by top-management, as it is not initiated by factory management.

Finally, the behaviour of management and auditors during the assessment process is found to affect successful implementation of assessments. In cases where someone external to the organisation does the assessment, it is important they are humble, and behave respectfully towards the subsidiary they visit. To avoid resistance against lean assessments, it is crucial workers feel improvement agents are there to help them improve, and not to point fingers or punish them. Further, giving operators credit for improvements is important to keep them motivated.

7.1. Contributions to theory

By applying a multi-faceted theoretical view to the topic of lean assessments, and conducting an empirical study on managerial perceptions and experiences with assessments, we have found aspects of lean assessments that contribute to lean assessment literature. The contributions to theory will be summarized below.

Firstly, we have found that lean assessments might need to be adapted to each individual organisation. A characteristic of lean assessment literature is that each study seeks to provide managers with a generally applicable assessment that is ready to use. Little attention is given to whether and how it might be necessary to adapt lean assessments to organisational characteristics and context. However, by considering literature regarding other similar evaluation tools, it is clear that adapting lean assessments to fit the organisation or unit can increase the efficiency of assessments.

The main factors to consider when deciding whether it is necessary to adapt lean assessments are lean maturity levels and resource constraints.

Second, several potential benefits of assessments have been revealed, that can be added to those benefits already mentioned by lean assessment literature. While lean assessment literature focus on the main benefit of making improvements visible, other literature and managers contribute by clarifying *why* it is beneficial to identify progress. The empirical studies have also revealed benefits that have not been mentioned by the reviewed literature. Assessments can provide a feeling of receiving attention, which can have an integrative effect by making subsidiaries feel closer to headquarters and the rest of the organisation. Also, assessments can trigger more improvement suggestions from employees.

Third, we have found that the importance of having a "positive approach" as emphasized by motivational theory mainly applies to how the auditor should behave. The "positive approach" was first interpreted as meaning that assessment results must not be overly negative. However, managers in the case company dismissed this assumption. Managers are able to see poor assessment results as opportunities for improvements, and not be demotivated by them. Motivational theories seem to over-emphasize the importance of a positive approach in communicating assessments results; however a positive approach is still important in management and auditor behaviour.

7.2. Implications for managers

From this research, the conclusion is that lean assessments can facilitate implementation of lean, if it is done in the right way. This obviously has implications for managers, as they usually are the driving force behind such initiatives.

The identified benefits and drawbacks with lean assessments can be valuable to managers because it provides a starting point for dialogue. As communication has proven to be critical in order to succeed with lean assessments, managers should focus on this from the beginning. Having credible evidence of the expected benefits from using lean assessments contribute to achieving a positive attitude towards the assessment, as it signals that pay-offs exceed the efforts required.

Next, the discussion of what type of assessment is appropriate in different organisational circumstances can help guide managers in choosing the right approach. Choosing the right approach from the beginning will save both time and money in the

long run. It is important that managers thoroughly consider what type of assessment and which approach is most appropriate to their organisation. The discussions on external/internal/self-assessment and standardization/adaptation can be a good starting point to select the right assessment type. For organisations feeling the need for adaptation, but currently lacking the required resources, a comprehensive standardized assessment could be an intermediate solution. One could then set individual goals for each location based on local maturity, or simply tell subsidiaries to only focus on a limited section of the scale.

Further, we have identified important criteria for succeeding with lean assessments, and optimizing their contribution to the organisation. The first two criteria are communication and involvement, and managers should realize that both of these demand management dedication. They need to be able to share information with their subordinates before, during and after the assessment. This is especially important when you work with improvements where employees are the ones actually doing the changes. Employees need to be on-board, and motivated to do the changes necessary. Thus, communicating purpose, progress, and feedback appropriately is therefore a management task that should not be taken lightly. Involvement is also related to the importance of keeping workers motivated. However, including more people demands more planning and coordination, which poses additional challenges.

Further, mangers should recognize that their behaviour and commitment to the lean assessment is decisive to its success. Empirical evidence have shown that lack of follow-up from top-management have been a central factor why lean work somewhat stagnated in the case company. Management must be careful not to lose momentum after the initial start-up phase. Further, they should be aware of importance of making the lean assessment sustainable and not dependent on individuals. This is especially in organisations with high management-turnover or frequent job-rotations.

To increase practical value of our study for managers, our findings are summarized in a process-oriented framework, meant to guide managers through the assessment process. This guide can be used as a checklist by managers, to ensure that issues that matter for the success of their lean assessment are not omitted.

7.3. Suggestions for future research

In this study we have investigated benefits and drawbacks of lean assessments, discussed how assessments should be designed and conducted, and identified several criteria concluded to be of special importance when implementing lean assessments. Findings are based on a limited selection of theoretical work, and future research could therefore benefit from including other streams of literature. Further, empirical evidence have been collected from a single case company. Thus, data is not readily generalizable to other organisations or industries. We therefore encourage future research to test our findings by conducting similar research using several case companies.

Further, as this research is not exhausting, we will recommend more investigation into the matter of how lean assessments should be conducted in different situations. This is especially to verify the role of involvement and communication, two criteria that stood out as especially significant for success with lean assessments.

An issue that has not been thoroughly covered in lean assessment literature is the effect of culture on lean assessments. We have found that literature covering other evaluation tools argue that both national and organisational culture matters. However, we have only covered this issue briefly in our study, and more comprehensive research remains to be done.

Finally, as lean is increasingly being applied in other areas than manufacturing, we will encourage future research to also investigate efficiency of using lean assessments in other sectors. This can be both within single organisations (including the whole value chain; sales, purchasing etc.), and within different industries, such as service organisations.

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Appendix A: Case study protocol

The purpose of the case study protocol is to help guide the researchers' inquiries during field investigations. We will first give an introduction to the case study, before an overview of the literature used in the theoretical background is provided. Then, the data collection procedures are presented, followed by the outline of the case study report. The final section describes the interview guides used in the study.

A.1 Short introduction to the study

This study comprises the concluding part of a master's degree in Industrial Economics and Technology Management at NTNU, Trondheim. The work has been done over the course of one semester, and will result in a diploma paper. The study has been performed in collaboration with, and on the behalf of, the case company, Jotun.

The aim of the study is to achieve greater understanding of how measurement can contribute to the process of implementing corporate lean programs in multinational companies. Many authors argue that lean assessments hold an important role in guiding lean implementation. Yet, little research has been done on *how* lean assessments actually affect lean implementation, and it is not clear whether the existing lean assessments found in literature are facilitating lean implementation efforts in an optimal way. Further, lean assessment literature does not seem to keep up with recent trends within lean literature: While companies are increasingly making tailor-made corporate lean programs, studies on lean assessments have little focus on whether or not assessments should be adjusted to fit the organisation. Also, experience has shown that many attempts to implement evaluation tools such as lean assessments fail. An assessment is successfully implemented when it is conducted regularly and results are being used for decision-making.

Thus, in this case study, we investigate how lean assessments should be designed and conducted to ensure they contribute optimally to lean implementation. Further, we contribute to the research on how lean assessments can add value to the organisation by identifying potential benefits and drawbacks, and important criteria that affect the success of lean assessments.

Empirical data has been gathered mainly through interviews with managers from eight different subsidiaries in Jotun. Observations and documents have however supplemented the interview-data. Empirical findings are presented and discussed in light of findings from literature. To ensure practical validity for managers, the study is structured in a process-oriented way, covering the whole assessment process. The discussion culminates into a process-framework for lean assessments.

The following research questions are proposed:

RQ1: What are the benefits of lean assessments?

RQ2: How should lean assessments be designed?

RQ3: How can companies succeed with lean assessments?

A.2 Overview of theory

The following table gives an overview of the most important literature used to present and discuss the theoretical background.

Topic	Study or reference
Lean & Lean Assessments	Almomani et al. (2014), Bhasin (2008), Bhasin (2012), Camacho-Miñano et al. (2012), Doolen and Hacker (2005), Fullerton and Wempe (2009), Gurumurthy and Kodali (2009), Jørgensen et al. (2007), Karlsson and Ahlström (1996), Loktu and Mathisen (2014), Malmbrandt and Ahlström (2013), Netland and Ferdows (2014), Netland et al. (2015), Nightingale and Mize (2002), Rother (2010), Sânchez and Pérez (2001), Shah and Ward (2007), Shah and Ward (2003), Tortorella and Fogliatto (2014), Womack and Jones (1996), Womack et al. (1990)
Performance Measurement Systems (PMS)	Bititci et al. (2015), Bititci et al. (2006), Bourne et al. (2005), Bourne et al. (2002), Bourne et al. (2000), Busco et al. (2008), de Waal (2006), Dossi and Patelli (2008), Evans (2004), Neely et al. (1997), Neely et al. (1996), Ukko et al. (2007)
ISO audits and Business Excellence Models (BEM)	Alic and Borut (2010), Domingues et al. (2014), ISO (2015), Karapetrovic and Willborn (2001a), Karapetrovic and Willborn (2001b), Williams et al. (2006), Young-Ha et al. (2012) http://www.nist.gov/baldrige/ http://www.efqm.org/the-efqm-excellence-model
Agency Theory	Bergen et al. (1992), Eisenhardt (1989a), Kunz and Pfaff (2002)
Motivational Theories	Carson (2005), Herzberg (1987), Maslow (1943), McGregor (1960)
Culture	Busco et al. (2008), Bititci et al. (2006), de Waal (2006), Henri (2006), Hofstede (2001), Newman and Nollen (1996)

A.3 Data collection procedures

The following section gives an overview of the managers and employees that have been interviewed, the types of data that has been collected, and our prior preparations to data gathering.

Overview of interview-objects

In order to give the reader an impression of the main contributors of information to this study, a list of interview-objects in Jotun is presented below.

Position	Location
Operations manager	Czech Republic
Operations manager	Turkey
Operations manager	United Arab Emirates
Managing director	Saudi Arabia
Logistics manager	Greece
Regional Supply Chain Manager	Western Europe
Head of operations	United Kingdom
Deputy Supply Chain Manager	Western Europe
Group Supply Chain Manager	Group level
Senior Supply Chain Specialist	Group level
Factory manager	Vindal, Norway
Project Manager, Group Operations Improvement	Headquarters
Head employee representative	Vindal, Norway
Managing Director	UK and Ireland
Group Technical Director, Group Operations Improvement and Supply Chain Management	Group level
Change agent	Vindal, Norway
Vice President Supply Chain	Group level
Group Engineering Manager	Group level
Senior Project Manager	Group level
Group HSE manager	Group level

Data collection plan

In this study, data will mainly be collected in two rounds. First, we will visit headquarters and the factory at Vindal, Sandefjord to do get to know the case company better, and do some introductory interviews. Second, we will participate at a regional supply chain meeting in Athens, Greece, to perform interviews with managers representing various European subsidiaries.

The following types of data are expected to be collected:

Round 1) Headquarters and the factory in Vindal, Sandefjord

- Minimum two interviews: One with a change agent and one with the factory manager. In addition, more interviews may be scheduled if opportunities emerge
- Some observation of both headquarters and the factory (we participated in an extensive factory tour during out pre-diploma project in the fall of 2014)
- We also expect Jotun to provide us with necessary documentation and archival records

Round 2) Regional supply chain meeting in Athens, Greece

- Conduct five to seven interviews with operations managers from various European subsidiaries
- Participate in a 2-day regional supply meeting and observe how it is conducted, and how Jotun managers collaborate and work together across geographic locations
- Observe premises and daily work at the sales-division in Athens, Greece
- Partake in a warehouse review at the local warehouse in Greece

Expected prior preparations

Prior to the field investigations, the researchers are expected to:

- Establish contact with the relevant contact persons at the sites to be visited
- Make appropriate preparations considering data collection, i.e. prepare interview questions/guides and other relevant information
- Distribute information about the study and interview questions by e-mail to contact person and potentially interview objects
- Ensure they are familiar with, and able to communicate, purpose of the study, research questions, theoretical background, and interview questions
- Prepare necessary equipment: Printout of interview-guide, writing material, and tape recorders

A.4 Outline of case study report

The outline of the case study report is presented below:

1) Introduction
2) Theoretical background
3) Literature review
4) Methodology
5) Case presentation
6) Discussion
7) Conclusion

A.5 Interview guide

During this study, we ended up doing three rounds of interviews. First, we held a number of unstructured interviews during our visit to Sandefjord. Then, five semi-structured interviews were conducted in Athens, Greece. Finally, because some operations managers had been hindered from participating at the regional meeting, we collected their answers through some short interviews distributed by e-mail.

Below, the interview-guide for the semi-structured interviews and the interview distributed by e-mail is provided.

Semi-structured interview

About the interview:

This interview will be conducted in a semi-structured form, meaning it will follow a fairly specific interview-guide, but the conversation is allowed and encouraged to flow freely within its boundaries. The interview will be recorded if the interview-object permits, and he or she will be offered the opportunity to review the transcriptions.

1. Introduction

The first 5-10 minutes of the interview will be used to give a brief introduction to the study and collect data about the interviewee's background and contact information.

2. Structure of the interview

a) Introduction to the study
b) Collection of interviewee data
c) Main interview – Topics for discussion
    a. Experience with current audits and assessments
    b. Questions related to audit design, audit conduction, and communication of audit results
    c. Measuring leanness in subsidiaries
d) Further progression

3. Interviewee data

a) Name and contact information
b) Current position
c) Education and work history
d) Any other important information

4. Experience with audits and assessments

The following questions intend to map the interviewee's experience with audits and assessments. This includes both evaluations related to measuring lean and any other area of the business.

a. Can you tell us about the most important assessments and audits held in your factory today (not related to JOS-progress)? *Examples: HSE, maintenance, financial performance etc.*
b. What do you think of these evaluations? Which do you think are helpful? Is anyone you obsolete? Why/why not? Pros and cons?
c. Is there anything in particular we can learn from any of these assessments that could also be used in a lean evaluation?
d. What do people think when they hear the word "audit"?
e. Has a JOS audit, or any other type of lean evaluation, been applied in your factory?
f. *IF YES*: Do you think the evaluation was important in the early implementation of JOS? Did it help or not? Why?
g. Do you use any type of JOS evaluation in your factory today?
h. Do you think performance measurement like assessments and audits is necessary or useful to organisations like Jotun? Why/why not?

5. Questions related to audit design, audit conduction, and communication of audit results

The following questions concerns how a lean assessment should be designed and conducted.

a. Is it best to use one standard assessment in all plants, or is it better adapt assessments to the different factories?
b. How should the results from the JOS audit be presented?
c. Who should get the results?
d. What feedback should be given?
e. What should the consequences for acceptable/not acceptable performance be?
f. Who should be responsible for following up results and taking action?
g. Should feedback include specific improvement initiatives/improvement goals?

6. Measuring leanness in subsidiaries

The following questions concern the interviewee's thought and opinions about measuring leanness in subsidiaries.

a. In your opinion, will an assessment that evaluates the use of JOS in Jotun's factories be useful to the organisation?
b. Will it be useful to you at your location? What kind of information would you like to gain from it?

c. What needs to be in place before a JOS audit can be helpful?
d. Do you think your factory has come far enough with JOS to be ready for an internal JOS audit? In what ways/why not?
e. Do the operators in your factory focus on continuous improvement on a daily basis? Can you give any examples?
f. What are the potential positive and negative effects of using JOS assessments? What can be done to prevent negative effects?
g. Do you think using a JOS audit could have an effect on the organisation's focus on continuous improvement and lean? In what way?
h. How do you think operators would react to a JOS assessment?

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Thank you for your answers

Interview distributed by e-mail

Dear <name>

We are two master students from the Norwegian University of Science and Technology (NTNU), enrolled in the program "Industrial Economics and Technology Management". We are currently writing a master thesis using Jotun as a case company, with the title "Lean assessments – do they work". The intention of our study is to investigate whether lean assessments can have a positive impact on lean implementation. *We define a lean assessment as any formal evaluation of how lean an organisation, or part of an organisation, is. In Jotun's case, a lean assessment would likely take the form of a survey/audit to evaluate to what degree Jotun Operations System (JOS) is implemented.*

Our master thesis is written upon request from Group Operations Improvement (GOI) as a part of their improvement work. Although we have held interviews both in Sandefjord/Vindal and at the regional supply chain meeting in Greece last week, we could still use some more empirical data for our study. To ensure the validity of our results we would like to get the perceptions of more key managers within Jotun, and our contact Sissel Feen Larsen recommended we contact you. If you could answer the questions below, we would be grateful.

Please note that we have signed contracts of confidentiality, and the information provided will not be used for any other purpose than the master thesis (if you need confirmation on this matter, contact Tore Riise (GOI): Tore.Riise@jotun.no).

Yours Faithfully

Marta Mathisen and Siri Katherin Loktu

Questions

The questions are meant as a guide. Please feel free to add anything you think may be of importance, and give examples when appropriate.

If there are any questions, or anything is unclear, please contact Marta Mathisen at: marta.the.ma@gmail.com

Personal information:

1. What is your current position in Jotun? Can you tell us a little bit about your work history in Jotun?
2. Is there anything special about your Jotun division/location that differs from the Jotun factories/warehouses?

Experience with audits:

NOTE: We here refer to all assessments/surveys/audits as "assessments".

3. What are the most important assessments used today? (Examples: HSE-audit, Warehouse survey)

We would like to know more about what you think about these different assessments, so that we can draw form your experience when making recommendations as to how an assessment should be designed, conducted and communicated.

3.1. Are these assessments helpful? In what way?
3.2. Is there anything you dislike about the assessments? What could be done better?
3.3. Is there anything in particular you like about the assessments?

4. Has there, to your knowledge, ever been an assessment of the use of JOS in your division?
4.1. IF yes: When? How was it conducted?

5. Do you use any sort of lean assessment in your division today? Why/why not?

6. Do you think an assessment that evaluates the use of JOS would be helpful to your organisation? What conditions need to be fulfilled if such an assessment is to be a success? (E.g. help with the further implementation of lean)
6.1. Who should be included in such an assessment – is it for example important to include operators? Why?
6.2. How should feedback be given, and to whom?
6.3. How should goals for improvement be developed? (E.g. teamwork, bottom-up/top-down processes) Who should be responsible for follow-up of these goals?
6.4. Do you think one should make one standardized lean assessment/JOS audit, or will it need to be adapted to each location?

Thank you for your answers