A Management Model for the effective, sustainable implementation of Operational Excellence initiative at plant-level.

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by

Dipl.-Ing. Horst J. Lechner, MBA

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Author	Horst J. Lechner,
Student Number	
E-mail	
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GLOSSARY OF ABBREVIATION

5S/6S	**S**ort, **S**traighten, **S**weep, **S**tandardise, **S**ustain/**S**afety
BB	**B**lack **B**elt
CI	**C**ontinuous **I**mprovement
CM	**C**hange **M**anagement
CPC-	**C**ontent-, **P**rocess-, **C**ontext- Perspective
DMAIC	**D**efine, **M**easure, **A**nalyse, **I**mprove, **C**ontrol
EFQM	**E**uropean **F**oundation for **Q**uality **M**anagement
FMEA	**F**ailure **M**ode and **E**ffects **A**nalysis
GB	**G**reen **B**elt
IMVP	**I**nternational **M**otor **V**ehicle **P**rogram
JIT	**J**ust **i**n **T**ime
KPI	**K**ey **P**erformance **I**ndicator
MBB	**M**aster **B**lack **B**elt
MIT	**M**assachusetts **I**nstitute of **Te**chnology
OEE	**O**verall **E**quipment **E**ffectiveness
OE	**O**perational **E**xcellence
OM	**O**perations **M**anagement
SCOR	**S**upply **C**hain **O**perations **R**eference
SMED	**S**ingle **M**inute **E**xchange of **D**ie
6σ	**S**ix **S**igma
TPM	**T**otal **P**roductive **M**aintenance
TQM	**T**otal **Q**uality **M**anagement
TPS	**T**oyota **P**roduction **S**ystem
VSM	**V**alue **S**tream **M**ap
YB	**Y**ellow **B**elt

ABSTRACT

The aim of this master thesis was to develop a valuable management model with which Operational Excellence- (OE) initiatives can be designed, guided and further developed. To be competitive on the packaging market many organisations are implementing OE-initiatives. Whereas most models consider only the social, economic and environmental aspect of OE. On the basis of the literature research carried out, it became clear that the focus of the traditional concepts described was purely on Content-aspects and that Process-aspects and Internal Context-aspects were completely ignored. A reference-model was developed to record, evaluate and analyse plants with regard to their OE-support in the internal Context and Process.

A comparative case study-analysis was carried out at eight European plants of a beverage can packaging company. This research enabled new insights to be gained into the influence of internal Context- and Process-aspects. Based on 70 interviews with the employees of eight plants in eight different European countries, two key-factors in implementation-processes and six factors in the internal Context were identified.

In the study it could be shown that despite the company-wide introduction of standardised OE-contents, the eight identified Key Performance Indicators (KPIs) had a massive influence on the actual design of the initiatives at the plant. A literature search, however, showed that existing CI-concepts usually focus on Content, while internal Context- and Process- aspects were neglected as key factors in their considerations.

Based on these findings, a reference model was derived for the recording, analysis and evaluation of plants with regard to their OE-support in the internal Context and Process. It could be shown that an organisation and culture of continuous improvement usually have a considerable influence and that changes do not necessarily have to be guided by the specification of content.

In addition, the case study-analysis showed that the Operations Management's (OM) dominant understanding of the relationships between social structures, such as management approaches, practices and methods, and the individual behaviour of acting actors on the basis of a structure-behaviour-determinism is insufficient in its explanatory power.

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas.

Any views expressed in the thesis are those of the author and in no way represent those of the University.

Signed .... Date .....27.01.2022.....

CHAPTER 1 INTRODUCTION

1.1 RESEARCH BACKGROUND

Operational Excellence (OE) is highly essential for the growth of organisation s and all sizes of industries, due to its characteristics of search for quality, efficiency and effectiveness of enterprises (Aguilera et. al., 2019). Decisions and actions in the companies are taken solely on the basis of figures, data and facts. However, Venugopal and Saleeshya (2019) state that the industries need to be viewed as a whole to ensure sustainability. OE is therefore always an investment in employees and sustainability. OE offers a wealth of different methods but requires long-term and sustained efforts. Further discipline and precision in the introduction and implementation are crucial. Any form of sloppiness leads to friction, errors and costs (Choudhary et al., 2019). Often, only individual elements from the extensive OE-method box are used and in addition, there are the applications of tools from multi-project management (Garza-Reyes et al., 2018). The basis of OE, however, remains the prior definition of corporate strategy and based on this, the customer needs that a company wants to satisfy are met as efficiently as possible (Ahmad et al., 2018).

In the existing literature a uniform definition of the term OE has not been established and it is often used as a trend word. Thus, various approaches to understanding OE are described in order to filter out commonalities and consequently delimit the term for this thesis. According to Kumar (2015) and Cameron et al. (2012) OE is the dynamic ability to realise effective and efficient core processes of the value chain through integrative use and design of technological, cultural and organisational factors on the basis of strategy. According to this approach, OE can be seen as a concept in its own right and is divided into six design fields. Within these functional building blocks, dynamic capability takes place equally: strategy, organisational structure and process, performance management, competencies and capabilities, culture and leadership, and systems and information technology.

Rusev and Salonitis (2016) and Mitchell (2015) define OE as a consequence of enterprise-wide practices based on correct principles and the wish to attain a high maturity level, sustainability and measurable success. This approach is based on the idea of a functioning and holistic production system. According to this, a holistic production system is an integrated system of various coordinated methods aimed at achieving quality improvements and cost reductions by minimising any kind of waste in the form of inventories, waiting times, lack of equipment availability or scrap rates. This approach

also focuses on optimising value-added processes by reducing waste to a minimum. This approach is intended to support the strategy and secure a competitive advantage. Found et al. (2018) equate OE with perfection. Perfection is the epitome of excellence and infallibility. In industry, perfection is called operational excellence, and, in terms of manufacturing, it means optimising the complete process chain and minimising energy consumption, but also avoiding downtime through predictive maintenance. Similarly, the focus on optimising value-added processes also applies here.

1.2 CONCEPT OF CHANGE MANAGEMENT

Change occurs either in response to an opportunity or a gap in a facility or institution related to its internal and external motivation. One of the main problems in project implementation is failure due to lack of action plans, poor organisation, lack of teamwork and organisational culture (Ruiz et al., 2019). Change Management (CM) is one of the biggest barriers that a company has to overcome. Trying to get an organisation to make a strategic change is hard but supporting that change is even harder. It is a conscious approach to bring about significant change to meet people's needs and easily move the organisation forward (Ahmed et al., 2018).

Buhulaiga et al. (2019) postulate that the changes in process improvement concern changes in the roles and responsibilities of staff but also reorganisation. New frameworks or systems bring about some degree of progress in an organisation; and therefore, new business framework projects should be treated as change. Three methods have been identified by the author in this thesis and then divided into three main theories. Total Quality Management (TQM), Lean Production (LP) and World Class Manufacturing (WCM).

Although most change processes and methods have their own circumstances, certain commonalities can be identified on an overarching level. Experience in practice has shown that the three dimensions of strategy, structure and culture must always be considered in change processes – similar to Pettigrew’s 3 Dimension of Change. In addition to fundamental and comprehensive organisational restructuring measures in general (structure), change processes also include a review or redefinition of direction (strategy) and the involvement of people in the change (culture). These changes can upset and threaten staff and thus generate blockage, aversion and fear (Salma et al., 2018). In summary, it can be said that in the classical theoretical sense CM is a concept that is given to the organisation from the outside, i.e., external consultants are brought in to develop the strategies for change. The people concerned are not or only sparsely involved in decision-making and the implementation of the concept.

1.3 OE AND CM LINKAGE

OE and CM (Bamford and Forrester, 2003) have their main characteristics and the significant thing is the implementation process. Each element of the two methodologies is applied equally by creating development plans in which they accompany each other to eventually merge and achieve the expected results. OE is a philosophy targeted at improving performance and concluding the realisation of the project, with culture being a key point to achieve this. CM targeted at promoting the culture with the drive of human capital and preparation of human resources and thus achieving the goals of OE.

1.4 STRATEGIC CHANGE OM AND CI

According to Pettigrew et al. (1992), core-elements are the Context (internal, external), Content and Process of a change. Examples of such observations can be found in Strategic Management (Isern, 2007, Neumann et al., 2018), Organisational Development (Burke, 1994) and Change Management (Cummings, 2009). In OM, most past scientific research has focused strongly on the Content-element, neglecting the Process- and Context-elements. Classical scientific studies until the end of the nineties, for example, dealt with questions of the fundamental effectiveness of specific methods and practices such as Total Productive Maintenance (TPM) or Total Quality Management (TQM). There are only a few statements on the influence of the implementation process, institutional factors or the competitive environment (Dieste et al., 2019).

The application of these methods seemed to fundamentally improve the operational performance of a company in every way, in every environment and in every context. Frequently associated with this is the term Best Practices for generically acting principles, approaches and methods. Nevertheless, practice shows that there are significant differences in the introduction and development phases. This neglected consideration of Context and Process may also be one of the reasons for contradictory and sometimes disturbing scientific findings in OM. These include, for example, the comparative consideration of empirical statements on the Content and Process of CI-initiatives. On the one hand, it is considered empirically proven that most CI-practices have a significant positive impact on the success of an organisation. Success is often understood remarkably differently between studies and ranges from a Return on Investment- (ROI) improvement, over the improvement of operational key figures up to qualitative statements that one would also recommend this method to other enterprises.

On the other hand, it also seems to be empirically resilient that these CI-practices suffer from a very high implementation failure rate of 70-90% depending on the study (Beer, 2000). The conclusion derived from this is that the corresponding CI-programmes are successful, but the clear majority of management teams are almost failing with certainty

due to their implementation. Therefore, more recent studies are increasingly focusing on the relationships between Process and Context for CI-implementation.

In addition to the loss of understanding of interrelations as a consequence of inadequate conceptual differentiation, how this differentiates between Content and Process, it has become clear that, as a result of a lack of differentiation, the Content of a CI-initiative itself can also become unclear. This might be one of the causes of different Content-definitions for certain CI-programmes. Although no fixed, meaningful number of TQM-constructs can be named, the clarity suggests limits, based on experience, to manageable complexity reduction.

The unclear separation of CI-concepts does not usually pose a problem for the completed examination and the statements of individual studies. A comparison of different studies, on the other hand, would only be meaningful if an explicit check had been carried out beforehand to ensure that the content was consistent. An undifferentiated examination, on the other hand, could lead to misleading interpretations, which is why a future analytical framework is necessary for the OM.

More recent studies such as those by Anand et al. (2009) focus, for example, on the differentiation of Content- and Process-practices. Thus Anand et al. subdivide into infrastructure practices and execution practices. Similar discussions regarding the need to differentiate the core elements can be found in strategic management (Pettigrew, 1985). In particular, strategy contents in the sense of the Golden-egg syndrome, without wanting to see the micro-political influences and resistances occurring therein, are under criticism.

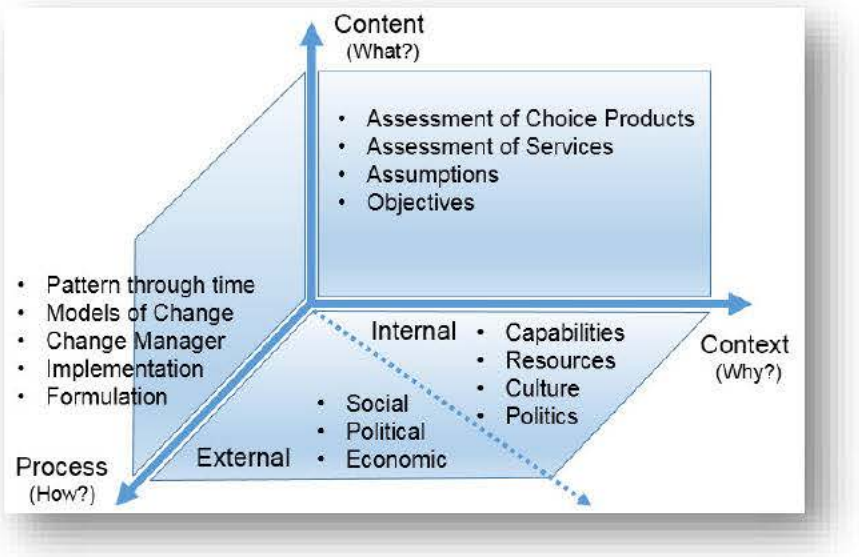


Figure 1: Dimensions of strategic change, (ad. from Pettigrew & Whipp, 1993).

It is therefore also considered relevant for the OM to differentiate between the elements of strategic change on the basis of recognised distinctions. The definitions and

understanding of Content, Process and Context used within this thesis are based on the descriptions of Pettigrew and Whipp (1993), Armenakis and Bedeian (1999) for the research area of Organisational Change and have been adapted by the author for the consideration of CI-programmes. Companies respectively in the packaging industry have a commitment towards OM and thus a fundamental requirement to cultivate CI. This commitment is proven using a variety of tools and techniques in OM.

The concept of OM describes the mechanisms used to identify the key supporting process in the implementation of CI. Adamek (2018) states that, a supporting process does not transform material; however, this process is important and necessary to ensure that the other processes throughout the organisation are in the right place and at the right time. Kumar and Kumar (2014) point out that there is often a misalignment between departmental and overarching CI-goals. This can lead to barriers preventing functional areas from working together. When this occurs, sustaining the CI-process becomes difficult. Elias and Davis (2018) state that the importance of focusing on the non-manufacturing process depends on the customer's perspective. The authors suggest that a CI oriented company recognises the value of meeting external as well as internal customer requirements by providing the resources required for performance. The Key Performance Indicators (KPIs) 1 to 8 are developed to measure organisational performance in achieving OE.

1.4.1 CONTENT ELEMENTS

According to Armenakis and Bedeian (1999), studies on the Content of organisational change focus on the actual substance of change. Research activities in this category typically attempt to define factors that distinguish successful from less successful changes. The focus is on how these factors have contributed to the change in overall organisational effectiveness. Content-elements of OE-initiatives are selected and purpose-oriented practices and methods, by which an improvement in the quality, productivity, flexibility and service level of the overall organisation should be achieved. These will be achieved in a certain context and through a process permanently implemented as routine practices or methods. The evaluation of the Content will consider the extent to which this practices or methods are applied in everyday business life (Pettigrew, 1988).

1.4.2 CONTEXT ELEMENTS

The second core-element of strategic change, the Context-element, relates to research activities dealing with contextual factors. These investigations focus on the forces and conditions that act through the external and internal environment of a research object. Results can be statements about the trigger or the barriers of changes as well as about the

framework and conditions. Internal Context factors typically involve factors such as an organisation's capabilities, resources, stakeholders and culture. Context-elements of OE-initiatives are internal and external conditions, forces, dynamics, stakeholder groups or events, which are based on the influence and the effectiveness and sustainability of an initiative. They could be barriers to or triggers of change. These are forces which cannot be influenced in the short and medium term. Every company should have a certain uniqueness of these factors. Contextual factors can be integrated into external, environmental and internal institutional factors.

1.4.3 PROCESS ELEMENTS

The third core-element, the Process-element, provides information on how a change should be managed and which measures should be taken to implement it. They align changes with implementation, integration, adoption and acceptance. Process elements are the flanking measures for the faster and broader introduction of Content under the orientation and influence of the Internal and External Context. Process-elements are all activities and mechanisms that are taken or occur during implementation to improve the effectiveness and sustainability of the Operational Excellence-programme. This involves, the mobilisation and management of resources and staff. During the evaluation of the Content, the extent to which these practices or methods are used at certain times it is taken into consideration.

1.5 RESEARCH CONTEXT

The challenges for packaging companies have changed rapidly in recent decades. Progressive internationalisation and globalisation are leading to more open and transparent markets with the bilateral advantage that companies themselves can become active in new markets, and with the disadvantage that this opportunity is also available to companies previously outside the market (Choudhary et al., 2019). Open, transparent and global markets lead to greater segmentation of customer groups, which must be served in a more individualised way to generate competitive advantages. Markets are largely saturated: formerly supplier-dominated markets have long since changed into buyers' markets. The dynamics regarding changes in product characteristics, technologies and customer requirements manifest themselves in constantly decreasing cycle times, i.e., innovation cycles, product life cycles, with a simultaneous shortening of the half-life of knowledge.

Increasing cost and efficiency pressures are forcing packaging companies to constantly optimise value-added processes and thus to continuously improve productivity. The growing industrialisation of emerging countries is also leading to an increase in global demand for energy and raw material resources, which means additional imponderables

and dependencies for packaging companies when it comes to procurement. Due to the previously strong strategic orientation of many research-based packaging companies in relation to research and development as well as partial sales and marketing, production was regarded as the stepchild of company management in the past. As a result, inefficiencies in value chains and manufacturing processes which evolved historically have been accepted. The average optimisation potential through the application of classical TPM, TQM, JIT and Management System principles of a packaging production plant is around 14% of the total manufacturing costs. This value of 14% was the result of an internal analysis of a Black Belt-project in one of the eight case companies. The same potential can be assumed for the other seven plants

The majority of packaging plants introduced OE-programmes using toolboxes from optimisation and improvement techniques such as Value Stream Mapping (VSM) or Single Minute Exchange of Die (SMED) setup workshops. VSM as a key lean tool is used to identify different lean techniques (Rahani and Al-Ashraf, 2012). As these methods were considered definitely effective in view of the experiences of other industries and were adopted in a standardised form by these industries, many packaging production managers initially assumed a comparatively plannable and predictable implementation process. This also applies to the case company.

Nevertheless, it turned out that the same standardised toolboxes led to significantly different efficacy and acceptance at different production plants. While a few plants were able to meet the expected changes and improvements in their productivity through the implementation of the corresponding methodologies, many plants failed to meet both the expected degree of implementation as well as the achievement of the desired improvements. Process-related and institutional influencing factors at the plant, which were previously defined as considered negligible, seemed to have a significant impact on the methodology and the success of the implementation. While most packaging plants have a sound knowledge of the content and general effectiveness of approaches and methods, the experience and knowledge of the interrelationships of key process and institutional factors in their implementation and further development are rather rudimentary. The investigation of these processual and institutional key factors in the process of strategic change is one of the core concerns of this thesis.

1.6 RESEARCH RATIONALE

The core endeavour of this thesis and the associated research project was to provide a useful contribution to the improvement of leadership and management tools in the design, governance and development of Operational Excellence (OE) programmes in the packaging industry. The initiation of the research project stemmed from a phenomenon and problem in practice, where managers and employees basically did not behave as

previously (rationally) expected by management in the context of implementing an OE programme at different locations.

This is a phenomenon and problem that is regularly encountered in the field of OE-initiatives in other fields and to which OM has so far provided only rudimentary responses. (Al-Haddad, 2015; Cortes et al, 2016). The interest of the study therefore lay in the questions relating to and explanations of how and why this lack of understanding and trends in different and partly deviating OM behaviour had come about and which institutional and process-related key factors at the location had a formative influence on this. Based on a literature review, the existing body of knowledge regarding key Process- and Context-factors in CI-programmes was examined and consolidated. The findings on possible factors illustrate the scattered diversity, frequent blurring and insufficient differentiation between the Context, Process and Content of a CI-initiative in previous studies (Kumar, 2015). Recent findings and critiques of academic OM-studies show an urgent need for research on integrative considerations of OM and the elements of strategic change, as well as the links between social structures and organisational and individual behaviour (Mitchell, 2015; Quesada et al. 2017; Rusev, 2016).

In this study, two critical shortcomings and gaps in the literature on plant strategy and structure specifically from the OE-perspective are identified and addressed:

firstly, a Context-perspective, the use of narrow and outdated definitions of strategy and structure and the requirement for a more realistic and comprehensive methodology for these core variables; secondly a Process-perspective, the dominance of an inadequate stagnant view and the requirement for an active approach.

1.7 RESEARCH AIM

The aim is to create a model by applying two (Context- and Process) of Pettigrew's 3 Dimensions of Change and the Key Performance Indicators (KPIs) that influence the success of strategic change.

1.8 RESEARCH OBJECTIVES

- To conduct a comprehensive literature review on Operational Excellence (OE), Change Management (CM) in the packaging industry, Key Performance Indicators (KPIs) and sustainability of Continuous Improvement (CI),
- To develop a management model for the effective and sustainable implementation of OE-initiative at plant level for a packaging-plant.
- To identify KPIs that contribute to the sustainability of CI in eight packaging plants of the case companies,

- To assess the influence of Context and Process on CM on the KPIs that influence the sustainability of CI,
- To identify the relationships between the Support-, Lean-audit- and Project-indices characterised by means of a correlation analysis,
- To develop a set of recommendations on constructs which influence the sustainability of the CI-process for packaging plants, researchers and practitioners.

1.9 RESEARCH QUESTIONS

- RQ: What should a management model for the effective and sustainable implementation of OE-initiative at plant level for a packaging-plant look like?

To response the RQ, the following sub-research-questions (SRQ) need to be answered:

- SRQ 1: Which KPIs contribute to the sustainability of CI at the case companies?
- SRQ 2: What is the influence of the Context-, Process- and Content-dimension of Pettigrew's 3 Dimensions of CM on the KPIs?
- SRQ 3: What is the relationship between the Support-, Lean Audit- and Project-indices?

1.10 RESEARCH CONTRIBUTIONS

1.10.1 PRACTICAL RELEVANCE

Packaging companies have responded to the changing environment by, among other things, introducing OE-initiatives. After starting to implement OE in the early 2000s, the packaging industry has had the opportunity to learn from the experiences others have had in implementing OE and has caught up more and more as a result. Interestingly, the main reason for introducing OE in the packaging industry is to initiate a culture change towards continuous improvement. Guidance on how an OE-initiative is organised, i.e., how OE-teams are organised or what an OE structure looks like, is missing in the practice environment. There seems to be a lack of knowledge on how to organise OE at the beginning of the journey to excellence and how to adapt it during the journey to ensure sustainability. To address this gap, this research focuses on dedicated OE-teams and how to organise them. Packaging practitioners' interest in the organisational structure used to embed continuous improvement is also reflected. In addition, to the direct contribution of the head office (Packaging Ltd.), this work provides a further company-independent contribution to the design, management and further development of OE-programmes in

practice. The practical contribution is measured in particular by the benefit of the findings on the design, control and further development of complex, open and socio-technical systems. The contribution of the present thesis lies in particular in the reference-model of an OE-supporting organisation developed in the previous section and it's embedding in a management model developed for OE-initiatives. These models can be used as decision aids for the following practical questions in terms of the design, governance and further development of OE-initiatives:

- Identification and analysis of external Context-. and Content-elements as conditionings of OE-initiatives
- Identification, analysis and evaluation of internal Context- and Process-elements in terms of their inhibitory or facilitating effect on the establishment of OE-programmes
- Derivation of recommendations for action with the help of a reference-model for the design of OE-promoting Context- and Process-elements
- Understanding of the connections between established management- and working-methods, the OE-methods used for organisational change and the actors acting within them

1.10.2 THEORETICAL RELEVANCE

The theoretical relevance lies in particular in the differentiated consideration of the connections between Content, external and internal Context as well as the Process of establishing an OE-programme on the basis of a comparative case study-analysis. The research design was able to prove that despite an identical external Context and identical programme content, the implementation of the OE-initiative at the respective plants was very different. Six factors from the internal Context of the plants were identified as key performance indicators; two factors from the introduction procedure, which had a significant influence on the effectiveness and sustainability of the activities, were also identified.

In addition, the existence and effectiveness of corresponding key performance indicators showed that the process of establishing an organisation and culture of CI can only be partly determined by Content and that this process is massively influenced by internal Context and implementation Process-factors. This massive influence also makes it clear that a simplified understanding of behaviour follows structure, as it is subject to Structure-behaviour-determinism, is insufficient to explain the phenomenon. With a reference to Giddens' Theory of Structuration it was shown that more integrative perspectives on these so far little researched interrelationships offer a better descriptive and explanatory power (see Appendix D)

1.11 OUTLINE OF THE THESIS

The structure of the thesis at hand is divided into five chapters:

1.11.1 FIRST CHAPTER

The first chapter focuses on the general development of production-based packaging companies and the difficulties encountered by the Operational Excellence (OE)-programmes. Subsequently, the current knowledge gaps and challenges in Operations Management (OM) as well as in the understanding of Change Management (CM) and Continuous Improvement (CI) programmes are described. This chapter also provides the research aim, objectives and research questions.

1.11.2 SECOND CHAPTER

A comprehensive and critical literature is presented in the second chapter. Based on a literature search, the existing knowledge base with regard to process and institutional Key Performance Indicators (KPIs) in CI-programmes is examined and condensed. Furthermore, the current state of research on CI-programmes, in particular on Total Quality Management (TQM), Lean Production (LP) and World Class Manufacturing (WCM) is examined and its relation to a new non-traditional Content-, Process- and Context-perspective. The insights gained in this chapter clarify possible factors, which illustrate the scattered diversity, the frequent blurring, and the insufficient differentiation between the Content, Process and Context of a CI-initiative in previous studies.

1.11.3 THIRD CHAPTER

This chapter discusses the research methodology and how its design relates to the research objectives. The various possible approaches, such as the qualitative or quantitative methods are explained, evaluated and selected and a defined design based on the theoretical guideline is described. The research strategy section determines the research question, the scope of knowledge, the time required, generally available resources and objectives, thus confirming the chosen research philosophy.

In the data analysis-section, after a description about prejudices or allegations of case studies, the eight Key Performance Indicators (KPIs) needed to develop the concept- and reference-model are listed. The third chapter concludes with a look at the possible methodological limitations, since the validity and reliability check for a theory or a concept can be misleading at the moment of its emergence or even impossible. The danger lies in a tautological trap. Therefore, the substitute for validity, plausibility, is used here. Plausibility is the next best option to test a theory or concept after its emergence.

1.11.4 FOURTH CHAPTER

The results of the study are presented in this chapter. Based on the obtained KPIs, the concept of an OE supporting organisation is created. The core of the concept is a reference model with the help of which organisation s can evaluate the degree of OE-support via an OE-index. In this chapter the degree of implementation or fulfilment of five Lean principles with data collected after the OE-case study was conducted is shown. For comparative purposes and to better illustrate the improvement, data were also taken before the start of the OE-case study and the out-come compared with data after it was conducted by using radar-charts (see Appendix C).

For estimation of the nature and scope of projects, the project database of Packaging Ltd. was evaluated with regard to certain criteria and whether projects were successfully completed or not. With the help of this reference model, the eight case companies examined are evaluated, the results are compared (triangulated) with data and facts from the internal Project- and Lean-audit-databases of Packaging Ltd. The results show plausible connections between the three considerations.

1.11.5 FIFTH CHAPTER

This chapter presents the findings and conclusions. Based on these findings, a reference model was derived for the recording, analysis and evaluation of plants with regard to their OE-support in the internal Context and Process. The subsequent evaluation of the eight plants examined using this reference-model and data triangulation between the internal project database and a study on employee engagement showed plausible correlations between the results. This chapter presents the recommendations for action for practice and the scientific knowledge gained. First, the Sub-Research-Questions (SRQs) are considered and then, with regard to the management model to be developed, the central Research-Question (RQ) is answered. Finally, an examination of the transferability and a summary of the results, the contribution to practice and science, as well as recommendation are given.

1.12 SUMMARY

This chapter provides an overall picture of the study. At first, it introduces the background of the study, the motivations for undertaking the research and its purpose. It states the research questions and how they will be answered, before providing a description of the structure of the thesis. It is hoped that this orientates the reader, and prepares them for the Literature Review chapter, which follows, where the literature relevant to the present study is described in detail.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

A scientific literature search includes both a systematic and complete survey of diverse publications. This is the only way to find as much literature as possible with multiple objectives and on specific topics. For this purpose, both the content and the field of research are determined and thus the What? and How? of the research. The research generates knowledge about core concepts but also theories and methods of the field under investigation. In order to prevent duplication and thus guarantee the originality of one's own research, the work of other researchers must be clearly identified and thus an unexplored gap found (Durach et al. 2017; Gash, 1999).

For scientific research, the focus should be on qualitative but also diverse literature sources. Practical literature provides less theoretical basis than academic literature, but it is helpful in indicating current developments and topics. According to Rowley and Slack (2002) literature sources can be classified. There is the book-class with its textbooks, encyclopaedias, dissertations and conference proceedings. Another class is formed by articles in scientific journals with which a good overview of the research topic can be gained, but this does not replace examination of the original sources. The so-called grey literature consists of publications on current research activities as well as technical reports and patents. Sources for literature research are library catalogues as well as online databases. The author mainly used the Scopus® database for his research. Neither the research method, the minimum journal quantity nor the region were restricted.

This chapter outlines how the literature was dealt with and summarises the resulting outcomes. Authors and publications relevant to this research have been included, as well as the arguments, themes and tools that validated the format and content of the primary publication. The involvement of the key data that emerged from the research and how it was formulated has been approved. Part of the objective of this investigation is studying Operational Excellence (OE), Operations Management (OM) and Change Management (CM); because of this, the terms Operational Excellence, Operations and Change Management will be presented and used throughout this research report. More specifically, the focus of this investigation is on studying how the implementation, sustainability and leading of changes should take place in eight European packaging plants. This is why, this report will also cover the area of Continuous Improvement (CI), which will include terms such as leadership and reorganisation (Groenveld et al., 2015).

2.2 LITERATURE RESEARCH PROCEDURE

2.2.1 LITERATURE SCREENING

The literature evaluation in this thesis is conducted according to Vom Brocke et al. (2009), Ridley (2008) and Torraco (2005), who suggest a literature evaluation to ensure both comprehensibility and quality as well as reliability.

DEFINITION OF REVIEW SCOPE

In order to clearly define the scope of the literature review conducted, the classification according to Cooper (1988) is chosen, following Webster and Watson (2002). The cataloguing consists of six basic categories: Focus, Goal, Organisation, Perspective, Audience and Coverage. Table 1 provides an overview based on Cooper (1988) and shows the selected characteristics in the categories presented. The focus of the research is on the research findings and their application. The goal is to integrate the research, with the organisation of the research focusing on conceptual aspects. The term Focus of the thesis has to be applied to the research findings and their application with the Goal to integrate the research and focus on conceptual aspects. The term Conceptual relates to understanding in terms of the development of a new context or the re-interpretation of existing concepts that explain or describe the phenomenon. The term Perspective is neutral, and the target Audience refers to specialised researchers and practitioners. The term Coverage of the research is both exhaustive and selective.

Characteristics	Categories			
Focus	Research outcomes	Research methods	Theories	Applications
Goal	Integration	Criticism		Central Issues
Organization	Historical	Conceptual		Methodological
Perspective	Neutral representation		Espousal of position	
Audience	Specialized scholars	General scholars	Practitioners	General public
Coverage	Exhaustive	Exhaustive selective	Representative	Central/pivotal

Table 1: Classification of literature review (adapted from Cooper, 1988)

CONCEPTUALISATION

The literature review should start with existing knowledge and potential areas where knowledge is needed. In the conceptualisation phase, the working definition of the keywords is provided (Webster and Watson, 2002). The definitions of the keywords will be given later. In order to avoid the search being too narrow and to make sure it still covers the research field; the same keywords are also used for the literature review. The keywords used are:

Operational Excellence and Change Management, Operational Excellence and Continual Improvement, Operational Excellence and Implementation, Operational Excellence and Lean Process, Operational Excellence and Sustainability. In addition, OE was replaced by CI in the same combination as with the term OE.

LITERATURE SCREENING

According to Kofoed et al. (2002) and Vom Brocke et al. (2009), literature screening involves a systematic and complete search for all types of publications in order to identify as much literature on a topic as possible. The literature search has several objectives. First, it identifies a research field and the context of the research. This enables an investigation into what and how research should be conducted in the context of a thesis. As knowledge about a research field is gathered during a literature search, the search leads to an understanding of core concepts, theories and methodologies of a field.

An important point to avoid duplication is to identify the work of other researchers. This ensures the originality of one's own work and can help to find a gap that has not been considered in previous research. Finally, the literature search also serves to identify key persons, organisations and important papers in the research field (Brettle and Gambling, 2003). Several strategies can be used to search for literature, allowing a structured approach. The most important main articles are usually found in the top journals of a topic area (Webster and Watson, 2002). These articles can then be used to search forward and backward. The backward search searches for references to the articles found so far. The forward search analyses articles that reference the previously examined papers (Vom Brocke et al., 2009).

KEYWORD-SCREENING OF DATABASE

Scopus® was used for the database research. Scopus® is a novel database from Elsevier that navigates the world's largest collection of abstracts, source references and subject indexes in the natural sciences, engineering, medicine and humanities and social sciences, and provides links to full-text articles and other bibliographic sources. Scopus® is updated daily and contains over 38 million abstracts and references from over 18,000 titles published by more than 5,000 international publishers. Researchers can search a database of abstracts going back to 1966, and in some cases as far as 1,823. For all articles published since 1996, the references are included in addition to the abstract, many of which are offered in linked form for the first time.

SEARCH-STRING CHARACTERISTICS

The search was conducted in the database as abstract and, where possible, in combination with a title and keywords search. Table 2 below summarises the search results in the Scopus® databases with the respective keyword combinations. The time period was

chosen was from Jan. 2011 to Oct. 2019. Depending on the search word combination, the time frame was shorter.

				Appropriateness			Document Type [1]				
Keywords 1	Keywords 2	Language	Total studies	High	Medium	Low	CP	AR	BC	CR	ED
Operational Excellence	Change Management	English	20	7	5	8	11	8	1	0	0
Operational Excellence	Continious Improvement	English	96	15	52	29	38	43	6	5	4
Operational Excellence	Implementation	English	110	12	43	55	66	41	1	2	0
Operational Excellence	Lean Process	English	31	7	14	10	8	17	4	2	0
Operational Excellence	Sustainability	English	78	6	48	24	23	40	5	8	2
			335	47	162	126	146	149	17	17	6

[1] Conference Paper (CP), Article (AR), Book Chapter (BC), Conference Review (CR), Editorial (ED)

Table 2: Characteristics of the search string

DISTRIBUTION OF APPROPRIATENESS

			Appropriateness		
Keywords 1	Keywords 2	Total studies	High	Medium	Low
Operational Excellence	Change Management	20	7	5	8
Operational Excellence	Continious Improvement	96	15	52	29
Operational Excellence	Implementation	110	12	43	55
Operational Excellence	Lean Process	31	7	14	10
Operational Excellence	Sustainability	78	6	48	24
		335	47	162	126
	[%]	100%	14.0%	48.4%	37.6%

Table 3: Appropriateness of studies distribution

Of the identified 335 papers in OE, 47 papers (14%) were classified as high, 162 papers (48.4%) as medium and 126 papers (37.6%) as low appropriateness papers with respect to the objective of this research study.

DISTRIBUTION OF DOCUMENT TYPE

Table 4 below displays the distribution of document types based on the 335 OE-papers identified.

			Document Type [1]				
Keywords 1	Keywords 2	Total	CP	AR	BC	CR	ED
Operational Excellence	Change Management	20	11	8	1	0	0
Operational Excellence	Continious Improvement	96	38	43	6	5	4
Operational Excellence	Implementation	110	66	41	1	2	0
Operational Excellence	Lean Process	31	8	17	4	2	0
Operational Excellence	Sustainability	78	23	40	5	8	2
		335	146	149	17	17	6
	[%]	100%	43.6%	44.5%	5.1%	5.1%	1.8%

[1] Conference Paper (CP), Article (AR), Book Chapter (BC), Conference Review (CR), Editorial (ED)

Table 4: Document-type distribution

A total of 146 papers (43.6%) are conference papers, 149 (44.5%) are articles, 17 (5.1%) are book chapters, 17 (5.1%) are conference reviews and 6 (1.8%) are editorials.

KEYWORDS EXANIMATION

A keyword exanimation has been attempted by retrieving the Author- and Index-keywords of the relevant papers from the Scopus® database. The results are shown in Figure 2 and Figure 3 below. The keywords were created using the IBM® SPSS® Statistics 24 and www.wordle.net software package. The size of the words and letters reflects the frequency of the keywords from the final sample of 335 papers. The most important author keywords are as expected Operational Excellence, Lean Six Sigma, Sustainability and Continuous Improvement. In addition, the top ranked index keywords are Operational (Excellence), Lean Six Sigma (Production), Management, Sustainability and (Total) Quality Management.

The screening of the database yielded different results. The keyword exanimation for the terms Organisational structure, Infrastructure and Organisational design, when combined with OE and CM, resulted in a low number of finds. The combination of the keywords OE and CM and Sustainability resulted in a high number of finds. Consequently, a detailed journal search was conducted with these keywords, which yielded a high number of search results.

Keywords	Authors
Lean (Six Sigma)	28%
Operational Excellence (OE)	20%
Sustainability	11%
Process Improvement	10%
Quality (Improvement)	6%
Continuous Improvement (CI)	6%
Environmental Pperformance	3%
Business Excellence	3%
Productivity	3%
Total Quality Management (TQM)	3%
Small-Medium-Enterprises (SME)	3%
Organizational Change	2%

Figure 2: Analysis of author-keywords

Keywords	Indices
Operational (Excellence)	23%
Production (Process)	16%
Lean Six Sigma (Production)	9%
Management	8%
Sustainability	7%
Manufacturing Organisations	7%
Environmental Performance	6%
(Total) Quality Management	6%
Industrial management	5%
Continuous Improvements	5%
Human Resource Management	5%
Performance	4%

Figure 3: Analysis of index-keywords

INCREASE OF RESEARCH STUDIES

In 2011, there were 18 papers (6%), in 2012, there were 16 papers (5.3%), in 2013, there were 23 papers (7.6%), in 2014, there were 28 papers (9.3%), in 2015, there were 21 papers (7.0%), in 2016, there were,37 papers (12.3%), in 2017, there were 31 papers (10.3%), in 2018, there were 58 papers (19.3%) and by Oct. 2019, there were 69 papers (22.9%) published.

Figure 4 below shows the increase in relevant research studies from Jan. 2011 to Oct. 2019.

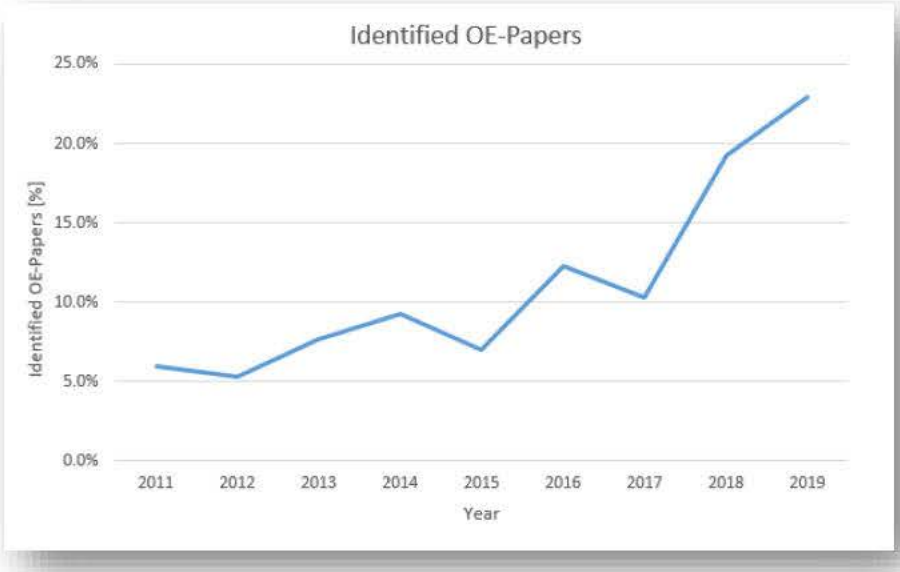


Figure 4: Increase of relevant studies from Jan. 2011 to Oct. 2019

JOURNAL RESEARCH OVERVIEW

Based on the Scopus® database search, an in-depth journal search was conducted for the search terms with a high number of search results. In the journal research, non-relevant journals such as mathematical content were excluded from the outset. Both empirical and conceptual papers were considered in the search. Table 5 shows a list of the journals with the keywords and criteria used.

Keywords 1 & 2	
International Journal of Advanced Manufacturing Technology	Business Process Management Journal
International Journal of Advanced Science and Technology	European Journal of Industrial Engineering
International Journal of Business Excellence	Global Journal of Flexible Systems Management
International Journal of Economics and Business Administration	Journal of Business Research
International Journal of Engineering and Advanced Technology	Journal of Industrial Engineering International
International Journal of Engineering Research in Africa	Journal of Information and Knowledge Management
International Journal of Innovation and Technology Management	Journal of Management Development
International Journal of Lean Six Sigma	Journal of Manufacturing Systems
International Journal of Management Science and Engineering Management	Journal of Pharmaceutical Innovation
International Journal of Operations and Production Management	TQM Journal
International Journal of Production Economics	
International Journal of Production Research	
International Journal of Quality and Reliability Management	
International Journal of Quality and Service Sciences	
International Journal of Six Sigma and Competitive Advantage	
International Journal of Supply Chain Management	
International Journal of Sustainable Engineering	

Table 5: Journal research overview Jan. 2011 - Oct. 2019.

BACKWARD- AND FORWARD-SEARCH

The process of checking sources is described by the backward search, where articles found in the keyword search are cited. In contrast, the forward-search is characterised by reviewing those articles that have cited articles extracted from the keyword search (Vom Brocke et al., 2009). Both review methods are used for the literature review process. The literature search undertaken was complemented by a review of OE-, OM- and CM-books. In particular, the early literature on CI and Lean that introduced the concept to the English-speaking world was reviewed, including Womack et al. (1994), Koufteros et al. (2007) and Marodin et al. (2016). In the TQM research path, literature used included Su et al. (2010). This knowledge is mainly used for the TQM-chapter on basic understanding Total Quality Management (TQM).

2.3 LITERATURE OBSERVATIONS AND SURVEY

2.3.1 LITERATURE IMPLICATIONS AND ANALYSIS

This chapter describes the analysis of the literature review undertaken, as introduced before. The literature search based on Vom Brocke et al. (2009) and Onwuegbuzie et al. (2012) provided numerous science papers. The following chapters details the relevant papers found with a focus on the commonalities or how they relate to the research topic and highlight the implications of the in-depth analysis of the most relevant papers for this research. While the drivers of change are multiple, this research focused on change through choice as opposed to crisis-driven change. When evaluating triggers, it is worth considering how plants evolve, why change is necessary, and the impact stagnation can have on long-term viability. In the following, Slatter and Lovett's plant life cycle is described (1999).

A growth- and evolution-curve would indicate that stagnation occurs after maturity. Without corrective action, such as a new management approach, decline and failure will quite certainly result. The further the decline develops, the more difficult the change programme and the more severe the remediation measures will become.

According to Slatter et al. (2006), in order to change,

- An organisation must lose confidence in the existing leadership before listening to the new abandon old goals before adopting new ones
- An organisation must change their perceptions to tolerate for a new way of looking at their environment and
- An organisation must accept that the old ways have not worked before adopting new ones.

Only when organisations deal with these barriers to change can decline then be stopped and strategic planning and recovery started. A number of considerations arise for plants seeking to change by entering new production, new markets or introducing new services. These fall into a broad category of what is commonly referred to as Change Management (CM). The issues facing CM-management and -staff arise in most aspects of business life, including processes and culture. Each aspect has its own influence and in order to develop a meaningful strategy or plan, the aspects must all be considered individually and collectively so that their impact on the CM-process is understood.

2.3.2 OPERATIONAL EXCELLENCE (OE) TQM, LP, WCM

Operational Excellence (OE) is crucial for the growth of organisations and industries of all sizes and especially for Small to Medium sized Enterprises (SMEs) as in the packaging industry. Within the characteristics that define OE, there is the quality, efficiency and

effectiveness of SME (Van Assen, 2012). OE is not just another theoretical concept; it is a philosophy aimed at achieving better performance and finalising commercial success. OE includes the organisational culture of the company, in which employees have the ability to identify problems and solve them analytically (Van Assen, 2012). OE is the development of skills to create competitive advantages in a dynamic environment based on the resources based on an organisation's adaptability.

The composition and expansion of the team of facilitators is the basis for Continuous Improvement (CI), in particular in terms of Total Quality Management (TQM), Lean Production (LP) and World Class Manufacturing (WCM). Today, market conditions set the tone for any organisation to take the road to success and face the challenges to remain competitive in the market by achieving significant improvements in the organisation's indicators. The core aim of this work and the research project associated with it was to make a useful contribution to the improvement of leadership and management tools in the design, guidance and further development of Operational Excellence (OE) programmes within the packaging industry.

The initiation of the research focused on a phenomenon and problem of the practice, in which managers and staff within the framework of the implementation of an OE-programme in different geographical plants did not behave as expected by the management (Kalyani and Sahoo, 2011). In some of the eight packaging plants, the desired changes to develop an organisation and culture of continuous improvement were extremely successful. In other places the changes were achieved satisfactorily but could not be stabilised in the long term. Some plants even failed to make any substantial changes. This is a phenomenon and problem that is regularly encountered in the area of OE-initiatives and on which questions about Operations Management (OM) have so far only provided rudimentary answers. The interest of this research therefore lies in the questions and explanations about how and why this different and sometimes deviating behaviour occurs and which institutional and procedural key factors have a formative influence on plants.

The European Foundation for Quality Management (EFQM) specifies OE as outstanding practice in managing an organisation and achieving results. Van Assen (2012) argues that OE is not only about reduction of cost and improvement of quality, but also about wise resources in manpower. Achieving OE requires strong leadership and tough CM-skills and. OE also relies heavily on staff support and a culture of CI. Its implementation generally challenges a plant with the need to change the way staff and management think and act. Mann et al. (2011) conducted a survey on the usage of OE in Asian organisations. More than 40%of the total survey population represented plants from manufacturing industries. Even though organisations believe that the application of OE is important to realise key objectives, there are still some barriers in these plants, such as poor

development of an OE-culture, non-existence of resources and insufficient training of staff in OE. This survey examined the use of OE in four countries (Singapore Thailand Japan and China). A study of plants in European countries, which may be at different stages of OE-maturity seems worthwhile.

Jankalova (2012) evaluated the business success factors in achieving business subject excellence in the Slovak Republic. The results showed that the factors relating to the success rate are not related to monetary values, but the overall function of the company. In other words, they are related to de facto non-economic factors that reflect the level of innovation, employee satisfaction, customer satisfaction and social responsibility. Therefore, identifying the right factors for success serves of the purpose in terms of making the right decision for the organisation. In view of this, non-economic factors of success, also known as non-monetary factors, are justified for the needs of an organisation. On the other hand, Anninos and Chytris (2012) investigated the meaning of sustainability and its relationship to OE. They found that sustainability and excellence are two interrelated concepts. These two interlinked concepts have helped to change national, corporate and sometimes individual mind-sets. The rapid magnification and intensity of the environmental and social consequences of the dominant global model are pushing organisations to address the challenges of sustainability and maintain their competitiveness through excellence (Garza-Reyes et al., 2018).

In a recent study Waal (2013) examined factors that lead to sustainable excellence, whether they are evergreen or remain the same over time. The result shows that almost 90% of the factors that create OE have been found in surveys before and after 2009. Although the manifestations of the factors may change occasionally, the factors found appear to be evergreens of excellence that are always critical to creating and sustaining a high-performance organisation. From this point of view, research on factors creating OE, as found in the earlier or more recent literature, is time constant. In this study, the findings from the application of OE are focused on operational performance and organisational sustainable performance. The organisational sustainable indicators in this study are Context-, Content- and Process-perspectives, while the financial indicators such as Return of Equity (ROE) and Return on Assets (ROA) are ignored (Hubbard, 2009).

Key Performance Indicators (KPIs) 1 to 8 are developed to measure organisational performance in achieving OE. More specifically, the dependent variables: OE- Plant staff, OE-plant Culture, OE-plant management role, OE-organisational resources, OE-organisational adaptability, OE-organisational integration, OE-programme management initiatives and OE-Packaging Ltd. Support are operationalised. The need to optimise productivity, quality and speed has a variety of strategic tools. Although the resulting operational improvements have been significant, sustainability has been a challenge and the tools have in some respects replaced strategy (Porter, 1998; Venugopal and Saleeshya,

2019). Successful use of such tools requires an understanding of the strengths and weaknesses of each tool and the ability to integrate tools creatively and effectively at the right time. No one tool can provide an optimal solution and strategy development should determine which tools are used and not the other way around (Found et al., 2017).

TOTAL QUALITY MANAGEMENT (TQM)

TQM BASIC STATEMENTS

As the first of the three concepts the Total Quality Management (TQM) concept is examined historically and content-wise next. Subsequently, the concept will be examined from the CPC-dimensions and a focused literature search will be conducted with regard to Process- and Context-aspects in the implementation of TQM. The latter is finally summarised and represents the scientific starting position from the perspective of TQM and the basis for later consolidation. The classic TQM-concept, the Business Excellence Models based on it, the EN ISO 9000 Series of Standards and the Six Sigma (6σ) approach form the basis for Quality Management Systems that are not limited to the perfection of individual products or services, but cover all management activities and areas of an organisation. Marzagão et al. (2016) and Montgomery et al. (2011) mention characteristics as essential for the TQM-philosophy:

- Inclusion of all sectors
- Understanding of internal customer-supplier relations and
- Alignment of the organisation with products and processes

The holistic orientation of this philosophy includes integrating social concerns into the organisation's target system and striving for outstanding performance in terms of quality, time and costs. These dimensions of performance are understood to be continuously improvable. Different views can be found on the extent to which quality has a prominent position in TQM. Nevertheless, all the concepts summarised under TQM point to the outstanding importance of multidimensional target systems, particularly those geared to stakeholders. These multidimensional target systems were often understood as a counter-position to one-dimensional profit maximisation targets such as shareholder value.

TQM is a philosophical approach to management that is based on gaining comprehensive advantage by focusing on customer satisfaction within a continuous improvement environment. The basic idea of this concept is the integration and responsibility of all employees, regardless of the hierarchy level, in the implementation and maintenance of Quality Management (Dale et al., 2001). In this concept the focus is on the continuous improvement of quality

TQM CONCEPTUAL AND HISTORICAL DEVELOPMENT

The origins of the TQM lie historically in Industrial Engineering in the USA and later in the quality philosophies of various Japanese companies. Since the 1920s, the TQM has changed over four phases from Quality Assurance, Quality Control and Total Quality Control to an independent management model. Each phase has contributed to the expansion of the concept. The pioneers of the initial TQM understanding were, in

particular, Feigenbaum (1956), Juran (1989), Deming (1986), Ishikawa (1985) and Crosby (1979). The early industrial forms of quality assurance activities related to inspection of finished products by a separate organisational department unit at the end of a manufacturing process (Ishikawa, 1985). This institutional separation of production and quality inspection was conceptually carried out in cooperation with the revolution, the Taylorism division of labour in the concept is accompanied by the promotion of specialisation (Taylor, 1911). The negative consequences of this separation were an implicit release of production from responsibility for quality, a limited technical understanding of product quality in the specifications, a focus of quality activities on a single, integrated late point of intervention, a monotonisation of individual activities as well as an increase in indirect and non-value-added activities and costs.

In the late 1950s, concepts developed as a countermovement from Japan and later from the USA, which shifted the focus of quality activities to process quality and defect prevention. Core methods in this phase were methods of statistical process control, quality control loops and quality planning. In the eighties, the TQM-concept was further extended to the entire company, including an evaluation of leadership and management. In addition to the technical quality circles, cross-divisional quality circles were increasingly established on a company level.

While initially the product capability and later the process capability were a central point of reference for the quality activities, the perspective developed in relation to the quality capability of an organisation. The previous assessments of quality of products and processes have been extended by reference models for organisations and companies. During the ninety's TQM became the dominant quality management model in theory and practice (Schroeder, 2007).

TQM CONTENT-, PROCESS- AND CONTEXT-PERSPECTIVE

In recent years, quality management has developed into a comparatively well-thought-out field of research with the overall organisation as the starting point. Compared to the other two approaches in particular, the TQM has proven and established definitions and concepts with little scope for interpretation (Su et al., 2008). The starting point for TQM has shifted to the organisational level at the latest since the appearance of Business Excellence Models. As already mentioned, the conceptual integration of Six Sigma into the framework of existing approaches is different and offers an interesting starting point (Rusev and Salonitis, 2016). In the view of Schroeder et al. (2006), Six Sigma contains a distinction between the elements of understanding and organisational implementation that are still too little thought through and have far-reaching consequences.

Thereby it can be recognised that it corresponds to the challenge of an increasingly differentiated consideration in CI-concepts between What is Content?/understanding, What is Process?/implementation and What is the Context?/environment and institution.

From the CPC-dimensions, it becomes clear that the essential aspects of Six Sigma-activities are based on unchanged content from TQM. New ideas and procedures, on the other hand, lie in the dimensions of the Process and the Internal Context or complement the concept. This thus reflects the increasing relevance of Context- and Process-knowledge in the TQM-approach and the previous conceptual gap in the CPC-structure.

TQM CONTENT-ELEMENTS

Due to the mentioned maturity and the focus of the TQM-approach on the organisational level, existing models can be used for the content description. As already explained, the separation into Content, Context and Process is not always clear. Origin is the CPC-dimension on CI-programmes shown in **Error! Reference source not found.**Table 6. While, for example, the use of process management methods as Statistical Process Control (SPC) is seen as the core content of TQM, the training of statistical methods is understood as a process element, since they are based on the definition of a supporting measure for the use of process management methods, but not a core method in itself.

Elements	Description
Clear Process-definitions for Cross-divisional Design of Products & Services	Cross-departmental design, customer integration, production-ready design, robust design, use of QFD.
Stringent use of Process-management-methods	Clear process responsibility, change of quality focus from inspections to in-process controls, SPC, TPM, process definitions.
Formalized, quality-oriented Top Management Leadership	Clarity of quality objectives, strategic relevance of quality, quality priority in performance evaluation, allocation of resources for quality, acceptance of quality responsibility.
Structured Involvement of Employees & Teamwork	Participation of all in quality teams; responsibility and recognition of quality in each employee, suggestion scheme, employee participation.
Introduction of quality control loops for Basis of Quality-data and Reporting-structures	Use of quality cost data, feedback on quality data, visualization of quality data, benchmarking.
Quality-oriented, long-term Supplier-management	Long-term relationship, few reliable suppliers, supplier involvement in the design process.
Continuous analysis & Alignment of Activities to Customer-requirements	Customer requirements as input, feedback on customer satisfaction.

Table 6: Content-elements of TQM.

TQM PROCESS- AND CONTEXT-ELEMENTS

On the basis of the PC-allocation explained before, further knowledge on key elements related to the implementation process and internal context of TQM-programmes are searched and captured. Process- and Context-factors are understood to mean all activities, conditions, events and methods that serve the sustainable and effective implementation of the content factors, but do not belong to the content methods. Only in the WCM-concept-, are Process- and Context-elements already explicitly anchored. As shown, with the Six Sigma activities, the first starting points to transfer these into a TQM-concept are provided.

In order to capture the existing knowledge about these key elements, information and findings from scientific studies in leading quality and production management publications as well as contributions from quality pioneers were examined (Flynn et al., 1995). The analysis does not claim completeness, but it covers for essential existing knowledge about context and process aspects.

TQM PROCESS- AND CONTEXT-ELEMENTS LITERATURE RESEARCH

Authors	Influencing Faktors	
Ishikawa, 1976	Guide to Quality Control	Quality data gathering and analysis at all levels, Process improvement through problem analysis, Quality function is the responsibility of all departments.
Crosby, 1979	Quality is free	Employee recognition. Quality awareness, Supervisor training & employee training, Quality improvement teams.
Adam et al., 1981	Productivity and quality	Participation of employee, Job enrichment, Employee training & orientation.
Juran, 1981	Product quality	Employee relations including quality circles, Organizational mechanism/ program to improve quality.
Leonard, 1982	The Incline of Quality	Training and development of employee & management, Personal concern for quality-conscious management style.
Deming, 1986	Qut of the crisis	Remove all barriers to work's pride of workmanship, Institute vigorous program of training and education, Management's permanent commitment and obligation.

Authors	Influencing Faktors	
Glover, 1993	Achieving the Organizational Change Necessary for Successful TQM	Extra work instead of a new way of doing things, Ineffective Implementation, Make only superficial attempts of change.
Mann et al., 1995	Factors affecting the implementation & success of TQM	Organizational structure, Process factors, Management style.
Harai, 1997	Reasons TQM doesn't work	Focuses on minimum standards, Focuses people's attention on internal process, Develops its own cumbersome bureaucracy.
Joseph, 1999	Organizational factors & total quality management	Communication, Organizational climate, Quality of life.
Sebastianelli et al., 2003	Understanding the Obstacles to TQM Success	Inadequate resources for TQM, Lack of leadership for quality, Lack of planning for quality
Schroeder et al., 2008	Six Sigma: Definition & underlying theory	Use of improvement specialist, Leadership engagement, Strategic project selection
Zu et al., 2010	Mapping the critical links between organizational culture & TQM/ Six Sigma Practices	Competing values framework.

Authors	Influencing Faktors	
Diegner 2013	Man vs. Machine in Industry 4.0	Cyber-Physical Systems (CPS) in Production Impact Megatrend Flexibility on production work Full automation in the flexible production of the future
Glück 2013	TQM 4.0 & Zero Fault	Quality-intelligence without humans Production-intelligence without humans
Wegener 2014	Industry 4.0	Merge an end-to-end digitalized Virtualized value-added process
Wolter et al. 2015	Model-based Impact of Industry 4.0	Results of changed occupational field structure Consequences of higher investment in equipment Consequences of increasing demand for new goods Consequences of higher investments in construction Results from changes in cost of materials & personnel
Arntz et al. 2016	Risk of Jobs due to Industry 4.0	Reflection of Studies Risk of Computerisation Job-automatibility of jobs
Nagl et al. 2017	Digitalization of Work	Employment Effects Social Changes in Technology
Ferrer et al. 2018	Improvement of Operational Processes	Concept and exemplary case study for the Implementation by focusing on the production line.

Table 7: Literature research on Process- and Context-elements of TQMs

TQM-DATABASE LITERATURE RESEARCH

				Appropriateness		
Keywords 1	Keywords 2	Language	Total studies	High	Medium	Low
Total Quality Management	Strategic Change	English	23	7	5	11
Total Quality Management	Lean Process	English	45	4	15	26
Total Quality Management	Continious Improvement	English	110	8	43	59
			178	19	63	96
		[%]	100%	10.7%	35.4%	53.9%

Table 8: Appropriateness of TQM-studies distribution

Of the identified 178 papers in the *TQM*-environment, 19 papers (10.7%) were classified as high, 63 papers (35.4%) were classified as medium and 96 papers (53.9%) were classified as low appropriateness papers with respect to the objective of this research study. Table 9 shows the distribution of document types based on the identified 335 texts in the field of TQM.

				Document Type [1]				
Keywords 1	Keywords 2	Language	Total studies	CP	AR	BC	CR	ED
Total Quality Management	Strategic Change	English	23	4	15	1	3	0
Total Quality Management	Lean Process	English	45	15	25	0	5	0
Total Quality Management	Continious Improvement	English	110	66	41	1	2	0
			178	85	81	2	10	0
		[%]	100%	47.8%	45.5%	1.1%	5.6%	0.0%

[1] Conference Paper (CP), Article (AR), Book Chapter (BC), Conference Review (CR), Editorial (ED)

Table 9: TQM-document type distribution

A total of 85 papers (47.8%) are conference reports, 81 (45.5%) are articles, 2 (1.1%) are book chapters and 10 (5.6%) are conference reviews.

TQM Process- and Context-elements state

If one looks at the investigations on procedural and institutional key factors in *TQM*-implementations, in which the forces, events and accompanying practices and methods affecting the implementation are considered, then three groups can be distinguished from each other. Table 7 essentially comprises the considerations and investigations of the quality gurus i.e., Deming, (1986), Leonard, (1982), Juran, (1998), Adam et al., (1981), Crosby, (1979) and Ishikawa, (1982), which dominated until the early 1990s. These are typically conceptual considerations and experiences, but less empirical studies.

Three frequently recurring key factors, which in a way honour investigations of this period are given below:

- First factor: demand for a generally high degree of formalisation in of the entire organisation
- Second factor: use of flanking training concepts, in particular for statistical quality methods for production staff
- Third factor: use of data- and fact-based, formal decision-making processes in the organisation

It is noticeable that the identified key performance indicators are almost exclusively supporting activities and thus process elements, but not contextual aspects. This also reflects the dominant Best Practice-understanding of the time and the conviction that TQM-practices are Context-independent. The degree of formalisation is also likely correlated with the increasing development of ISO 9000 Standards. The first three authors of the table mainly cover studies from the nineties. Soft factors of the process in particular,

but also initial Context factors, are gaining increasing relevance (Glover, 1993; Mann et al., 1995). This is probably due not least to the fact that corresponding studies are no longer dependent on conceptual quality gurus but are written by economists, often with the help of the case study-research.

Three factors gain increasing influence in this period of investigations:

- First factor: role of top management
- Second factor: Content-quality and consistency of the concepts
- Third factor: Organisational attributes, such as number of staff, process-steps, and product-types

The remaining three authors in the second table mainly concerns large quantitative surveys since 2000 (Sebastianelli and Tamim, 2003; Schroeder et al., 2007; Su et al., 2010). They supplement the key factors with further attempts to operationalise soft organisational factors such as the corporate culture or the organisational climate. Here the improved stock of valid constructs such as the Value Competing Framework for corporate culture and more in-depth considerations of project management and organisation may have had a significant influence on the investigations. Therefore, the next factors were typically added as key factors for the effective use of TQM-practices:

- First factor: corporate culture and climate
- Second factor: supporting activities such as project-management and project-organisation

In the table from the literature research on Process- and Context-elements of TQM the mentioned authors between 2012 and 2018 mainly deal with digitalisation in Industry 4.0-plants. Quesada et al. (2017) have a clear position on the vision of Industry 4.0: A digital Plant-platform must be used to merge an end-to-end digitalised and virtualised value-added process with the real world of industry. This is the only way to meet future market requirements. The first examples show that some of the goals formulated in the vision are already feasible today. What matters now is to take the next steps along this path. In the discussions about digitalisation, the revolutionary nature of technology is very often seen in the possibility of replacing human labour. These discussions are, of course, also part of future planning in the packaging industry. The effects of digitalisation on employment, i.e., the number of jobs, are assessed very differently. The authors Wolter et al. (2015) described the automation risk of occupations on the basis of their content of routine activities, but also of non-routine activities, if they can be transformed into well-defined problems through the further development of technology. In addition, they took into account obstacles to automation in the form of the need for social intelligence, creativity or perception skills.

LEAN PRODUCTION (LP)

LP BASIC STATEMENTS

The second of the three concepts, the Lean Production (LP) concept will be examined in the next section, both historically and in terms of content. Subsequently, the concept will be examined from the Content-process-context-perspective, and literature and studies will be researched with a focus on Process- and Context-aspects. The latter is finally summarised and represents the scientific starting position from the perspective of the LP and the basis for later condensation.

Since the beginning of the 1990s, LP has been regarded as one of the most influential concepts of OM. The term Lean and its use go back to the publication *The Machine that Changed the World* and are closely linked to the history of the Japanese automobile company Toyota and the benchmark study International Motor Vehicle Program (IMVP) of the Massachusetts Institute of Technology (MIT). Many years later Rymaszeweska (2014) outlined in his paper the general characteristics of the studied LP-organisations and compared them with those in the Toyota Company.

The Machine that Changed the World developed into one of the OM's most quoted publications, although, as Holweg (2007) showed, central elements had already been published ten years earlier in works by Schönberger (1982) and Monden (1993). Wincel and Kull (2013) examine the numerous LP-components developed all over the world and supply the expertise for integration in the plant. The LP-approach managed above all to empirically refute the trade-off between productivity and quality that had hitherto been seen in classical mass production principles and regarded as imperative, at least using Toyota as an example. Botti et al. (2017) introduce, a year later a mathematical model to develop LP.

The aim of the LP-concept is to combine the flexibility of workshop production with the productivity of mass production (Ohno, 1988; Cortes et al., 2016). The example of Aslam et al. (2019) showed that if users were not immediately successful, they would distance themselves from LP in the future.

LP CONCEPTUAL AND HISTORICAL DEVELOPMENT

In line with Syska (2006), classic controlling instruments are often at odds with the principles of Lean Production, which may lead to wrong decisions. Thus, as an example, the inventory build-up in the Profit- and Loss-statement was not only tolerated but actually rewarded. Another important factor for success on the road to LP is the employee potential, which is not really covered by any classical controlling instrument.

The concept of Syska (2006) presents a theoretical framework for the design of a of a LP-production-control, which can be filled with company-specific metrics. The strengths of this approach are in the direct alignment with the guideline and the interactions of Lean

Production. Pakdil and Leonard (2017) describe in their paper that LP in some plants is easier than in others and this might be caused by social culture differences. They examined the interconnection of LP and societal culture.

LP CONTENT-, PROCESS- AND CONTEXT-PERSPECTIVE

The historical and conceptual development shows that the LP-concept seems to be less mature than that of the TQM and closely related to the processes at Toyota. In comparison to TQM, LP as a concept is generally considered to be much less clear in reference to the object of observation. Whereas TQM-considerations at the latest since the Business Excellence Models (Jankalova, 2012) took place at company level, the core idea is, for example a process geared towards maximum added value and minimum waste production as with the LP-concept applied to different activities.

These activities include both individual projects and workshops as well as greater optimisation of extensive value creation processes or entire Management systems. In the context of the consideration of this work, only such preliminary work is included whose understanding of LP focuses on concepts related to management systems.

LP CONTENT-ELEMENTS

As already discussed, the frequently used principal level of the LP-literature is not pursued here in concrete terms, as it represents a mixture of essential elements. Nevertheless, the principal perspective can usually be linked to the level of practices and methods, as these are aligned with the principles. Since the aim of this work is to examine Context- and Process-factors in a more differentiated way, the practices and methods are regarded as the content dimension of the CPC-perspective.

The starting point for the Content-perspective is the work of Fullerton et al. (2009), which comprises ten elements within the framework of the LP. It should be noted here that these ten elements also include TQM and TPM, some of which are understood as independent CI-concepts. As already explained initially in this chapter, terms and interpretations in OM can differ from each other. Within the LP-concept of Fullerton et al., TQM is only a reduced construct that includes improvements in process quality and variability with the help of quality techniques and does not represent a holistic understanding of business processes. Thus, Fullerton’s understanding is a narrow one and thus does not includes general process considerations, internal and external as well as cross-departmental cooperation. The Content-elements of LP according to Fullerton et al. (2009) are described below in Table 10.

Elements	Description
Poka-Yoke, DfA	A technique that avoids errors to reduce errors of assessment and judgement in the manufacturing process in order to ensure highly reliable products. DfA is a computer-aided design system that reduces the number of individual components within a product to improve quality and cost.
TPM	Total Preventive Maintenance: Organized program for periodic plant maintenance and provision of spare parts to reduce the frequency and duration of plant malfunctions. Smaller routine maintenance tasks should be carried out by the production employee himself.
SOPs	Standard Operating Procedures: Detailed description of production tasks with the aim of documentation, support of organisational learning and compliance with ISO 9000 standards. Helps to maintain cumulative activities for improvement.
SMED	Reduction of the changeover time between the production of one product and the production of another product with the aim of lead time and inventory reduction.
Kaizen	Continuous improvement programs for quality, cost and lead time of products and processes through the effective collaboration of engineers and manufacturing staff.
Kanban	Production control system in which the requirements of the downstream process step are displayed with the aid of visual signals. With this *pulling* of the supply, parts are produced on the basis of the actual demand.
TQM	Integrated program to improve process and product quality using quality techniques such as Statistical Process Control (SPC) and Quality at the source.

Table 10: Content-elements of LP

LP Process- and Context-elements

In *The Machine that Changed the World* Womack et al. (1994) state regarding the environment of LP-implementations, that the fundamental ideas of LP are universal, applicable anywhere and to anyone, and that many non-Japanese companies have already learned this. This statement plays an important role in our understanding. It contributed significantly to the fact that, with regard to the context of LP-implementations, a Best Practice- or one solution fits-all-understanding is extremely widespread in the LP practical literature. The argumentation of whether this is right or wrong is not pursued here and is also not the subject of this thesis. On the other hand, two hints about this formulation should be considered by the founders of the LP understanding, as they concern the Process and Context.

Basically, the statement, which was made, relativises the influence of external factors on the effectiveness and sustainability of implementation and questions its influence. It seems to be possible in all environments (Cherrafi et al., 2016). On the other hand, this statement does not exclude the effect of external or internal Context-factors related to implementation speed. This is where a central misunderstanding on the role of Process- and Context-factors in the LP-approach mainly lies. Thus, the authors formulate that the basic implementation is always possible and useful, but they do not say whether this implementation is always the same difficulty, timely or competitive.

LP Process- and Context-elements literature research

Analogous to the procedure of the TQM literature analysis, publications in leading quality, production and logistics journals as well as from opinion leaders in practice were examined. The literature analysis had to examine the respective understanding of LP to a much greater extent. The list presented in Table 11 with 13 corresponding sources, which are based on a comparable LP understanding and offer insights into the role of Process- and Context-factors plus the influence of Industry 4.0, does not claim to be complete.

Authors		Influencing Faktors
Wafa et al. 1998	A conceptual framework for effective implementation of JIT.	Extent of staff resistance, Extent of management support, Extent of cross training workers, Extent of use of single suppliers, Lack of formal training programs for staff, Lack of formal training programs for management, Lack of communication between management & staff, Lack of cooperation of suppliers in timing of supplied materials, Lack of cooperation of suppliers in correctly supplied materials, Lack of cooperation of suppliers in communication & information.
Bessant et al. 1999	Developing strategic continuous improvement capability.	Formalized monitoring, Formalized measurement, Creating of a clear & coherent strategy, Direct financial rewards in proportion to the value of suggestion, Adequate system is in place for receiving & acknowledging ideas, Cascade process to build understanding & ownership of the goals.
Yasin et al. 2002	Organizational modifications to support JIT implementation in manufacturing & service operations.	Training of staff, Training of management Reducing equipment downtime, Use of multi-function equipment, Reducing the number of suppliers, Increasing the level of automation, Simplification & sandardizationof operations, Sharing production & service plans with suppliers, Establishing joint quality control procedures with suppliers.
Voss et al. 2002	Lean Process Improvement Activities - Bridging Short Term Outcomes & Long Term Sustainability	Ongoing support, Lean specialist skills, Developing lean champions, Scoping & trailoring intervention, Clear strategy & objectives for change, Managing the portfolio of change projects, Organizing HRM and resources for change, Rewarding and recognizing change initiatives, Planning organizing & resources for the intervention.
Koufteros et al. 2007	An empirical assessment of nomological network of organizational design constructs.	A decentralized decision-making process High level of vertical and horizontal communication, Rules & regulations that encourage creative, work, & learning, High level of horizontal integration to increase knowledge transfer, Few layers in the organizational hierarchy to enable quick response,

Authors	Influencing Faktors	
Wangwacharukul et al., 2014	LP & Cultural aspects	Physical, technical & Business factors (Dependency), Human, Cultural & Organisational factors (Dependency),
Bauernhansl et al., 2014	LP & Industry 4.0	Comparison of number of LP, Analysis of the classification of pracitse.
Marodin et al., 2016	LP & Performance in Automotive	Effect of lean practices on performance metrics.
Atari et al., 2016	LP & Intrapreneuship	Relationship between: Lean manufacturing, Structural frame conditions, Organisational development.
Lodgaard et al., 2016	LP & Barriers	Knowledge by training & education, Properly applying of tools & methods, Management commitment & involvement, Organize for lean including involvement of employees.
Martínez-Jurado et al., 2016	LP & Human resource	Phases of transition process.
Duarte & Machado 2017	LP & CI	Paradigm involves continuous improvement in: quality, productivity & time
Mittal et al. 2017	LP & Design	Paradigm includes: Methods, Techniques, Design tools, Enactment tools

Table 11: Literature research on Process- and Context-elements of LPs

				Appropriateness		
Keywords 1	Keywords 2	Language	Total studies	High	Medium	Low
Lean Production	Strategic Change	English	3	0	0	3
Lean Production	Lean Process	English	50	4	18	28
Lean Production	Continious Improvement	English	175	11	54	110
			228	15	72	141
		[%]	100%	6.6%	31.6%	61.8%

Table 12: Appropriateness of LP-studies distribution

Of the 228 papers identified in the LP-environment, 15 papers (6.6%) were classified as high, 72 papers (31.6%) were classified as medium, and 141 papers (61.8%) were classified as low appropriateness papers in relation to the aim of this research study. The following Table 13 shows the distribution of document types based on the identified 228 papers in the area of LP.

				Document Type [1]				
Keywords 1	Keywords 2	Language	Total studies	CP	AR	BC	CR	ED
Lean Production	Strategic Change	English	3	0	2	1	0	0
Lean Production	Lean Process	English	50	25	20	2	3	0
Lean Production	Continious Improvement	English	175	77	86	6	6	0
			228	102	108	9	9	0
		[%]	100%	44.7%	47.4%	3.9%	3.9%	0.0%

[1] Conference Paper (CP), Article (AR), Book Chapter (BC), Conference Review (CR), Editorial (ED)

Table 13: LP-document type distribution

A total of 102 papers (44.7%) are conference papers, 108 (47.4%) are articles, 9 (3.9%) are book chapters and 9 (3.9%) are conference reviews.

LP Process- and Context-elements state

Since the LP-concept did not emerge until the early 1990s, the number of empirical observations of key factors is visibly lower than that for TQM-studies. In addition, LP, including the consideration of Just in Time (JIT), can be assessed as significantly less clear. While today TQM essentially looks at company-wide management systems, sometimes with different readiness between only quality practices and quality and management practices, different reference levels can be assumed for LP and JIT. This can concern the understanding of a comprehensive management model as in the case of TPS, but there are also considerations which focus on individual production and logistics principles to reduce batch sizes or which limit themselves to the implementation of individual Kaizen workshops. Furthermore, consideration of the management system in the literature analysis is also assumed for LP; even with this more limited consideration of the sources, two subgroups could be identified.

On the one hand, there is a group with an LP-, JIT-understanding of a combination of management system, production, and logistics principle (Wafa and Yasin, 1998; Yasin et al., 2002) and on the other hand a group with an understanding between the management system and continuous improvement (Bessant and Francis, 1999; Bessant et al., 2001; Savolainen, 1999). Both groups differed in their statements on key Process- and Context-factors.

First group KPIs:

- Structural influencing factors such as automation, complexity and plant-flexibility
- Cooperation and communication with suppliers. Cooperation with suppliers can also be seen in the basic idea of involving suppliers as well as the company itself in LP-activities

Second group KPIs:

- Accompanying, comprehensive training courses, whereby the character of the training courses is emphasised as being suitable for the respective target groups
- General vertical and horizontal communication between managers and staff
- Management-commitment as a factor in implementation and leadership-style as an internal Context
- Intervention- and counselling-factors

The second group shows the role of the human-factor, since in contrast to the first group these aspects are strongly oriented towards management and personnel issues. It can be seen that, as with TQM, the breadth of possible influencing factors can be assessed as very diverse and not free of overlap despite the focus in the LP's understanding. In addition, it can be seen that a production- and logistics-oriented image tends to be influenced by external Context-factors, whereas a continuous improvement image contains Process- and internal Context-factors.

WORLD CLASS MANUFACTURING (WCM)

WCM BASIC STATEMENTS

As the third and last concept in the following section, the World Class Manufacturing-(WCM) concept is elucidated historically as well as content-wise. Subsequently, the concept will also be examined from the CPC-perspective. Focused research of further studies with regard to Process- and Context-aspects in the WCM-implementation was deliberately omitted, as the concept, in contrast to TQM and LP, already has its own explicit Process- and Context-aspects. These aspects represent a special feature compared to the LP- and TQM-concepts. The social practices of the WCM-model represent both the scientific starting position and the basis for later consolidation. The WCM-approach includes focus on enhancing processes, aims to reduce waste, and establish lean organisations (Poor et al., 2016).

The approach should help managers to select those principles and tools of Lean Manufacturing and WCM that are expected to be effective in their company (De Felice, 2019). While the meanings of individual practices had already been examined before the WCM approach, in the context of the WCM, for the first time a total consideration of different methods united as bundles took place. The practices subsumed within the framework of the WCM-concept were not new, but rather combined existing concepts into one picture. Consequently, the WCM-concept has the greatest overlap with the contents of the TQM and the LP-approach. Results of scientific research have shown that there are significant interdependencies between different practices and their effectiveness. These interdependencies become a success factor in the WCM, creating further and different basic statements and thus a significant conceptual change to the pure LP- and TQM-concept.

The further characteristic feature of the WCM-concept is the consideration of the efficiency of an organisation across different dimensions such as costs, quality, flexibility and service levels (Flynn et al., 1995). The multidimensional consideration goes back, like the TQM to the criticism of classical, monocentric, cost-dominated management systems. In contrast to the TQM-approach, however, the multidimensional approach in WCM was due to a different reason. While in the TQM-philosophy it was particularly a matter of balancing between stake- and shareholder value and was influenced significantly by movement in the human resource approach of the eighties, the multidimensionality of the WCM-approach goes back to the understanding of production as a complex system and the associated factual necessity for multidimensional control.

WCM Conceptual and Historical development

The term World Class Manufacturing was first used by Hayes and Wheelwright in 1984 and later adopted by countless authors and scientists. The term WCM is both a management reference model and the name of a US research project in the early 1980s to investigate the capabilities and performance differences between Japanese, German and American companies in different industries. In the mid-1980s, Wheelwright and Hayes were the first to argue that the success of the new Japanese competitors seemed to be explained less by a superior ability to innovate, a special marketing capability or a structured financial strength than by the superiority of the Japanese production systems. They pointed out that unlike most American companies, production is the key competitive factor for many Japanese companies.

In contrast to the LP-approach, the discussion in WCM was conducted based on an even closer understanding of the strategic positioning of a company order. Thus, to react and not only to build on the findings of the TPS and Toyota, the WCM-concept was developed and should help to scientifically describe and investigate the influence of practices. Within this framework, the further developments of the WCM- and the LP-approach proceeded differently, although both had as their initial impulse the success of Japanese companies in the mid-1980s through their organisational principles. A not insignificant part of the scientific investigations in the environment of the WCM-concept refer primarily to the relationships of the performance dimensions to each other. In comparison to TQM and LP, the WCM-approach is in the sense of the CPC-dimensions the most differentiated approach. It contains very structured efforts, in addition to the content, and also describe and understand the Context and Process. In addition, the WCM-approach is based on Socio-technical-systems theory, which distinguishes between human- and strategic-oriented practices and technical practices and emphasises their interdependence.

WCM Content-, Process- and Context-perspective

The WCM-approach is the most differentiated approach compared to the TQM and LP in terms of the CPC-perspective. It contains very structured efforts to describe and understand not only the Content but also the Context and Process. Cua et al. (2001), for example, deal particularly with the problems of implementation in relation to the investigations of the core practices of the WCM, namely those related to cultural resistance to change, lack of training and education (Crawford et al., 1988), lack of coordination of the different departments, and confusion about the relationship between manufacturing sub-systems (Safayeni et al. 1992; Guo and Leu, 2013). In addition, the WCM-approach builds on the Socio-technical-systems theory, which distinguishes between human- and strategic-oriented practices and technical practices and emphasises their mutual interdependence. Chaple and Dharajiya (2019) develop a framework for

WCM implementation and overview through TQM. The term technical practices refer to classical practices such as TPM, TQM and JIT. At the same time, these practices show strong congruence with the TQM- and LP-approaches in terms of content. Human- and Strategic-oriented-practices are practices that encompass the comprehensive management of the plant or company and that support or hinder the use of technical practices. This differentiation of supporting measures and conditions is not found in classical TQM- and LP-considerations (De Felice et al., 2019). An optimal implementation is also expected in the WCM if both subsystems are tuned. Since the practices of the technical system refer to the core objectives of quality and productivity improvement, they are seen as the Content of the CI-programme in the CPC-perspective. The practices of the social system are general practices for leading and guiding an organisation, which can hinder or promote the implementation of practices for quality and productivity improvement. Therefore, these practices are attributed to the process-related and institutional elements in the Content-Process Context-perspective.

WCM CONTENT-ELEMENTS

The WCM-concept has evolved several times since 1984. The initial model here is the model defined by Cua et al. (2001).

Elements	Description
TQM Basic Methods	TQM aims to continuously improve product and process quality and builds on support from management, employees, suppliers and customers to meet or exceed customer expectations.
	Cross-functional product design: Production employees and production engineers are involved to a large extent in the new and further development of products through mixed teams or in an advisory capacity. In general, teams from different fields (marketing, production, ...etc.) are involved before a new product is launched on the market.
	Process Management: A large part of the systems and processes in production are regulated with the aid of statistical process controls. Statistical methods are used intensively to reduce process variations. Charts are used to control process quality and monitor processes.
	Supplier Quality Managment: Quality is the most important criterion for the selection of suppliers. In the majority, only suppliers that have previously been certified by the company are selected.
	Customer Involement: There is regular contact with the customers. Customers have the opportunity to give feedback on quality and delivery satisfaction. If the customer approaches the company with further wishes, they will react immediately. In addition, the company conducts regular surveys on customer requirements.

Table 14: TQM basic methods

Elements	Description
JIT Basic Methods	JIT aims at the primary goal of continuous reduction and ultimate elimination of waste through just-in-time manufacturing and intensive employee involvement.
	Setup Time reduction: Activities to reduce set-up times in the plant are carried out continuously. The employees are trained in appropriate methods for reducing set-up times. *Best practices* for short setup processes are standardized and applied by the employees.
	Pull System Production: The majority of suppliers supply on the basis of a Kanban container system rather than on the basis of individual purchase orders. Delivery is made directly into the necessary kanban containers and does not require any further packing or transport material. Kanban is used throughout the plant for production control.
	JIT Delivery by Supplier: Suppliers supply on a just-in-time basis. Orders can also be placed at short notice. Replacement times are short. The overall delivery reliability of the suppliers is high.
	Equipment Layout: The production area and the processes are designed to be as close as possible to each other. The plants are arranged according to the product families. In the plant layout, care was taken to ensure that low inventories and fast throughput times were possible.Processes and warehouses are designed to minimize material handling and transportation.
	Schedule Adherence: Care is taken to ensure that the production schedule is usually met one day.

Table 15: JIT basic methods

Elements	Description
TPM Basic Methods	TPM primarily aims at maximizing plant efficiency by involving and motivating employees in maintenance activities.
	Autonomous Maintenance: Part of the daily work is consciously scheduled for maintenance activities. Predictive maintenance is considered an important strategic aspect for achieving the highest quality and production reliability. For this reason, specific maintenance activities are carried out per shift. The task of the maintenance department is understood as a support task for plant operators within the scope of their own preventive maintenance activities. Plant operators are specifically involved in preventive maintenance measures.
	Technology Emphasis: The production site is at the *leading edge* of the industry with regard to newer technologies. Developments and newer technology generations are continuously monitored. Newer technologies can be effectively introduced in the plant and further developed after their installation.
	Proprietary Equipment Development: Some plants are developed in-house and protected by patents. In order to have a strategic advantage, we also enter into regular cooperation agreements with plant suppliers.

Table 16: TPM basic methods

WCM Process- and Context-elements

As mentioned before, to describe the institutional and process-related key factors of the WCM-concept, the elements of the social practices of Cua et al. (2001) are applied. They enclose the accompanying activities and conditions explicitly included in the concept in order to improve the effectiveness and sustainability of the practices of the WCM-approach described in the contents. Consequently, no further analyses were carried out, since these practices are the explicitly present core statements of the WCM on Context- and Process-factors.

WCM Process- and Context-elements literature research

Elements	Description
Common strategic- and HR-related practices	**Committed Leadership**: All division managers at the site feel responsible for the quality. Activities for product quality and quality improvement are managed personally by the site management. The division managers actively support the JIT production approach. In addition employee involvement by the management team within the framework of the JIT production promoted. The plant management team designs and also communicates a factory vision, in which quality improvements are play the central role. The plant management is personal involved in quality improvement projects.
	Strategic Planning: The plant has a formalised strategic planning process, the results of which are summarised in a version, long-term objectives and a strategy for implementation. The plant manage-ment regularly reviews and updates this strategic plan.
	Cross functional Training: Employees are trained in various tasks. The aim is for employees to be able to take on different tasks and jobs. If necessary, they can then take over the tasks of employees who have lost their jobs.
	Employee Involvement: If problems arise, teams with members from different areas are specifical-ly formed at the plant. Part of problem-solving projects in general is to bring together all team members involved in order to find out their opinions. Over the past years, problems have been solved regularly in smaller teams.
	Information & Feedback: In production, there are diagrams showing the reject rate, delivery reliability and the number of machine downtimes. Information on quality performance and productivi-ty is available to every employee.

Table 17: Literature research on Process- and Context-elements of WCM

				Appropriateness		
Keywords 1	Keywords 2	Language	Total studies	High	Medium	Low
World Class Manufacturing	Strategic Change	English	72	8	31	33
World Class Manufacturing	Lean Process	English	71	9	39	23
World Class Manufacturing	Continious Improvement	English	44	5	23	16
			187	22	93	72
		[%]	100%	11.8%	49.7%	38.5%

Table 18: Appropriateness of WCM-studies distribution

Of the 187 papers identified in the WCM-environment, 22 papers (11.8%) were classified as high, 93 papers (49.7%) were classified as medium and 72 papers (38.5%) were classified as low appropriateness papers in relation to the aim of this study. Table 19 shows the distribution of document types based on the 187 texts identified in the WCM-environment.

				Document Type [1]				
Keywords 1	Keywords 2	Language	Total studies	CP	AR	BC	CR	ED
World Class Manufacturing	Strategic Change	English	72	19	43	6	4	0
World Class Manufacturing	Lean Process	English	71	44	19	3	5	0
World Class Manufacturing	Continious Improvement	English	44	12	27	1	4	0
			187	75	89	10	13	0
		[%]	100%	40.1%	47.6%	5.3%	7.0%	0.0%

[1] Conference Paper (CP), Article (AR), Book Chapter (BC), Conference Review (CR), Editorial (ED)

Table 19: WCM-document type distribution

A total of 75 contributions (40.1%) are conference papers, 89 (47.6%) are articles, 10 (5.3%) are book chapters and 13 (7.0%) are conference reviews.

WCM Process- and Context-elements state

The accompanying measures and conditions recorded as social practices in the WCM-model represent the state of knowledge on procedural and institutional key factors for the sustainable implementation of OE-programmes from the point of view of the WCM:

- Staff-involvement
- Cross-functional training
- Information and feedback-systems,
- Implementation of strategic planning
- Leadership commitment to the CI-goals

CI Process- and Context-elements state

A cross-comparison shows that individual aspects are recurring. These include, for example, training and education plans as well as the involvement of managers. Nevertheless, there are also different aspects. For example, formalisation and documentation are most pronounced in TQM. Structural influencing factors are rare overall, but they are among the key factors at LP. The WCM-concept most intensively combines the management infrastructure with sustainability and effectiveness, as for example the management objectives, strategic planning or information systems show.

Total Quality Management TQM	Lean Production LP	World Class Manufacturing WCM
Formalisation/Documentation	Structural influencing factors	Information/Feedback Systems
Decision-making data-based	Management commitment	OE-objectives commitment
Plant's Culture/Climate	Comprehensive trainings	Crossfunctional trainings
Project management	Integration concept	Staff involvement
Management's roles	Supplier cooperation/ Communication	Formalised strategic planning Implementation
Statistical quality methods Trainings	Vertical/Horizontal communication	
Convincing concepts Communication		

Table 20: Literature research on dominant CI-concepts

In summary, the diversity of Process- and Context-factors is great. There are recurring, but also differing aspects. The understanding of the three CI-concepts, their historical and conceptual background as well as the results of the research on Process- and Context-factors represents the scientific basis for answering the research-question as well as for the research design.

CONTENT-, CONTEXT- AND PROCESS-REVIEW

The literature review revealed three research priorities: Content, Context and Process, where traditionally the main focus has been on strategy-context research and thus what can be changed or achieved through strategy. The Context-aspects, i.e., the environmental aspects, of the strategy are considered. The more recent literature review highlights more the Process-aspect and less the Content-aspect of strategy, but with a focus on the Context-aspects of individual organisations. What is different is the focus on Process and less on strategy outcomes. Primarily, the conceptual framework deals with the Process-aspect of strategy, in addition to the Content- and Context-aspects. The reason for this is the idea that all concepts need to be considered during the strategy process, as they are interconnected. However, the focus is placed on the Process, as this is the easiest aspect to control during strategy implementation. Nevertheless, the emphasis is placed on the Processes, as this is the only aspect that can be monitored easily during the strategy implementation phase.

2.4 CONCLUSION

In this chapter, the theoretical foundation for this study is laid by searching the relevant literature for basic knowledge in books and papers on Operational Excellence, Change Management and Operations Management as well as on organisational change,

organisation-al design and development. It was found that the essence of improvement is a continuous approach and that it is synonymous with both ongoing, incremental and fundamental change as an improvement concept. In Total Quality Management (TQM), Lean Production (LP) and World Class Manufacturing (WCM), and therefore as a consequence also in OE, these improvements find their application. The CI offers itself not only as an intellectual basis, but also as a helpful application for continuous process improvement and thus as a critical factor in an OE-initiative. OE is seen as an initiative to improve effectiveness or efficiency through Content-, Process- and Context-related changes. With the help of the characteristics, barriers and potentials of OE, it is possible to derive the requirements for a cross-plant management OE-support model. With the knowledge of OE-characteristics, the field of action is mapped out and potential OE-opportunities deliver a starting point and direction for the objective of a management OE-support model.

In addition, as part of this chapter the existing strategy literature in relation to strategy implementation has been reviewed. This was done in order to develop a more holistic primitive framework that can be used to explore the influencing factors that affect strategy implementation processes in the context of the packaging industry. Different definitions of terms and approaches to understanding the strategy implementation process available in the literature were described, with particular interest expressed in the more contemporary process view. This view was seen as underused in the literature, although there is a growing belief in its effectiveness. It was noted that most frameworks have been influenced by the more contemporary process school, and in particular the work of Pettigrew (2012). Many researchers have considered the work of Pettigrew as the basis for their work (Okumus, 2001) and therefore further attention was then given to the prominent work of Pettigrew (2012). His work was further analysed and areas for development were identified, i.e., the different strategic orientations that are specifically required for operations in the packaging industry (i.e., flexibility, speed).

As a result, an affirmative primitive structure was developed to increase the level of control of the study (Pettigrew, 2012). This structure includes the following.

- First approach: gives the opportunity to study a variety of different topics
- Second approach: gives the opportunity to include both internal factors and external factors; most previous research has been contextual and focused only on the more controllable internal factors
- Third approach: gives the opportunity to adopt the contemporary process view and considers the entire process of strategy implementation from initiation to outcome

- Fourth approach: gives the opportunity to consider soft aspects, which has been enabled by the addition of another layer to the previous internal subdivision identified by Pettigrew
- Fifth approach: gives the opportunity to include more factors as enablers and barriers under context, which as such goes beyond environmental aspects

Thus, the literature review helped to identify the key considerations that apply to businesses like the packaging plants that want to enter new markets with new products or services. The change process is shown to require a mixture of planning, structure, investment and monitoring, with close attention paid to those contingency considerations necessary to counter the internal and external elements that might otherwise threaten positive growth. Implementing structures, processes and monitoring tools will help sustain the case companies through possible problems they are likely to encounter during the change transition. Within the scope of the thesis, understanding the contributory elements of successful CI-implementation were identified. This was achieved to a high degree due to the wide scope of research undertaken, including research of domain areas previously unknown. There were a number of differences relating to published authors' perspectives and opinions relating to numerous areas researched and an attempt has been made to provide a broad spectrum of opinion offering a balanced perspective to the reader.

2.5 SUMMARY

This chapter attempted to highlight the literature on strategic organisational change and implementation models. In line with this, various theoretical views of Operational Excellence with the TQM-, LP- and WCL-perspective and their evolution were also reviewed in an attempt to explicate the structure within which the theoretical contribution of the present research can be situated. The next chapter presents the research methodology employed in the present study.

CHAPTER 3 RESEARCH METHOLOGY

The methodology of research deals with choosing a method for an investigation in order to answer the research question. Methodology starts with the selection of a paradigm. The paradigm is the way in which the researcher observes the area under observation, the so-called ontology. This in turn is linked to epistemology, which describes what is to be considered valid knowledge and the relationship between researcher and the reality (Guba and Lincoln, 2005). In this thesis, the abduction approach is used. Thereby from the literature research, a theory is deducted and then compared with the outcome of the research. Interactions occur between the researcher and the world to be observed in order to generate knowledge through various possible methods. For this research, the case study-approach was chosen. It is important that the paradigm and research strategy fit together optimally. Data collection was done through questionnaires for model development at the two lean audits before and after model development. The questionnaire creates the opportunity to compare the information obtained with the conceptual model. The result is then compared with findings from the OE-indices and the Lean-Audit- and Project-indices.

3.1 RESEARCH PHILOSOPHY

According to Saunders et al. (2012), research philosophy relates to knowledge generation and its nature, i.e., it supports both the researcher's perspective of the world and the research strategy. Every researcher must inevitably grapple with the interdependent and complex relationship between important questions and ontology, epistemology, methodology and ethics before he can concretise his research. Various types of so-called paradigms can be found in the literature. The author has examined in this thesis which paradigm is most effective in addressing the research questions. Possible paradigms found would be positivism or interpretivism as the outermost areas of the continuum with other paradigms such as pragmatism and transformativism in between (Ferrer et al., 2018). For a better understanding of the OE in eight packaging plants, the interpretivism paradigm was applied. The selection of the paradigm is based on how suitable it is for the research, i.e., how far it can address the research questions and offers methods for data collection, its analysis and interpretation. The transformative paradigm seemed unsuitable due to the inclusion of social justice and politics. This would have been beyond the scope of this thesis. The positivist paradigm appeared unsuitable as it involves quantitative methods and would not generate satisfactory and sufficient information needed to create reality in the constructivist paradigm, where knowledge and truth are the result of perspectives (Schwandt, 1994). The pragmatic paradigm was not applied, as it does not encompass the specified ontology for answering the research question. The interpretivist paradigm with

its ontological, which is to say the nature of reality perspective, thus indicates better how the research was approached.

3.1.1 POSITIVISM

The research design as a whole is characterised by a pragmatist approach to research. According to Van de Ven (2007), pragmatism distinguishes itself from positivism, relativism and realism due to its independent positioning. In positivism, there exists an objectively valid, observer-independent reality. Pragmatism recognises the fundamental existence of a valid reality, but sees its capture under the influence of cognitive schemata and the needs of acting people. The knower has a priori cognitive frameworks, which effect his/her perception of the world. Due to these cognitive schemes and needs of acting people the truth recognition of an individual human being is considerably limited. The ideas, perceptions and above all judgments refer to the pragmatism in terms of the respective acting person and his needs. Truth and thus better knowledge about the world are insights that are first and foremost satisfying the needs of acting persons. The truth indicates not to follow immovable, possibly ideological, principles, but rather the use of knowledge. Thus, in contrast to relativism and positivism, knowledge can ultimately be judged by benefit. In positivism, statements about inductive verification or deductive falsification can be evaluated and thus divided into those which are refuted and not refuted for the time being (Creswell and Poth, 2018).

3.1.2 INTERPRETIVISM

Interpretivism is a form of qualitative methodology. It sees both human and researcher as instruments to measure phenomena and observations. Interpretivism was developed by a group of sociologists from Chicago in the early 20th century and is mainly associated with Anderson N., Burgess E., Cavan, R.S., Frasier, E. and Mead, G.H. to name a few prominent names, and presents the distinguishing features of the interpretive paradigm. In research, interpretivism refers to the understanding of difference between humans as social actors (Saunders et al., 2012) and objects. It focuses on subjective meanings and the interpretation of the meanings behind social phenomena. By applying an interpretivism philosophy for the research, the qualitative methodology is more appropriate to help the researcher interact with the small sample in-depth interview and focus group interview (Silverman, 2007).

Interpretivism arose when scientists believed that humans were not puppets who responded to stimuli in prescribed ways. They also responded differently to stimuli depending on the interpretation of the individual. Humans are seen as having intention and interpretive power, meaning they are capable of constructing their environment and not just being an uninvolved bystander. Through their thinking, intentions and behaviour

they come to more realistic and valid conclusions than with a positivistic approach (Cohen et al., 2007). The underpinning indication of the interpretivist's perspective is that since the researcher is involved in the observation, he/she interprets the outcome. As such, research can never be completely objective and detached from the observation. As an interpretivist is concerned with specific, contextualised environments, one recognises that knowledge and reality are not all objective but are influenced by the individuals within that environment (Grix, 2004).

3.2 RESEARCH APPROACH

According to Yin (2002), there are two methods of conducting a scientific investigation, namely quantitative and the qualitative methods. These two methods are important because they also take into account different aspects of reality. This general description, their differences and the final justification of the choice made are described in the first part of this chapter. According to Andersen (1993), two methods can be used to generate knowledge about human behaviour, society or entire organisations. These are the inductive and deductive methods. The right choice depends on the implementation and the given situation and accordingly the researcher can draw his conclusions from the chosen approaches. Andersen (1993) also states that the data used in a study can have different levels of abstraction, with the two extremes being general and concrete. Here, the first, general level refers to a scientifically accepted theory and the second, concrete level refers to empirical data.

3.2.1 QUANTITATIVE VS. QUALITATIVE

QUANTITATIVE METHOD

According to Bryman and Bell (2015), the quantitative method emphasises the precise control of empirical variables and measurement of observations. This method with its statistical analysis requires a large sample to examine the variables and meanings and helps the researcher to develop a hypothesis for the phenomenon or problem under study and then test it through quantitative techniques. Quantitative methods first focus on the cause of the behaviour and facts (Bertrand and Fransoo, 2002). The information must be in quantifiable and summarisable form, the norm for numerical data analysis corresponds to the mathematical process and the result is obtained through statistical considerations. The aim is to test the validity or the range of validity of the theory by checking central predictions from an already existing theory model. In order to guarantee equal conditions for the development of the measured values within a study, quantitative methods are usually fully standardised and structured, i.e., the information given by each respondent is created after as exactly as possible the same instruction and by means of the same

question formulation and given answer scaling, in order to make the statements of the respondents comparable with each other.

In the case of observational data, each observer uses the same observation scheme and subjective interpretations by the observer should be avoided as far as possible. The strength of the quantitative approach is that statements can be made about the validity of theory predictions. Methods are available to exclude the possibility that the proven findings could be explained by alternative causal relationships or by statistical chance. The recipient of the research findings knows whether the predictions derived from the theory are correct and how strong, the verifiable effects are and for which persons and situations the proven effectiveness is valid (Easterby-Smith et al., 2015).

QUALITATIVE METHOD

In the qualitative research paradigm, according to Bryman and Bell (2015), the theory does not exist at the beginning of the research process, but the aim is to develop a theory model based on empirical data that adequately describes a topic/content area. Thus, these methods are primarily used when researchers do not yet have a sufficiently consistent a priori model of the research area so that empirically verifiable phenomena could be used to test the validity of the model. Through intensive engagement with individual phenomena or persons, individually significant processes are to be explored in an exploratory manner. In the course of the research process, isolated causal relationships or theory fragments are usually identified, which are then further differentiated or validated on the basis of specifically selected new observations. Here, therefore, areas are typically researched that have so far been little elaborated theoretically: starting with more or less precise questions, the aim is to structure and model the research area, i.e., questions instead of assumptions. For this purpose, the researcher enters into direct dialogue with the person being researched.

Through communication, their view of things should become comprehensible. It is not the world as the researcher conceives it, but as the researched person sees it that is essential to understanding his or her actions, thoughts and feelings. In order to preserve the subjectivity of the individual, the wholeness of the content of the information must be taken into account. This is done primarily by identifying relationships between, for example, text passages, condensing and concentrating text material in order to subsequently extract latent meaning, which can form the basis of a theory model. Here, direct personal contact is an essential part of the research process, instead of standardised, objective survey conditions. It is central here that the investigator, by understanding the individual situation of the interviewee(s), optimally adapts the further procedure within the framework of the study, i.e., data sources and methods, to the information and theory fragments already available.

It can be formulated as a strength of the qualitative approach that the foundations of a theory can be developed in an unbiased way from the empirical information. This is made possible by the fact that one wants to experience and understand human experience as holistically as possible and from the inside out, subjectively, without theoretical presuppositions. By using open, non-standardised survey procedures and interpretative evaluation methods, one can optimally meet this demand. At the end of the research process, there are not generally valid, generalisable statements, but a representation that adequately describes the individual situations of the cases studied.

QUALITATIVE VS. QUANTITATIVE

Depending on how the research project is approached, different methods or techniques of empirical social research are possible. The two qualitative and quantitative methods described above will be distinguished in the following. In comparing the two methods, the aim is to clarify how social science research should proceed methodically in its basic principles. The two methods are not necessarily mutually exclusive, although they differ in some dimensions. As research practice shows, it is even common to combine the two methods, and the change of paradigm is fluid and thus cannot be clearly separated from each other. Quantitative research is seen as the more object-oriented one that seeks explanations and cause-effect relationships, while the qualitative method is seen as interpretive and subject-oriented (Bryman, 2012; Punch, 2014).

QUALITATIVE RESEARCH JUSTIFICATION

In this thesis, qualitative research instead of quantitative research has been chosen because it differs greatly in the way it is approached. As the subjectivity of qualitative research can make the results unreliable, a reflective approach to validation is very important. Since the Packaging Ltd organisations with its eight packaging plants are trying to explore the strategy process with a qualitative interaction between the plants' staff and the author, a subjective study can be assumed. In order to answer the research question “What should a management model for the effective and sustainable implementation of an OE initiative at plant level for a packaging plant look like?”, a qualitative approach is therefore used to conduct the process, as this approach is best suited for developing a better understanding of the strategic organisational activities and their rationale.

3.2.2 CONCLUSION

Due to the author’s decision to do a qualitative case study with pre-prepared structured questions, the inductive method seemed the better choice. In the application of interpretivism, the inductive approach is often used. Thus, it can be assumed that

empirical research cannot be dispensed with in the selected research topic for a correct conclusion and without inadmissible generalisations. In this way, it is possible to gain a sound insight into the complexity of the research topic, with a better and more comprehensive understanding of the situation. In order to develop conclusions on an empirical basis and a better understanding of the situation and to avoid a rigid methodology, this approach is therefore appropriate, as inductive research offers both qualitative and extensive data collection and thus creates a better understanding of the situation with empirically comprehensive conclusions. As the research question is both context- and process-specific to the strategic change projects of the eight packaging plants, the inductive approach lends itself to this approach. This also makes it more likely that the KPIs identified will be distinguishable when examining different business processes and content.

	Qualitative	Quantitative
Epistemological approach	Interpretivism	Positivism
Ontological approach	Constructivism	Objectivism
Research approach	Inductive, Theory creating	Deductive, Theory testing

Table 21: Methodological approach, (adapted from Bryman and Bell, 2015).

3.3 Research Strategy

According to Saunders et al. (2012), the research strategy determines the research question, the scope of knowledge, the time required, generally available resources and objectives, thus confirming the chosen research philosophy. According to Anderson (1993) are the various research methods based on the research process. Among the established research methods are experiments, surveys, histories and the case study used in this thesis. The author has chosen this case study strategy because the decisive result is the determination of certainty (Yin, 1994). Case study also allows the predefined phenomena to be investigated in the selected context, in contrast to experiment where phenomena are investigated out of context. The type of case study can therefore be determined by the research strategy. The content of the case study and the method of data collection were already defined in the planning process. Thus, with this design, the case study was prepared, the data collected and then analysed. From the data analysis, conclusions could be drawn about whether the concept and reference model support the OE-process or not and whether the requested management-model is a suitable tool.

3.3.1 CASE STUDY BACKGROUND

In explaining what a case study is, Yin (1993) suggests that "it is an empirical inquiry that investigates a contemporary phenomenon within its real-life context in which multiple sources of evidence are used". "The distinctive need for case studies arises out of the desire to understand complex social phenomena. The case study allows an investigation to retain the holistic and meaningful characteristics of real-life event" (Yin, 1993). This view is reinforced by Woodside (2010): "The detailed observations entailed in the case study-method enable us to study many different aspects, examine them in relation to each other, view the process within its total environment and also utilise the researcher's capacity for understanding. Consequently, case study-research provides us with a greater opportunity than other available methods to obtain a holistic view of a specific research project".

Anderson (1993) defines case studies as "being concerned with how and why things happen, allowing the investigation of contextual realities and the differences between what was planned and what actually occurred". Noor (2008) asserts case studies are not intended to study the entire organisation, but rather to focus on a particular issue, feature or unit of analysis within a bounded context (Miles and Hubermann, 1994). An important advantage of case study-research is the emphasis on context, which provides a frame of reference for interpretation, this combined with the depth of involvement over time allows links to be made and organisational processes to be inferred (Bryman, 1989). In social sciences case studies are used both as a research method as well as a teaching tool. Complex social phenomena can be characterised by a case study that is holistic and meaningful. This is done by collecting and analysing data. Companies are characterised by complex decision-making processes and social behaviours. For the questions to be examined, the information must be scrutinised carefully. It will be used as evidence of sustainable management observations, further surveys and analysis of secondary material. Here a purely quantitative analysis would not be sufficient, since the backgrounds, in particular, need to be analysed. It is therefore reasonable to analyse the businesses with a more qualitative case study methodology (Rozakis, 1999). This argumentation will be pursued, build on the demarcation of the purely quantitative research, on the comparison of different research strategies. Thus, a clear definition of the term case study can only refer in the context of a specific case study (Miles and Hubermann, 1994). As there are many different types, they will be discussed in the following section. Depending on the type, a case study is referred to in the literature as based teaching method, with the collection and analysis of data on an investigation unit. To distinguish the case study from the teaching method and illustrative practical examples, the case study will be understood, in accordance with Bonoma (1985), in the context of this work as a qualitative research strategy that examines real management situations using various data sources.

The need for this research approach is supported by Michael Porter, another influential academic in this field: "Academic journals have traditionally not accepted or encouraged the deep examination of case studies, but the nature of strategy requires it. The greater use of case studies in both books and articles will be necessary for real progress at this stage in the field's development" (Porter, 1991). The qualitative to quantitative research direction and the problem of induction and deduction are considered in the following discussion (Leedy, 2001).

CASE STUDY RESEARCH STRATEGY

The choice of research method depends primarily on the nature of the research-question, but is also determined by the control capabilities of the researcher as well as the actuality of events. Yin focuses on five research strategies in the social sciences, which are under the various conditions of advantage or disadvantage. Table 22 below indicates the relevant situation and which research strategy is suitable for an investigation.

Strategy	Research Question	Analysis of Current Issues	Control Option by Researcher
Archivanalysis	Who, What, Where, How much	Yes/No	No
Case studies	Why, How	Yes	No
Experiment	Why, How	Yes	Yes
History	Why, How	No	No
Survey	Who, What, Where, How much	Yes	No

Table 22: Relevant situations for diff. research strategies, (ad. from Yin, 1994).

According to Yin (1994), the case study is advantageous, if the analysis of current issues to which the researcher has little influence, the research-questions How? and Why?, are used. However, this derivative, obtained from the table, is not unique. For example, there is overlap in terms of the history analysis, since past events in case studies can also be considered. There are also problems when the researcher has unconsciously influenced certain situations and thereby the results are distorted. In addition, too long and unstructured case studies are criticized.

A case study should therefore be carried out, summarised and analysed with special care. In addition, Weber et al. (1994) postulate that the case study is only appropriate for Why? questions if the method, such as several hours of interviews, excludes a large-scale survey. In the present survey this is the case and the data for sustainable corporate governance can only be detected through a direct conversation. The theoretical framework as the basis of the case study and a detailed examination of the quality criteria are also considered to be requirements for a scientific generalisation. The investigation of

the quality criteria for the present case study is carried out later on. First, a description of different types of case studies follows connected with the explanation of the most suitable case study type for the question.

CASE STUDIES TYPES

The different types of case studies are divided in the literature for the purpose of the object of investigation, the use or purpose of the case study-research. A case study can serve the purpose of teaching or research. In science, case studies have been used more as a didactic tool or illustration than for research purposes. The focus of this work is the research case study whose types are considered in more detail here. Furthermore, there is a distinction between single and multiple case studies. Single case studies are used in scientific phenomena or as a critical case to test theory. In the literature, it is doubtful whether a single case study is suitable for hypothesis testing. In contrast to the single case study, the multi case study has found, as a scientific method of research more and more acceptance in recent years. There are several units of analysis chosen deliberately, which then lead within a theoretically defined framework to generalisations. The number of cases should be a minimum of two to three cases for the prediction of similar results, and a sample size of six to ten for the differentiation (Yin, 1994). With more than ten cases the volume of data would be too large and too difficult to work with. With less than four cases, according to Eisenhardt (1989), there is a risk that the empirical basis for theorising is not convincing.

The number of cases may be determined in the course of the investigation. Representatives of this view say that the research process should be completed when the marginal utility of an additional case is considered low and theoretical saturation is reached (Gummesson, 2000). This iterative procedure is also considered to be useful for this study. In addition to the prediction and differentiation, case studies are distinguished according to the following five types of usage (Woodside, 2010):

- Explanation of complex causal relationships
- Description of real events
- Illustration of specific topics within the evaluation
- Research of unsafe situations
- Evaluation of studies

This division of case studies is provided for general differentiation and explanation of the multiple uses of case studies. The applications are explained, but the exact objective targets of the actions remain unclear. A commonly used and for research purposes more meaningful, distinction of case studies can be found at Weber et al. (1994) in terms of

typification, in which a detailed explanation of the research goal and the approach is compared. The following Table 23 gives an over-view of these different types of case studies:

Case Study Types	Explanation
Diagnostic Case Study	In this type of CaseSstudies the use of context is the focus of the attention. Possible aims are organizational diagnosis or the evaluation of design measures.
Didactical Case Study	These Case Studies do not constitute a research strategy. Its content may be fictitious nature.
Heuristic Case Study	The aim of this Case Study is to discover relevant relation-ships and variables.
Ideographic Case Study	Each Case is seen as an one-time event. Regularities in social processes are negated. This precludes the ex ante formulation of hypotheses and the use of quantitative methods.
Illustration Case Study	These Case Studies serve to illustrate abstract statements such as theoretical models.
Nomothetic Case Study:	Each Case can be classified on the basis of theoretical considerations in a classification scheme. Regularities in the social sector are therefore accepted and quantitative methods accepted.
- comparative Casa Study	Several Case Studies usually descriptive nature get collected and compared.
- hypothesis testing Case Study	Elimination of implausible hypotheses by comparing with Case Studies or several case studies found variables forms.
- falsifying Case Study	Severe form of hypothesis-testing Case Study, since even a single "unexpected" case can lead to falsification of the theory.
- deviating Case Study	The reasons for a Case strongly deviating from the average or from the theoretically expected results are intensively analyzed. A prerequisite for this is a hypothesis-testing or falsifying Case Study.

Table 23: Types of case studies, (adapted from Weber, 1994)

Weber et al. (1994) differentiate the Nomothetic Case Study, at which principles within the social field are underlayed. In this type of case study, both qualitative and quantitative methods are used. For this present investigation, heuristic, ideographic, diagnostic, didactic as well as illustrative case study are ruled out due to the objective. The differentiation of the nomothetic case study with the corresponding explanations of the procedure and objectives thus facilitates the selection of a type of case study. On the basis of theoretical considerations about Lean companies, regularities were adopted regarding sustainable corporate governance. Because these regularities are checked against the hypotheses, only the falsifying or hypothesis-testing case study was considered.

The simple form of the falsifying case study results even at an unexpected case to a falsification and thus is unsuitable for the review of sustainability due to the complexity. Therefore, in this study, the hypothesis-testing case study is used. This, from the case studies generated variables methods of sustainable plant management, leads to an elimination of implausible hypotheses. However, this does not necessarily lead to a rejection of the entire assumption. In the case study analysis in which multiple methods and data sources are used, overlaps of qualitative and quantitative research exist. Often

observations, archive material, documentation, or other data are linked to quantitative surveys in order to obtain meaningful results on one or more occasions (Preece, 1994). A convergent analysis of different data sources is preferred in the case study, since the objective of a holistic point of view is more representative. To ensure convergence for case studies triangulation is recommended. Various sources and methods are used for data acquisition in order to increase the validity of the research findings. A case study is increasingly used in management research. In order to ensure the acceptance of a case study analysis as a research method, however, certain principles should be observed. This includes, like for quantitative studies the examination of the quality criteria so that an analytic generalisation is also affected by a small number of cases.

CASE STUDIES SELECTION

For the case study, investigation eight packaging companies from Packaging Ltd. with the above criteria were selected in across Europe. An extension of the search and contact with potential companies out of Europe would only be necessary if these eight cases did not lead to sufficient data. In addition to the procedure particular the cooperation in this sector is considered in this chapter. In the packaging industry, competitiveness of individual companies depends heavily on their involvement in collaborations such as buying groups or trade associations. In considering the industry, therefore, there is a focus on the associations and collaborations.

3.3.2 CROSS-PLANT FOUR ASPECTS

The external Context and the Content of the OE-initiative thus represent cross-plant conditions, whereas the internal Context and the Process of introduction were strongly influenced by the respective plant. The following table shows the breakdown of the present case study description is also divided into this subdivision between cross-plant terms and conditions in the first part, and plant-specific procedures and conditions in the second part.

The first part of the case study-description considers, as explained in detail, the cross-plant- and framework-conditions which were directly or indirectly, but always significantly, related to the entire OE-introduction of Packaging Ltd. before and during the time of the analysis. This includes:

- Historical background of Packaging Ltd.
- Environment of Packaging Ltd.
- Production’s strategic role within Packaging Ltd.
- Programme-content of the company-wide OE-initiative

These aspects represented, as the name should already make clear, the eight case-plant-specific OE-introductions, which were later considered in detail, the framework conditions and forces, which have an external effect. In particular, the similarities between the eight plant-specific introductions are emphasised. Essentially, these are aspects, which were not influenced, or designable by the decision-makers involved at a plant. The understanding of a strategic change according to Pettigrew (1988) concerns the basic elements of the external Context, history and strategy, and the Content of the OE-introductions, TQM, Lean and Six Sigma methods. For further understanding of the group of cross-plant conditions, it is important to understand partial aspects of the internal Context and strategic role of the production, since each plant within certain limits through the overall organisation of the company is influenced. Nevertheless, it was demonstrated in the second part of the case study-description that the focus of the internal Context of the OE-launches has been found at plant level and not at company level. The second part of the description covers the plant-specific aspects of the eight local OE-introductions. These include:

- Respective internal organisational context at the plant
- A concrete procedure for the introduction of the specified OE-methods and practices.

While the first part deals with the common framework conditions of the eight OE-implementations, the second part deals with commonalities, but the differences between the eight implementations are considered to be more insightful. These aspects considered in the second part could be shaped by the respective local management or represented by the results of the approach chosen. In the CPC-perspective, these are the elements of the internal Context, integration into the plant organisation and day-to-day business, as well as the process, communication and information channels used and training concepts implemented, of the OE-introduction. The elements of strategic change considered, as well as their specific aspects, the respective level of consideration and the focus on commonalities and/or differences in knowledge gain are shown in Table 26.

In summary, the descriptive framework from the CPC-perspective can be summarised as follows: the eight OE-launches under investigation are being conducted under an almost identical external Context and with the same OE-contents and methods, but the internal Context and implementation Process were essentially different between the plants.

In the following section, those aspects of the eight OE-packaging plants launches that represented cross-plant conditions are described. Following a description of Packaging Ltd. as a research-based, internationally active packaging company, the second step is to examine the strategic challenges of Packaging Ltd. and thus the Context of the OE-initiative on the basis of Porter's strategic competitive analysis framework (1997).

Subsequently, the strategic role of production as part of the internal Context of Packaging Ltd. will be illuminated by the role model according to Hayes and Wheelwright (1985) in addition to the past and the competitive environment as a third aspect of the conditions.

A common aspect of the eight packaging plants' OE-implementations is the consideration of the company-wide Lean, Six Sigma or World Class Manufacturing approaches, methods and practices associated with the OE-initiative to develop an organisation of continuous improvement. As part of the global introduction, the production approaches, methods and management tools to be used were made mandatory for the plants as part of an enterprise-wide production system (Da Graça, 2005). In contrast to alternative procedures, Packaging Ltd. decided on a largely stringent, standardised procedure across all plants in terms of the OE-contents.

PLANTS RESEARCH AND ACTIVITY

Packaging Ltd. was founded at the end of the 19th Century and is now, in the year of observation, one of the world's largest packaging companies. However, this situation will change to a large extent. Around 25% of total sales will lose market exclusivity at this time. The company's senior management expects massive market entry from competitors in all market segments. For individual Packaging Ltd. products, industry analysts anticipate a loss in sales of around 20%. The management has already had occasional experience with competitors in the past and has mostly had to accept significant market prices and share losses. Nevertheless, in the past, the size of these competitors was significantly smaller. These prospects have put the company's share price under increasing pressure in the last few years prior to the analysis and led to significant losses in market capitalisation.

The production and manufacture of packaging were historically determined within Packaging Ltd. and have always been regarded as an important strategic component. All production at Packaging Ltd. took place exclusively within its own organisation under more or less barriers (Sim and Rogers, 2009). Packaging Ltd. developed a largely fully integrated value-added chain for the production that includes the different stages of packaging. As is the case with the majority of packaging companies, the focus of Packaging Ltd.'s corporate development in the past was primarily on research and development as well as sales. Innovative packaging was the main cash flow source of the company.

PLANTS' ENVIRONMENT

COMPETITIVE ANALYSIS

As the second of the four cross-plant conditions, the competitive environment of the company through the Five-Forces-framework according to Porter (1997) is considered below. The competitive environment demonstrably represents a significant force in terms of the internal relationships of an organisation and its processes. The Five Forces-model serves as a strategic management tool for carrying out sector analyses and determining future corporate positioning in the context of corporate planning. Thus, it is an analytical model that has its origins in the industrial economy and the structure-behaviour-result approach. The model is characterised by the fact that it goes beyond a pure analysis of competition and equally includes the factors of suppliers, customers, substitutes and possible market entries. The model is based on the assumption that market structures and the market attractiveness derived from them, restrict or enable the scope for strategic behaviour. Entrepreneurial success according to Porter, is essentially a function of basic market attractiveness and chosen strategic positioning. Porter emphasises the equivalence of and the interrelationship between the structure of the industry and the chosen strategy option.

Due to the anonymisation, the specific strategic challenges of Packaging Ltd. will not be dealt with in the following, but rather those of the strategic group of internationally active, researching packaging companies will be considered. To analyse the industry structure, Porter distinguishes between five forces that affect companies and their strategic behaviour. Various strategic options can be selected, which is why Porter differentiates between strategic groups within an industry. According to Porter (1980), a strategic group is understood as a group of firms pursuing similar strategies along strategic dimensions and an industry as a group of firms producing products that are close substitutes for each other's (Porter, 1980). The theory of strategic groups is based on the assumption that if the factors of market attractiveness and positioning essentially coincide, success will also be comparable (Hunt, 1972). This theory is based on a series of empirical studies which have demonstrated a fundamental relationship between corporate performance and strategic group membership.

EXTERNAL CONTEXT OF STRATEGIC GROUP

The group of internationally active, research-based packaging companies examined below combines market competitors with their competitive advantages and business strategies. In addition, they integrate the entire value chain of research, development, production, sales and marketing and supply international markets with their products. This classification distinguishes them, for example, from small local producers with whom they compete. Strategic challenges are identified in the following industry analysis as an interplay of the existing industry structure as well as future developments and trends.

The international packaging market is looked at on the basis of the Five Forces according to Porter (1997):

- Rivalry among competitors
- Threat of new competitors
- Customers' bargaining power
- Suppliers' bargaining power
- Danger of substitution

The external Context-factors are further described in the competitive analysis of Porter, which directly or indirectly as a whole have an influence on the future internal conditions and requirements of an organisation. Porter (1999) defines an industry as a collection of enterprises, producing almost homogeneous goods for a defined market. With a rate, which is proportionally higher than in other sectors, the capital inflow will be new suppliers or operational investment activities. The profitability of the industry is, in turn, determined by the five competitive forces, the most relevant being the most intense. For example, a market leader only generates low returns when low-cost replacement products are available. Basically, a company must also deal with short-term factors, such as economic fluctuations, strikes, bottlenecks in raw materials, etc., which, however, have a negative impact on the analysis, since the identification of the elementary characteristics is decisive. The factors that determine the expression of the five driving forces responsible are explained below (Porter, 1999).

The entry of new packaging companies into the market often reduces the profitability of existing packaging companies, since they are pushing into the industry with new capacities, reduced prices and thus increased costs. Kumar and Kumar (2014) mention that potential market entry is, however, affected by existing barriers to entry and dependent on the countermeasures of the established competitor. The existence of economies of scale often has a negative effect on newcomers, as they have to accept higher costs in the case of marginal production volumes and higher risks in the case of quantitatively higher volumes. These economies of scale could be achieved in all business areas, such as production, purchasing, marketing, sales and distribution, research and development. Furthermore, market entry is made more difficult, when the current operations are vertically integrated. The new entrant would have to calculate higher costs, as they are offered less favourable conditions or certain purchases of raw materials are even denied.

The product differentiation of new packaging companies is also an entry barrier, as they usually have a well-known brand name as well as a fixed buyer base. Accordingly, it is necessary for the packaging industry leader to incur high expenses in order to establish

itself as well. Furthermore, a massive capital requirement, which is usually burdened with high-risk surcharges when procured on the financial markets, acts as a deterrent. For the customer with a supplier change, changeover costs frequently arise, which are paid only if the product is convincingly better achievement/quality and/or a low price.

In addition, size-independent cost discounts can be applied for the packaging competitors that exist, such as the ownership of product technologies (e.g., know-how, patents), favourable access to raw materials, state subsidies and experience-based cost-digression. The state policy can indirectly/directly limit market entry through regulations. These regulations should mostly generate societal benefits, such as environmental protection regulations (Porter, 1999). When making a business decision to become active in the packaging industry, the probability of the competitors retaliating is included. As negative has to be seen if corresponding activities have been carried out in the past. The packaging competitors have extensive free tangible and intangible assets at their disposal. These are closely related to the packaging industry and causing slow market growth.

In addition, newcomers must be able to maintain a monetary level above their critical price. This means that the price structure, with its terms and conditions, balances revenue and cost expectations in order to generate long-term profits. Even if the barriers to entry mentioned above can change temporarily, it is still necessary to exert an influence on companies through strategic action, and to adapt to new developments (Porter, 1999). The degree of rivalry between existing packaging companies can be assessed on the basis of the volume of advertising battles, price competitions, new product launches and special services. These measures are often taken to improve the market position or to defend oneself against the competition. The intensity of competition increases with the number of packaging companies as it is believed that individual actions go unnoticed. Even if there are packaging competitors with relatively similar equipment, the rivalry increases as a result of the frequent combination of willingness to fight the availability of financial resources.

Slow packaging industry growth also leads to increased competition between expanding companies. In sectors where there is an unfavourable ratio of fixed costs to value added or where there are immense storage costs, there is a danger of price reductions to secure sales. The strategic actions of heterogeneous packaging competitors can cause conflicts if their intentions appear unclear and unfavourable to the other side. As soon as a packaging group considers success in a certain industry to be very significant, the situation will be further aggravated by high stakes (Porter, 1999).

High exit barriers are often the reason why packaging companies remain active in an economic sector with low/negative earnings rates. Reasons for this can include: specialised assets, fixed costs in the event of withdrawal, strategic interrelationships, emotional barriers as well as administrative and social restrictions. An attempt is then

made to sell the surplus capacities produced to the market through rigorous actions, which can reduce the profitability of the entire packaging competitor. The competitive pressure in an industry changes with the maturation process, so that the companies must constantly strive to improve their competitive position through strategic steps, i.e., concentrating sales on strongly growing segments and marketing innovations.

An important factor influencing the degree of rivalry in the packaging industry is the interrelated consideration of entry and exit barriers. Profits in the packaging industry are best stimulated when high entry barriers are combined with low exit barriers. However, if both barriers are highly rated, there is a risk that unsuccessful packaging competitors will continue to operate in the sector. The most unfavourable for packaging industry profit are low entry restrictions with high exit barriers, since on average increasing capacities are available with uncertain yields.

The threat of substitutes affects all companies in the packaging industry. The profit potential is limited, since the companies are slowed down in their pricing by the existence of an alternative. Substitute products are defined as products which are identical in their functionality. In order to strengthen the position of the packaging industry, a collective approach can be effective, such as marketing initiatives that draw attention to increased product quality. The substitutes, whose price/performance ratio tends to improve and whose manufacturers generate high profits, require special analysis. The reaction can be differentiated into two variants: on the one hand, there is the option of strategically displacing the good from the market or integrating it as a factor into one's own strategy. The customers can be affected by the demands for price reductions, quality improvements or better performance reducing the profitability of the industry. The bargaining power of the customers is particularly strong when they are concentrated and account for a significant proportion of the manufacturers' sales. If the packaging product is a significant component of the total cost, it is probable that customers are very price-sensitive (Porter, 1999).

In the case of undifferentiated, standardised goods, the exchange risk for the enterprise is immense, and the same applies if the changeover costs are low in the event of a change of supplier. Even if the profit margins of the buyers are low, there is a tendency towards cost reductions. If the buyer already has partial backward integration, he or she can threaten further expansion in negotiations in order to obtain better conditions. If the buyer fills up the packaging’s product with its own goods, it is of relevant importance whether the input makes a high contribution to product quality. If this is the case, then the seller is more flexible in terms of price. For the manufacturer, it is a disadvantage if information asymmetries are not present, since the customer, through his/her industry knowledge, will reduce prices to a minimum. The above-mentioned reasons for bargaining power also have a modifying effect on consumers, industrial customers or traders. For example,

customers are relatively price-sensitive when it comes to undifferentiated goods. Buyer power may be affected by temporary changes in the factors described or by tactical corporate decisions. Basically, a manufacturer should attach great strategic importance to the selection of customers, because a less powerful trader increases the own bargaining power (Porter, 1999).

An announcement of suppliers to reduce quality, volume or increase may reduce profitability in packaging industries when it is not possible to pass on cost increases to customers. The conditions for suppliers' bargaining power are contrary to those for customers. The more strongly a supplier group concentrates on its customers, the more power they have. The absence of substitute products and a small economic contribution of the packaging industry to the suppliers' sales results in the same effect. If the input is essential for the course of the production process and cannot be stored, the dependency situation worsens from the manufacturer's point of view. Differentiated products and the existence of conversion costs are also positive for the supplier. Purchasing conditions tend to deteriorate if there is an option for forward integration of suppliers. Porter defines the suppliers not only as enterprises, but also as workers, who increase their power through a high degree of organisation and the ownership of qualification not available at the market. The negotiating power of suppliers can also be influenced by changes over time or by entrepreneurial measures (Porter, 1999).

The state can also be integrated into the model as a factor, since it can act as a buyer or supplier on the market in addition to influencing entry barriers. In addition, laws and regulations can restrict the scope of behaviour of industry participants and the development of substitute products. As a rule, a sector analysis sheds lighter on the state effect for the five competitive forces (Porter, 1999). In the further course of this thesis, Porter's Five Force-model will be applied to the packaging industry market. This will make it possible to identify the structural characteristics that identify and classify the competition.

EXTERNAL CONTEXT SUMMARY

To describe and classify the external Context of Packaging Ltd. The overall picture shows that established research-based packaging companies were already facing considerable changes in competition at the time of the analysis. In the past, R&D was the dominant key to success. Due to the drop in R&D productivity since the end of the 1990s, the strong market growth in price-driven markets and the increased intensity of competition in established markets, the competitive mechanisms have changed. The profitability of globally active packaging companies has increasingly been affected by falling trends. Innovations that fell short of expectations also hampered the usual growth rates and thus the opportunities for product-innovation-based sales growth. In view of the lower profitability, this increased the pressure to reduce production costs and the previously

accepted inefficiencies in particular. High-cost efficiency and productivity of the entire value chain has played an increasingly decisive competitive role ever since.

PRODUCTION'S STRATEGIC ROLE

As the third of the cross-plant-aspects in addition to history and external market factors, the internal Context between corporate strategy and production within Packaging Ltd. will be examined using role analysis according to Hayes and Wheelwright (1985). Following Hayes and Wheelwright, the respective strategic role of production within a company has a significant impact on the management principles applied by a production organisation. In this sense, the way in which a production organisation is designed, managed and developed differs between companies, such that production makes different contributions to the overall success of the company. It is similar in companies in which production plays a comparable strategic role. According to Hayes and Wheelwright (1985), changing this role within a company as a result of competitive change is the most effective driving force behind any production reorganisation. Empirical studies have shown that changes in an organisation are typically caused by external competitive changes and much less often by internal impulses. This includes, in particular, the changes in the intensity of competition as initial spark. Studies have also shown that the desired strategic positioning and strategic priorities are demonstrably related to production-strategy, -organisation and -structure (Ward et al., 1996).

HAYES AND WHEELWRIGHT ROLE-MODEL

Valid and objective models to describe and classify the production capability of a company outside of simple and often insufficient dichotomies such as strengths- and weaknesses-analyses or from innocent to excellent evaluation models are rare. Hayes and Wheelwright have identified four successive stages that allow conclusions to be drawn on key decisions and challenges related to strategic production management decisions. The four stage-types differ from each other in terms of their contribution to corporate strategy through:

- First possible contribution: pro-activity of production
- Second possible contribution: attitude of top management vs. production
- Third possible contribution: way to coordinate with others functional areas
- Fourth possible contribution: way in which the production-strategy is formulated
- Fifth possible contribution: integration of production-managers into the strategic objectives of the company

The four different stages of production are described below:

- First stage: Internal Neutral

  The first stage of the model is the Internal Neutral stage, the primary objective of which is to avoid negative and unexpected disruptions to production. Strategic competitive advantages are achieved almost exclusively through factors such as superior product technology, brand impact or distribution network advantages, but not in the manner of production. Strategic decisions in the structural and infrastructural decision fields are usually made by external consultants.

  Production capacity and qualification of staff are rather low, easy to imitate by competitors and do not represent a differentiation factor. The internal control and management of production are based on detailed performance measurements, since specifications can be clearly described and checked without great effort. Production is particularly geared to high operational flexibility, as it has to respond reactively and in an unplanned way to the requirements of other functional areas. This flexibility is not considered strategic, but as a daily operative, it is hectic, since it is caused by frequent priority changes. Continuous efforts of improvement are thereby prevented. Structural decision fields are defined more important than infrastructural.

- Second stage: External Neutral

  The second stage is that of External Neutral, in which a parity of the production performance with competitors is aspired to. Innovations, planning and investments are undertaken predominantly within the framework of a respective product life cycle. Industry standards are adapted, such that technologies and plants are similar among the competitors and a competitive advantage is seldom sought through self-developed machines. The advantages that production can achieve are seen in particular in the areas of size and capacity. Otherwise, the second stage includes, in terms of other decision fields, only minor changes to the first stage.

- Third stage: Internally Supportive

  The third stage is the stage of Internally Supportive, whereby a cross-divisional consistency between production strategy and corporate strategy is aimed at. As a rule, a production strategy with quantitative but also qualitative goals is explicitly defined for this purpose. In most cases, this strategy is downstream of other functional areas and geared to their needs. The main difference with the second *stage* lies in the intensity of interaction and dependence between production and other functional areas such as sales, marketing and R&D, as well as higher expectations of productivity, flexibility and quality.

- Fourth stage: Externally Supportive

  The fourth and last stage is the stage of Externally Supportive and requires a major rethink, since production is a strategic core competence of the performances. In the case of the fourth stage, the production not only supports the business strategy, but makes it possible in the first place and is therefore a creative force at strategy formulation. Developments and changes in production are less reactive when they are being driven anticipatively. Infrastructural and structural decision-making fields are usually of equal value and have a decisive impact on the strategic position of the company. Highest product quality, productivity and flexibility are the goals at the same time. Wheelwright and Hayes (1985) point out that within this continuum, only a few companies aim for or are in a position to reach the final stage. While steps one to three are reduced in intensity due to foreign control mechanisms, the fourth stage is based on a high degree of self-organisation of production.

INTERNAL CONTEXT WITHIN PACKAGING LTD.

Following the introduction of Hayes and Wheelwright's Four Stage-model, the strategic role of production at Packaging Ltd. will be examined below using the criteria of the model. Historically, the role of production in Packaging Ltd. was particularly evident in ensuring fast and trouble-free product start-ups, the guarantee of a high ability to deliver and the maintenance and constant safeguarding of high-quality standards in the sense of inspection requirements. With regard to the role of the production organisation within Packaging Ltd., the board member for production stated the following in an interview: that production is not the main sales generator for business, but it is an integral part of success. Strategically, production in the past has generally been reactive to management, product development and sales. Looking at the logic behind the investment decisions for production facilities within Packaging Ltd., this was generally based on the phases of the product life cycle of individual products. New plants were often planned and built for new products or customers. In a similar way to the situation for most leading packaging companies, the production organisation of Packaging Ltd. continues to be characterised by overcapacities and high inventories of finished goods.

With regard to the technological maturity of the production facilities, the adoption of the latest process technology for Packaging Ltd. as well as for the entire packaging industry was subject to prevailing restraint. Packaging Ltd. also generally used standardised systems, which are seldom characterised by company-specific adaptations or technological, unique state-of-the-art facilities.

INTERNAL CONTEXT SUMMARY

The previous analysis of external market factors has already shown that the innovation crisis, price pressure, the internationalisation of customers and suppliers as well as more

extensive product differentiation have resulted in established packaging companies facing far-reaching changes. This overall external impression was also reflected in the description of the internal strategic role of production. The main purpose of production was to ensure fast product start-ups and uninterrupted supply to the market. Cost and efficiency were low on the priority list, at least in relation to quality, timelines, and continuity of supply. In summary, the strategic role of production within Packaging Ltd. has moved from an original first stage of the strategic role of the production, which improved until the analysis year to an understanding of the role of the second stage. There is already a tendency towards cross-cutting approaches towards the third stage.

PLANTS' OE-STRATEGY INITIATIVES

PLANTS' OE-STRATEGY DESCRIPTION

Two years before the author started his research, an attempt was made by Packaging Ltd. in cooperation with a consulting firm to survey the OE situation and a possible change of strategy in one of the nine factories at that time. However, due to the imminent sale of this plant, the contract with the consultant company was terminated prematurely and the investigation thus ended without results. The remaining eight factories examined in this thesis remained unaffected by this action. The author was in no way part of that Consulting firm before, during or after his research in any manner.

While the OE-launches at the plants considered in the case description took place within the framework of the same company and thus within the framework of the same competitive environment and understanding of the role of production, the OE-content associated with the introduction was also specified company-wide by the central management across all plants. As a result of these discussions on necessary methodical adjustments to the quality management system with the aim of reducing manufacturing costs and improving internal process quality, at the end of the 2000s, the top management of Packaging Ltd. saw the opportunity to address this issue company-wide and not just with individual projects.

The management considered the necessary changes to be so extensive and innovative that this could not be achieved by individual top-down projects, but required a more comprehensive, integrative approach. In the second decade of this century, the senior management decided to launch an extensive OE-programme within the production organisation and to establish a cross-plant production system with the goal of continuous improvement. In contrast, to past productivity initiatives, the focus was less on the implementation of individual projects and more on structural and organisational changes as catalysts. The aim of the OE-initiative should be to enable and motivate the organisation, and in particular the plants, to continuously initiate improvements at all levels in a self-organised way, even beyond the initiative. Consequently, the OE-strategy

of Packaging Ltd., which was derived for this purpose, emphasised the imperative need to develop an organisation and culture of continuous improvement and to promote new leadership and change behaviour for all staff.

In order to be able to proceed with production analysis and design approaches with the same content at all plants during the introduction, the implementation took place with the worldwide support of an internal central consulting department, which ensured the necessarily consistent approach of a production system as well as the worldwide-standardised training capacities. In order to achieve management, buy-in on the one hand and a common understanding and acceptance among production staff on the other, the following four decisions were initially made under the leadership of senior management and communicated as guidelines for the OE-programme:

- First decision: OE-strategy

A Packaging Ltd. production mission and an OE-strategy derived from it were formulated to demonstrate the coherence and relevance of the company management for the programme. The central message was that the urgent need for reliable and efficient processes and committed staff was seen to have in direct connection with the competitiveness of Packaging Ltd. The top management of Packaging Ltd. thus made clear the relevance of the competitive importance of this programme for the whole company.

- Second decision: Global OE-leadership-, Regional expert-teams

A high-ranking global OE-leadership team consisting of five former plant managers or regional managing directors as a 100% management and support team for the OE-initiative was established. The criteria for selecting these five team members were at least five years of management experience in one of the larger sub-organisations and a corresponding academic degree or further qualification.

The tasks of the members of the global OE-management team have been specified as follow:

- First task: organisational learning between the plants
- Second task: design of structures for the exchange of knowledge
- Third task: planning and implementation of cross-plant-projects
- Fourth task: implementation of indicators to measure OE-performance at the plants
- Fifth task: coordination of the global training associated with OE and the implementation of the training-concept

- Sixth task: implementation of the global implementation-plans and ensuring a common understanding of OE at the global level

The global OE-management-team was supplemented by a small regional OE-expert-team consisting of two to three Master Black Belts from each region. The tasks of the OE-experts, who were jointly responsible for all plants and regions, were as follows:

- First task: coordination of interplant projects
- Second task: providing technical and methodical support for more complex issues
- Third task: delivery of the trainings for the implementation of the training-concept

- Third decision: Local OE-champion at the plants

Each plant was asked to provide an OE-champion in its organisation who has to report directly to the plant manager. As further support an OE-organisation similar to the Six Sigma organisation should be implement. In addition, it was clarified, that the OE-resources during the projects should come mainly from the plants and not by the central or regional OE-team. A well-established reporting line has also been established between OE-plant champion and regional as well as international OE-management team in order to clarify local responsibility and to ensure exchange between the plants on a voluntary basis. A well-established reporting line has also been established between OE-plant champion and regional as well as international OE-management team in order to clarify local responsibility and to ensure exchange between the plants is promoted on a voluntary basis. The tasks of the OE-champions at the plants, which are delegated to the plant management team, but not to the global leadership team, were:

- First task: support of all plant-specific OE-activities
- Second task: common understanding of OE at the plant
- Third task: implementation of OE-metrics to measure OE-performance
- Fourth task: support in the implementation of suitable technological projects
- Fifth task: close coordination with the plant management team on all OE-activities
- Sixth task: securing timelines, resources and commitment for all plant-specific OE-projects
- Seventh task: work with global OE-leaders to ensure consistency of all OE-activities at global level

- Fourth decision: Global OE-trainings concept

A training concept was created by the global OE-team as well as the supporting internal consultants, a training concept was created to ensure that all staff were given the right analysis and change methods and that all staff were convinced of the necessity of this change. The four-stage training concept developed for this purpose, consisting of problem-solving techniques, statistical methods, Six Sigma, Lean Production and Value Stream Mapping, was defined as a company-wide toolbox and thus as a Packaging Ltd. production system across all plants.

SUMMARY AND CLASSIFICATION OF OE-PROGRAMME

The content of the OE-programme of Packaging Ltd. consisted of nine elements, which are listed in

Table 24 with a description of their respective references to Lean Production, Six Sigma or World Class Manufacturing.

Process- and Management-control	Elimination of process deviations and reduction of process variability, approach and methods are primarily derived from the Six Sigma- and TQM-concept. Within Packaging Ltd. this was referred to as Level 2- and Level 3-methods.
Cross-functional development	Involvement of production employees in the product development phase with the aim of incorporating experience from the use of previous manufacturing processes into process improvements from the outset. This is based in particular on approaches from the TQM.
Organisational learning	Documentation and exchange of best practices and experiences using modern information and communication technology to support implementation. For this purpose two knowledge management systems. On the one hand, so-called *Community-of-Practice*s and on the other hand an IT-based project database have been created. While the first is based more on the personal face-to-face exchange, the project database system is based on the formalised documentation of all larger projects.
Flow principle and Kanban control.	Alignment of production to the flow principle and introduction of *Kanban Control* to reduce throughput times. This is based on the principles from LP, waste to and make problems visible. Within Packaging Ltd. this was introduced as Level 4-method.
Standardisation	Standardisation and documentation of change processes with the help of a central document and project management system. Approach and method of standardisation can be found in TQM- and LP-approaches.
Technology deployment	Introduction and development support of modern process control technology. In particular, this aims to automate process control to a greater extent and is based on the understanding of the TQM-approach.
Preventive maintenance	Introduction of preventive maintenance and integration of cleaning activities into the activity profile of the plant operators in order to reduce unexpected malfunctions and machine downtimes. Approach and methods are based on the LP-concept.
Set-up time reduction	Standardisation and reduction of set-up times in order to create the conditions for smaller batch sizes. The approach is based on the corresponding ideas of the LP and was introduced within Packaging Ltd. as part of the Level 4-method.
Employee cmmitment and Continuous improvement	Standardisation and introduction of methods and techniques for workplace optimisation and problem solving. The aim is to understand change and improvement as typical. Especially based on the understanding of LP to demand even small changes at all levels. Within Packaging Ltd. this was introduced as Level 1-method.

Table 24: Content of Packaging Ltd.-programmes

The nine elements above show the conceptual breadth of the Packaging Ltd. OE-programme, which combines content from TQM, LP and WCM.

3.4 RESEARCH DESIGN

3.4.1 BUILDING THEORY FROM CASE STUDIES

In the following, the design of the research process will be discussed. The research design is the logical plan to get from the question to the answer using the method. Frankel et al. (2005) point out that there are a number of research designs developed for different kinds of studies and problems. The most prominent ones are case studies, surveys, longitudinal studies and action research. The case study-approach of this thesis is methodologically based, in particular, on Yin (1982) and Eisenhardt (1989), on the case study-based theory development with qualitative data analysis according to Glaser and Strauss (1967) and the Engaged Scholarship-approach according to Van de Ven (2007). Each of these approaches emphasises different challenges and thus contributes to improving the quality of the results. Eisenhardt and Graeber (2007) see the central challenges for case study-research on theory development as being primarily dependent on the type of research-question and its motivation. They both differentiate between theory-driven and phenomenon-driven research motivations and the challenges they pose.

Phenomenon-driven research projects are more likely to be driven by broader How?- and Why?-questions instead of What?- and Who?-questions, which are the focus of attention in theory-driven questions. The decisive impetus for this thesis came from a management problem and the quest for a more valid understanding of the context between an OE-initiative with its internal context- and implementation-factors. The focal point of the analysis refers to the Who?- and What?-questions and, in particular, to the How?- and Why?-questions. Therefore, the thesis belongs to the category of phenomena-driven, inductive case study research and addresses the corresponding challenges.

Eisenhardt (1989) and Yin (2003) point out that case selection in case study-research does not have to follow the traditional approaches of representativeness, in which a population is first identified, from which the cases are then selected with the aid of statistical procedures. In case study-research, case selection can be carried out according to very different criteria. The present case of Packaging Ltd. was essentially selected for the reasons of high relevance and extensive access to the host organisation. The high level of interest in the case is due to the fact that Packaging Ltd. has become one of the world's leading packaging companies, was one of the first companies with extensive OE-programmes and was therefore in a position of high relevance for other packaging

companies. The unusually extensive and open access to different sources such as the internal project databases, internal staff surveys, management interviews, group interviews and the permission for on-plant visits opened up varied possibilities for data acquisition.

In the following section, the design of the research process will be discussed. The research design is the logical plan to get from the question to the answer using the method (Yin, 2003). It contains tactical information about the sequential steps and respective sub-methods as well as operational information about the implementation of the individual methods. The aim is to secure the quality criteria of social science research:

- First criterion: to construct validity, internal and external validity and reliability as well as the relevance
- Second criterion: tactical and operational design of the research process of this thesis was oriented in particular on Van de Ven's *Engaged Scholarship* and Yin's replication logic for comparative case study-research, which will be briefly discussed below

Following Van de Ven (2007), four different approaches can be taken to answer a research question. Depending on the question, these alternative paths differ in the intensity of collaboration between practitioners and researchers as well as in the order of the research steps Model, Process, Theory and Problem of Reality. The four alternative paths by Van de Ven (2007) are:

- First path: perspectives and advice on a basic research-question
- Second path: collaborate and co-production of knowledge
- Third path: design and evaluation of a policy or programme
- Fourth path: intervention and implementing a change to solve a clients' problem

The research question of the present type belongs to the group design and evaluate a policy or programme according to Van de Ven, since the research question is based on a phenomenon and problem in the real world and, in addition to descriptive and explanatory results, recommendations for action and design for the implementation of the OE-programme are also to be issued.

In addition, the order of the research steps is as follow:

- The Problem of Reality
- The Process
- The Model

- The Theory and Solution of Problem

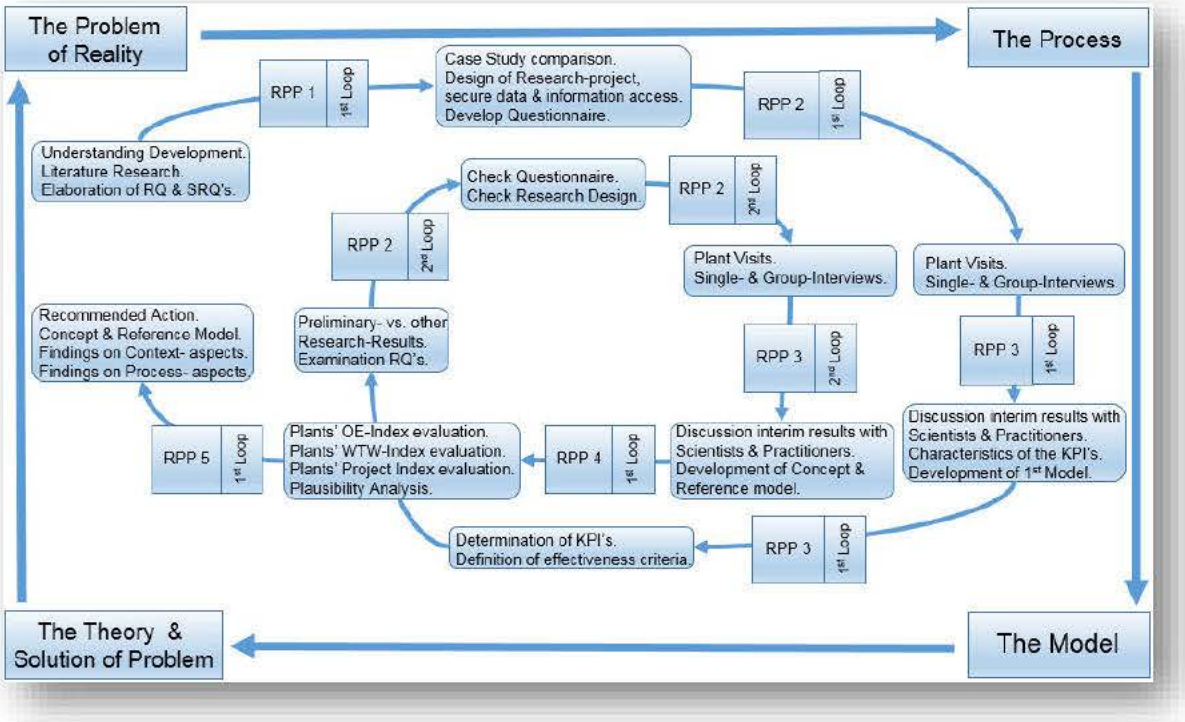


Figure 5: Iterative Research Process of thesis.

3.4.2 Research Process Phases (RPP)

The present case of the Packaging Ltd. was essentially selected for the reasons of the high relevance and the extensive access to the host organisation. A five-phase process was chosen to answer the research-questions, which is described in the five phases below:

- First RPP: formulation of the problem, literature analysis, design of the research process

  To formulate the Problem of Reality, analyses and expert interviews were carried out to describe and classify the initial situation and the associated challenges. In particular, the results were used in the first part of the third chapter to describe the location-independent influencing factors and conditions. This was followed during the search for answers by an analysis of existing scientific contributions from the fields of production and quality management. The critical reflection of the results from the literature search is summarised in the second chapter. With regard to the Problem of Reality, the background of challenges and the current knowledge base, the formulation of the research-question, the selection of the research method and the design of the research process take place.

- Second RPP: qualitative case study analysis and model-development

  The process of data acquisition, individual case analysis and the development of a first-order model on the basis of comparative case study analysis was in line with replication-logic after Yin (1994) and opened up by two loops. This procedure is shown in Figure 5. The objectives of the first loop were the identification of possible key factors and the description of their fundamental nature. This first loop included the visits to plants in Italy, France, Germany and Austria. The second loop focused on the validation and further operationalisation of the identified key performance indicators. This loop included the plants in Serbia, Switzerland, Spain and Finland. The results were recorded in line with the understanding of Yin's replication logic in eight individual case analyses regarding the background, the overall impression, the peculiarities and the challenges at the respective location during the OE-implementation. On the basis of these eight individual case studies, eight cross-plant key factors were identified and described using convergent and divergent considerations in a first-order model.

- Third RPP: concept- and reference model-development

  In the third phase and partially parallel to the identification and description of the key performance indicators, the concept of the OE-supporting organisation was developed, which focuses on the institutional and process-related key factors as well as their hindering or promoting effect for the establishment of an organisation and culture of continuous improvement. For this purpose, the key performance indicators identified in the second phase were evaluated using eight constructs as well as their variables and characteristics in a reference-model for recording and evaluating of plants. The model is available as a result in the fifth chapter.

- Fourth RPP: plant evaluation and plausibility analysis

  On the basis of the developed reference model, the investigated plants were measured by the degree of their internal OE-support and evaluated according to the associated OE-support index. Subsequently, the results of the OE-support index were compared with evaluations of the internal project database and the results of a staff engagement survey with regard to the plausibility of the concept were undertaken. The successful implementation of projects and the commitment of staff should plausibly be linked to the identified capacity to support OE. The aim of the plausibility analysis was to check whether the evaluations of these two data sources would lead to similar or contrasting results compared to the results of the OE-support evaluations. At the end of the fourth chapter, why the results

from the three different data sources appear plausible to one another and thus support the concept in its descriptive and explanatory power is explained.

- Fifth RPP: solution and scientific contribution

  In the last phase, based on the results, recommendations for action were derived for Packaging Ltd., the results were considered with regard to the original research-questions and the scientific added value of the results was presented. Finally, recommendation for further research projects were pointed out.

REPLICATION LOGIC

The Replication Logic is obligatory for case study-based theory development and thus independent of the nature of the concrete research object at hand. The theory development process according to Yin (2003) is based on recursive analysis steps between the individual cases. Each case analysis is still an individual case, and its comparison provides indications of similarities, contradictions and additions. Eisenhardt and Graebner (2007) consider a number of cases between 4 and 10 to be meaningful. The process serves the objective development of the theory and also depends on the honesty of a researcher. The third chapter contains the eight individual case studies of this thesis, which were conducted as eight separate analyses. The next chapter refers to the recursive insights from commonalities, contradictions and additions to the eight individual case studies.

COLLABORATIVE RESEARCH TEAM

The collaborative nature and the pluralistic approach of research design are reflected in the composition of the research team. The research team consisted of three members from science and two from the host organisation.

- OE responsible for Europe, Packaging Ltd.
- Human resources responsible for Europe, Packaging Ltd.
- Scientists and consultants

This reflects the equivalence between practitioners and scientists in the exploration of the research field.

3.5 RESEARCH DATA COLLECTION

After the selection of the cases, the next step in the research design follows the description of data collection. Yin (1993) identifies three principles of data collection, which will be complied with this survey:

- Multi-methodology approach: this principle of combining different data sources can be equated with the triangulation already described before in the validation of case studies. This approach leads only to further knowledge if the methods correspond to the theoretically based research subject and are inter-subjectively verifiable.
    - Create a database: in order to create a database for each case study, secondary materials, observations, in this thesis structured interviews and notes partially in tabular form and preliminary results are documented.
    - Logical chain of evidence: data must be traceable from the formulation of the question to the results in a logical sequence. This principle serves to increase the reliability.

The most important data sources of a case study include documentation, archives, interviews, and observations. In the present survey, the secondary material was collected as a generic term for collecting documents in electronic form as well as observations, interviews and expert surveys as sources, to edit the question accordingly (Onwuegbuzie et al., 2012). These so-called primary sources are also referred to as first-hand sources. Have the documentary resources been published for the first time without being filtered, summarised, evaluated or interpreted? These sources come from the creative or investigative activity of humans. They can be found in print and digitally in a variety of formats. In many cases, they are derived from the reaction or documentary nature of human beings. For this reason, news events or interviews are in this category.

3.5.1 STRUCTURED INTERVIEW

QUESTIONNAIRE

The structured interview is a research tool that gives the interviewee a little leeway in obtaining and analysing the results. In order to be able to ask the same questions in the same way for each interviewee, a structured interview must also be conducted with a strictly structured catalogue of questions; only in this way can a desired quantitative method of data analysis be pursued. With the questions defined by the author, the possible answers are also predetermined. With these pre-coded answers, it is easier to obtain a comparison across all interviewees. In conducting the interview, the author took care to follow all the instructions required by the notes, namely:

- Withholding of personal opinions
- Selection of appropriate participants for sampling criteria
- Maintaining order and filtering throughout the questionnaire

The use of a structured interview creates a good opportunity for sample comparability, provided the interviewees are proficient in the use of questionnaires and familiar with the research topic. In the questionnaire (see Appendix A) developed by the author, it was decided not to elicit a limited range of responses, i.e., possible answers that are predetermined and would restrict the interviewees to a pre-coded answer.

DEMOGRAPHIC PROFILE

In the last section of chapter 3.2.1. the justification for the qualitative research approach was explained. The following is an explanation of the selection of participants and the method of interviewing. The target participants for this survey include managers, directors, quality and operations managers representing decision makers, policy implementers and policy receivers as well as team leaders and operators from the shopfloor. These participants were selected to gather the data, so that the research objectives can be achieved.

The participants were composed of 70 employees in the top- and middle-management and team-leader area (25 pers.) and in the shop floor area (45 pers.), thus in thus in all, they were conducted across eight packaging plants a total of 560 participants within one year. The author had no influence at all on the participants, while collecting the data from them.

The primary data collected were intended to provide insight into the impact of the OE-project. Structured interviews offer several advantages, such as accurate answers to questions, a formal relationship between interviewer and interviewee, and access to a large number of people. The known disadvantages, such as the limited scope for generating results by the interviewer and the necessity for the interviewee to provide specific information, combined with a high expenditure of time, were consciously accepted by the author.

	Sub Category	No.	%
Corporate Level	Top Management	24	4.3%
	Middle Management	64	11.4%
	Team-Leader	112	20.0%
	Shopfloor	360	64.3%
	Total	560	100%
Work Experience Level	> 15 years	287	51.3%
	10 to 15 years	108	19.3%
	5 to 10 years	89	15.9%
	1 to 5 years	76	13.6%
	< 1 year	0	0.0%
	Total	560	100%
Education Level	PhD / Dr.	19	3.4%
	Master (Champion)	34	6.1%
	Bachelor	22	3.9%
	Diploma (Champion)	105	18.8%
	Specialist	380	67.9%
	Total	560	100%

Table 25: Demographic profile of interviewee

3.5.2 TRIANGULATION

The term triangulation (Stake, 2000) comes from geodesy. A point on the earth's surface is targeted from different and known fixed points and can thus be measured. Similarly, a conclusion can be viewed from the perspective of different data sources. The validity of the statement is increased, and all sources support the conclusion equally. Triangulation can also take place from the perspectives of several researchers involved in the case study (investigator triangulation) or against the background of different theoretical views (theory triangulation). The term methodological triangulation refers to the approach to a phenomenon of different methodological approaches and ways of thinking. For example, processes in a production process could be observed from a business perspective and at the same time, the perceptions of engineers and natural scientists on the same object could be queried and compared.

In order to ensure the quality of the methodological approach and the results, the methods applied are related to the quality criteria of qualitative social research. One quality criterion is triangulation. In social research, the term triangulation is used to describe the observation of the object of research from at least two points (Flick, 2008). The aim of triangulation is to collect the cases in a more detailed, careful and reliable way (Lamnek, 2010) in order to establish the validity of the results. In this thesis, the data and methodological triangulation is realised. Data triangulation is ensured through the

collection and evaluation of various data, verbal data and documents. Methodological triangulation is ensured by the application of various survey (guideline-supported expert interviews, short questionnaires, document analysis) and evaluation methods (descriptive evaluation, cluster analysis, content analysis).

FIRST SOURCE: CASE STUDY OE SURVEY

Merriam Webster's online dictionary defines a survey as at least a sample, or full population in the case of a census, a method of data collection (i.e., a questionnaire) and individual questions or items that become data. The easiest way for a researcher to understand how a person understands or perceives a problem is by asking questions, for example in the form of an interview or generally through a questionnaire. The number of questions depends on the desired information. However, when collecting data, a critical approach is needed to make it suitable as a data collection method. The questions refer to the phenomenon, the nature of things and the meaning of the topic. A scale is a good way to answer the question. It can be in the simplest form of yes- and no-answers but can also be adapted depending on the case. In this thesis, four possible answers were given, i.e., on a scale of 1 to 4. In order to obtain comparable and standardised answers, four different answers were given. With this method, suitable amounts of primary data can be generated. Although an interview can be designed differently, the starting point remains the same, because it has to solve a problem or answer questions. Therefore, the researcher must define the purpose of the research, determine the value of the problem and select the appropriate method.

Before proceeding with important methodological decisions, the case to be studied must be clearly defined, as it can be for different purposes or due to the different nature, depending on what is to be presented. In this research, a management model will be developed to record, evaluate and analyse plants with regard to their OE-support in the internal Context, Process and also in a real context. The cases will also be used to increase the understanding of the interconnectedness of strategy with OE. To quote Yin (2009), there can be different realities in a case and the case type with its definition should relate to the formulation of the research question. The cases are intended to help increase the deep understanding of how strategy is really related to the OE, and whether the theories are relevant in the real world. As Yin (2009) also describes, a case can have different rationalities. The critical case is a rationale where the case is used to test an existing theory. The theoretical propositions are confirmed, challenged or extended with a case that fits the conditions required to test the theory. The case study is appropriate for this research since the findings about strategy and OE are derived from a real setting with case criteria for the particular purpose of the study.

How strategy and strategic changes are communicated in the individual eight plants is captured by the research question. Therefore, the cases need to cover different levels of the company and not only individual departments in order to understand the bilateral communication process between them. By covering the process work with both strategy formulation and implementation and OE-formulation and OE-implementation, the understanding of the link between strategy and OE can be increased. For this application, a multiple case study was chosen rather than a single case study. The eight different plants also provide different perspectives in the realisation of OE-research.

SECOND SOURCE: LEAN AUDIT-DATABASE

The challenge for companies that want to introduce OE is to prove that the introduction of OE leads to improvements in operational performance. Meeting this challenge is critical, as implementing OE requires significant investment of (human) resources and finances. Furthermore, once OE has been implemented, the organisation must demonstrate that the OE-model continues to deliver benefits. In this respect, CI is an essential component of the OE-principle. A proven approach is to develop and implement a lean audit process that can identify improvement opportunities through gap analysis. The audit results can be used to correlate with relevant individual plant performance indicators or, as in this thesis, with the OE-model. In general, it is important to be clear about the implemented Lean features that are to be audited. For the applied audit on Continuous Improvements (CIs), these following manufacturing characteristics have been taken into account.

- Sustaining CI
- Managing CI
- Building a culture of CI
- Leading CI
- Creating a waste free Value Stream

In this thesis, the author investigates the relationship between the above-mentioned five lean manufacturing audit scores and the indices from the developed OE-model. The five lean areas mentioned could be measured either directly or by summing up or averaging the scores generated from individual questions. The author, as a qualified Master Black Belt, has developed the questions and answers with his Lean-team and tested them in individual works as an auditor (see Appendix B). The Lean-questionnaire covers 29 questions. The results from all the audits of all eight packaging plants were archived in the Packaging Ltd.-database for years. Since the author has permission to access the database for research purposes for this thesis, the results from the eight plants over two years were used, one audit-result before the OE-model approach and one audit-result after

the approach. The Lean-indices from after the OE-approach were compared with the OE-indices.

THIRD SOURCE: PROJECT-DATABASE

For estimation of the nature and scope of projects, the project database of Packaging Ltd. was evaluated with regard to certain criteria. Particular attention was paid to whether and which projects were running, whether projects were successfully completed, whether certified Green Belts and Black Belts continued to carry out projects after their certification and whether all areas were involved. For this purpose, the selected data for each plant were retrieved from the database with regard to the type, scope and number of projects, and is standardised in the first step to the number of staff per plant in order to achieve comparability. Subsequently, a ranking of the plants was established for each criterion. These rankings for the plants per criterion are shown in Table 37.

3.6 RESEARCH DATA ANALYSIS

Drucker (1990) notes already in the early days, that reporting of a profound change only reflects an abstraction and thus a reduction of actual, complex events to a few aspects. There is probably much more that can be said or written about by different parties involved, because it has not always been easy for the author to shorten it within the given framework. Nevertheless, this report is ultimately a kind of concentrate that has passed through various filters within the framework of the research process. The description framework used for the present case study-description represents Pettigrew's CPC-perspective already introduced before and its basic elements of strategic change: the external and internal Context, the Process and the Content.

Looking at and comparing the eight OE-implementations at the packaging plants from this perspective in more detail, the four elements of Pettigrew can be distinguished according to their influence and design ability by the respective plant management. On the one hand, aspects are considered which can be understood as cross-plant- and framework-conditions for the decision-makers involved. On the other hand, plant-specific procedures and conditions are also included. It turned out that the four elements of Pettigrew can each be assigned to one of the two groups.

The external Context and the Content of the OE-initiative thus represent cross-plant conditions, whereas the internal Context and the Process of introduction were strongly influenced by the respective plant. The following table shows the breakdown of information and the present case study-description is also divided into this subdivision between cross-plant terms and conditions in the first part, and plant-specific procedures and conditions in the second part. The first part of the case study-description considers,

as explained in detail, the cross-plant- and framework-conditions which were directly or indirectly, but always significantly related to the entire OE-introduction of Packaging Ltd. before and during the time of the analysis. These aspects represented, as the name should already make clear, the eight plant-specific OE-introductions, which were later considered in detail, for which the framework conditions and forces have an external effect. In particular, the similarities between the eight plant-specific introductions are emphasised.

Essentially, these are aspects which were not influenced or designable by the decision-makers involved on plant. In understanding strategic change according to Pettigrew (1988) this concerns the basic elements of the external Context, history and strategy, and the Content of the OE-introductions, TQM-, Lean- and Six Sigma-methods (Cheng and Chang, 2012). In further understanding the group of cross-plant conditions, there are also partial aspects of the internal Context and strategic role of the production which have an influence, since each plant operates within certain limits through the overall organisation of the company. Nevertheless, it is demonstrated in the second part of the case study-description that the focus of the internal Context of the OE-launches has been found at plant level and not at company level.

While the first part looks at the common framework conditions of the eight OE-implementations, the second part looks at commonalities, but the differences between the eight implementations are considered to be more insightful. These aspects considered in the second part could be shaped by the respective local management or represented by the results of the approach chosen. In the CPC-perspective, these are the elements of the internal Context, integration into the plant organisation and day-to-day business, as well as the Process, communication and information channels used and training concepts implemented, of the OE-introduction. The elements of strategic change considered as well as their specific aspects, the respective level of consideration and the focus on commonalities and/or differences in knowledge gain are shown in Table 26. In summary, the description framework from the CPC-perspective can be summarised as follows that the eight OE-launches under investigation are being conducted under an almost identical External Context and with the same OE-contents and methods, but the internal Context and Implementation-process were essentially different between the plants.

	Considered Aspects	Packaging Ltd.- or Plant-specific	Gain of Knowledge
Content	TQM, LP, WCM	Packaging Ltd.	Commonalities of eight OE-implementation
Process	Worldwide roll-out,	Packaging Ltd.	Commonalities of eight OE-implementation
	Project and trainingpProcedures	Plant	Comparative analysis of plants
External Context	Historical background competitive environment	Packaging Ltd.	Commonalities of eight OE-implementation
Internal Context	Strategic role of production	Packaging Ltd.	Commonalities of eight OE-implementation
	Integration into plant organization and routine process	Plant	Comparative analysis of plants

Table 26: Case description by CPC-perspective

A target system is required for the structural alignment of a model. The target system of a model as an image of real interrelationships is aligned to the target system of an OE-production in the sense of the present work. The quality of an OE-production is measured by the target dimensions KPI 1 to KPI 8. The improvement of a key figure that describes one of these target dimensions often leads to a deterioration of the key figure of another target dimension. These key figures therefore compete with each other. This is also referred to as the dilemma in plant flow planning. As a result, the weightings will shift between the target dimensions, depending on the observation periods and the respective specifications for improvements. The character of a production system is characterised by the fact that several sub goals are derived from a clear formulation of objectives, which must be met by various methods. The question of the extent to which OE-production-methods influence key figures is difficult to prove scientifically, since the figures available at companies regarding OE-production optimisation are often not meaningful. This is because enterprises, which are busy with the introduction of OE-production, do not document clear results of their measures, but determine these only in the follow-up to or in the process of an optimisation. It is often difficult to separate the effects of OE-production-optimisation from those of other projects in the company. This becomes even more difficult, if not only one but a bundle at methods is introduced. A plant study by Proctor et al. (2013) comments on this: “With regard to the individual methods, only the degree of implementation, the success of implementation cannot be measured”.

When describing the effects of OE-production methods on company key figures, Li et al. (2005) demonstrate that the introduction of OE-production methods has effects on the key figures of the SCOR-model. Using the SCOR-model, Shah et al. (2007) identify ten constructs that can be used to demonstrate the success of OE-production optimisation in a key figure change. The most important contribution of their study is the proof that OE-

production methods are connected within a larger framework and that OE-production should therefore be understood and implemented as a system. In addition to confirming the systemic character of OE-production, the study of indicators is once again helpful in this context. Not only is the question of which methods have an influence on which key figures or target figures important, but it is also important to determine the interdependence of the KPIs. Ferdows and De Meyer (1990) investigated these relationships with a statistical study. A company study in a different business sector by Proctor et al. (2011) also leads to the conclusion that selected target dimensions are the desired goals within the framework of OE-production optimisation. This chapter presents the results of the comparative case study-analysis between the plants examined in the previous chapter. Within the framework of two rounds of analysis in the research team, eight Key Performance Indicators (KPIs) have been identified with regard to the internal Context and the Process of OE-implementations at plant level, and what influence they have on the way they are implemented.

The eight KPIs were then described and deepened with the help of respective attributes and their mechanisms of action. These eight KPIs were then presented to the Plant- and OE-managers in individual meetings and they were offered the opportunity to discuss them, which they generally used. Subsequently, the findings derived from these discussions were incorporated into the descriptions and explanations. The procedure thus corresponds to Van de Ven's approach of a joint production of knowledge between scientists and managers instead of a one-sided transfer of knowledge. The results are presented in this chapter and supplemented with examples from the individual case studies for illustrative purposes. Overall, the questions were pursued, and which key factors had an effect such as attributes and why on the individual OE-implementations was considered.

3.6.1 CASE STUDIES DATA ANALYSIS

The selection of the method of analysis in qualitative research depends on the object being examined and the gathered material of data. In addition, there are only a few standardised approaches at the qualitative data analysis. Everyone must invent her/his own form of analysis. This view is to be considered critical, since methods of qualitative social research should also proceed according to certain rules. Within these rules, there is no right or wrong way. Not the strict application of methods, but creativity based on the object of survey is required for qualitative research. The evaluation process spans quasi-statistical via content analysis techniques, to structured interpretations. Here an approach for data analysis was used, which orientated itself, in the light of the quality criteria and scientifically recognised methods and with the questions, as described below. Because of the questioning, for the present survey, nomothetic case studies were considered to be an

useful method to test hypotheses. The survey of the sustainable management of companies took place based on sustainability indicators according to the developed hypotheses. For data collection, several methods were selected to verify the sustainable management of the companies from different angles. A preliminary briefly description of each chase is given briefly. For this purpose, the following data are presented in a unified scheme across all the cases:

- Names, addresses: due to the anonymisation of the entire work, names, addresses and websites have been omitted from the bibliography.
- Cooperation: what cooperation exists and how long it has existed for are mentioned in this subsection.
- Guided interview: the contact person, his/her function, date, time and duration of the interview is listed, whereby specifics of the interview situation has been incorporated.
- Overall assessment: taking into account the secondary material and the observations here, the statements of the expert and the interlocutor are assessed by the author of this work.

CASE STUDY ANONYMISATION

The company data was intentionally alienated for data protection reasons to the extent that no conclusions can be drawn about the companies. The packaging plant-names Plants (D), (I), (F), (A), (SRB), (CH), (E) and (FIN) are also fictitious and have no relation to reality, but it is mentioned that the plants deal with food packaging. The identities of the individual persons have also been changed to such an extent that the concrete persons are no longer recognisable. As far as possible, generalising terms such as manager, supervisor or specialist are used. Anonymisation and foreignization are intended to direct the view from the concrete individual fate of this one company and the individual actors to the structural conditions and interrelationships that can be found in a company in such a situation. Even if the real actors at the plants have an interest in how their own situation can be improved, this is not the aim of this scientific work, which concentrates mainly on describing and recognising contexts. Therefore, the exact details of persons, plants and times are irrelevant.

CASE STUDY PREJUDICES AND ALLEGATIONS

There are reservations about qualitative research methods in general and case studies in particular, especially in the economic sciences, which are traditionally oriented towards physical-mechanistic ways of thinking (Kirman, 1998) and Popper's scientific views, which are oriented towards the natural sciences. Consequently, qualitative methods are

soft sciences that are not very desirable or are even completely unscientific. Some of these accusations are understandable. The paths taken by some management consultants and management gurus, which were rightly worthy of criticism (Kieser, 1996), found support in scientific circles. Scientists such as Weick (1982) and Daft et al. (1990), successful authors such as Peters et al. (1985), among others, provided the arguments. Astley et al. (1992) summed up this attitude in an essay in which they argued, among other things, that the task of (organisational) science is primarily to be seen in storytelling and to illustrate theory with anecdotal case studies.

Theories, on the other hand, should be formulated so vaguely and arbitrarily that they could be subjected to a very broad interpretation and not refuted (Astley et al., 1992). The replica on the part of orthodox research followed immediately by Donaldson, who accuses the authors of flaws in their understanding of theories in organisational and management research and suggest that their approaches are insubstantial. This debate was primarily taken up and continued by Astley et al. (1992). A certain reserve in the scientific community towards these anecdotal case examples is thus understandable and justified. This reserve, on the other hand, must not lead to the rash and misguided judgment that "anecdotal case examples" and storytelling on the one hand and case study research on the other are to be equated (Astley et al., 1992).

Case studies are and have always been subsumed under the systematic social science methods, which, as the explanations have shown, exhibit rigour and stringency. It could, of course, be argued that it is precisely the case study-method that leads to dubious storytelling or even invites it. In contrast, however, it is quantitative methods that are increasingly used or abused for selfish or commercial purposes, as noted by critical practitioners, although the procedure of case studies follows a less standardised process. In quantitative research the analysis processes can be automated almost completely on the computer; in case study research this is only possible to a very limited extent (Kelle, 1995), as has been shown; however, case study research can also be measured against quality criteria, and measures can be taken to systematically increase this quality. Case studies are therefore not storytelling and can therefore be clearly distinguished from the views of Astley et al (1992).

CASE STUDY CONCLUSION

It was shown that the prejudices and reservations that exist against case studies and qualitative research methods are either unfounded or controllable, or that they apply to the same or greater extent to quantitative methods and economic models. Nevertheless, in a science striving for objective truth, subjective paradigms obviously remain subject to negative connotation. However, a science striving for objectivity must free itself from connotations, i.e., the subjective and emotional connotation of a word that superimposes

its actual, objective meaning. Consequently, qualitative research methods and especially the case study-research discussed here must be understood as what they actually are: a meaningful and necessary complement on an equal footing with economic models and quantitative research, because case studies have strengths that other methods lack. Case studies are therefore not necessarily preliminary work or pre-tests preceding the actual (explanatory) science (Porter, 1991). Conversely, quantitative surveys can be pre-tests for a case study or a component thereof.

Firstly, case studies enable the researcher to perceive complex interrelationships in their overall context. Porter also comes to this conclusion. Porter has undoubtedly had a lasting influence on business research, teaching and practice over the last two decades. Other representatives of business administration, such as Aharoni, (1993), Mintzberg, (1979), Eisenhardt, (1989), Ellram, (1996) or Nohria et al., (2003), to name a few prominent contributors, are also representatives and users of qualitative methods.

Secondly, case studies can quickly get to the bottom of new or rare phenomena. The quantitatively oriented scientist is always dependent on a large number of cases. At the same time, this means that a large number of errors may have already occurred. Against this background, a question should be asked about whether business research does not even bear joint responsibility for the emergence and consequences of the Internet hype. Targeted case study-research could have uncovered shortcomings and weaknesses in Internet technologies and dotcom business models at an early stage.

What will happen if scientific forecasts are repeatedly wrong? What will happen if companies are left alone by science and driven into the abyss for lack of warning signals? What will happen if quantitative empirical research runs behind reality and degenerates into a pathologist? It is then irrelevant whether the insights provided by economics are significant or not. If they do not find an echo in economic practice and, for lack of trust and understanding, do not meet with acceptance in society, science becomes an awkward situation. Case studies as a research method are a transparent, honest and rigorous research instrument and a chance to confront these problems.

3.6.2 CONCEPT- AND REFERENCE-MODEL

After the description and explanation of the Key Performance Indicators (KPIs), the Concept- and Reference-model development, the evaluation of the examined locations based on this and two comparative observations of the eight packaging plants for the plausibility assessment of the results follow in this chapter. The purpose of the concept is to supplement the existing and proven concepts of OE such as TQM, LP and WCM, which focus on content-related aspects, with aspects of the implementation process as well as the internal Context based on the KPIs identified. From the perspective of cross-case practical use, the challenge of concept development lies in what the corresponding

reference model should look like so that it can help a decision-maker entrusted with OE to grasp and assess the procedural and organisational aspects of OE-implementation in order to identify fields of action. For this, the identified KPIs are integrated as constructs and their attributes as variables that can be objectively and reliably measured via interviews or questionnaires, into an operationalised concept of an OE supporting organisation

The developed concept thus serves as a reference-model for an organisation whose internal context as well as its method of programme-management optimally supports the introduction of an OE-programme in the best possible way. Following the Concept-development, the analysed eight packaging plants will be evaluated and compared in line with this. In order to test the plausibility of the results and the developed concept, the results from the site evaluation are compared with the results of a Lean-audit- and Project-database. Since Lean-audits and the implementation of projects are two essential aspects of an organisation and culture of continuous improvement, these comparative analyses serve to examine the plausibility of the site results and thus the reference model.

KPI 1: OE-PLANT STAFF

Not surprisingly, the manner of implementation was shaped by the respective plant staff, which constituted the Key Performance Indicator 1. Based on the OE-initiative's intention to develop organisations and cultures of continuous improvement at the respective plants, the KPI plant staff represents an influencing factor and at the same time, at least in the sense of a change in culture and working methods, also a component of the results. A retrospective comparison of the plants revealed that the respective local OE-initiatives followed the claim of an organisational and cultural change in different ways. The KPI of plant staff played a particularly important role in determining whether the plant manager and the OE-champion were successful, to trigger the initiative on the broadest possible basis of all staff, or whether the initiative is limited to a smaller group of experts and project leaders. The comparative analyses between the plants and the discussions in the interviews showed that, in particular three attributes in this context were the subsequently described key factor (KPI 1) for plant staff:

OE-UNDERSTANDING

An attribute of KPI 1 of the plant staff about the way OE is implemented was the understanding of the employees at the production level with regard to the basic intention of the OE-initiative. The interviews between the plants revealed that the more the staff associated the contents of the OE-programme with the improvement of competitiveness and less as pure method building blocks, the more they saw their own behaviour affected by it. The research showed that the OE-understanding contributed significantly to plant-wide implementation among the production staff.

Methodological expertise at the manufacturing level alone hardly led to identification with the initiative or motivation. Thus, the OE-programme at the plant in Germany was seen to have a clear connection with long-term competitiveness. This was associated with staff seeing their own behaviour affected and feeling encouraged to participate in projects. The staff at the plant in Austria showed a different understanding. Here, the OE-programme was seen as a technical and statistical tool to improve process stability, which affected the OE-champion and a smaller number of experts, but not the majority of staff. As a result, the staff saw no reason to change their behaviour and actively contribute improvements.

OE-TRAINED METHODS

The scope of training and education provided at each plant proved extremely influential. In the interviews, the staff and managers repeatedly made clear how decisive the prior transfer of knowledge was for project success. However, the effect of training courses was not limited to knowledge transfer and better project preparation, as the comparison between the plants showed. In addition to the teaching of methods, it was shown that the training courses also contributed significantly to a common understanding and thus made coordination and communication in the projects and subsequently in everyday operations more effective.

This indirect effect of a common understanding also allowed for comparison of the plants and in the interviews, showed that a critical number of staff seemed necessary in order to use the impact of this effect. The effect could only be achieved comprehensively if training courses and trainings did not take place on a project-by-project basis, but throughout the whole area. A second effect of comprehensive training courses could be observed at the plant in Germany, where the staff had an astonishing common knowledge of the current strategic challenges of the plant. At the plant, the training courses were also used to teach more than just methods, but to tune the staff in to a common vision of the future. The willingness to change could be massively increased in comparison to the other plant by this training supplement.

A comparison of the plants showed that the proportion of trained staff ranged from a small number, who were only trained in preparation for projects, to a comprehensive 100% training of all staff in the basic methods of OE. The nature and scope of OE-training had a significant impact on the establishment of an organisation and culture of continuous improvement.

OE-CROSS-FUNCTIONAL EXPERIENCE

A further attribute of the KPI of plant staff was the question of experience in cross-divisional teamwork already existing before the OE-initiative. In particular, the comparative analysis between the plants made it clear that those plants which already had relevant experience were more open to these methods and possibilities and were quicker

to adopt them than plants without the relevant experience. In the interviews with the production staff, it became clear that the change from strongly externally organised to more self-organised working methods, as it took place in interdepartmental teams, is one of the most significant core challenges of OE.

The interviews showed that staff at the plant in Spain generally had little project experience in addition to their day-to-day work. Problems and conflicts were usually dealt with directly by their superiors. When looking at the OE-projects launched since the start of the initiative, it also became clear that these were almost exclusively micro and small-scale projects, such as workplace optimisation, with no cross-divisional themes. Under these circumstances, it became clear that it was not possible to establish an organisation and culture of continuous improvement with only micro and small projects.

In contrast, the staff at the plants in France and Serbia showed a high level of initiative in solving problems that occurred with the relevant colleagues, but mostly without the supervisor. At the same time, both plants already had initial experience with matrix and team organisations. At both plants, the OE-initiative was used to advance this development further and the aspect of structured teamwork was set as one of the focal points. Similar to the attribute of the formative leadership style in the key factor of plant culture, cross-departmental team projects showed that the more positive experiences with it existed before the start of the programme, the more they were promoted in OE-projects.

Construct 1: OE-Plant Staff				
Variable 1	Percentage of employees trained in OE-methods at a given location.			
	Training of individual specialists in preparation for projects.	Training of less than 50% of employees.	Training of 50-80 % of employees.	Training of more than 80% of employees.
	❶	❷	❸	❹
Variable 2	Understanding OE as a cross-departmental initiative and experience with self-organized project teams to solve cross-departmental problems.			
	OE is understood as a purely production-oriented program.	OE is understood as a program focused on production and adjacent areas.	OE is used in almost all areas.	OE is applied in all areas and is directed at the entire site.
	❶	❷	❸	❹
Variable 3	Understanding the OE-initiative at the manufacturing level and identify manufacturing personnel with the program.			
	OE is understood as an expert program. Employees hardly identify with the initiative.	OE is understood as an expert program in which production employees are needed to obtain information and implement it.	OE is understood as an expert program in which manufacturing employees are used as a source of ideas and change drivers.	OE is understood as a strategic program, which requires change regardless of areas and management levels.

Table 27: Construct and variables of OE-plant staff

KPI 2: OE-PLANT CULTURE

In the analysis rounds following the plant investigations, it emerged that, in addition to their adaptability, certain plant cultures could also be distinguished. These different plant cultures proved to be a further key factor for the respective OE-introduction. In the following, a plant culture is generally understood to mean the totality of all values, assumptions, thought patterns and behaviour patterns shared by the location employees and their managers, which shape social cohesion, organisational self-image, internal and external interactions and future expectations. Since the term, Organisational Culture covers a broad range of different meanings and definitions, two attributes that were significant for this study are summarised below. Both attributes of an organisational culture showed a strong correlation in the way the OE-programme was implemented. They concern in particular the way in which a plant interacts, coordinates, solves problems and makes decisions.

OE-CHARACTERISTIC LEADERSHIP STYLE

The dominant leadership style proved to be an essential attribute in the context of the manner of interaction, coordination, problem solving and decision-making at the plant. The consideration of the management style is not limited to the plant manager or the plant management team alone. The analysis also includes managers in middle management and project managers in OE-projects. The research team agreed, in the joint analysis, that there was a high degree of homogeneity across plants with regard to this aspect. In the case of the plants examined, no case was found in which the plant manager pursued an authoritarian management style, but a participatory approach to decision-making at the level of divisional and group leaders was followed. As already mentioned, as the key factor of organisational adaptability, parts of the OE-methods involve a far-reaching rethink and a shift from the credo of protection of the status quo to an organisation and culture of continuous improvement. The interviews revealed that the way leadership is conducted has a significant influence in this context. The dominant leadership style was particularly recognisable and perceivable on the basis of the experiences described in the interviews regarding the type of project selection, the reactions to conflicts in projects or the expected role of the plant manager or the OE-champion.

While at some plants these aspects were agreed in a participatory way through votes, discussions and consensus with compromises, other plants made much greater use of an authoritarian management style and formal and hierarchical instructions. The different management styles proved to be differently compatible with the basic intention of the OE-initiative and the goal of improvements at all levels. At the plant Switzerland, for example, it became apparent that the technocratic and hierarchical leadership style that was characteristic of the plant was associated with the elitist implementation approach of OE-methods and a focus on control instruments. It could also be seen that this was not

limited to the behaviour of the plant manager and the OE-champion. In the various group interviews at the plant in Switzerland, there were no indications that the majority of staff saw any reason to doubt this hierarchical legitimacy at the plant in Switzerland.

Rather, the elitist and controlling OE-approach corresponded to the typical method of coordination and communication at the plant. Project initiation and selection at the plant Switzerland was carried out exclusively by the plant management team. Staff involvement in the projects was usually limited to supporting data collection and implementing the changes at the plant in Switzerland. As a consequence, OE-implementation followed, which was not able to establish itself as a far-reaching change in the general working method across individual projects.

The characteristics of this attribute were considerably different at the plants in Germany, France and Serbia, in which, in addition to Lean and Six Sigma projects, the topics of team organisation, reduction of hierarchical levels and a participative management style were part of the basic understanding of the plant and the declared goal of the OE-initiative. At least in the case of the plant in France, it became clear in the interviews that a participative management style was the goal of the OE-initiative but was already pursued before the initiative. The dominant management style thus seemed to differ significantly between the plants, while it was comparatively homogeneous within one plant. Based on the respective experience, the respective dominant management style in the plant also became the management style in terms of the implementation of OE-activities and -projects. Based on their characteristics, the plants could be classified between an authoritarian and a participatory management style.

OE-THINKING AND -ACTING

A further important aspect in the implementation process and with regard to the respective plant culture was the question regarding the development of sector-oriented and hierarchical silo mentality and action at the plant. Thus, the plants differed considerably with regard to their experiences with functional area barriers during the coordination and implementation of OE-projects. At some plants, these barriers proved to be particularly coloured by conflicts of interest in cross-divisional projects. Very pronounced silo mentality and action at one plant seemed to have a negative impact on OE-implementation. For the attribute of the primary management style, clear correlations could be recognised. Nevertheless, it could not be concluded that, for example, an authoritarian management style inevitably leads to a hierarchical silo mentality, even if the probability was higher.

Depending on the intensity of the area-oriented and hierarchical silo thinking and action, this was evident in group-dynamic effects directly during the group interviews themselves. It could be seen from the interviewee's arguments that general sector-specific conflicts of interest were mixed up with the conflicts in the OE-projects. The case

descriptions of the plants in Germany and France on the one hand and Italy, Spain and Finland on the other hand served as a comparison for this attribute. While at the plants in Germany and France, the interview partners discussed their experiences openly and independently of their hierarchical or organisational affiliation, there were clear tensions in the discussions at the plants in Italy, Spain and Finland and one of these was noticeably guided response for the interviewees. In addition, the plants in Italy, Spain and Finland experienced severe problems with cross-divisional OE-projects. The divisional and hierarchical silo thinking, and acting was different between the plants from a rather weak to a rather strong one and was able to create a high barrier for the introduction of the OE-programme.

Construct 2: OE-Plant Culture				
Variable 1	The nature of interactions, coordination, problem-solving and decision-making processes at the plants:			
	The plant is characterised by strict instructions, strong hierarchies and an authoritarian management style	The plant tends towards instruction guidelines, strong hierarchies and an authoritarian management style.	The plant tends towards open discussions, flat hierarchies and a participative management style.	The plant is characterised by open discussions, flat hierarchies and a participative management style.
	❶	❷	❸	❹
Variable 2	Development of area- and hierarchy-oriented silo mentality and action at the plant, where the primary focus is on one's own interest rather than a process chain of information and material flow.			
	Improvements at the plant usually only take place in individual areas and are not assessed on a cross-divisional basis.	Functional and hierarchical silo mentality and acting at the plant obviously disables interdepartmental improvements.	Functional and hierarchical silo mentality and acting now and then represent resistance in projects at the plant.	Improvements at the plant are usually made by cross-divisional project teams from the perspective of the overall process.

Table 28: Construct and variables of OE-plant culture

KPI 3: OE-PLANT MANAGEMENT ROLE

In the analysis discussions and conversations, a third KPI was identified which concerned the different roles of plant management. Management does not mean a specific hierarchical level, but every position that is affected by the tasks of designing, steering and further developing the plant. The research team agreed that the contributions of the plant manager, the OE-champion, the plant management team and the middle management were by no means the same but differentiated in essential aspects. Due to this fact, the frequently used term management commitment is not used because this term does not adequately reflect these differences. Seven attributes are associated with the effect of management, which summarise the management from the plant manager to the middle management to the OE-project managers:

OE-PLANT MANAGER INVOLVEMENT

The involvement of the plant manager had a fundamental influence on the implementation at all plants, both directly on the effectiveness and sustainability of the implementation

and indirectly on the design of other key factors. With regard to the direct involvement of the plant manager, two underlying relationships seemed to play a special role. On the one hand, the interviews revealed that the plant manager, and less the CEO or other manager, was the role model for the staff at Packaging Ltd. Whether an initiative is relevant in the long term or not was determined by the majority of staff through the commitment and behaviour of the plant manager. In the interviews, it became clear that the staff judge if he is personally engaged or not on the basis of his behaviour. The differences between the plants in France and Italy clearly illustrate the effect in the key factor here. Answers to the question about the role of the plant manager at the plant in France, at which the plant manager was usually present in person at final presentations, underlined that he actively and credibly supported the OE-programme and was regarded as a major sponsor of OE. At the plant in Italy, where the plant manager was usually not involved in OE-activities, a staff member responded to the question about the role of the plant manager by saying that the management thinks positively about OE, which signalled the lack of substantive association between OE and the management-team.

A second connection between personal commitment and the way OE was implemented seemed to be the need for the plant manager to actively participate in and assess the overall situation of the OE-initiative. The less the plant manager was personally involved in OE-activities, the greater the discrepancies between his statements and those of his staff and managers in the interviews. From this, it can be concluded that the perception of the overall situation and the critical influencing factors of an initiative, even in the case of the greatest interest, for a plant manager through indirect reports or punctual enquiries is only possible to an insufficient extent.

As a result, the plant manager improved his realistic understanding of the overall situation and thus the influence of his decisions, if he was able to regularly record the situation personally at the plant. The interviews showed that in most cases two different approaches could be identified among the plant managers. On the one hand, there was indirect involvement of the plant manager via fact-based situation assessments by the respective direct staff, mostly in meetings. On the other hand, there was direct involvement via personal on-plant visits, perception of the situation through presence and the active search for discussion possibilities with staff involved.

Two different examples of the direct and indirect involvement of the plant manager are the plant managers of the plants in France and Switzerland. While the plant manager of the plant in France often showed a personal involvement and regularly participated in final presentations of OE-projects, the plant manager of the plant in Switzerland was hardly involved in OE-activities. However, he kept himself regularly informed about the main progress made by the OE-champion. While both plant managers were largely informed about the general context in the individual interviews and supported the

necessity of the initiative, their statements on the plant-specific situation nevertheless achieved different levels of coverage in comparison with the statements of their own staff and managers. It turned out that the direct involvement of the plant manager of the plant in France was more beneficial for the OE-programme.

OE-CHAMPIONS COMMITMENT

The commitment of the OE-champion was identified as a further attribute of the plant management deployment. First and foremost, it seemed to be influential how intensively and enthusiastically the commitment was associated with the initiative. This could be related, for example, to the respective time commitment, but the analyses showed that this did not necessarily have to be the case. Therefore, this attribute is understood as commitment in the sense of commitment and enthusiasm. The enthusiasm of a committed OE-champion at the plants in France and Austria became clear. While the identification of the OE-champion with the programme at the plant in France and his enthusiasm was extremely high, the OE-champion at the plant in Austria was able to convey less enthusiasm for change. The interviews revealed that the OE-champion's enthusiasm and ability to drive and motivate change was one of its most important contributions from the point of view of managers and staff.

OE-PLANT MANAGER- AND CHAMPION-RELATIONSHIP

In addition to the plant-manager and OE-champion, the personal relationship between the two proved to be a further attribute in the role of management. This had a direct as well as an indirect effect. On the one hand, a good relationship between the two key figures seemed to improve the consistency and effectiveness of their decisions. On the other hand, the quality of this relationship and its external perception played a significant role in the overall perception of the OE-initiative. Examples of the direct and indirect effect of this attribute can be found at the plants in Germany, France and Spain. While the relationship at the plants in Germany and France was based on a trusting understanding, the relationship between the plant manager and the OE-champion at the plant in Spain proved to be contradictory and uncoordinated. Because of the group interviews and the subsequent analysis rounds it became obvious that the consequences of this poor relationship were that the OE-champion suffered an additional loss of acceptance and assertiveness and that his statements were partly contradictory to those of the plant manager.

OE-PLANT MANAGER- AND RESOURCES-COMMITMENT

In the retrospective analysis, it was possible to see that the plant manager was not the only key person in the management team, but that the entire management team of a plant also played a leading role. This was not so much the case for the role model as it was for the provision of resources and personnel before and during OE-activities and -projects. In terms of resource provision in particular, the plant manager was in a weaker position than

expected. Although he was able to order support, the decision was de facto up to the respective department heads in terms of which staff they actually made available, and to what extent, from their day-to-day work. In the absence of conviction in the plant management team, the discussions with the OE-project managers showed, in many cases that conflicts with routine operations and complaints about insufficient support for the OE-projects inevitably followed. In the absence of conviction, the division heads generally continued to argue for the need to prioritise routine production and could thus verbally promise their support but de facto refuse it.

The plants in Finland and Italy are examples of inadequate staff and resource support due to a lack of support from the management team, while in the plants in Germany and Serbia the support of the local team was clearly noticeable in the projects. At the plant in Finland, for example, it was evident that, despite the commitment of the plant manager, the successful implementation of most projects failed due to a considerable lack of resources and personnel. As the majority of the plant management team members at the plant in Finland were not convinced of the goals of the OE-programme consequently also the majority of the project managers were not convinced and therefore only insufficient staff for the production and distribution of the OE-projects were made available.

The influence of the plant manager proved to be of little help. The example of the plant in Italy shows, in addition to that of the plant in Finland that this resistance does not necessarily have to be openly expressed and dealt with. While in the interviews the members of the plant management agreed to the necessity of OE-projects, the experiences described in the group discussions were marked by the refusal of the division managers to release staff and resources for the projects. In addition, the production staff at the plant complained that not enough time was allowed for their own work on OE-projects, even in day-to-day operations, as the topic was given low priority. At the plants in Germany and Serbia, on the other hand, all members of the plant management team showed extensive understanding of OE and were often personally involved. At both plants, personnel and resource shortages were reported to a much lesser extent than negative experiences with OE-projects, than at other plants. The attribute varied between the plants from a low level of commitment and hardly any binding commitments on the part of the members of the respective plant management team to a high level of commitment with binding statements.

OE-MIDDLE MANAGEMENT UNDERSTANDING

Another attribute of the role of plant management was the understanding of OE by middle management. While the plant management teams were all aware of the changed competitive situation and the risk of production relocation in connection with the initiation of the OE-initiative, this was not the case in middle management at most plants. In contrast to the respective plant manager and plant management team, a significant

difference could be seen in the interviews. The understanding of OE as a strategic initiative proved to be influential in terms of the necessary support by middle management. In the analysis rounds following the interviews, the question arose why middle management in particular represented a particular obstacle in all the plants examined. One of the plant managers interviewed described this management level as a clay layer, as this would block information from above as well as from below. Based on the interviews, two possible explanations emerged.

On the one hand, it is the level that is intensively involved in day-to-day operations and at the same time is intended to drive forward the implementation of new, conceptual ideas. Thus, middle management represents the level at which the pendulum between design and implementation changes directly in the direction of implementation. Another challenge at this level is the tension between day-to-day business and change activities from a time perspective. Compared to the higher plant management team, there is also a high-level involvement of the middle plant management team, which at the same time usually fill positions with specialist knowledge, which distinguishes them from the other production staff and makes them difficult to replace in everyday operations.

The interviews showed that middle management in particular generally found themselves in considerable time conflicts with their day-to-day tasks in projects and training courses. As a compromise, middle management was more frequently omitted from training courses, which usually caused damage to the plant-wide implementation, as support from this level subsequently failed to materialise. On the other hand, many members of middle management saw themselves as experts and rejected the ideas from the outside in this self-image even more strongly. The challenges in middle management could be identified, for example, at the plants in France and Austria, although both plants had different OE-approaches. The perception of the OE-initiative as a strategic initiative and not the image of a method’s implementation that is independent of the changed environment proved to be significant for the conviction and support of middle management.

OE-PROJECT SPONSORS

The respective management levels of the project sponsors proved to be further attributes for the key factor of plant management. The project sponsors are mostly managers, who are responsible for several projects, their objectives, progress controls and tactical execution. Although they are not involved in the operational implementation, they are responsible for setting and achieving these goals. The results analysis showed that the plants examined selected different management levels. These ranged from the member of the management team, the division manager to the team leader of smaller groups. In connection with this decision consequently, the decision-making and instruction powers and thus the implementation of support provided by the project sponsors also differed. Of

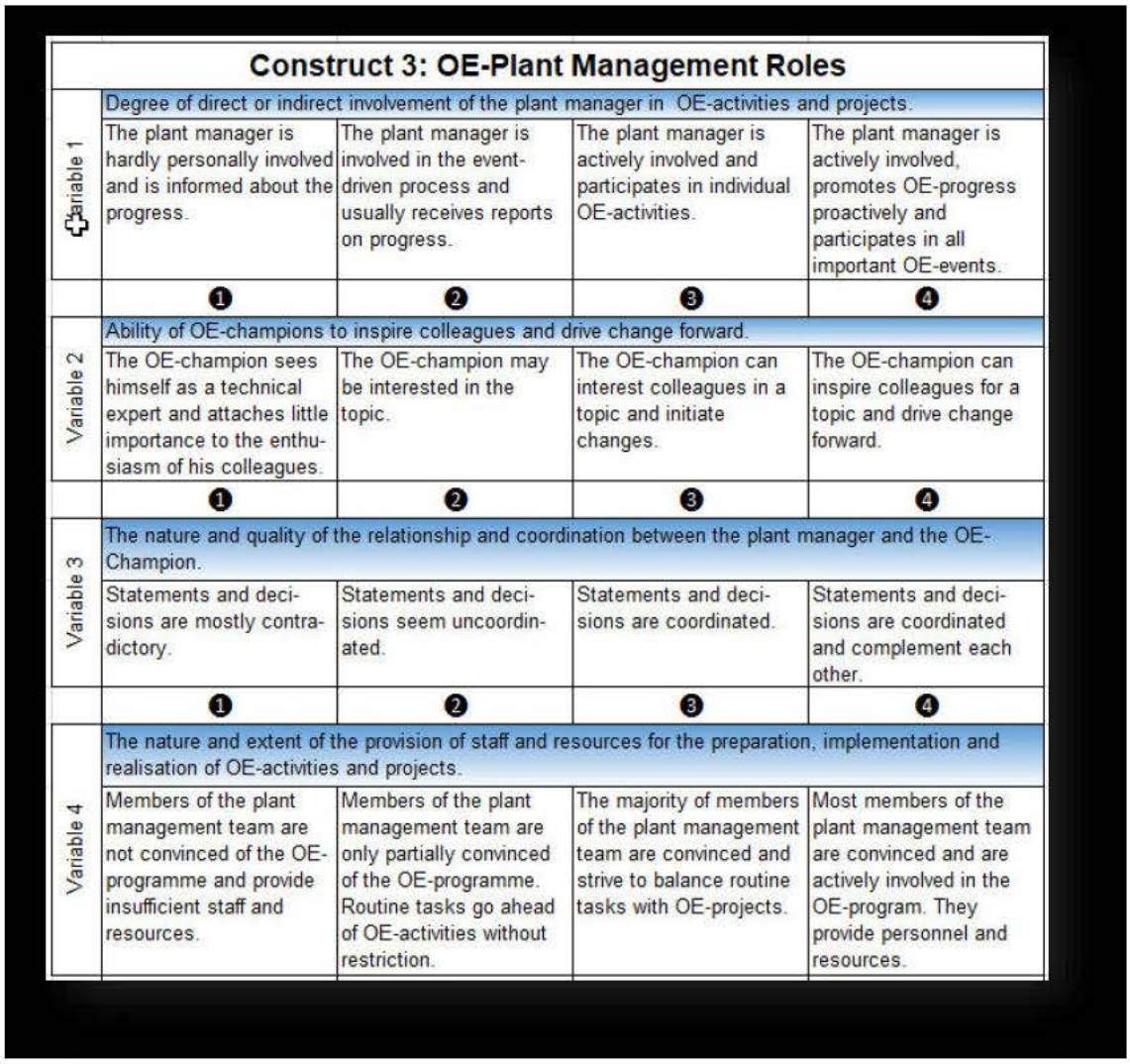
the plants examined, the plants in Germany and Italy used different management levels as project sponsors. While at the plant in Germany, a project sponsor had to be at least a member of the plant management team, at the plant in Italy an OE-steering committee was formed of project sponsors, the majority of which was staffed by middle management. Cross-divisional projects at plants with a lower sponsor level were more likely to show up conflicts with regard to staff shortages and different divisional interests than at other plants.

OE-PERSONNEL SELECTION CRITERION

In addition to sponsorship, the plant discussions on barriers and drivers made clear the importance of the role of each operational project manager in the implementation of projects. This usually concerned the OE-champion and the respective Black Belts and Master Black Belts. The primary selection criterion of this group was another important attribute of plant management in the analyses and varied between the plants from a selection based on expert knowledge to a selection based on management potential. The comparative analysis between the plants showed that both criteria were linked by a kind of dilemma. OE-project managers, who were selected on the basis of their leadership potential, could often not be completely freed from their previous activities at the plant and were therefore not 100% available.

OE-project managers, who were selected on the basis of their training and expert knowledge, were usually 100% released from their previous activities. Nevertheless, they were therefore not described by the staff as better project managers. Compared to the technical knowledge, the leadership potential proved to be far more decisive from the point of view of the project members with regard to a good project manager. At the plants in Germany and Switzerland, the OE-champion and project-managers were primarily selected according to their leadership potential, while the plant manager of the plant in Austria considered the technical qualification to be decisive.

While OE-project managers at the plants in Germany and Switzerland mostly received encouragement and respect in the interviews and were regarded less as barriers, the interviews showed clear criticism of the project management skills of the project managers and the OE-champion at the plant in Austria despite convincing specialist knowledge. What influence the selection criterion can have directly could also be observed at the plant in Serbia in connection with the appointment of a new OE-champion. Initially, the position was led by a highly qualified professional, and later a person with a management background was chosen. This decision to change the selection criterion proved to be one of three influencing factors that led the OE-programme from an expert change to a staff-oriented change and significantly improved its effectiveness and sustainability.



Construct 3: OE-Plant Management Roles				
Variable 1	Degree of direct or indirect involvement of the plant manager in OE-activities and projects.			
	The plant manager is hardly personally involved and is informed about the progress.	The plant manager is involved in the event-driven process and usually receives reports on progress.	The plant manager is actively involved and participates in individual OE-activities.	The plant manager is actively involved, promotes OE-progress proactively and participates in all important OE-events.
	❶	❷	❸	❹
Variable 2	Ability of OE-champions to inspire colleagues and drive change forward.			
	The OE-champion sees himself as a technical expert and attaches little importance to the enthusiasm of his colleagues.	The OE-champion may be interested in the topic.	The OE-champion can interest colleagues in a topic and initiate changes.	The OE-champion can inspire colleagues for a topic and drive change forward.
	❶	❷	❸	❹
Variable 3	The nature and quality of the relationship and coordination between the plant manager and the OE-Champion.			
	Statements and decisions are mostly contradictory.	Statements and decisions seem uncoordinated.	Statements and decisions are coordinated.	Statements and decisions are coordinated and complement each other.
	❶	❷	❸	❹
Variable 4	The nature and extent of the provision of staff and resources for the preparation, implementation and realisation of OE-activities and projects.			
	Members of the plant management team are not convinced of the OE-programme and provide insufficient staff and resources.	Members of the plant management team are only partially convinced of the OE-programme. Routine tasks go ahead of OE-activities without restriction.	The majority of members of the plant management team are convinced and strive to balance routine tasks with OE-projects.	Most members of the plant management team are convinced and are actively involved in the OE-program. They provide personnel and resources.
Variable 5	General understanding of the OE-initiative in middle management of a plant.			
	The OE-initiative is understood as a method implementation.	The OE-initiative is understood as a method-based improvement project.	The OE-initiative is understood as a long-term improvement project.	The OE-initiative is understood as a strategic initiative to improve competitiveness.
	❶	❷	❸	❹
Variable 6	Average management level for OE-project sponsors.			
	OE-project sponsors are members of middle management.	OE-project sponsors are partly members of the plant management team.	OE-project sponsors are majority members of the plant management team.	OE-project sponsors are exclusively members of the plant management team.
	❶	❷	❸	❹
Variable 7	Primary criterion in the identification and selection of OE key individuals such as OE-champion, Master Black Belts and Black Belts			
	Expert knowledge as a decisive selection criterion.	Expert knowledge as the primary selection criterion.	Leadership potential as the primary selection criterion.	Leadership potential as a decisive selection criterion.

Table 29: Construct and variables of OE-plant management role

KPI 4: OE-ORGANISATIONAL RESOURCES

In order to achieve an organisation and culture of continuous improvement effectively and in the long term, Packaging Ltd. instructed the plants to create a separate position as OE-champion in the plant organisation, which would have to report directly to the plant management team. In retrospect, a comparison of the plants showed that all plants complied with this obligation but implemented it in different ways. The key factor for the OE-organisation influenced the resources available to the OE-champion, the rank and importance of his position and task and the scope of his instructions and decisions. The following three points represent the attributes identified for the key factor of the OE-organisation:

OE-CHAMPIONS POSITION

At the beginning of the OE-initiative, the plants were required to create an OE-champion position with the task of internal and external project coordination of the plants. Another requirement was that the person should report directly to the plant management team, but not be part of the team. The plant was also given the freedom to decide whether to create a new OE-position at the plant or merge it with an existing one. Likewise, it was not specified whether this should be a staff, matrix or line position. As a result of the design freedoms mentioned, it became apparent during the plant visits that different options were selected by the plants. The options selected for the plants in France, Spain and Finland are particularly exemplary. Thus, an independent and comparatively influential matrix position was created at the plant in France. Although the OE-champion has no staff of his own, he was nevertheless a member of the plant management team and thus on an equal footing with the division managers. OE was thus positioned in the plant as a separate function.

The plants in Spain, Austria and Germany selected the option of having an advisory staff unit. While the two OE-managers at the plants in Spain and Austria had little influence in the plant management team and were dependent on the plant manager's approach and procedure, the trusting relationship between the plant manager and OE-champion at the plant in Germany resulted in a much more influential position in the same function. Nevertheless, the interviews at all three plants revealed that the OE-champions were not regarded as equal members of the management team and were essentially dependent on coordination with the plant manager. The plants in Italy and Finland created or took positions below functional managers and therefore not as direct staff of the plant manager. For example, the plant in Italy integrated the OE-champion post into the existing production controller post. As a result of quality problems, the plant in Finland saw OE as a quality management task and created a position below the quality manager. In both cases, this resulted in massive resistance in other areas, especially within the framework of cross-divisional projects, and inevitably led to conflicts.

In the case of the plant in Italy, it became apparent that the integration of OE into an existing productivity programme could represent a barrier in the medium term, despite possible initial advantages, since the signal for change, which emanates from a new position, could not be used and the spiritual heritage of the old position was taken over. Overall, the analysis process revealed that the optimal OE-champion position should be created in a superior, strong and independent matrix position in order to act from an unencumbered position and to have a certain freedom of action as well as to use the symbolic effect and message of an organisational change of the old position.

OE-CHAMPIONS AVAILABILITY

Irrespective of their position, the OE-championships differed in the following ways between the plants depending on whether these were designed as full- or part-time positions with other areas of responsibility in addition to the OE-programme. As distinct from the commitment attribute of the OE-champion in the KPI 3 of plant management, the OE champions' available work time was allocated regardless of their commitment to CI. Their willingness to cooperate in the interviews showed a direct influence on the external perception of the initiative, the support in the projects as well as the danger of failing due to time and interest conflicts between OE-activities and other tasks. While in the plant in Germany, for example, the OE-champion was 100% employed as an OE-officer, the OE-champion at the plant in Italy was appointed as OE-contact person but remained in his position as production controller and took on the OE-responsibility on top. In the interviews with the respective OE-responsible persons as well as the project staff it became clear that the necessary activities connected with the programme could not be fulfilled as a part-time OE-champion.

OE-STAFF RESOURCES

Another attribute of the selected OE-organisation options was the opportunity to provide additional full-time or part-time staff for OE-projects and -activities. Only individual plants made use of this option. The interviews showed that, moreover, the resources made available for the OE-programme had a positive influence on implementation. In particular, the use of other full-time or part-time project managers was considered, usually Black Belts or Master Black Belts at the same time. While additional Master Black Belt jobs were created at the plants in Switzerland and Italy, for example, this did not take place at other plants.

Construct 4: OE-Organisation/Resources				
Variable 1	Creation or integration of an OE-champion position within the organisational structure of a plant.			
	Integration into an existing position below an area manager.	Integration into an existing staff position.	Creation of a new staff position.	Creation of a new matrix position.
	❶	❷	❸	❹
Variable 2	Design of the OE-position as a 100 % full-time position or as a part-time position with further tasks.			
	Part-time job with less than 50% of working time for OE-activities.	Part-time job with more than 50% of working time for OE-activities.	Full-time position with smaller additional tasks.	Full-time position with no other duties.
	❶	❷	❸	❹
Variable 3	Additional full-time or part-time positions for OE-Activities and projects.			
	No more resources.	Nomination of OE-contact persons in individual functional areas.	Creation of further part-time positions for OE-project managers.	Creation of additional full-time posts for OE-project manager

Table 30: Construct and variables of OE-organisation and -resources

KPI 5: OE-ORGANISATIONAL ADAPTABILITY

The ability of a plant to understand and achieve profound changes as a whole and not just in individual areas proved to be one of the key performance indicators. In addition to changes in the structure and process of a plant, the introduction of the OE-initiative to establish a culture and organisation of continuous improvement required significant changes in the understanding and attitudes of managers and staff. Similarly, common distinctions in organisational development between First order- vs. Second order-change, Single-loop- vs. Double-loop-learning, Alpha- vs. Gamma-change or Episodic- vs. Continuous-change could also be applied here as differentiation. Various statements from the 70 individual interviews revealed that the implementation of the OE-methods Six Sigma and Lean Production was implicitly associated with principles that stood in considerable conflict with the management and working methods previously established at the plants. In particular, two principles seemed to cause conflicts between the externally introduced and required OE-methods and the assumptions established in everyday packaging operations:

OE-QUESTIONING STATUS QUO

The study shows that in the everyday packaging life of the past, a mentality was promoted among staff to secure the status quo of existing processes and systems and to fundamentally avoid changes. Methods such as Six Sigma and Lean Production, on the other hand, focus on the opposite. They require regular systematic and critical observations of the status quo and include the desire for recommendation for improvement and change and their implementation as internal quality and efficiency drivers. The ability to provide a service or create a product is not considered a competitive advantage, however the ability to further develop it by continuously improving the existing systems and processes to a level of high quality, efficiency, flexibility and

furthermore make it as not imitable. The interviews showed that the necessary willingness to question the status quo more critically and regularly than ever before followed a ratio at the investigated plants, which has had a significant impact on the way in which an organisation and culture of continuous improvement has been established. On the one hand, this ratio consisted of the question of whether the respective staff was basically aware of the connection between changes in competition on the one hand and the introduction of the OE-programme as an organisational response on the other. On the other hand, it included the question of whether the emotional perception of this change was perceived as an opportunity or risk for one's own plant.

Up to the middle management level, the managers interviewed were generally aware of the changes in the competitive arena for Packaging Ltd. The initiation of the OE-initiative and the threat of closing plant alternatives were seen to have a causal connection with these changes. With the exception of middle management, the plants differed from each other only to a negligible extent. Considerable differences were found between the plants with regard to the associated future expectations and the overall mode of the change at the plant. Similar to the differentiation between a major and minor key, differentiation was found between change as an opportunity and change as a risk. The respective attitudes were shown to have a close connection at the respective plants with whether changes were generally approached openly, proactively and on a broad basis or rather closed, reactive and only selectively approached. While in the first case the motivation to change structures, processes and working methods within the framework of Six Sigma or Lean Production-projects was derived from the potential gain in competitiveness, in the second case, the same changes were seen as a sign of the weakness of one's own abilities and to close gaps, which subsequently led to the avoidance of transparency and openness.

Similar to cognitive psychology, it could be seen that managers and staff followed a similar cognitive pattern at each plant. Cognitive psychology showed that people’s perceptions of the world do not consist of events that have meaning in themselves but are dependent on interpretations or understanding structures that are guided by ordering schemata and frameworks of an existing cognitive faculty and thus change can be seen as an opportunity and as well as a risk. What was regarded as normal, ideal-typical, abnormal or odd in the interviews was influenced by specific, locational shared schemes of opportunity and risk. The influence of this attribute on the way OE was implemented was particularly evident in the comparison of the plants in Germany and France with their understanding of change as an opportunity and the plants in Italy and Switzerland with their understanding of change as a risk. At the plant Germany, it became clear in the interviews that the understanding of change was perceived by almost all staff as an opportunity for the competitiveness of their own plant. This cannot change in the credo would be expressed as a risk. In the interviews, the managers and staff at plant Germany

were aware of the increased intensity of competition due to their experience with major personnel reductions in the past.

In this environment, the OE-programme was seen as a helpful method of continuously improving and safeguarding competitiveness. With a view to the future, the majority of managers and staff regarded change as the increasing norm. In management, a certain restlessness in the daily course of OE-projects was seen as a sign of movements to improve competitiveness. Similar attitudes were found at the plant in France. On the other hand, the same competitive changes at the plants in Italy and Finland were seen as a danger and the reactions to them as a partially unnecessary risk. Changes and, as a result, more extensive OE-projects and activities were regarded as disruptions to day-to-day management operations. The integrative path chosen by the plant in Italy to implement the OE-programme shows this particularly well, as it also represents the path of minimal organisational change. On closer examination of the interviews, it became clear that the basic motivation for this form of implementation was to avoid major organisational changes and potential unrest. This is in contrast to the procedure at the plant in France, in which a matrix organisational form with the organisational tensions contained therein was deliberately chosen. The differently established schemes for understanding change at the plants therefore had a considerable effect on the way in which they were implemented and could inhibit this through an understanding of risk or promote it through an understanding of opportunity.

OE-OPENNESS TO EXTERNAL IDEAS

In addition to the willingness to question the status quo and to see this as an opportunity or risk, the initial comments on the KPI of organisational change ability reveal a strong internal orientation in problem solving in the packaging industry. In the past, solutions and ideas from outside hardly played a role here. Six Sigma, Lean Production and Knowledge Management methods, on the other hand, originate from the automotive and electronics industries and can therefore only be established if there is openness to ideas from outside. The introduction of the methods associated with the OE-programme represented a transfer of knowledge from the automotive and electronics industries to the packaging industry. This approach was initially considered very critical and unhelpful by quite a few managers and staff, as the interviews showed. Also, in the interviews, many interviewees continued to be convinced of a necessary special path for the packaging industry. Another manager referred to the Not Invented Here (NIH)-syndrome of Kats and Allen (1982), i.e., to the phenomenon that foreign ideas are always seen as inferior to one's own.

The overall view revealed that the NIH-syndrome does not necessarily refer to packaging vs. non-packaging. This allowed parallels to be identified as to whether, on the one hand, a general openness towards ideas from the automotive industry was expressed in

conversations and on the other hand, whether an exchange of knowledge and experience was maintained with other Packaging Ltd. plants. Managers and staff were either closed or open to both aspects. The internal and external world did not seem to exist primarily through industry or the company, but also in relation to his/her own or other plants. This attribute could be particularly clearly distinguished between openness and closedness to change and its consequences recognised in the OE-implementation approach for the plants in France, Italy, Switzerland, Spain and Austria. Inspirations and concrete ideas for further improvements were discussed in the past at the plant France often via the exchange with other production plants or with other companies.

The OE-champion as well as the plant manager searched on a regular base for possibilities to find out more about the Benchmarking or Best Practices studies with others and thus to compare them and learn from other organisations. In addition, it was possible to recognise a high openness and curiosity towards new ideas from outside the plant during the interviews. On the other hand, the plants in Italy and Spain showed only a low degree of openness to ideas from outside. In the case of the plant in Spain, further ideas and comparisons with other plants were described by the plant manager as confusing.

At the plant in Italy, the content of OE was examined to see how far individual Six Sigma methods could be applied and whether Lean Production or Continuous Improvement processes were also possible. In addition, during the interviews at the plant in Italy, managers in particular referred to the successful past of the plant. This was mostly associated with doubts about the fundamental necessity of an OE-programme, as the plant ran already excellently before. The communities of practices and the research function of the project database were deliberately not used at the plants in Italy and Spain as internal knowledge management after consideration, which also showed a lack of awareness of the experiences of other plants. This negative attitude towards new approaches and ideas from outside was also found in a weaker form at the plant in Austria.

The discussions there showed, however, that in contrast to the plants in Italy and Spain, this was not due to a lack of willingness or interest, but to the experience of frequent changes of ownership for the plant as a result of various mergers and acquisitions over the last ten years. The experience was based on the fact that with each change of ownership, new initiatives for improvement were introduced and this usually took place without comparison with the already established approaches. It became clear how important it is to integrate new initiatives with existing ones in order to avoid credibility, conceptual clarity and frequent priority shifts. This effect of the negative attitude as a result of the lack of integration with existing initiatives was reflected in a similar way at the other plants acquired by Packaging Ltd. such as the plants in Italy and Serbia.

Construct 5: Organisational Adaptability				
Variable 1	The willingness of managers and staff to question established working methods and structures in a constructive manner:			
	Established working methods and structures are hardly questioned and exist for years without significant changes.	Employees rarely question established working methods and structures.	Employees question established working methods and structures in projects and in a constructive manner.	Employees regularly question established working methods and structures in a structured and constructive manner.
	❶	❷	❸	❹
Variable 2	Openness to ideas, principles and methods that are brought to the organisation from outside:			
	Executives and employees are sceptical about outside ideas. The exchange of experience with external parties is avoided. The own success past of the location seems to confirm the high-level personnel in this behavior.	Executives and employees are sceptical about outside ideas. Opportunities to exchange information with external parties are rarely used. Solutions to problems are almost only sought internally.	Managers and employees are open to ideas from outside. To solve problems, exchanges of experience with external parties are also used.	Managers and employees are open to ideas from outside. They regularly exchange experiences in order to understand the strengths and weaknesses of their own location.

Table 31: Construct and variables of OE-organisational adaptability

KPI 6: OE-ORGANISATIONAL PROGRAMME INTEGRATION

The sixth KPI was that the OE-programme had to connect with certain internal activities and structures in order to achieve its objective of continuous improvement in organisation and culture. The comparative analysis between the plants showed that effectiveness and sustainability have been influenced in particular when the contents of the OE-programme have an internal consistency with the daily routine, with other initiatives and staff development. Three points of reference were identified as particularly supportive. The attributes of the KPI-integration with other ongoing and established activities and structure are:

OE-DIFFERENTIATION AND INTEGRATION OF PLANTS INITIATIVES

As already described for the KPI of the commitment of group units, the plant managers of the plants surveyed agreed that the large number of uncoordinated, company-wide initiatives posed a significant risk of confusion for the company as a whole as a result of the use of different terms, overlapping content and conflicting priorities. A comparative examination of the plants examined revealed that the plants found different answers to their criticisms. The most important aspect was whether the respective plant manager and OE-champion decided to position the OE-programme either in isolation from other initiatives or coordinated with other initiatives at the plant or as an umbrella concept for other initiatives. While the plants in Germany and France restructured the initiatives under a common mission or vision and thus developed a plant-specific umbrella concept, the plants in Italy, Switzerland and Spain had a fundamentally negative attitude towards

Packaging Ltd. initiatives and let them run in isolation with minimal effort in some cases. At the plant in Spain, a kind of defence strategy against Packaging Ltd. initiatives was also observed, in which innovation and novelty in connection with OE were deliberately avoided. Behind these possibilities was a kind of hierarchy, where an isolated initiative at the plant gave the lowest priority compared to an OE umbrella-concept.

OE-LINKAGE TO HUMAN RESOURCE STRATEGY

The second attribute in connection with the integration into the structures of the plant was the coordination with the plant's own Human-resource- and Learning-strategy. Similar to the use of knowledge management methods, this only took place at a few plants. Nevertheless, the interviews showed that where there was a connection, and that the OE-implementation and the HR-strategy were mutually beneficial. In those cases, in which the content was coordinated, this usually concerned the support of the training plan and simplified and institutionalised the project of nationwide OE-training on a sustainable basis. The plant in France in particular was able to use this support to increase the proportion of trained staff to almost 100%. Another example of cooperation was found at the plant in Switzerland, which combined the Green Belt training with the plant's own trainee programme and thus upgraded both programmes. Overall, it could be shown that a connection with the human resource strategy, especially with regard to a sustainable and long-term establishment, was a promoting attribute of integration.

OE-LINKAGE TO DAILY JOB

This was the intention behind the OE-initiative, to support the plants through mandatory targets and the provision of content and resources, to significantly expand their capabilities as organisations of continuous improvement and thus to improve the competitiveness of Packaging Ltd. The content and methods provided by Packaging Ltd. through the OE-programme are based on the experience of the automotive and electronics industries in significantly improving quality, productivity and flexibility. As shown in the KPI for the capacity for organisational change, some of the desired principles are in considerable conflict with established ways of working, which in essence, due to historical reasons, have strictly urged the preservation of existing processes and the avoidance of any changes. Through the OE-initiative, the plants should in this way, be separated from an established, stable system of assumptions and principles to protect the status quo via a phase of change and should be moved to a new, stable system with changed assumptions and principles, complemented by aspects of continuous improvement.

Specifically, at the workplace level and below this conceptual level, this includes far-reaching changes in the requirements of daily work. This is concerned, in particular, with the motivation and ability of staff to address problems and necessary changes in team-based working methods as well as their own workplace improvements in addition to their

routine activities. In the strong focus on external organisation among staff and on control among role understanding, as the interviews showed, this was not a problem. The interviews and the comparisons between the plants made it clear that in addition to conceptual clarity and organisational professionalism, the mediation of this bridge between concept and concrete changes in daily life has an important influence on the acceptance and effectiveness of OE-projects and activities.

The interviews showed that the mediation of this bridge was pursued differently at the plants investigated. While the interviews at some plants showed a fundamental benefit, OE-methods were primarily used to increase the amount of documentation required for everyday life. On the other hand, there were also statements that could bring both principal benefits and examples from their daily life in order to explain the overall intention of OE. This understanding of the bridge proved to be particularly important with regard to the stability and sustainability of the plants. The clearest differences were between the plants in France, Austria and Switzerland.

Construct 6: OE-Program Integration				
Variable 1	Type and degree of differentiation and integration of the OE-initiative with other global and local initiatives.			
	OE will be positioned as another Packaging Ltd. initiative.	OE will be positioned as a separate Packaging Ltd. initiative with certain differences to other initiatives.	OE will be positioned as a building block of the plant strategy.	OE will be positioned as an umbrella concept that bundles various initiatives and aligns them with the strategy.
	❶	❷	❸	❹
Variable 2	Link to long-term management and employee development at the plant.			
	There is no coordination between the OE-programme and the HR-strategy.	OE-trainings can be chosen as part of the training offer.	OE-trainings take place with HR-support and coordination.	OE-trainings are coordinated with trainings for long-term management and employee development.
	❶	❷	❸	❹
Variable 3	Approach to mediating between OE as a concept and the daily job.			
	There is no connection between the OE-programme and the daily job.	OE is seen as an additional effort to the job.	OE is understood as support for the daily job.	OE is understood to simplify and improve the daily job.

Table 32: Construct and variables of OE-organisational programme integration

KPI 7: OE-PROGRAMME MANAGEMENT INITIATIVE

The interviews and the subsequent discussions showed that managing an OE-initiative at plant level meant much more than just carrying out individual projects. With what aim, how and how professionally this project and programme management was carried out, had an obvious impact on the implementation. This particularly affected the aspects of how successfully targets were achieved, how much attention and resources the plant management gave to the initiative and whether the initiative was able to involve large

parts of the staff, their skills and knowledge. The most important key factor could be divided into six attributes:

OE-INITIATIVE FOCUS

The comparative analysis between the plants and the interviews showed that the basic orientation and focus of the OE-programme, despite its specifications on standardised content and a formulated mission on the part of Packaging Ltd., did not necessarily lead to the same focal points at the plants. Three different approaches could be identified in the plant comparison.

- First approach:

  On the one hand, the OE-programme could have a strongly method-oriented focus, which focused primarily on the introduction and use of analytical quality and production improvement methods. The focus was on process improvements and efficiency enhancements. Inevitably, this did not mean that no broad behavioural changes were aimed at in everyday life. Rather, this approach was accepted by the respective plant managers and OE-managers, based on the idea that changes in behaviour and attitudes can be achieved in the long term through the rigorous use and observance of methods. The activities and competences of the OE responsible person focused mostly on planning, the own implementation or management of individual projects and the development and transfer of expert knowledge.

- Second approach:

  On the other hand, the understanding could also have a strong staff-oriented focus, which focused on crosscutting cooperation, sustainable problem-solving processes and the social design of a culture of continuous improvement. This approach was often based on the assumption that long-term process improvements require a broad change in behaviour and attitudes, which would lead to a critical questioning of established methods and inevitably to an interest in the new methods. The focus here was mostly on group-oriented, comprehensive staff training courses with the aim of changing attitudes. The activities and competencies of the OE-manager mostly related to the long-term training concept, the plant and the creation of a willingness to change. The implementation of projects and the development of a high level of technical expertise were not among the most important tasks of the OE-champions themselves.

- Third approach:

  The third focus emphasised the need to balance the two approaches. OE requires both a method-oriented approach with selective projects and a staff-oriented approach with extensive training and persuasion. This was based on the

assumption that both aspects are mutually dependent, promote each other, and must therefore be dealt with in parallel and not sequentially. The activities and competences of the OE responsible person were strongly situation-dependent with this approach. Staff- or method-oriented procedures were used according to their practical requirements. At the plants in Austria and Switzerland, for example, it was observed that the focus of the initiative was on Lean and Six Sigma expert knowledge and its standardised and stringent implementation. The plants in Germany and Serbia, on the other hand, did not use stringent methods, but were based more on the motivation, involvement and basic skills development of staff. A deliberately balanced approach could be observed at the plant in France, which emphasised the mutual relevance of method and staff orientation. A further indication of the design scope of the focus and its consequences, accompanied by changes in other key factors, could be observed at the plant in Serbia. In contrast to the other plants, the plant in Serbia did not follow a continuous path in the implementation but changed the focus from a method-oriented to a staff-oriented approach in the ongoing implementation. Including the changes of other key factors, it could be seen that this had a positive effect on the introduction of an organisation and culture of continuous improvement.

OE-PROJECT GENERATION

Another attribute lay in the procedure of project idea generation. This procedure showed clear differences between the plants. Four alternative options (types) were identified:

- First type:

  In the selection process of type 1, identification, evaluation and selection of project ideas and their initiation were carried out exclusively by off-plant group staff, the plant manager or the OE-champion. This decision-making process was characterised by a phase of rapid generation of ideas and initiation with the help of hierarchical instructions. In most cases, the number of ongoing projects was small, and the scope of application limited. The brainstorming took place through a push-process.

- Second type:

  Type 2 provided for the use of a more bottom-up driven approach to the project idea generation, while the subsequent evaluation and implementation of ideas was not carried out by the regular management structures, but by OE-specific steering committees and project organisations. The ideas were generated and evaluated within the framework of the OE-specific steering committee. The regular management team was less affected. The brainstorming process was based on a mixture of push and pull on the part of the organisation.

- Third type:

  For type 3, a joint analysis of the starting position in the plant management team was first carried out in order to come up with larger and cross-departmental project ideas. The brainstorming process was indeed participative, but only within the framework of the plant management team. This was followed up by a stringent top-down derivation of projects. The main source of ideas was management. Ideas were found by a pull principle at the level of the management team.

- Fourth type:

  Type 4 was a bottom-up generation of ideas on the one hand, which could only be initiated top-down by a joint second consideration and a decision of the plant management team. Idea generation was based on a pull principle on the part of the entire organisation. In addition, project responsibility was secured by the plant management team. Project initiation at the plants in Switzerland, Finland and Austria followed type 1, at the plants in Italy and Spain, they followed type 2, at the plants in Serbia and Germany, they were type 3 and at the plant in France they were type 4. With regard to the OE-implementation, it turned out that the more effective the project initiation process was in synthesising the ideas of staff and managers, the more effective the projects were.

OE-PROJECT STANDARDISATION

In particular, the analysis of the group interviews with the OE-project managers and the production staff showed that a standardised approach to project management could have a considerable influence on the success of the project. This may be partly due to the fact that the majority of Packaging Ltd. production staff had little experience in temporary, self-organised teams put together to solve a problem. The analysis showed that in the initial phase, the various OE-projects were not able to be completed due to the previously strongly externally organised way of working. The specification of standardised procedures in the form of checklists, project templates simple analysis methods such as Ishikawa or Gant Diagrams have proven through the interviews to be very helpful support. In the immediate aftermath, in particular in the comparative analysis of the plants, it can be shown that a through a structured and standardised approach, the operational project management was simplified and improved. This became clear in the interviews at the various plants as a result of the intense complaints about unstructured projects, missing project plans and forward-looking procedures. In particular, the risk of never-ending stories, of projects that could not be formally completed, seemed to be much higher without the prescribed standards.

While at the plants in Germany, France and Serbia, for example, the professional approach of the OE-champion and the project manager was praised, at the plants in

Austria, Spain and Finland there was criticism of the operative project management. In addition, the interviews at the plants in Austria and Finland showed that a considerable number of projects did not bring about a formal conclusion and thus no lasting change.

OE-PROJECT MANAGEMENT

The establishment of an organisation and culture of continuous improvement in a company, which had previously been primarily aimed at protecting the status quo, was initially carried out in all the plants examined via individual selective projects, for example to improve individual processes or process steps. In the course of the introduction, the number of simultaneously running projects rose usually clearly at each plant. As could be observed at the various plants, this inevitably led to a dilemma. While each additional project drove the establishment and learning curve forward with the new OE-methods at the plant, no plant was able to handle a large number of projects simultaneously. For example, the increasing number of projects often placed an increasing burden on the plant, and the projects, which usually had the same staff, hindered each other and inevitably resulted in longer lead times, which in turn caused frustration among project staff. In order to break out of this dilemma, the interviews showed that it was less important how many projects were running de facto than whether the benefits of ongoing projects were critically questioned. At the plants, it could be observed that the analysis was either informal, on a case-by-case basis based on formal criteria, i.e., using a checklist, or regular in the form of a project pipeline process at the plant.

For example, the benefits of a correspondingly formalised project selection at the plant in Germany were evident. There the OE-champion made sure that projects were not only initiated due to problems or machine downtimes, but also continuous improvement of the quality and reliability of running equipment and lines, and that project proposals were considered by both management and production staff. In order to coordinate these project proposals from different sources and to allow the information on them to converge, all project proposals had to run through the same project evaluation process in the plant management team. This prevented even well-intentioned projects from experiencing uncontrolled growth in different areas and at different levels and becoming an overload for the plant and a danger to the individual projects. This was the best way of ensuring that projects were only launched for maximum benefit due to the system, proved to be the best option for the project pipeline process.

OE-INITIATIVE COMMUNICATION STRATEGY

One of the most important attributes of the management of the OE-initiative at each plant proved to be the way in which OE-communication is designed. The comparative analysis between the plants showed that very different approaches were chosen. This concerned the questions of which content was communicated to which group of people via which

channels and at what time. In the interviews with the OE-managers, it also became clear that the different approaches were based on fundamentally different communication goals. Communication for information, knowledge and method transfer, conviction and image building as well as organisational learning could be identified as the four driving motivations at the investigated plants. Communication for information purposes concerned the disclosure and dissemination of organisational information and events such as the number of ongoing projects, the proportion of Green Belts, Black Belts and even Master Black Belts trained, and project deadlines.

OE-communication for knowledge and method transfer included information posters or flyers on OE related approaches and methods such as Lean, Six Sigma, Value Stream Mapping, 5S and others. For this purpose, standardised materials were generally used at the plants, some of which were provided by the regional or globally responsible OE-champions. Communication for persuasion and image building aimed at communicating the necessity and effectiveness of the methods and projects associated with the OE-programme. This included above all local project posters on successfully completed projects or so-called market places, where staff were directly informed about OE-projects and could ask questions. The content was pushed into the background. Rather, the aim was to give OE a certain image and to improve acceptance.

Communication as organisational learning could also include the aforementioned intention, but went one-step further and was aimed at opportunities to receive active feedback from managers and staff. For this purpose, specific event formats were chosen, which required the active participation of the staff, such as review meetings or open events for project completion. The goal was to achieve this, to present the OE-champion's and the plant manager's own approach, to receive further ideas for additions and improvements from the staff and to recognise and counter frustration and envy as early as possible. As a consequence of these four different goals, three basic approaches with regard to content, communication channel and target group could be identified.

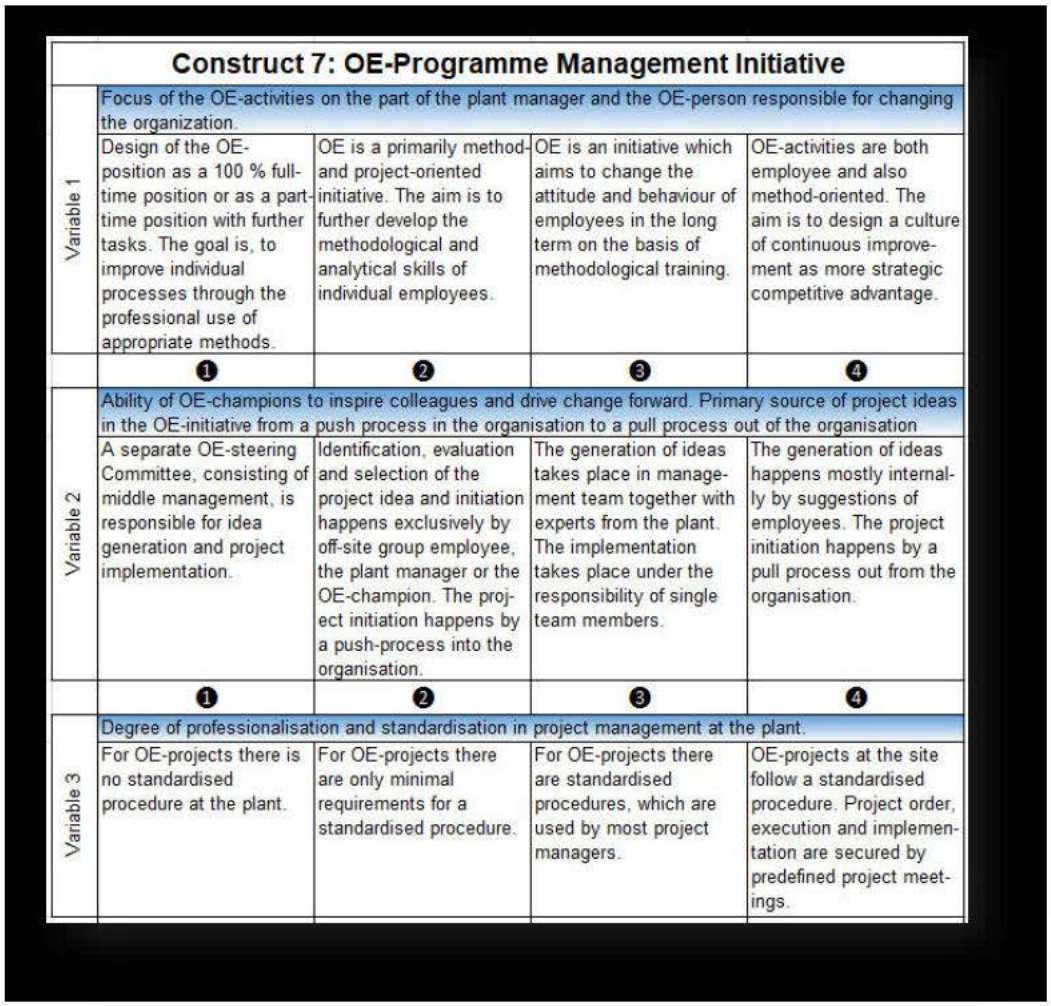
This included the question of whether the communication was rather narrow to a few executives or broadly and differentiated to all staff, whether primarily standardised advertising and information materials or plant-specific project flyers were used and whether communication was one-sided from OE-activities to staff or not. The different approaches can be seen very well when comparing the plants in Serbia, Italy, Germany and France. As a result of the plant in Austria's OE-focus on carrying out individual, complex expert analyses, communication moved into the background and was essentially limited to informing the plant management team about the progress of each individual project. The OE-champion at plant Italy relied on the widespread use of standardised flyers and posters, to anchor selected content, such as the Value Stream Mapping procedure or 5S with staff, using redundant messages as communication or conversation

between and OE- and plant-managers. At the plants in Germany and France, special attention was paid to the broad and plant-related content during communication. Standardised posters and flyers such as those used at the plant in Italy were not used. For example, the OE-champions at the plants in Germany and France used local project stories, individually created project walls and short films, some of which were even shot at the plant. In addition, the OE-champion organised so-called Townhall Meetings at the plant in France, where staff could ask questions and make suggestions for improvement. As an essential part of his communication, the OE-champion at the plant in France also knew how to organise a project-review after each project, at which the project managers and participants presented their results and suggestions to the plant manager. The situation of a direct, open and constructive exchange was consciously aimed at and meetings were considered successful if the participation of the staff was particularly active. At appropriate meetings, the content of the OE-initiative was pushed into the background in order to communicate the necessity of the initiative and the associated activities on the one hand, and to motivate staff to directly express their displeasure and contribute further ideas on the other.

OE-KNOWLEDGE MANAGEMENT SYSTEMS

Overall, both the community of practice and the project database were not used continuously at most plants. However, if they were used, in the same way as at the plants in Germany and France, it was shown that they could make a significant contribution to idea generation and project implementation. Therefore, they are also seen as an attribute of the management key factor of the OE-initiative. These knowledge management systems were used particularly at the plant in France. A number of project examples showed that similar problems were initially dealt with independently at different plants, such as loss reductions on cupper-lines or set-up time reductions on printers. By using and participating in the two knowledge management systems, a structured exchange between the plants was considerably simplified.

The interviews showed that as soon as the application of one of the two knowledge management systems was used, the analysis and implementation phase of a project could be considerably accelerated with a successful exchange between the plants. In addition to the technical system requirements of a user-friendly programme, it was found that two further requirements were associated with this at the respective plants. On the one hand, there were a certain number of documented projects in the database so that the search function could successfully deliver results, and on the other hand, there was an openness towards ideas and solutions from outside described in the key factor of organisational adaptability.



Construct 7: OE-Programme Management Initiative				
Variable 1	Focus of the OE-activities on the part of the plant manager and the OE-person responsible for changing the organization.			
	Design of the OE-position as a 100 % full-time position or as a part-time position with further tasks. The goal is, to improve individual processes through the professional use of appropriate methods.	OE is a primarily method- and project-oriented initiative. The aim is to further develop the methodological and analytical skills of individual employees.	OE is an initiative which aims to change the attitude and behaviour of employees in the long term on the basis of methodological training.	OE-activities are both employee and also method-oriented. The aim is to design a culture of continuous improve-ment as more strategic competitive advantage.
	❶	❷	❸	❹
Variable 2	Ability of OE-champions to inspire colleagues and drive change forward. Primary source of project ideas in the OE-initiative from a push process in the organisation to a pull process out of the organisation			
	A separate OE-steering Committee, consisting of middle management, is responsible for idea generation and project implementation.	Identification, evaluation and selection of the project idea and initiation happens exclusively by off-site group employee, the plant manager or the OE-champion. The proj-ect initiation happens by a push-process into the organisation.	The generation of ideas takes place in manage-ment team together with experts from the plant. The implementation takes place under the responsibility of single team members.	The generation of ideas happens mostly internal-ly by suggestions of employees. The project initiation happens by a pull process out from the organisation.
	❶	❷	❸	❹
Variable 3	Degree of professionalisation and standardisation in project management at the plant.			
	For OE-projects there is no standardised procedure at the plant.	For OE-projects there are only minimal requirements for a standardised procedure.	For OE-projects there are standardised procedures, which are used by most project managers.	OE-projects at the site follow a standardised procedure. Project order, execution and implemen-tation are secured by predefined project meet-ings.
Variable 4	How project ideas are collected and evaluated.			
	OE-projects are not collected and started at the plant according to a systematic procedure.	OE-projects are not collected systematically and are usually started according to informal evaluation criteria.	OE-project ideas are collected at the plant and evaluated on the basis of few specific criteria.	OE-project ideas are collected at the plant and only started after an assigned benefit analysis or after a business case.
	❶	❷	❸	❹
Variable 5	Objectives of communication via OE at the plant.			
	Communication at the plant serves to pass on information.	Communication at the plant serves to pass on information and knowl-edge.	Communication at the plant serves the convic-tion and image building of OE.	Communication at the site is understood as an essential element of or-ganisational learning at the plant.
	❶	❷	❸	❹
Variable 6	Use of the knowledge management systems Community-of-Practices and the project database with search function.			
	The knowledge manage-ment systems are not used at the plant.	The knowledge manage-ment systems are used from time to time to find ideas.	The knowledge manage-ment systems are used from time to time to find ideas and solutions. Usually own projects are documented there.	The knowledge manage-ment systems are regu-larly used to find ideas and solutions. Success-ful projects are only com-pleted after the documen-tation has been com-pleted.

Table 33: Construct and variables of OE-programme-management at the plant.

KPI 8: OE-PACKAGING LTD. SUPPORT

The scope and type of support provided by Packaging Ltd. to the plants proved to be another key factor for the implementation of OE at the plant level. In the interviews, it became clear across all plants that the attributes of this KPI were significantly influenced by a Packaging Ltd.-specific phenomenon of a flood of initiatives, as a plant manager called it. The interviews showed that all plants before and during the OE-initiative were confronted with a large number of new company-wide initiatives by Packaging Ltd. On average, 10-15 global initiatives ran simultaneously at Packaging Ltd. shortly before and during the OE-initiative. Global initiatives at Packaging Ltd. were characterised by the fact that each plant was obliged to participate in a certain form. This situation of the high number of different initiatives from productivity to creativity, equality, motivation, IT-integration and technology initiatives was regarded by the plant managers as obstructive, confusing and overtaxing for their own plant.

The plant managers shared the assessment that the high number of initiatives not coordinated with each other increased the danger that staff might become confused and that it seemed impossible to set reasonable and comprehensible priorities in each respective management team through frequently changing initiatives. In addition, almost all initiatives were based on the principle of individual project implementation and were therefore in competition with each other in terms of resources. Since each plant was asked on average to initiate two to three projects or workshops per initiative each year, at least 10 to 30 projects and workshops were carried out at each plant in addition to day-to-day business. As a result, there was regular displacement between the different programmes, in which the initiatives were in dispute with each other among the project staff. The interviews and discussions showed that the OE-programme under consideration was initially seen as another of these 10-15 company-wide initiatives. On the other hand, the programme was able to differentiate itself from the other initiatives through individual aspects. The following three attributes of Packaging Ltd.'s support contributed to this differentiation:

OE-GOALS ANCHORING

In contrast to other initiatives, the OE-programme was linked from the outset with binding target agreements between Packaging Ltd. and the plants and the plant managers. The plant managers were able to improve their variable salary share and the strategic positioning of their plant by demonstrating that their plants had a high number of OE-projects and a high proportion of staff trained in OE. Depending on the plant, this attribute of anchoring contributed significantly to encouraging and stimulating the entry into the programme. In addition to this obligation to adhere to the binding target agreements, it also had a signal effect on the respective plants.

Examples of the effect of the anchoring of targets are the plants in Italy and Spain with regard to binding target agreements as well as the plants in Germany, Italy and France in relation to the development of OE-related plant visions or missions with a signalling effect. Even though the plant in Spain showed an overall low level of implementation and little conviction regarding the usefulness of OE and the need for a continuously improving organisation and culture, the anchoring of the OE-progress indicators in the target agreements of the plant manager nevertheless seemed to be a driving force for minimum fulfilment. Similarly, at the plant in Italy, the link between OE and the formal factory vision proved to be an overall positive signal, even though the lack of lived factory-vision did not go beyond this signal. Likewise, the anchoring of the OE-goals in the factory visions of the plants in Germany and France influenced the relevance and sustainability. Their inclusion signalled and demanded the development of an organisation and culture of continuous improvement throughout the-plant highlighted the importance of the initiative to staff and managers.

OE-RESOURCES AND KNOW-HOW AVAILABILITY

The interviews with the plant managers and the OE-champions showed that the provision of personnel and technical support by Packaging Ltd. was a decisive attribute. On the one hand, this had the immediate effect of clarifying the relevance and long-term nature of the initiative compared to the other initiatives of Packaging Ltd. On the other hand, the provision of additional staff increased the willingness of the plants to tackle more complex problems and projects, even if the methodical skills of their own staff, for example in terms of complex process analyses, did not appear to be sufficient. As a result, support from highly qualified experts at Packaging Ltd. was available comparatively quickly and promptly when required. At the same time, the provision of resources and staff by Packaging Ltd. underscored the service understanding of the concept and this secured the acceptance of the management and specialists at the plant. At the plants in Austria and Finland, which pursued a fundamentally technical or elitist approach to OE, the support of group experts proved to be a particularly beneficial aspect, especially in the case of technically complex challenges.

OE-EXPERTS' INVOLVEMENT

The group interviews with the production staff showed that, in addition to availability, on-plant-support and the associated project integration were further attributes of this KPI. Availability and on-plant commitment as attributes were close to each other, but differ in that the availability, on the one hand contributed to the initiation and acceptance of OE-projects and activities, while the on-plant assignment on the other hand, promoted the knowledge transfer of the methods and the motivation of the respective plant staff. While, for example, the plants in Spain and Finland hardly used any support from the group team, the plants in Germany, Italy and France made more frequent use of this option.

In the last three mentioned plants, the interviews showed that the staff benefited from the experience and knowledge of the Packaging Ltd. experts. In the case of the plant in Germany, this included both the technical support by Master Black Belts and leadership-trainings by the person responsible Europe-wide for the OE-programme. Plant staff working with cross-plant staff reported similarly intensive learning conditions as were experienced during training by external trainers or through projects with the local OE-champion. Knowledge transfer from the various projects by OE-experts from the group-team was all the more beneficial the more often the opportunity for on-plant projects was seized.

Construct 8: OE-Packaging Ltd. Support				
Variable 1	Nature and scope of the objectives and support provided by Packaging Ltd. to the plants			
	OE-objectives are neither directly nor indirectly part of the strategic objectives.	OE-objectives are indirectly linked to strategic objectives.	OE-objectives are a comparatively small component of strategic goals.	OE-objectives are part of the strategic goals and part of the respective plant vision.
	❶	❷	❸	❹
Variable 2	Provision of plant-independent OE-Experts by Packaging Ltd. to support OE-projects, training and coaching at the plants.			
	No additional employees and resources are provided by Packaging Ltd..	In an emergency case, additional employees and resources will be provided by Packaging Ltd..	Additional staff and resources will be provided by Packaging Ltd. upon request.	A certain number of employees and resources will be made available by Packaging Ltd. on a permanent basis.
	❶	❷	❸	❹
Variable 3	On-site involvement of OE-experts and Packaging Ltd. responsible persons at the plants.			
	No on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plant.	Rare on-site involvement of OE-experts and Packaging Ltd.-responsible persons at the plant.	Average on-site involvement of OE-experts and Packaging Ltd. responsible at the plant.	Regular on-site involvement of OE-experts and Packaging Ltd.-responsible at the plant.

Table 34: Construct and variables of OE Packaging Ltd. support

3.6.3 Research Methodology limitations

Validity

The validity can be differentiated into internal and an external validity. Internal validity describes the validity of the results for the examined sub-aspects. Other factors that are not raised can play a role, since they turn a supposed failure into an actual success. External validity describes the generalisability of the results. The application of the classical quality criteria from quantitative research (objectivity, reliability and validity) to qualitative research is largely rejected. This is justified by the peculiarities of the qualitative-methodical procedure, the epistemological positions on which it is based, as well as ethical and practical research aspects. The transfer of classical criteria can only be found in isolated cases. For example, reliability assessments are sometimes carried out in qualitative content analysis within the framework of determining intercoder reliability

(Basim et al., 2007). In addition, there is the rather seldom presented position that fundamentally opposes the application of quality criteria to qualitative research.

However, the main focus of the debate is on various proposals and efforts to develop criteria that genuinely relate to the challenges of justifying the validity of qualitative studies. What is discussed here is the attempt to establish method-appropriate quality criteria (Sharifirad, 2011; Song et al., 2009). In this context, specific catalogues of criteria are also discussed with a view to the diversity of survey and evaluation procedures and disciplinary focal points. Individual quality criteria are also weighted differently with regard to their areas of application (basic, applied, evaluation research, etc.).

RELIABILITY

In order for an interested person to be able to replicate the research work exactly and check the consistency of the results, there is the reliability test for quantitative research and the dependability test for qualitative research (Yin, 2009). In the case of research methodology for replicating the study, the research design must be known first, followed by the method for generating the data, and finally the approach to data analysis must be described (Agus and Hajinoor, 2012). The coherence between the design of the outcome and the internal process can thus be assessed by clearly defining the research process. In order to achieve a high degree of reliability for a reliable and valid research result, the case study background and data analysis were described extensively. The reliability of the applied case study is based on the transparency of the possibility of further research. With the critique of results from this research, the reliability can then be increasingly increased through a coherent application approach (Prajogo and Sohal, 2003).

PLAUSIBILITY

Following Van de Ven (2007) and Weick (1982), it is pointed out that validity and reliability checks of a theory or a concept can be misleading at the moment of its emergence, or even impossible. The danger lies in a tautological trap. Therefore, the substitute of validity, plausibility, is used here. Plausibility is the next best option to test a theory or concept after its emergence. It is examined whether the theory or concept is conclusive, whether it meets with acceptance among the participants, whether it corresponds to experience or contradicts it, whether it appears credible and whether it fits into the overall picture, so to speak. Partly, this has already happened through the final feedback loop with the plant managers and OE-champions involved in the research process. The plant- and OE-managers were given the opportunity to question, discuss and comment on the results. The findings were also incorporated into the concept, its constructs and variables.

For the supplementary plausibility check, however, two further sources and thus perspectives will be included in the following to test whether the concept with its constructs and variables captures what it is supposed to capture. The key performance indicators of a plant can support or hinder the implementation of a continuously improving organisation and culture. As outlined in the introduction, two core aspects of an organisation and culture of continuous improvement, Lean audit and Projects, allow staff, in addition to their daily routine of self-organised teams, to adapt and improve the systems and processes of an organisation.

Therefore, there should be a positive correlation between the Lean-audit commitment and the type and number of projects on the one hand and the OE-index on the other. As a result, the plants surveyed were also evaluated in terms of these two aspects and on the basis of data from two other sources. A project-index was used for each plant to evaluate the projects of a plant. This index refers to an evaluation of the Packaging Ltd. project database described before. The project-index is based on the project data of the Packaging Ltd. database. To evaluate Lean-audit-commitment at a plant, a Lean-audit-index was used for each plant, which refers to the results of the Lean-audit. Both indices are described in more detail below and are used to evaluate the plants.

3.7 ETHICAL CONSIDERATIONS

A very important part of any study is the issue of ethics. Discipline and integrity must be taken into account when conducting the study (Bryman and Bell, 2012). The author informed the participants at the eight case-plants in advance about both the purpose of the research and the time involved, and then sought their consent. The interviewees were also informed in advance about the structure and procedure of the questionnaire and its subsequent use. Anonymisation of company names and interviewees was agreed with the company management. The interview took place in the spirit of trust and respect and any questions could be answered in advance. Bryman and Bell (2012) defined four core areas of ethical principles, none of which were an issue while the study was conducted, thus preserving the integrity of the research:

- First area: harm to interviewees
- Second area: lack of consent
- Third area: invasion of privacy
- Fourth area: deception to interviewees

3.8 SUMMARY

The case studies of the eight packaging plants confirm the simple functionality and practicable applicability as a research tool. The individual topics of the research methodology include, on the one hand, the research philosophy, which is described with its two main types, positivism and interpretivism. In this thesis, the author applies the philosophy of interpretivism to take on board the factors influencing KPIs, and on the other hand, the appropriate research approach, which is described, where the eight KPIs used are applied in the case study. In this chapter, the logic of the methodological approach was discussed with regard to the research purpose. The various possible approaches, such as the qualitative or quantitative methods on the one hand and the inductive or deductive methods on the other, were explained, evaluated and selected and a defined design based on the theoretical guideline, was described.

The research strategy section determines the research question, the scope of knowledge, the time required, generally available resources and objectives, thus confirming the chosen research philosophy. A more detailed background description of the packaging industry in general and, in particular, the eight case-plants and their cross-plant aspects is also provided, thus outlining a structure of the research context. The present case was essentially selected for its high relevance and extensive access to the packaging plants. The research design is the logical plan to get from the question to the answer using the method, which, in this thesis is the case study on which the management-model will be built. Since, according to Van de Ven, there are different ways to answer the research question, his four-step phases, the four RPPs, were applied, described and an explanation given on the scope and way to use the replication logic obligatory in case studies. In the data collection section, the list of structured interview questions and the demographic profile of the interviewees were discussed in detail. Under the triangulation heading, the cases and data sources necessary to confirm the validity of the result are listed. After the description and explanation of the Key Performance Indicators (KPIs), the Concept- and Reference-model development, the evaluation of the examined locations based on this and two comparative observations of the eight packaging plants for the plausibility assessment of the results is introduced but also its methodological limits are presented.

CHAPTER 4 RESULTS AND DISCUSSION

The distributed questionnaire (see Appendix A) consisting of 28 questions, each with four answers, was developed by the author to test the case study and verify the conceptual model. The questions with possible answers can be found in Appendix A. In order to test the questions and answers, a pilot survey was conducted with a few people experienced in survey methods before the survey was conducted.

4.1 RESULTS OE-SUPPORT-INDEX

The OE-support index represents the evaluation of the eight case packaging plants along with the previously developed reference model. The plants were evaluated on the basis of the defined variables and their scale from 1 to 4 and then condensed per construct and plant. If, for example, the interviews showed an attitude towards change that was characterised by positive associations, proactive action, opportunities and constructive activities with regard to the willingness to question the status quo, the corresponding variable of the construct of organisational adaptability was rated with the highest value of 4 points. If, on the other hand, fears, risk and persistence were more likely to be evident, the plant was rated with only 1 point.

Following the individual evaluations of all the variables for each construct, the variable values were compressed by using an average value calculation. The results per construct and plant are given in Table 35. If, for example, the construct of organisational adaptability is taken into consideration, it represents an OE-promoting aspect at the plants in Germany, France and Serbia, while it is an obstacle at the plants in Switzerland, Spain and Finland. The average value of the eight constructs was then used to calculate the OE-support-index for each plant, for which the value can lie between 1, extremely obstructive, and 4, extremely conducive.

Construct	Plant (A)	Plant (CH)	Plant (D)	Plant (E)	Plant (F)	Plant (FIN)	Plant (I)	Plant (SRB)
KPI 1	2.26	2.29	3.25	2.28	3.74	1.75	2.04	2.74
KPI 2	2.98	1.00	3.50	1.54	3.99	2.52	1.04	3.98
KPI 3	2.31	3.14	3.31	1.63	3.66	1.84	2.03	3.63
KPI 4	2.34	3.33	2.67	2.34	2.97	1.01	1.34	3.04
KPI 5	3.04	1.52	4.00	1.54	3.96	1.49	2.04	3.96
KPI 6	1.33	2.67	3.33	1.69	3.69	1.04	2.03	2.74
KPI 7	1.34	1.69	2.52	1.19	3.34	1.17	1.52	3.19
KPI 8	2.68	3.04	3.31	2.34	3.34	2.33	3.02	3.34
OE-Index	**2.29**	**2.34**	**3.24**	**1.82**	**3.59**	**1.64**	**1.88**	**3.33**

Table 35: Evaluation of plants investigated by OE-support-index

The plant in France (F) proved to be the plant with an OE-index of 3.59, which, through its internal Context and its method of implementation, has best supported the OE-programme in establishing a culture and organisation of continuous improvement. In contrast, the plant in Finland (FIN) had the lowest score of 1.64.

On the basis of the values, three groups can be identified within the plants examined:

- First group: OE-totally-resistant, with an OE-index value of 1.5 - 2.0 for the plants in Finland (FIN), Spain (E) and Italy (I),
- Second group: OE-partially-resistant, with an OE-index value of 2.0 - 3.0 for the plants in Austria (A) and Switzerland (CH),
- Third group: OE-supporting, with an OE-index value of 3.0 - 4.0 for the plants in France (F), Serbia (SRB) and Germany (D).

4.2 RESULTS LEAN-AUDIT-INDEX

The popular Lean manufacturing has been used for many years by many companies of different sizes as well as by the eight packaging plants studied in this thesis. The five principles of lean manufacturing applied here relate specifically to CI-perspectives throughout the whole plant and also to production. The data for this research was taken from the database of Packaging Ltd. The data extracted contains Lean manufacturing scores reflecting the extent of implementation of the five selected Lean-principles of the case-packaging plants.

Reviewed Lean-principles:

- First principle: Sustaining Continuous Improvement
- Second principle: Managing Continuous Improvement
- Third principle: Building Culture of Continuous Improvement
- Fourth principle: Leading Continuous Improvement
- Fifth principle: Creating a waste free Value Stream

The degree of implementation or fulfilment of the five Lean-principles is shown in Table 36 with data collected after the OE-case study was conducted. For comparative purposes and to better illustrate the improvement, data were also taken before the start of the OE-case study and the out-come compared with that after it was conducted by using Radar-charts (see Appendix C). The almost continuous improvement in all plants and all areas examined visualises the success of the OE-model applied. All of the 29 questions, each with three possible answers, has a minimum score of 0 and maximum score of 4 in units of 2. (weak- (0), medium- (2), strong-linkage (4)). The final numeric scale, i.e., the Lean-audit-index, per column respectively packaging plant is the sum of the individual average

value from the five selected lean principles. The answers to 29 audit-questions, were collected once a year from all eight packaging plants by an external auditor and the author and stored in the database of Packaging Ltd.

CI	Plant (A)	Plant (CH)	Plant (D)	Plant (E)	Plant (F)	Plant (FIN)	Plant (I)	Plant (SRB)
SUST CI	3.8	3.8	3.8	3.4	4.0	3.4	3.8	4.0
MANG CI	3.2	3.6	3.4	3.0	3.8	3.2	3.4	3.6
CULT CI	3.6	3.6	3.6	2.6	3.8	2.0	3.2	3.8
LEAD CI	3.0	2.6	3.3	2.9	3.4	2.4	2.7	3.6
WAST VS	3.4	2.6	3.4	2.2	3.6	1.8	2.8	3.2
Lean-Index	**3.40**	**3.24**	**3.50**	**2.82**	**3.72**	**2.56**	**3.18**	**3.64**

Table 36: Evaluation of plants investigated by Lean-index

4.3 Results Project-index

For estimation of the nature and scope of projects, the project database of Packaging Ltd. was evaluated with regard to certain criteria. Particular attention was paid to whether and which projects were running, whether projects were successfully completed, whether certified Green Belts and Black Belts continued to carry out projects after their certification and whether all areas were involved. In Table 37 the selected criteria for the database as well as their weighting for the subsequent calculation of the project-index per plant are given.

For this purpose, the selected data for each plant were retrieved from the database with regard to the type, scope and number of projects, and standardised in the first step to the number of staff per plant in order to achieve comparability. Subsequently, a ranking of the plants was established for each criterion. These rankings of the plants per criterion are shown in Table 37. For example, value 8 for the plant in Germany (D) of the criterion-relative number (rel. No.) for successfully completed Green Belt Projects (GB-Proj. OK) divided by the number of plant staff (No. Staff) indicates that the plant reached eighth place of the eight packaging plants in this question. Subsequently a weighted, average rank beyond the seven selected criteria on the basis of weightings for each plant was determined. This is shown for each plant in Table 37. For example, the value 4.2 for the plant in Germany means that the plant has achieved a weighted, theoretical average rank of 4.2 among the eight packaging plants in relation to the seven selected criteria.

The number of certified Green Belts (GB) and Black Belts (BB) was not considered when selecting criteria for the project-index, since staff training can be purchased and is already an attribute of the key performance indicator for plant staff. Also not considered was the average duration of the projects of a plant. On the one hand, this could say something

about the quality of the local project management, but on the other hand, a closer look revealed that the projects between the plants were too different and varied for the project durations to be comparable. Nor was it taken into account how many projects were delayed or abandoned. The data recorded in the database for this purpose could be created or manipulated by undemanding schedules. On the other hand, it was evident in the discussions, that it can turn out to be a management strength to stop a project that is not very useful. This circumstance would not be taken into account or contradicted by an overall negative evaluation of the number of abandoned projects.

Criteria	Weighted [%]	Plant (A)	Plant (CH)	Plant (D)	Plant (E)	Plant (F)	Plant (FIN)	Plant (I)	Plant (SRB)
rel. No. BB-Proj. nOK / No. Staff	15	7	6	1	5	4	2	3	7
rel. No. GB-Proj. nOK / No. Staff	15	1	7	4	2	5	8	6	3
rel. No. BB-Proj. OK / No. Staff	5	3	2	8	4	1	2	5	6
rel. No. GB-Proj. OK / No. Staff	5	7	2	8	4	1	6	5	7
BB-Proj. OK / No. BBs	25	8	1	4	7	3	4	2	4
GB-Proj. OK / No. GBs	25	4	2	6	7	1	5	3	8
OE-Proj. div. Areas	10	6	2	1	5	4	6	2	6
Project Index (Avg. weighted)	**100**	**5.3**	**3.1**	**4.2**	**5.5**	**2.9**	**4.8**	**3.3**	**5.8**

Table 37: Evaluation of plants investigated by Project-index

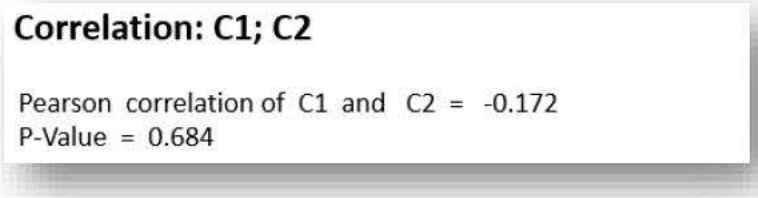
The values of the project-index, which lie between 3.3 and 5.8, as well as the distribution of the individual ranks per criterion show that only slightly dominating plants could be identified in the project-index. For example, the plant in Serbia, with a project-index value of 5.8, achieved the worst rating, but was still able to take second place in two criteria.

4.4 Plausibility Analysis correlation

4.4.1 Comparison OE- and Project-index

In the following, the three evaluations OE-, Project- and Lean Audit-indices are considered with regard to possible correlations. The comparison between the OE- and project-index showed that there is only a very slight correlation. Both evaluations are compared in Figure 8. The correlation between the two indices is negative, which is plausible in terms of content. The higher the OE-index, the lower the weighted average value in the project ranking. For example, the plant in France leads the OE-index with 3.7 points and in the project-index ranking, it is ranked on the weighted average of approx.

third place among the eight packaging plants examined. Looking at the Correlation



Coefficient (

Figure 6) according to Pearson (MiniTab), which is a dimensionless measure for the linear correlation of both interval-scaled characteristics, a value of r = -0.172 can be seen, which can be interpreted as a -17% correlation. The low number of eight data sets further limits the significance at this point and should not be overestimated.

Correlation: C1; C2

Pearson correlation of C1 and C2 = -0.172
P-Value = 0.684

Figure 6: MiniTab Correlation by Pearson all eight packaging plants.

Further consideration makes it clear, that the plant in Serbia is an obvious exception in the consideration between OE- and project-index. This has the second highest OE-support-value but is sixth out of eight places in the weighted average project ranking. This could be due to the unsteady development of the OE-programme at the plant, where some of the key performance indicators such as focus of the initiative, communication strategy and selection criterion of the OE-champion were significantly changed after the start of the introduction phase and shortly before the plant investigation. Although the effects of this change could be taken into account in the interviews and in the OE-index recording, they could not be taken into account to a sufficient extent in the type and scope of projects that followed. If the evaluation of the plant in Serbia were excluded from the overall evaluation, the Correlation Coefficient (Figure 7) would be r = -0.492 and thus nearly 50% correlation between the two indices would increase significantly.

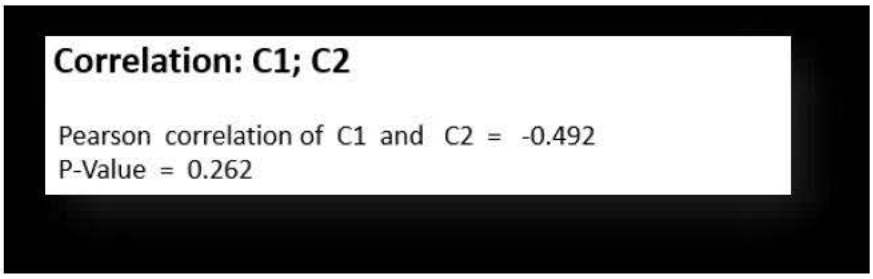


Figure 7: MiniTab Correlation by Pearson exclusive plant Serbia.

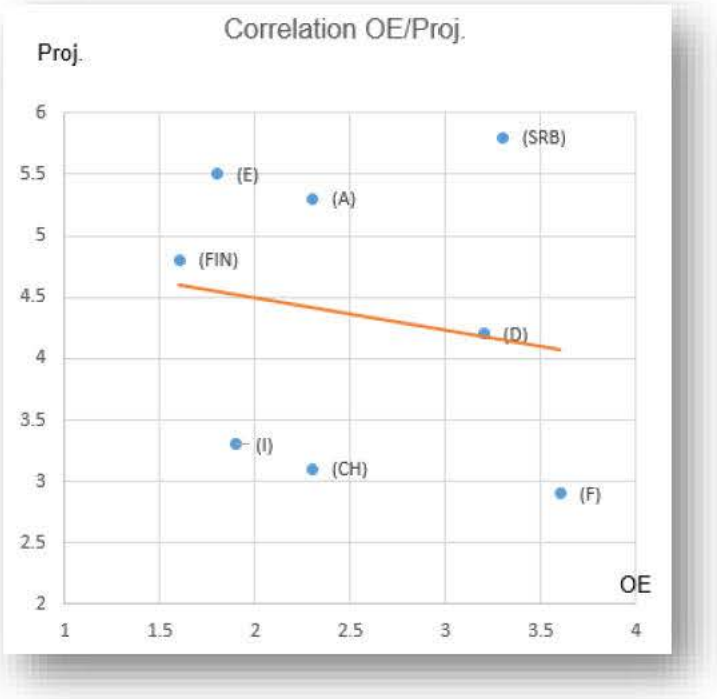


Figure 8: Correlation analysis OE- and Proj.-index

4.4.2 Comparison of OE- and Lean Audit-index

The comparison between the OE- and Lean Audit-index showed that there is a high correlation. Both evaluations are compared in Figure 10.The correlation between the two indices is positive, which is plausible in terms of content. The higher the OE-index, the higher the weighted average value in the Lean Audit-ranking. For example, the plant in France leads the OE-index with 3.7 points and in the Project-Lean-Audit-ranking, it is ranked on the weighted average also in first place among the eight packaging plants examined. Looking at the Correlation Coefficient (Figure 9) according to Pearson (MiniTab), which is a dimensionless measure for the linear correlation of both interval-scaled characteristics, a value of r = 0.782 can be seen, which can be interpreted as a nearly 80% correlation. The low number of eight data sets further limits the significance at this point and should not be overestimated.

Correlation: OE; Lean

Pearson correlation of OE and Lean = 0.782
P-Value = 0.22

Figure 9: MiniTab Correlation by Pearson.

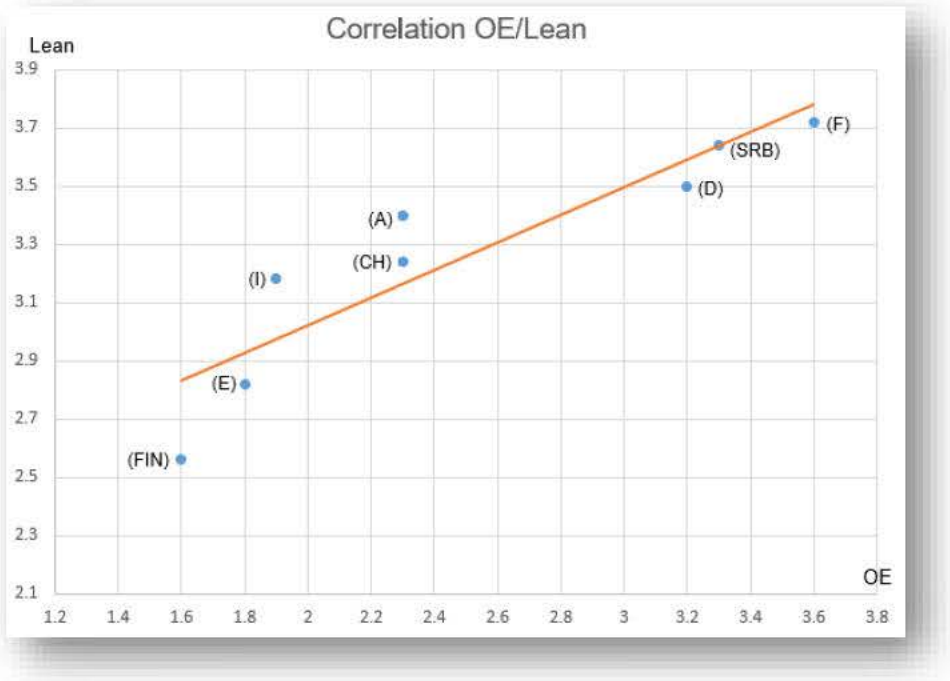


Figure 10: Correlation analysis OE- and Lean Audit-index

4.4.3 Result of Plausibility assessment

Following Van de Ven (2007) and Weick (1982), it is pointed out that a validity check of a theory or a concept can be misleading at the moment of its emergence or even impossible. The danger lies in a tautological trap. Therefore, the substitute of validity, plausibility, is used here. Plausibility is the next best option to test a theory or concept after its emergence. It is examined whether the theory or concept is conclusive, whether it meets with acceptance among the participants, whether it corresponds to experience or contradicts it, whether it appears credible and whether it fits into the overall picture, so to speak. Partly, this has already happened through the final feedback loop with the plant managers and OE-champions involved in the research process. The plant- and OE-managers were given the opportunity to question, discuss and comment on the results. The findings were also incorporated into the concept, its constructs and variables.

For the supplementary plausibility check, however, two further sources and thus perspectives will be included in the following to test whether the concept with its constructs and variables captures what it is supposed to capture, the KPIs of a packaging plant, which can support or hinder the implementation of a continuously improving organisation and culture. As outlined in the introduction, two core aspects of an organisation and culture of continuous improvement, committed staff and projects, in which the staff, in addition to their daily routine of self-organised teams, adapt and improve the systems and processes of an organisation. Therefore, there should be a positive correlation between Lean-indices and the type and number of projects on the one hand and the OE-index on the other. As a result, the plants surveyed were also evaluated in terms of these two aspects and on the basis of data from two other sources.

A project-index was used for each plant to evaluate the projects of a plant. This index refers to an evaluation of the Packaging Ltd. project database described before. The project-index is based on the project data of the Packaging Ltd. project database. To evaluate Lean-commitment at all eight packaging plants, a Lean-audit-index was used for each packaging plant, which refers to the results of Lean-audit from the Packaging Ltd. database. Both indices are described in more detail beforehand and are used to evaluate the packaging plants.

4.5 MODEL-REFLECTION AND -IMPLICATION

In this sense, the right question before an OE-production system introduction is not that related to identifying suitable methods, but rather that related to understanding the overall system: understanding instead of copying is the idiom often used for this purpose. Successful optimisation therefore first defines the sense and purpose of using OE-production methods. This then leads to the correct design of the company's own production system in order to achieve the previously analysed and defined corporate goals. Only with such a strategy, based on clearly defined company goals, can the design of a production system be derived for successful use.

Once the right methods have been identified, the question arises as to the sequence in which methods or tools are to be optimised. In reality, the path is often taken via trial and error and thus an approach to a suitable implementation strategy is achieved via learning effects. The technical literature remains unclear on the question of introduction strategies and optimisation sequences and differs in its statements regarding generally valid introduction strategies. Specific different starting situations of companies are not dealt with. This is the starting point of the present thesis. A model was presented, which enables a decision support for the choice of the suitable optimisation strategy for OE-production, based on the interactions of its individual methods and the initial situation of an enterprise.

For this purpose, the essential interactions between OE-production methods were determined within the framework of an extensive literature analysis and the findings were mirrored and expanded with expert interviews. With the help of this model, it is possible to define different starting situations of companies and on this basis to compare different optimisation strategies in their effect on the target values. The present model offers the possibility to simulate the influence of the different methods of the OE-production on the defined target values. In particular, it is suitable to model and determine the effects of the introduction of the overall system on key target variables. With the help of the model, it is also possible to simulate the effects of individual methods on the target variables. However, the results depend on the interactions determined within the framework of literature research and interviews.

Similarly, corresponding indications from experience with the introduction of OE-production systems that have already taken place can serve to quantitatively concretise the alternating effects. Thereby at least the threshold values and the mutual support factors should be worked out. Ideally, separate thresholds and support factors would be defined for each identified interaction. With the help of a model described in this way, the accuracy of the results and thus also the possibility of deriving deeper insights and making interpretations could be improved. One of the most important extension possibilities of the model is the consideration of methods that go beyond CI-methods. In addition, for example, the introduction of the methods or their intensity, with which the introduction can be worked on, must be linked to the maximum available employee capacity.

If the annual increase of all methods should require too much capacity in total, the model would have to offer a possibility of intervention that initially prevents the continuation of individual methods until sufficient employee capacity is available again. The adaptability of production structures, the suitability of products for series production or structural deficits in existing plants could also be taken into account. Despite limitations, the present model is the first scientific work to offer indications for quantifying the effects of introducing an OE-production system, which are often described qualitatively but have never really been measured, in a procedure that comes close to reality. In particular, different introduction strategies can be compared, and their effects evaluated. This allows an analysis based on mathematical methods of the causes for the positive effects of OE-production to be carried out. This, in turn, leads to a better overall systemic understanding of OE-production, which is a prerequisite for the definition of efficient optimisation strategies.

4.6 CONCLUSION

It turns out that even with management methods, the right questions come first, then the right goals, and then the right tools and their professional use in the next step. In the

challenge of designing and keeping a plant or parts of a plant competitive and viable in the long term, all those responsible always act over different time periods. On the one hand, day-to-day business must run in a routine, on the other hand, long-term viability must be ensured. It is crucial for successful long-term strategies that organisations do not lose any relevant key competences and resources in the case of short-term efficiency and effectiveness measures.

OE therefore extends beyond temporary market changes and company phases in terms of its impact and shows itself to be a dynamic and continuously maintainable capability of an organisation. In a volatile plant environment, it makes it possible to be both a competitive leader and highly profitable. Strategy implementation, workflows, plant processes and management control can be made more efficient and effective using proven OE-methods. With the mentioned OE-instruments, it is possible to systematically target objectives such as achieving market leadership. Long-term corporate structure and current day-to-day business can be successfully aligned with optimised corporate strategies.

On the one hand, this demanding task requires a well-positioned management team that keeps an eye on all processes in the plant. On the other hand, a structured presentation of the business processes is required in order to achieve the highest possible transparency and control competence. In addition, operational performance needs to be constantly improved. Moreover, it is often indispensable to use different tools and methods simultaneously to optimise business and plant processes and to keep an eye on the interaction of different projects in parallel. Effective OE requires a corporate culture that is characterised by permanent willingness to change, striving for quality in all areas and company-wide transparency. It is not present in all companies from the outset. This culture does not focus on people verbally, but in real terms, and is supported by a leadership in which change is a living will. Top management speaks with one voice. Differences of opinion are discussed, but not carried out. Employees talk, take responsibility and make decisions. They keep up to date with tailor-made training measures and receive daily support and feedback from their superiors.

In this way, motivation, creativity, personal responsibility and willingness to perform are strengthened. Performance-oriented remuneration systems complement the efficiency culture. Successes are recorded on the basis of defined KPIs, which give each individual employee a clear orientation and can be directly influenced by him. OE enables plants to continually reposition themselves in line with the market and to improve business processes strategically, economically and in a customer-focused way. Since the market environment is changing ever faster, the OE-approach is by no means comparable to one-off restructuring measures. Rather, the entire value chain of a plant is continuously adapted to the circumstances. Many researchers have devoted great attention to the

development of OE (Found et al., 2018). So there has been a lot of research in the field of OE. In the past, the goals for OE were high and later the results were difficult to evaluate. Often only one economic dimension was taken into account. Little research has been done in the field of effective sustainable implementation of OE at the plant-level. No papers at all were found in the business area of the packaging industry. In comparison to all the papers mentioned above, this thesis is the first one to investigate how OE-implementation can be modelled after several years of application and improvement. The shortest period of time considered was a plant with only five years' OE; all the other plants had already practiced OE for up to a decade.

4.7 SUMMARY

This has chapter attempted to describe, based on the KPIs, the concept-development of an OE supporting organisation. The core of the concept is a reference model with the help of which organisations can evaluate the degree of OE-support via an OE-index. Additionally, for estimation of the nature and scope of projects, the project database of Packaging Ltd. was evaluated with regard to certain criteria. The cases show how eight different multinational packaging plants organise their implementation of operational excellence and how they allocate the appropriate resources at both company and plant level. The cases are based on an iterative process during the research conducted and on different data collection methods. According to Voss et al. (2002), the reliability of the data is also increased when multiple data sources on the same phenomenon are used. For the present research, a multiple case study design was chosen with a single unit of analysis, with eight cases in eight different packaging companies. Since multiple cases address the same issue more intensively, multiple implications can be drawn from the analyses. Particular attention was paid to whether and which projects were running, whether projects were successfully completed or not. With the help of this reference model, the eight case companies were examined. The results were compared (triangulated) with data and facts from the internal Project- and Lean-Audit-databases of Packaging Ltd. The results show that there are plausible connections between the three considerations.

CHAPTER 5 FINDINGS AND CONCLUSION

5.1 ANSWERING THE RESEARCH AND SUB-RESEARCH QUESTIONS

In the following, the results of the research-question (RQ) raised in the chapters before, and its sub-research-questions (SRQs) will be examined. Since the sub-research-questions are prerequisites for answering the central research-question, they will be considered first.

5.1.1 SUB-RESEARCH-QUESTIONS

In order to answer this central question, the following sub-research-questions (SRQs) need to be answered as well as, according to Giddens (1997), the relationship between the actions of knowledgeable human actors and the structuring of social systems.

SRQ 1: WHICH KPIS CONTRIBUTE TO THE SUSTAINABILITY OF CI AT THE CASE COMPANIES?

With regard to a management model for OE-initiatives, SRQ 1 refers to the Content and What?-questions of a programme. The Continuous Improvement concept examines the Content-background of new OE-programmes, which are used in Packaging Ltd. plants. It could be shown that these programmes are conceptually a combination of the proven TQM- LP- and WCM-concepts. Already, TQM, LP and WCM were approaches which were not without overlaps. The conscious integration and combination of these existing concepts, on the other hand, distinguishes OE-approaches that are more recent. In the following Table 38 Content-elements of newer OE-initiatives are listed.

The OE-programme of the Packaging Ltd. organisation examined before contains elements from all three dominant CI-approaches. From the TQM-approach, for example, methods for Process control and Process management were transferred into the OE-concept. The Content-elements Set-up time reduction, Kanban control, Process control and Process management, and Flow principle of the OE-initiative of Packaging Ltd. can be assigned to the LP-approach. The OE-mission and the OE-programme are borrowed from the WCM-approach. Thus, the Packaging Ltd. OE-programme under review is representative of CI-programmes for the younger generation.

Content-Elements	Description
Total Quality Management	Stringent use of Process-management-methods, Quality-oriented & long-term Supplier-management, Formalized, quality-oriented Top-management-leadership, Continuous analysis & alignment of the activities with customer requirements, Clear Process-definitions for cross-departmental design of products & services, Introduction of Quality-control-loops on the basis of quality data & reporting structures.
Lean Production	Kanban-control, Design for Assembly, Preventive Maintenance, Reduction of Set-up-times, Continuous Improvement-programs, Inventory- & Waste-reduction partnership, Methods for Error-avoidance - Poka-Yoke, Establishment of Standard Operating Procedures, Mixed-model Production-programs & smaller Batch-sizes,
World Class Manufacturing	Analysis of strategic priorities for production, TPM, TQM and LP as a bundle of methods with interactions between them, Simultaneous tracking of improvements in quality, lead time, costs and flexibility.

Table 38: Content-elements of newer OE-initiatives

SRQ 2: What is the influence of the Context-, Process- and Content-dimension of Pettigrew's 3 Dimensions on CM on the KPIs?

SRQ 2 refers to the external Context and Why?-question of the programme with regard to a management model for OE-initiatives in the first part of the chapter and the internal Context as well as the Process and How?-questions within an organisation in the second part of this chapter. The competitive analysis framework according to Porter (1991) was used to examine the competitive environment of packaging companies in detail. This consideration plays an important role, in particular, in the overall understanding of and intention to engage in a strategic change as well as in the question of the generalisability and transferability of the knowledge gained. Changes in competition can be seen as the biggest driving force behind changes in internal organisation. In all five competitive forces according to Porter (1991), significant changes in the established competition laws could be observed. The analysis showed that in the past, innovative products were the key to success in the packaging industry. Due to increasing market maturity in established markets and high market growth in price-sensitive markets, research-based packaging companies came under greater pressure. Efficiency and flexibility became increasingly decisive for successful market positioning. The far-reaching changes in competitive requirements required established packaging companies to find internal answers and launch company-wide OE-programmes. Thus, the external Context factors had an overall influence on the initiations, direction and legitimation of the OE-initiative. The identified influencing factors of the external Context are listed in the following Table 39.

External-Context-elements	Description
Rivalry among competitors	Relocation to low-cost countries, Declining market growth in Europe, High R&D-expenditure and innovation-crisis, Low industry concentration and increasing number of Mergers & Acquisitions,
Threat of new competitors	Growing importance of the price-based plastic market, Market price erosions by plastic, glas and cardboard suppliers, Growing risk of brand entry by plastic suppliers from low-cost countries, High market entry barriers for new, research-oriented packaging companies.
Customers´barganing power	Partnership as the most important selection factor, Lower market concentration among packaging vendors, Development of the packaging market in low-cost countries,
Suppliers´barganing power	Increasing demand for availability and proof of added value, Increasing forms of customer concentration compared to the packaging companies.
Danger of substitution	Potential hazard from plastic, glas and cardboard packaging.

Table 39: Key factors of external Context

SRQ 3: What relationship is there between the Support-, Lean audit- and Project-indices?

In the third chapter, eight keys institutional- and procedural-factors related to local OE-implementations were identified and described using a comparative analysis between the Packaging Ltd. plants studied. Six of the eight identified KPIs related to the internal Context of the plants and are described in Table 40. Two KPIs related to the process of implementation and further development of the programme is described in Table 41. The KPIs had a significant impact on the way OE-implementations were conducted and, on the sustainability, and effectiveness of the related activities. These factors were summarised as Constructs in the reference-model of the OE-supporting organisation and designed to be recordable via variables Table 41: Key factors of Process.

The KPIs from represent the core results of the thesis and, as inhibiting or promoting institutional and procedural aspects in their entirety reflect the degree of support within a plant in the establishment of OE.

Internal-Context-elements	Description
Plant staff	Existingknowledge and lived understanding of the core aspects of OE-programme.
Plant culture	All values, assumptions, patterns of thought and behaviour shared by the plant staff and & their managers, which are responsible for social cohesion, organisational change and the development of the company as a whole.
Plant mgmt. roles	How to support site management to promote OE-introduction.
Organization resources	Integration of the OE-organization into the existing plant-organization.
Organizational adapability	Ability of the plant as a whole to make far-reaching changes from within.
Packaging Ltd support	Type and scope of the objectives and support provided by Packaging Ltd. to the plants.

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Organizational adapability	Ability of the plant as a whole to make far-reaching changes from within.
Packaging Ltd support	Type and scope of the objectives and support provided by Packaging Ltd. to the plants.

Table 40: Key factors of internal Context.

Prozess-elements	Description
Programme mgmt. initiative	The professional way in which project-, programme-management is carried out at a location.
Programme integration	Activities and structures to which the OE-programme must develop links.

Table 41: Key factors of Process.

STRUCTURATION THEORY

Giddens' Theory of Structuration deals with the relationship between the actions of knowledgeable human actors and the structuring of social systems. Giddens distinguishes between social structure and system. As a social system, Giddens sees the totality of social practices, which are reproduced over time and place by the actions of humans. Social

systems are a network of concrete, spatially and temporally socially organised practices and their connections. These take place by influencing social structures and also change them over space and time. By structures, Giddens understands the structuring capacities that bind social practices to the social system. Social systems arise through interaction and action. Anthony Giddens (1997) describes this connection as the Duality of Structure, in which social structures are both the medium and product of actions. As already seen, the structuration process reflects the dynamic element of theory and links social structures and their changes with the conscious and unconscious behaviour of actors. Structuring stands for the conditions that determine the continuity or change of structures and therefore the reproduction of social systems (Giddens, 1997). Analysing the structuring of social systems means examining how these are produced and reproduced in interactional contexts. Reproduction takes place in a reciprocal effect between discursive and practical consciousness, and the subconscious and thus between social structures and free will.

5.1.2 RESEARCH-QUESTION

Research-question: What should a management-model for the effective and sustainable implementation of an Operational Excellence Initiative at plant level look like for a packaging production organisation?

If a management model wants to present and understand an OE-programme as a strategic change and give design recommendations, then, according to Pettigrew (1987), it must also consider the partial elements of a strategic change as a whole and in their contexts. The model shown in Figure 11 refers to this finding and condenses the results of the present thesis into a management-model developed for OE-initiatives. The model contains the external Context- and Content-elements as conditioning of change, the internal Context- and Process-elements as areas of action and design as well as considerations of Structuration Theory as mechanisms and dynamics of change. In order to understand the external Context- and Content-elements of an OE-programme is essential to bear in mind the Why?- and What?-questions as relating to the direction and legitimation of change. This understanding is fundamental and absolutely necessary and therefore requires descriptive and explanatory statements but does not fall within the scope of corresponding initiatives and does not require any formative statements. In particular, established concepts such as TQM, LP and WCM can be used here. The internal Context- and Process-elements that predominate at the plant, however, are influencible and designable KPIs in the guidance and further development of an OE-initiative. These were questioned in more detail by the sub-research-questions in the case of Packaging Ltd. and the eight case plants. As a whole, the eight key performance indicators of these two elements identified in this thesis define the degree of support or

resistance of a plant in the strategic change towards an organisation and culture of continuous improvement. They represent the primary area of action and design in the establishment of an OE-programme.

The reference model developed in the previous chapter provides the basis for the acquisition and evaluation of organisations and the derivation of recommendations for action and design. The dynamics and mechanisms for the overall view, for the change process, for the duality of change and for the channels of change derived from the Theory of Structuration of Giddens help in understanding and predicting correlations beyond individual key factors during the introduction and in using them for the change and leadership of an OE-initiative. These describe and explain how and why institutional and procedural key performance indicators influence defined Content and given external Context. The management-model is shown in the following Figure 11.

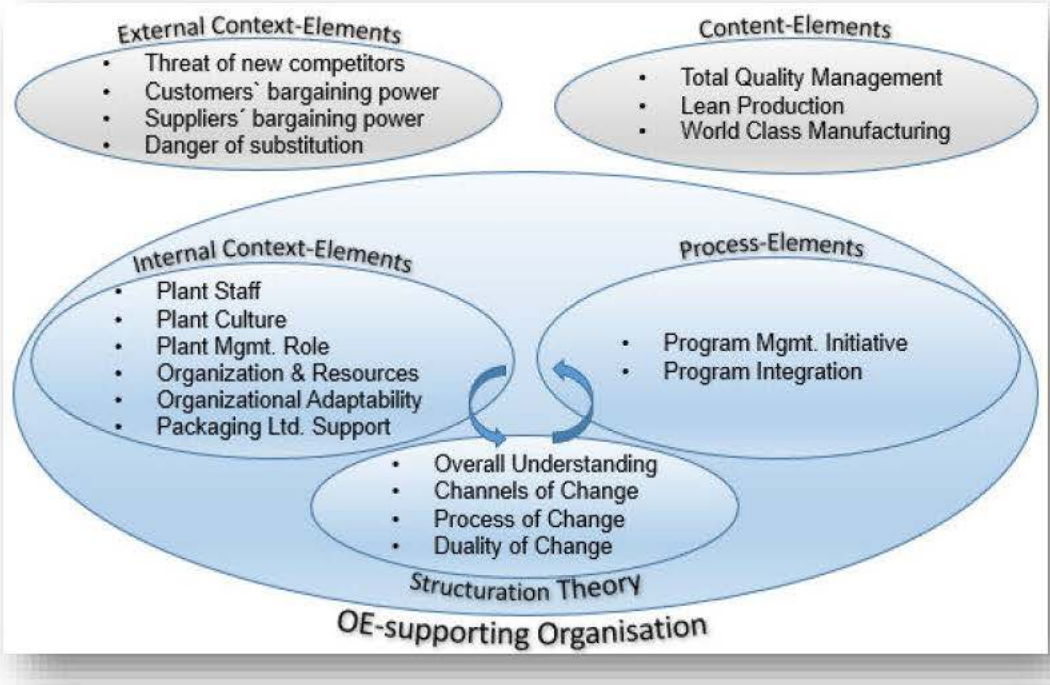

Figure 11: Management-model for OE-initiatives

5.2 CONTRIBUTION TO PRACTICE

In addition to the direct contribution to Packaging Ltd., this work provides a further company-independent contribution to the design, management and further development of OE-programmes in practice. The practical contribution is measured in particular by the benefit of the findings on the design, control and further development of complex, open and socio-technical systems. The contribution of the present thesis lies, in particular, in the Reference-model of an OE-supporting organisation developed in the previous section and its embedding in a management model developed for OE-initiatives. These models

can be used as decision aids for the following practical questions in terms of the design, governance and further development of OE-initiatives:

- Identification and analysis of external Context-. and Content-elements as conditionings of OE-initiatives
- Identification, analysis and evaluation of internal Context- and Process-elements in terms of their inhibitory or facilitating effect on the establishment of OE-programmes
- Derivation of recommendations for action with the help of a reference-model for the design of OE-promoting Context- and Process-elements
- Basic understanding of the connections between established Management- and Working-methods, the OE-methods used for organisational change and the actors acting within them

5.3 CONTRIBUTION TO SCIENCE

The value for science lies in particular in the differentiated consideration of the connections between Content and the internal Context of establishing an OE-programme on the basis of a comparative case study-analysis. The research design was able to prove that despite an identical external Context and identical programme content, the implementation of the OE-initiative at the respective plants was very different. Six factors from the internal Context of the plants were identified as key performance indicators, as well as two factors from the introduction procedure, which had a significant influence on the effectiveness and sustainability of the activities.

In addition, the existence and effectiveness of corresponding key performance indicators showed that the process of establishing an organisation and culture of CI can only be partly determined by Content and that this process is massively influenced by internal Context and implementation Process-factors. This massive influence also makes it clear that a simplified understanding of behaviour following a structure, as it is subject to Structure-behaviour-determinism, is insufficient for an explanation. With reference to Giddens' Theory of Structuration it was shown that more integrative perspectives on these so far little researched interrelationships offer better descriptive and explanatory power (see Appendix D).

5.4 RECOMMENDATIONS FOR ACTION

Leaders and middle managers in the eight investigate factories can review their organisational culture, leadership approach, performance measurement and retention

strategies. The author recommends the following strategies, identified in this study, for leaders and middle managers but also shopfloor.

(a) Establishing an employee-centred and participative organisational culture, with the following elements: support of top-, middle-management, leadership, create support structure and performance-based rewards and recognition for shopfloor.

(b) Practicing staff-oriented leadership that creates a healthy, safe, and friendly working environment and values staff, apply situational leadership style, promote staff ownership, empowerment and results-based accountability and create open communication.

c) Introduction of a performance management system with continuous improvement and elements of competence.

(d) Promoting staff's engagement through their commitment, trusting relationship and reassurance.

The KPIs defined in the study are scalable and transferable. Even though the study was conducted in the packaging industry, the strategies and findings may be transferable to leaders in any industry. If a company identifies a gap in OE- and CI-improvement implementation or performance, middle managers could adapt these strategies. This can successfully implement change and improve productivity and profitability.

Integrating all the strategies that leaders can use improves shopfloor staff engagement and increases organisational performance and profitability. According to de Waal and van der Heijden (2015), there are strong and significant correlations between all dimensions of performance management and the factors of a high-performing organisation.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

In connection with continuous improvement, OE is a headline to an extensive but not a new topic. As is well known, the basic aim for any plant in the packaging industry is to generate profit and thus offer added value to both customers and potential stakeholders. For the eight packaging plants analysed, small improvement actions to improve OE have emerged:

- First possible action: to define responsibilities more precisely
- Second possible action: to visualise process areas in more detail
- Third possible action: to implement additional communication channels
- Fourth possible action: to promote a management system with a deeper understanding of OE
- Fifth possible action: to deepen OE-culture throughout the plant

With the realisation of these small steps, some ongoing fundamental problems could be addressed and eliminated in the medium term. It would also be interesting to investigate what challenge an Industry 4.0-perspective has on OE and whether it is able to keep up with the new technology. Since it is not only the eight packaging plants that are equipped with and guided by data, but those with the earliest possible application will also create a competitive advantage for themselves, as other new revenues and value creation become possible through a new or expanded business model. Furthermore, an OE-investigation would be interesting to see whether advantages could also be generated through monitoring. In the eight packaging plants examined, it was found that strategy and monitoring do not always conform and thus information about operational capability and efficiency can be missing.

On the other hand, it would also be interesting to investigate whether monitoring that is too precise slows down or even prevents OE, since it means that the required numerical targets or metrics in general lose sight of the big picture. What the research on the investigated eight packaging plants also showed was that CI on OE is only achieved and further developed in the plant if the OE-values of the plants are understood and more importantly lived. An interesting study could also be the general investigation of the extent to which the organisational changes influence the employees individually and the company efficiency as a whole and the possible positive or negative effects of these influences.

5.6 RESEARCH LIMITATIONS

The answers to the questions asked and the case study-analysis in general showed that the external Context of the initiative on the strategic role of production had a significant influence on the initiation of the OE-initiative. Only eight packaging plants from different European countries were selected for this case study research. It can therefore be assumed that the results will most likely be similar in other similar packaging plants as the core contents of the OE-programmes are usually comparable. However, it must also be clear that a different outcome may be possible for other companies in other fields with different Content-, Process- and Context-perspectives.

However, since the empirical research confirms the theoretical background of this research and a consensus is visible, a generalisation can be assumed. The consideration of complex situations with the Content-Process- and Context-perspectives in the field of OE, where an understanding of human behaviour in relation to the subject must be assumed, was the aim from the very beginning. In general, case studies are suitable for studies on organisational and administrative processes, with the aim of obtaining a comprehensive understanding of the situation. This reinforces the choice for quantitative, comparative case study-research.

5.7 CONCLUSION

This chapter thus describes the design of an abstracted OE-model to serve as a basis for discussion of practice-related challenges and solutions at different organisational levels and to reduce overall complexity. Case studies were used as a research method to answer the How?-question, thus resulting in high validity among practitioners with an exploratory purpose (Yin, 1984). The use of this management-model was demonstrated within the cases. In doing so, the eight case studies have confirmed the practical applicability and functionality of the model to describe an OE-support unit. The model also contributes to improving reality by fostering discussion and a better understanding of how to design an OE-support-unit as well as how to organise an OE-initiative. It is important to describe the characteristics of the packaging industry to better understand the chosen empirical context of the case studies. Certain regulatory requirements or process validations may make changes more difficult than in other industries. Consequently, continuous improvement activities need to be considered.

In the quest for a useful management-model for designing, steering and further development of OE-initiatives, a comparative case study analysis at eight European plants of a leading global packaging company provided new insights into the influence of internal Context- and Process-aspects. The unique research design based on 70 individual interviews per plant with the research team of scientists and practitioners identified six key factors (KPIs) in the internal Context and two key factors in the implementation Processes. It could be shown that despite the company-wide introduction of standardised OE-contents, the eight identified key performance indicators had a massive influence on the actual design of the initiatives at the plant. A literature search, however, showed that existing CI-concepts usually focus on Content, while internal Context- and Process-aspects were neglected as key factors in their considerations.

Based on these findings, a reference model was derived for the recording, analysis and evaluation of plants with regard to their OE-support in the internal Context and Process. The subsequent evaluation of the eight plants examined using this Reference-model and data triangulation between the internal project database and a study on employee engagement showed plausible correlations between the results. Understanding the introduction of an OE-initiative as a strategic change, the findings were finally condensed into a management model. This management model for OE-initiatives captures the external and internal Context, the Content and the Process of an OE-initiative holistically. While the external Context and Content in this model represent conditions, the integrated reference model and a theory of change serve as a structuring process, a tool for action and design.

As a contribution to science, additional findings have been found from the internal Context- and Process-aspects gained in the establishment of an organisation and culture

of continuous improvement. It could be shown that these usually have a considerable influence and that changes do not necessarily have to be guided by the specification of content. In addition, the case study-analysis showed that the OM's dominant understanding of the relationships between social structures, such as management approaches, practices and methods, and the individual behaviour of actors on the basis of Structure-behaviour-determinism is insufficient in terms of its explanatory power. Based on Giddens' Theory of Structuration and the findings of the present comparative case study-analysis, it was shown that there are considerable interrelationships between established modes of leadership and behaviour, selected management approaches, practices and methods as well as the individual behaviour of actors, which reveal a process of structuring when changes occur. It is relevant that future research in the area of OE should concentrate on the research directions explained in the thesis in view of the findings.

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APPENDICES

5.1 APPENDIX A, QUESTIONS OE

5.1.1 OE-KPI 1 CONSTRUCT FOR PLANT STAFF

- How would you evaluate the percentage of employees trained in OE-methods at a given location?

① Training of individual specialists in preparation for projects.

② Training of less than 50% of employees.

③ Training of 50-80 % of employees.

④ Training of 81-100 % of employees.

- How would you evaluate the understanding of OE as a cross-departmental initiative and experience with self-organised project teams to solve cross-departmental problems?

① OE is understood as a purely production-oriented programme.

② OE is understood as a programme focused on production and adjacent areas.

③ OE-programme is used in almost all areas.

④ OE is applied in all areas and is directed at the entire site.

- How would you evaluate the understanding the OE-initiative at the manufacturing level and identify manufacturing personnel with the programme?

① OE is understood as an expert programme. Employees hardly identify with the initiative.

② OE is understood as an expert programme in which production employees are needed to obtain information and implement it.

③ OE is understood as an expert programme in which manufacturing employees are used as a source of ideas and change drivers.

④ OE is understood as a strategic programme, which requires change regardless of areas and management levels.

5.1.2 OE-KPI 2 CONSTRUCT FOR PLANT CULTURE

- How would you evaluate the nature of interactions, coordination, problem-solving and decision-making processes at the plants?

① Plant is characterised by strict instructions, strong hierarchies and an authoritarian management style.

② Plant tends towards instruction guidelines, strong hierarchies and an authoritarian management style.

③ Plant tends towards open discussions, flat hierarchies and a participative management style.

④ Plant is characterised by open discussions, flat hierarchies and a participative management style.

- How would you evaluate the development of area- and hierarchy-oriented silo mentality and action at the plant, where the primary focus is on one's own interest rather than a process chain of information and material flow?

① Improvements at the plant usually only take place in individual areas and are not assessed on a cross-divisional basis.

② Functional and hierarchical silo mentality and acting at the plant obviously disables interdepartmental improvements.

③ Functional and hierarchical silo mentality and acting now and then represent resistance in projects at the plant.

④ Improvements at the plant are usually made by cross-divisional project teams from the perspective of the overall process.

5.1.3 OE-KPI 3 CONSTRUCT FOR PLANT MANAGEMENT ROLES

- How would you evaluate the degree of direct or indirect involvement of the plant manager in OE-activities and projects?

① Plant manager is hardly personally involved and is informed about the progress.

② Plant manager is involved in the event-driven process and usually receives reports on progress.

③ Plant manager is actively involved and participates in individual OE-activities.

④ Plant manager is actively involved, promotes OE-progress proactively and participates in all important OE-events.

- How would you evaluate the ability of OE-champions to inspire colleagues and drive change forward?

① OE-champion sees himself as a technical expert and attaches little importance to the enthusiasm of his colleagues.

② OE-champion may be interested in the topic.

③ OE-champion can interest colleagues in a topic and initiate changes.

④ OE-champion can inspire colleagues for a topic and drive change forward.

- How would you evaluate the nature and quality of the relationship and coordination between the plant manager and the OE-champion?

① Statements and decisions are mostly contradictory.

② Statements and decisions seem uncoordinated.

③ Statements and decisions are coordinated.

④ Statements and decisions are coordinated and complement each other.

- How would you evaluate the nature and extent of the provision of staff and resources for the preparation, implementation and realisation of OE-activities and-projects?

① Members of the plant management team are not convinced of the OE-programme and provide insufficient staff and resources.

② Members of the plant management team are only partially convinced of the OE-programme. Routine tasks go ahead of OE-activities without restriction.

③ Majority of members of the plant management team are convinced and strive to balance routine tasks with OE-projects

④ Most members of the plant management team are convinced and are actively involved in the OE-programme. They provide personnel and resources.

- How would you evaluate the general understanding of the OE-initiative in middle management of a plant?

① OE-initiative is understood as a method implementation.

② OE-initiative is understood as a method-based improvement project.

③ OE-initiative is understood as a long-term improvement project.

④ OE-initiative is understood as a strategic initiative to improve competitiveness.

- How would you evaluate the average management level for OE-project sponsors?

① OE-project sponsors are members of middle management.

② OE-project sponsors are partly members of the plant management team.

③ OE-project sponsors are majority members of the plant management team.

④ OE-project sponsors are exclusively members of the plant management team.

- How would you evaluate the primary criterion in the identification and selection of OE key individuals such as OE-champion, Master Black Belts and Black Belts?

① Expert knowledge as a decisive selection criterion.

② Expert knowledge as the primary selection criterion.

③ Leadership potential as the primary selection criterion.

④ Leadership potential as a decisive selection criterion.

5.1.4 OE-KPI 4 CONSTRUCT FOR ORGANISATION AND RESOURCES

- How would you evaluate the creation or integration of an OE-champion position within the organisational structure of a plant?

① Integration into an existing position below an area manager.

② Integration into an existing staff position.

③ Creation of a new staff position.

④ Creation of a new matrix position.

- How would you evaluate the design of the OE-position as a 100 % full-time position or as a part-time position with further tasks?

① Part-time job with less than 50% of working time for OE-activities.

② Part-time job with more than 50% of working time for OE-activities.

③ Full-time position with smaller additional tasks.

④ Full-time position with no other duties.

- How would you evaluate additional full-time or part-time positions for OE-activities and projects?

① No more resources.

② Nomination of OE-contact persons in individual functional areas.

③ Creation of further part-time positions for OE-project managers.

④ Creation of additional full-time posts for OE-project manager.

5.1.5 OE-KPI 5 CONSTRUCT FOR ORGANISATIONAL ADAPTABILITY

- How would you evaluate the willingness of managers and staff to question established working methods & structures in a constructive manner?

① Established working methods and structures are hardly questioned and exist for years without significant changes.

② Employees rarely question established working methods and structures.

③ Employees question established working methods and structures in projects and in a constructive manner.

④ Employees regularly question established working methods and structures in a structured and constructive manner.

- How would you evaluate the openness to ideas, principles and methods that are brought to the organisation from outside?

① Executives and employees are sceptical about outside ideas. The exchange of experience with external parties is avoided. The own success past of the location seems to confirm the high-level personnel in this behaviour.

② Executives and employees are sceptical about outside ideas. Opportunities to exchange information with external parties are rarely used. Solutions to problems are almost only sought internally.

③ Managers and employees are open to ideas from outside. To solve problems, exchanges of experience with external parties are also used.

④ Managers and employees are open to ideas from outside. They regularly exchange experiences in order to understand the strengths and weaknesses of their own location.

5.1.6 OE-KPI 6 CONSTRUCT FOR PROGRAMME INTEGRATION

- How would you evaluate type and degree of differentiation and integration of the OE-initiative with other global and local initiatives?

① OE will be positioned as another Packaging Ltd. initiative.

② OE will be positioned as a separate Packaging Ltd. initiative with certain differences to other initiatives.

③ OE will be positioned as a building block of the plant strategy.

④ OE will be positioned as an umbrella concept that bundles various initiatives and aligns them with the strategy.

- How would you evaluate the link to long-term management and employee development at the plant?

① There is no coordination between the OE-programme and the HR strategy.

② OE-trainings can be chosen as part of the training offer.

③ OE-trainings take place with HR support and coordination.

④ OE-trainings are coordinated with trainings for long-term management and employee development.

- How would you evaluate the approach to mediating between OE as a concept and the daily job?

① There is no connection between the OE-programme and the daily job.

② OE is seen as an additional effort to the job.

③ OE is understood as support for the daily job.

④ OE is understood to simplify and improve the daily job.

5.1.7 OE-KPI 7 CONSTRUCT FOR PROGRAMME MANAGEMENT INITIATIVE

- How would you evaluate the focus of the OE-activities on the part of the plant manager and the OE person responsible for changing the organisation?

① Design of the OE-position as a 100 % full-time position or as a part-time position with further tasks. The goal is, to improve individual processes through the professional use of appropriate methods.

② OE is a primarily method- and project-oriented initiative. The aim is to further develop the methodological and analytical skills of individual employees.

③ OE is an initiative which aims to change the attitude and behaviour of employees in the long term on the basis of methodological training

④ OE-activities are both employee and also method-oriented. The aim is to design a culture of continuous Improvement as more strategic competitive advantage.

- How would you evaluate the ability of OE-champions to inspire colleagues and drive change forward? Primary source of project ideas in the OE-initiative from a push process in the organisation to a pull process out of the organisation?

① A separate OE-steering committee, consisting of middle management, is responsible for idea generation and project implementation.

② Identification, evaluation and selection of the project idea and initiation happens exclusively by off-site group employee, the plant manager or the OE-champion. The project initiation happens by a push-process into the organisation.

③ The generation of ideas takes place in management team together with experts from the plant. The implementation takes place under the responsibility of single team members.

④ The generation of ideas happens mostly internally by suggestions of employees. The project initiation happens by a pull process out from the organisation.

- How would you evaluate the degree of professionalisation and standardisation in project management at the plant?

① For OE-projects there is no standardised procedure at the plant.

② For OE-projects there are only minimal requirements for a standardised procedure.

③ For OE-projects there are standardised procedures, which are used by most project managers.

④ OE-projects at the site follow a standardised procedure. Project order, execution and implementation are secured by predefined project meetings.

- How would you evaluate how project ideas are collected and evaluated?

① OE-projects are not collected and started at the plant according to a systematic procedure.

② OE-projects are not collected systematically and are usually started according to informal evaluation criteria.

③ OE-project ideas are collected at the plant and evaluated on the basis of few specific criteria.

④ OE-project ideas are collected at the plant and only started after an assigned benefit analysis or after a business case.

- How would you evaluate the objectives of communication via OE at the plant?

① Communication at the plant serves to pass on information.

② Communication at the plant serves to pass on information and knowledge.

③ Communication at the plant serves the conviction and image building of OE.

④ Communication at the site is understood as an essential element of organisational learning at the plant.

- How would you evaluate the use of the knowledge management systems community-of-practices and the project database with search function?

① Knowledge management systems are not used at the plant.

② Knowledge management systems are used from time to time to find ideas.

③ Knowledge management systems are used from time to time to find ideas and solutions.

④ Knowledge management systems are regularly used to find ideas and solutions. Successful projects are only completed after the documentation has been completed.

5.1.8 OE-KPI 8 CONSTRUCT FOR PACKAGING LTD. SUPPORT

- How would you evaluate the nature and scope of the objectives and support provided by Packaging Ltd. to the plants?

① OE-objectives are neither directly nor indirectly part of the strategic objectives.

② OE-objectives are indirectly linked to strategic objectives.

③ OE-objectives are a comparatively small component of strategic goals.

④ OE-objectives are part of the strategic goals and part of the respective plant vision.

- How would you evaluate the Provision of plant-independent OE-experts by Packaging Ltd. to support OE-projects, training and coaching at the plants?

① No additional employees and resources are provided by Packaging Ltd.

② In an emergency case, additional employees and resources will be provided by Packaging Ltd.

③ Additional staff and resources will be provided by Packaging Ltd. upon request.

④ A certain number of employees and resources will be made available by Packaging Ltd. on a permanent basis.

- How would you evaluate the on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plants?

① No on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plant.

② Rare on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plant.

③ Average on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plant.

④ Regular on-site involvement of OE-experts and Packaging Ltd. responsible persons at the plant.

5.2 APPENDIX B, QUESTIONS LEAN AUDIT

5.2.1 SUSTAINING CONTINUOUS IMPROVEMENT

- What is the current standard of 5S in all areas of the plant and surroundings?

  Maintaining a world-class 5S-programme is vitally important to sustaining any continuous improvement initiative. 5S is at the very heart of what people see and feel and without this cultural bedrock, it is always going to be difficult to sustain any kind of process improvement. However, a vibrant 5S-programme will inspire employees to engage more and more in the lean plant programme. Look for visual evidence that a healthy 5S-programme is in place. The working environment should be clean and clutter free with a high degree of consideration taken for work place ergonomics and visual controls. Area responsibilities should be clearly posted and involvement should be evident. There should be clear evidence that the management team is actively involved in managing a programme that includes all people in a measurable way.

⓪ In your experience the 5S-performance is consistent with a Bronze (50-69%) classification against the standard 5S-audit.

② 5S-performance is consistent with a middle ranking a Silver (70-84%) classification against the standard 5S-audit.

④ 5S-performance is clearly consistent with achieving a Gold (85-100%) classification against the standard 5S-audit.

- How effectively is the plant using Value Stream Map (VSM) to orchestrate and measure continuous improvement activity tied to the business goals and strategy?

  Deploying an effective tool such as VSM is vital to connect the goals and objectives of the business to a plan of continuous improvement. Look for visual evidence that VSM is being actively used to orchestrate continuous improvement activity that is aligned to the plant's objectives. There should be obvious continuity and connection between successive current/future state maps and the increase in the value generated should be clear. Maps should comprehensively include all opportunities across the entire value stream. Consideration can also be given for mapping issues such as environmental impact and energy consumption as a result of the Value Stream.

⓪ There is little or no evidence mapping activity is consistent or linked to business goals.

② Mapping activity is conducted and consistent but still focused primarily on the manufacturing process, or, is comprehensive to include all aspects of the Value Stream but does not cover all relevant products.

④ VSM has been fully integrated into the business and is used to connect the continuous improvement activity to the annual objectives of the business. The Value Stream for all

relevant products has been mapped in its entirety and opportunities have been identified in the supplier-, information-, manufacturing- and customer-loop.

- How effective is the plants Total Productive Maintenance (TPM) programme in driving improvements in Overall Equipment Effectiveness (OEE), or similar, through control of the six big losses, and achieving reductions in maintenance costs?

  TPM is a vital programme that allows us to consistently seek a better demand availability of plants' equipment particularly where are capacity constraints, high maintenance costs or most importantly, safety is compromised. It also allows to engage the workforce in taking ownership in the performance of their equipment. Look for evidence of an effective TPM-system by visually checking the state of equipment, tooling and all maintenance areas. Analysis of reliability data should be used to optimise maintenance task frequency. Assess the level of operator engagement in the TPM-programme through clean and check workshops, metrics ownership and the ability to conduct autonomous process improvements. Clear evidence that TPM activity is having a beneficial effect on increasing capacity where necessary, and lowering maintenance costs. Prove understanding of the six big losses and efforts to reduce their impact should be demonstrated. Consideration can also be given for TPM improvements that have reduced the potential for accidents.

⓪ There is little or no evidence of a sustainable TPM-system.

② Systems are in place because the machines look well cared for and operators have a sense of ownership but there is no clear evidence that TPM is being used comprehensively to drive improved performance.

④ TPM programme is a comprehensive system that links management, operators and machines to improving results in Overall Equipment Effectiveness (OEE) (i.e., unscheduled stoppages, cycle time performance, and quality losses), maintenance costs, safety and accident prevention.

- How effective is the plants Single Minute Exchange of Die (SMED) programme in continually reducing times for critical change over therefore increasing flexibility and reducing minimum run lengths?

  Without doubt, our customers are increasingly expecting more variety in smaller quantities at lower costs, and more often. To survive in this world, we need to be outstanding at performing fast, effective and safe changeovers to minimise our productivity and availability losses. SMED is the key tool to provide this flexibility. Look for evidence that there is consistent management review of changeover performance in all key areas with baselines clear, daily performance monitored and improvement targets set. Assess the level of SMED-activity historically and the plans for the future on all critical equipment.

⓪ There is little or no evidence of a sustainable SMED-system.

② Targeted SMED-activity occurs and the methodology is thorough giving good results, but the overall approach cannot be said to be consistently managed through results monitoring, target setting and SMED-execution.

④ SMED-programme is comprehensive. All key areas are continually monitored for changeover performance or maintenance task administration against standards. Improvement targets are clear for all areas and SMED-events are scheduled for each area within a rolling 12 months. History should show that each key area has been subject to a formal SMED-review within the last 12 months at time of audit.

- How effective is the plant in building capability and deploying 6 Sigma (6σ) to reduce internal and external PPM levels for key CTQ variables and reducing costs with focused improvement projects?

  The requirement for adequate 6σ-capability has never been higher. Many of our processes are now in control and do not suffer from obvious waste so the next big opportunity is around controlling variation. Excess variation creates increased Parts per Million (PPM's) internally and externally as well as making it difficult to position the mean of the process economically and so losing tangible cost saving opportunity on every product we make. Assess the plant's capability to conduct appropriate 6σ-project using the DMAIC process. This does not mean they know some of the tools and may do the occasional Failure Mode and Effects Analysis (FMEA), but they have the true capability to identify and execute proper Six Sigma style opportunities unable to be realised by using more simple tools. Look for evidence that capability is being at least maintained or where necessary a clear plan exists to increase capability through recognised training and certification programmes. Look for evidence that 6σ-project management is effective and statistical methods are used to validate changes, while using control plans to hold process gains. Tolerances on critical process inputs should be defined and input control monitored using Statistical Process Control (SPC). Quality improvements should have led to reductions in the amount of product quality checks.

⓪ There is little or no evidence of a sustainable 6σ-programme.

② 6σ-capability is still apparent but there are limited pure 6σ-activities actually underway. Nearly all continuous improvement projects are of the Lean type rather than 6σ but all Belts can demonstrate they are actively at least using the tools.

④ 6σ-capability has been maintained with further development and training plans identified. The project hopper contains a suitable balance of Lean and 6σ-projects based on the plant’s objectives.

Sustaining CI			
A	What is the current standard of 5S in all areas of the plant and surroundings?		
	⓪	②	④
B	How effectively is the plant using VSM to orchestrate and measure continuous improvement activity tied to the business goals and strategy?		
	⓪	②	④
C	How effective is the plants TPM program in driving improvements in OEE (or similar) through control of the six big losses, and achieving reductions in maintenance costs?		
	⓪	②	④
D	How effective is the plants SMED program in continually reducing times for critical change over therefore increasing flexibility and reducing minimum run lengths?		
	⓪	②	④
E	How effective is the plant in building capability and deploying 6 Sigma to reduce internal and external PPM levels for key CTQ variables and reducing costs with focused improvement projects?		
	⓪	②	④

Table 42: Sustaining CI

5.2.2 Managing Continuous Improvement

- Is all critical performance data captured in a proactive manner including customer satisfaction indicators and employee welfare?

  Capturing the right data in a timely and effective manner to manage continuous improvement is vital to sustain any lean plant programme. It is the bedrock of decision making and resource allocation, and the only way to assess if we are making a difference. Look for evidence that the plant has a consistent set of key performance indicators that embrace all plant operations and balance the needs of our stakeholders. (Corporate & Shareholders, Employees, Customers and where necessary our neighbours & surrounding environment). Assure that the frequency of collection is sufficient to capture out-of-control or undesirable performance trends to take appropriate corrective action. The majority of these KPIs need to be established for more than 18 months at the time of the audit, and be formally visible to management and readily available to all employees.

⓪ Little or no evidence exists of a balanced set of KPIs is available to management.

② Many KPIs exist but they generally relate to process performance and do not consider a balanced stakeholder approach.

④ The KPI set is well established across the entire operation and wholly consistent with a balanced approach to business improvement. The KPI data is formally available to management and readily available for all employees.

- Is all critical performance data subject to formal review and analysis?

  Clearly, there is little point in measuring if we do little with the data. The ability to analyse data effectively and plan the appropriate course of action in a resource limited environment is vital to maximising the value of a continuous improvement programme. Look for evidence that the management deals with performance data in a way that defines plans and action. Assess how consistently performance is reviewed, how the improvements are planned for and the resultant trends in performance.

⓪ Data is collected but there is little or no evidence of regular formal management review.

② Regular data review does happen but it is mainly focused on manufacturing process performance, or, data review is thorough across the entire business but little or no progress is being made in improving trends.

④ Data review is comprehensive and balanced across all plant activity and there is clear evidence of improving trends over a minimum of 12 months at time of audit.

- What evidence is there of effective continuous improvement based on the analysis of critical performance data?

  The final piece of the continuous improvement puzzle is to effectively execute on the improvement opportunities identified. Look for evidence that continuous improvement activity has taken place against a formal plan, i.e., SMED project completed with defined c/o reduction target, derived from inventory reduction programme and cash targets for the year. Look for what ongoing activity is planned for considering the opportunities identified from VSMs or Kaizen activity plans. Test the quality of the improvements that have been put in place. Does management follow a PDCA-methodology or something similar that ensures quality and sustainability of the solution? Have control plans been put into effect or updated to reflect the changes made?

⓪ Little or no evidence that continuous improvement is effectively implemented.

② Good evidence that continuous improvement occurs as planned but sometimes results are poor or un-sustained, or, continuous improvement activity is conducted thoroughly but is mainly focused on manufacturing processes.

④ There is clear effectiveness in the execution of continuous improvement and results are nearly always sustained. Continuous improvement is applied to all aspects of the plant and plans for future improvement activities are clear with resources identified. Reference documents are updated to reflect changes made.

- To what extent has Standardised Work been used to reduce variation in key activity and behaviour?

  The major benefit of adopting Standardised Work is to minimise any process variation caused as a result of people, machines, or inconsistent use of specified methods. It does this in a non-confrontational way that relies on almost zero supervision where every employee can understand the correct way to behave, the right way to do a job, and importantly, when something goes wrong! Assess the level of standardised working evidence against the opportunities you see. The level of standardised work should be evaluated cross the entire plant and the surrounding areas for application and usage or reference. Standardised work includes all elements to create the Visual Factory and by extensive use of 5S techniques. The work practices should correspond to performed activities and be used as training guides for those unfamiliar with the process.

⓪ There is little or no evidence of standardised work, or it can be clearly seen that what is there is being ignored.

② Good application of standardised work but still many opportunities or great evidence but isolated to particular areas such as manufacturing or warehouse.

④ Standardised work is in evidence across the entire operation and the level of compliance is total.

- What evidence is there to demonstrate the root cause prevention of process defects or system failures?

  The absolute prevention of defects or process variation is the ideal situation in many cases. No more costly inspection, no more risky sampling plans and no more activity that only addresses symptoms of the problem. Techniques known as mistake proofing or Poka Yoke are well proven, as are analysis tools such as 5 Whys, Fishbone diagrams and FMEA. Look for evidence that the plant operates with a zero-defect mentality and that the aim is always to design quality into the process. The plant should provide a substantial body of evidence as examples of where root cause has been identified and addressed. Assess the Critical To Quality (CTQ) points of the process and determine the extent that root cause analysis and mistake proofing concepts have been applied.

⓪ Permanent defect prevention is not normally applied in critical to quality areas and the processes are still subject to a high level of visual inspection.

② Effective process control is in place that would automatically prevent defects from advancing in the process, or, effective mistake proofing is applied in around 50% of opportunities.

④ Mistake proofing concepts are applied routinely to prevent defects being created or errors being made. New problems are always investigated to establish root cause and for the opportunity to apply Poka Yoke.

Managing CI			
A	Is all critical performance data captured in a proactive manner including customer satisfaction indicators and employee welfare?		
	⓪	②	④
B	Is all critical performance data subject to formal review and analysis?		
	⓪	②	④
C	What evidence is there of effective continuous improvement based on the analysis of critical performance data?		
	⓪	②	④
D	To what extent has Standardised Work been used to reduce variation in key activity and behaviour?		
	⓪	②	④
E	What evidence is there to demonstrate the root cause prevention of process defects or system failures?		
	⓪	②	④

Table 43: Managing CI

5.2.3 Building Culture of Continuous Improvement

- How is the plant developing its employees to have the correct capabilities to be a successful Lean Enterprise now and in the future?

  Knowledge accumulation and skill development in the right areas is an important ingredient of a continuous improvement programme. The ability to identify and act upon improvement opportunities self-sufficiently will greatly accelerate results. Knowledge levels should be appropriate for the person's position in the business and for what they are expected to achieve in the way of process improvement. Look for evidence that due consideration has been taken for the development of continuous improvement knowledge at all levels and all areas of the business. The capabilities of the individuals should match the continuous improvement plan, or there should be a comprehensive training plan in place to meet these needs in advance of any improvement activity.

⓪ Knowledge accumulation is generally weak with little or no consideration given to developing the right knowledge at the right levels.

② Knowledge accumulation is generally good with clear evidence that the continuous improvement tool box is well understood at all levels of the business. There may be some weaknesses in a few areas but no plan exists to close these gaps.

④ The plant can demonstrate a clear knowledge map for CI and Lean principles across the entire organisation, identifying core competencies for each level in the business.

- How does the plant engage the entire workforce in continuous improvement activity?

  A cornerstone of a true lean plant is its ability to harness everyone in the belief that what they do they can do better tomorrow. It takes a clear system of education and expectation driven by the management team to empower employees to contribute effectively in a continuous improvement programme. Look for evidence that the plant management has effectively communicated the goals of the organisation to all levels of the business and that each individual understands how they contribute and has the capabilities and resources to do so. Engaging them really means they know what you want and they have the capabilities to do it and have taken ownership to get it done.

⓪ There is little or no evidence that employees have an awareness or capability to contribute to the continuous improvement programme.

② Involvement is generally good with a clear commitment from management to regularly communicate goals and performance. Sometimes expectations are not clearly defined or systems are not in place leaving employees unsure as to the correct course of action.

④ All employees are actively engaged in continuous improvement. They understand what is expected from them and are clear about how that contributes to the business objectives. Regular appraisals are conducted for all employees and specific elements of continuous improvement are agreed as targets.

- To what extent is the plant encouraging autonomous process improvement teams to work in a Kaizen-manner?

  A well proven methodology of harnessing the power of team work is known as Kaizen. With appropriate facilitation, a group of employees are urged to work on a known process problem they are all familiar with but have not yet solved. The Kaizen is a high impact and focused event that not only solves chronic process problems but also builds strong teams and ownership as a result of this shared experience. Assess if the Kaizen methodology is understood by the management team and look for evidence that Kaizen is being applied to solve opportunities such as process problems, quality issues, clean and check TPM, change over reduction SMED events, 5S-improvements, Safety issues etc. Autonomous means that the employees have a responsibility for identifying and acting upon improvement opportunities without always relying upon management's explicit direction. All employees should participate in at least one formal Kaizen per year.

⓪ There is little or no evidence that Kaizen-principles are understood or applied by the management team.

② There is good evidence that Kaizen is understood but the focus is mainly around production problems when they occur and there is no clear plan to involve everybody in all areas. Quite often, the same people are in each Kaizen.

④ All employees have been involved in at least one Kaizen in the 12 months prior to the audit date, and a clear plan of activity exists for all employees to take part in another Kaizen in the following 12 months.

- To what extent can the plant management and employees demonstrate a "Zero Tolerance to Waste of all kinds"?

  Becoming a lean plant is as much down to the leadership in the plant as anything else. If the management operates with a state of mind that abhors waste of any kind, then this is quickly conveyed to all employees. From turning off lights in empty rooms to picking up products dropped on the floor are ways that management can model the appropriate behaviour. Understandably, this question is not easy to audit objectively as it relies to some extent on the passion displayed by the leadership team on how they view waste. Ask for physical evidence that may reinforce anecdotal evidence, but also be constantly observing people's behaviour at all levels to see if what you are hearing is true. Product all over the floor, dumpsters full of materials, excess electricity being consumed, and waste not being segregated or recycled are all indications that waste is tolerated.

⓪ There is little or no evidence that a passion for eliminating waste exists.

② Waste is not tolerated in the manufacturing process but other areas do not demonstrate the same commitment, or, individual department heads model the correct behaviour but it is not consistent across the business.

④ An abhorrence of waste of any kind is a consistent behaviour of the entire management team. This feeling conveys itself to all employees and physical evidence exists of innovative ways that eliminate waste of all kinds and not just in the manufacturing process.

- How does the plant effectively provide recognition and celebration to individuals and teams engaged in successful continuous improvement activity?

  Effective recognition is one of the best ways of maintaining a healthy and happy environment that inspires people to do more. When we say recognition, do not confuse this with reward, as the psychology is completely different. Recognition should inspire the individual to do more and others to do the same, whereas reward may have certain destructive elements that promote individuality and unhealthy competition. Look for evidence that the plant management is aware of what meaningful recognition is within the culture of the plant and geographical location. Look for evidence that a recognition system is in place that operates equitably and consistently across all employees and

caters for individual and team recognition alike. Assess the sustainability of the system for a minimum of 12 months prior to audit date.

⓪ There is little or no evidence of an equitable system for recognising individuals or team's contribution to continuous improvement.

② Good evidence that recognition is used by the plant management to encourage continuous improvement but it is not always consistently applied.

④ Employees understand that recognition is a key part of the continuous improvement programme. Recognition is always given consistently and equitably, and is valued by employees as being meaningful and sincere. The recognition programme must have been in existence at least 12 months prior to this audit date.

Building a Culture of CI			
A	How is the plant developing its employees to have the correct capabilities to be a successful Lean Enterprise now and in the future?		
	⓪	②	④
B	How does the plant engage the entire workforce in continuous improvement activity?		
	⓪	②	④
C	To what extent is the plant encouraging autonomous process improvement teams to work in a Kaizen manner?		
	⓪	②	④
D	To what extent can the plant management and employees demonstrate a "Zero Tolerance to Waste of all kinds"?		
	⓪	②	④
E	How does the plant effectively provide recognition and celebration to individuals and teams engaged in successful continuous improvement activty?		
	⓪	②	④

Table 44: Building a culture of CI

5.2.4 Leading Continuous Improvement

Formal Best Practice sharing

- To what level is the plant actively participating in formal best practice seeking and sharing?

  Best Practice is a phrase often used and not often actually pursued! However correctly organised and well managed Best Practice sharing is highly effective at dramatically accelerating benefits. It will not happen by chance but only as a result of a managed and monitored system. Assess the level of activity underway in the plant to effectively

identify and implement best practice in all areas of the business. External to plant sources of best practice should also be considered, nor should best practice identification be limited to the manufacturing process.

⓪ There is little or no evidence that the plant actively seeks or shares best practice.

② Good evidence of formal best practice sharing but it is generally confined to manufacturing opportunities, or, opportunities are sought in all areas but there is a lack of a systematic, managed approach to realise its true value.

④ All areas of the plant actively seek best practice solutions in their key processes. If they know they are the owner of the best practice then they ensure that they formally share data and details effectively across all interested parties at least within their sector.

- In all recognised areas, is the plant aware of the benchmark performance, and their own performance gap?

  Most sectors now operate with a standard set of KPIs and as such, opportunity exists to benchmark performance across sites. Look for evidence that the plant is fully aware of the items recognised as suitable for best practice sharing and they are effectively tracking their own performance against the benchmark. KPI performance expectations and achievement are posted in visible areas with current updates showing gap to target, along with identified action plans.

⓪ There is little or no evidence that the plant is aware of any recognised Benchmarks or improvement expectations.

② Benchmarks are clearly identified and the process is understood but there is some inconsistency in the measurement of plant performance against each benchmark.

④ Benchmarks are clear in all cases. Plant performance is tracked consistently against each benchmark and in all cases, the gap is continually calculated and communicated.

- What level of progress has been made to close the gap to benchmark?

  The progress to benchmark should be swift as the knowledge in how to get there should be readily available. However, in our Benchmark-plants it is likely that they are not standing still either and are actively working to improve their own performance. Ideally the gap between benchmark plants and the others should always be closing but this means we must be aggressive or the gap may in fact increase. Look for evidence that significant improvements have been made within agreed timescales to close the gap on benchmark. Consider all recognised benchmarks for progress and derive a score for overall progress.

⓪ Little or no progress has been made to close the gap on any recognised benchmark.

② Progress is steady but slow across all recognised benchmarks, or, progress is excellent in some and behind in others but plans exist to get there in time. An activity plan exists but execution has been inconsistent.

④ All recognised benchmarks are being closed within suitable timescales and a clear plan of activity exists that will guarantee success.

SPONSORING AND LEADING INNOVATION

- How are employees encouraged to think innovatively regarding our products and processes?

  Innovation is an initiative critical to the future of the plant. Not just product innovation but also process innovation. Plant management should actively seek the participation of all employees in contributing innovative suggestions. Look for evidence that plant management actively encourages innovative thought in all employees through a process of education, expectation and recognition. Sessions for exchange of ideas should document potential considerations or opportunities to pursue. Ideas are made visible to employees to promote further generation, collaboration and modifications that may foster a greater success for application.

⓪ There is little or no evidence that employees are encouraged to think innovatively.

② Innovative thinking is encouraged and there is evidence that some formal education and expectation setting around innovation has happened, however it has not reached all employees or lacks some rigour.

④ There is a clear educational programme around innovation and all employees understand the role it plays in plant's future. They understand what is expected from them and there is strong evidence that employees are bringing forward ideas at a meaningful rate.

- How are innovative ideas managed to execution and what is the ratio between raised and executed suggestions?

  Ideas without execution does not constitute innovation. Innovation should be seen as the execution of good ideas that bring us benefit. Benefit in all areas though, like safety, quality environment, energy consumption as well as in our product range or manufacturing process. The effective management of these ideas whether they are good or bad is vital to sustain any system reliant on employee participation. Look for evidence that a robust process exists to seek innovative ideas, filter out the best ideas and implement them. Also, ensure that there is an equally robust system that feeds back information to the originator explaining why an idea is not being considered or reports on the progress of one that is. Assess the level of ideas raised to those implemented, the gap should not be widening. We should differentiate between a standard suggestion scheme and one that is explicitly around innovation.

⓪ There is little or no evidence that innovative ideas are managed in any effective way.

② Good evidence that employees are bringing forward innovative suggestions but, in some cases, they slip through the net and the originator is not sure why.

④ All ideas are logged and tracked to either completion or rejection. Originators are always aware of progress of their idea and in the event of rejection; they are told why in order to reshape their thinking for next time. The ratio between ideas being raised and being implemented is steady and not widening.

ENVIRONMENTAL CONSIDERATION

- Are all major sources of energy consumption monitored, and are they subject to a formal effort to reduce consumption?

  Not only should we be more aware of the environmental impact of our behaviour but we should also recognise that we could actually realise some significant economic benefits by better utilisation of energy. The plant is a significant user of electricity and natural gas and is under considerable operating profit pressure due to steep increases in the price of these commodities. Therefore, an environmental benefit is also a profit opportunity for the plant. Look for evidence that all major sources of energy consumption have been identified and that their performance is understood in terms of relevant consumption units. Look for evidence that steps have been taken or plans are in place to mitigate the level of consumption needed to operate the plant on a like for like basis (i.e., consumption can be normalised against parts produced).

⓪ There is little or no evidence that any activity has been initiated to reduce energy consumption.

② Efforts to reduce energy consumption have begun but plans are in process or not fully developed. There has been no systematic approach established to roll out improvements made to pilot programmes. Only a few employees have been involved in limited areas - programme lacks rigour.

④ Fully developed energy consumption programme is in place and operational. All employees know their role for keeping energy consumption to a minimum and bottom-line results have confirmed the success of the programme.

- Are all major sources of material waste monitored and are they subject to a formal minimisation effort?

  Not only should we be more aware of the environmental impact of our behaviour but we should also recognise that we could actually realise some significant economic benefits by a reduction or better utilisation of our production by-products. We also know that mistakes can be very costly to the environment but also for our bottom line. Look

for evidence that all major sources of waste have been identified and are being actively reduced, re-used or recycled using process re-design, segregation, minimisation techniques etc.

⓪ There is little or no evidence that any activity has been initiated to record or reduce the level of waste by-products.

② Efforts to reduce waste by-product levels have started but roll out plans are in-process or not fully developed. There has been no systematic approach established to extend improvements made from pilot programmes. Only a few employees have been involved in limited areas. There is recognition that a programme exists, but few can describe its operation or impact.

④ Comprehensive material waste minimisation control programme is in-place and operational. All known material wastes are measured and evaluated for reduction potential. Waste minimisation methods have been utilised and programme results have shown significant bottom line savings. Systems, methods and training have made the programme a success.

EMPLOYEE SAFETY

- What evidence is there that the Plant is managing health and safety risks in a proactive way?

To better support all employees with the safe working environment they deserve, we must move from a reactive reporting system of safety incidents to a system that utilises proactive performance indicators. These indicators recognise the input measures of a safety management system, establishing methods to prevent incidents from ever taking place. Being able to eliminate risks and restructure behaviours to avoid unsafe practices will not only benefit the employees involved, but the company as a whole. Look for evidence that all proactive safety measures (risk assessments, management tours, hazard identification, behavioural programmes, near miss reporting etc.) are in place and are being used to reduce the occurrence of safety incidents.

⓪ Reporting of lost time accidents remains the primary method for tracking safety. There is little or no evidence that proactive methods for preventing safety incidents have been explored.

② A few pilots have started to explore proactive safety methods but it is not widespread and only a handful of people have been involved. It is apparent that something is changing but not everyone is aware of her/his role quite yet.

④ A robust programme for safety incident prevention has been established and incorporated throughout all areas of the operations. Employees can describe their role and the changes that have taken place.

- What improving trends can be shown in increased health and safety management?

  Accepting status quo for employee safety levels, where greater than zero, is very unacceptable for the future of the plant. All levels of the organisation are contributing towards practices that drive safety reporting and compliance closer to zero incidents. Look for evidence that safety measures show indications of strong improvement trends. Effective use of proactive safety behaviours, innovative prevention methods, behavioural measures and ongoing training should drive performance at or near zero incidents.

⓪ There have been little or no visible efforts to change the level of safety in the operation.

② Efforts have initiated in a few locations to reduce safety incidents but the programme lacks rigour. People in areas of highest incidents can relate that some changes have been made, but they are waiting for more details and consistency in the overall approach.

④ A structured approach for safety incident prevention has had documented positive impact on safety levels. It is very clear and evident that the organisation is committed to improving safety to the point of zero incidents.

Leading CI				
What improving trends can be shown in increased health and safety management?	A	To what level is the plant actively participating in formal best practice seeking and sharing?		
	B	In all recognised areas is the plant aware of the benchmark performance, and their own performance gap?		
	C	What level of progress has been made to close the gap to benchmark?		
		⓪	②	④
Sponsoring and leading Innovation	D	How are employees encouraged to think Innovatively regarding our products and processes?		
	E	How are innovative ideas managed to execution and what is the ratio between raised and executed suggestions?		
		⓪	②	④
Environmental Consideration	F	Are all major sources of energy consumption monitored, and are they subject to a formal effort to reduce consumption?		
	G	Are all major sources of material waste monitored and are they subject to a formal minimisation effort?		
		⓪	②	④
Employee Safety	H	What evidence is there that the Plant is managing health and safety risks in a proactive way?		
	I	What improving trends can be shown in increased health and safety management?		
		⓪	②	④

Table 45: Leading CI

5.2.5 CREATING A WASTE-FREE VALUE STREAM

MANAGING BY VALUE STREAM

- Has the plant identified all of its Value Streams (VS) and have they identified a suitable owner for the value stream mapping activities within the plant?

  An effective lean plant looks for improvement opportunities throughout the entire VS, by evaluating supplier, operations, support and customer performance gaps, Use of a VS-manager to prioritise and drive projects, Kaisens and business opportunities that yield the greatest return for the plant is essential to attain expected profits. Verify that VSs have been identified for the plant's primary products and that VS-managers have been appointed to lead improvement efforts for key products. Assure that the active projects are tied to the critical KPIs and that results are being tracked to show improvement to a performance baseline. Assess the level of involvement that the VS-manager has had on moving the organisation toward the ideal Value Stream Map (VSM).

⓪ There are still a number of VSs that have not been mapped, and the VS-manager concept has not yet been embraced or considered by the operation.

② VS-managers have been appointed for a few key areas but the process is still being developed for how the structure interacts with others in the organisation. Employees can name who the VS-managers are, but they are not certain as to what their role is.

④ VS-managers have been selected to drive the improvement process for specific products within the lean plant with responsibilities for suppliers, operations, support areas and customers. Results are visible and all involved in the process know their role for reducing waste and supporting ongoing efforts.

- Is there evidence that end-to-end processes are in place that optimise the Value Stream and minimise the influence of functional silos?

  The greatest operating returns come from the most flexible and continuous flow processes. Where activities or production steps need to wait for departmental transfers or centralised, functional approval, significant amounts of waste or cost are institutionalised. Look for evidence that layouts are structured to flow products sequentially through their operational steps and that processes are not waiting for external resources or influences to enable forward movement. Identify plans that have been made or that are needed to further improve flow. The ultimate objective is a waste-free value stream.

⓪ There is little or no evidence that any effort has been made to re-configure layouts or better link processes to improve flow throughout the value stream.

② Some layout changes have been made, but they have been limited in their impact. There are still some departmental boundaries that need to be re-evaluated for more effective flow to occur, including boundaries with centralised functions such as Supply Chain. Plans have been or are being established to improve flow but organisation commitment is lukewarm.

④ The process has been streamlined to reduce waste throughout the flow path. Barriers have been removed that prevented flow from occurring and plant actively works with central and external functions to ensure effective communication has been established to immediately address waste, cost, quality, delivery or service issues.

CREATING A WASTE FREE VALUE STREAM

- Is it possible to demonstrate how the business is working to minimise levels of inventory through the entire value stream?

  Levels of inventory can be equated to the degree of waste or cost reduction potential as it relates to process flow. Movement towards one-piece flow is the ultimate goal for a flexible lean plant. Look for evidence that sustainable improvements have been made to reduce inventory in Work in Progress (WIP) by minimising changeover times, improving quality performance, assuring equipment reliability, reducing batch size, modifying container design, or addressing other operational issues that addressed waste in order to improve process flow. All sources of identified waste should be reviewed for inventory reduction potential throughout the value stream.

⓪ There is little or no evidence that any effort has been made to reduce inventory levels.

② Initial efforts have begun to reduce inventory levels. There are pockets of improvement, but no structured plan for inventory reduction continuity or sustenance. Activities have been coordinated by a few key individuals and controls have not yet been established to hold the gains.

④ Inventory levels have been systematically reduced by isolating the cause of waste requiring coverage and attacking it, to allow for controlled reduction. All areas are involved in contributing towards solutions and sustaining the improvement gains through use of levelled flow, small lot, and use of Pull-, Kanban-approaches.

- To what extent has the plant created "pull" and "flow" along the entire Value Stream?

  One of the primary objectives of a mature lean plant is to produce in strict accordance to customer demand. The suppliers should have the same objective as we work to enable plant-wide supply based on consumption patterns for replenishment. This should similarly be extended to tooling and support materials based on histories of usage. Look for evidence that tact times have been calculated and pull or Kanban systems have been

installed to trigger production based on this usage throughout the production pipeline and sources of supply.

⓪ Traditional methods of scheduling, material movement and reordering are based on forecasts and push strategies. There is little or no evidence that pull system or Kanban strategies have been employed.

② Initial efforts have begun to utilise tact time/pull concepts, exclusively within manufacturing. There are pilots initiated in a few isolated areas, but no structured plan for rollout or expansion has been established. Activities have been coordinated by a few key individuals and controls have not yet been established to hold the gains.

④ Tact time/pull/Kanban approaches have been fully deployed throughout the entire lean plant within virtually all value streams. The work with operational areas, suppliers and customers have embraced flow strategies and re-supply based on consumption. Lead-time to replenish customer inventories can be accurately predicted. Implementation has expanded to tooling, supplies and other areas requiring ongoing replenishment. Visual signals are evident and easy to understand.

EXTENDING VALUE STREAM

- To what extent does the plant involve customers and suppliers to drive improvements to the overall Value Stream (VS)?

  Key customers and suppliers should be considered as essential business improvement partners. Their input on influential items such as product mix, delivery cycles, quality levels, lead times, and performance expectations is vital to establish the boundaries for improvement potential. Look for evidence that key suppliers and customers have been invited and participated within strategic/tactical lean tool implementation sessions or Kaisen to drive improvements and reduce waste within the value stream. There should be identified projects where documented benefits have result of strategic improvement partnerships.

⓪ There have been little or no invitations extended to suppliers or customers to participate in ongoing improvement or Kaisen activities.

② A few selected suppliers or customers have been involved in isolated areas of improvement but initial efforts have not developed into a robust programme of interaction. Discussions regarding next steps have taken place and plans for further sessions are being developed.

④ Suppliers and customers are regularly involved in ongoing continuous improvement activities. There is strong evidence of willing participation and results have confirmed the significance of plant-wide interaction.

Creating a waste free Value Stream				
Managing by Value Stream	A	Has the plant identified all of its value streams and have they identified a suitable owner for the value stream mapping activites within the plant?		
	B	Is there evidence that end to end processes are in place that optimise the value stream and minimise the influence of functional silos?		
Creating a waste free Value Stream	C	Is it possible to demonstrate how the business is working to minimise levels of inventory through the entire value stream?		
	D	To what extent has the plant created "pull" and "flow" along the entire value stream?		
The extended ValueStream	E	To what extent does the plant involve customers and suppliers to drive improvements to the overall value stream?		
		⓪	②	④

Table 46: Creating a waste free Value Stream

5.3 APPENDIX C, AUDIT RADAR CHARTS PER PLANT

PLANT (F) & (SRB)

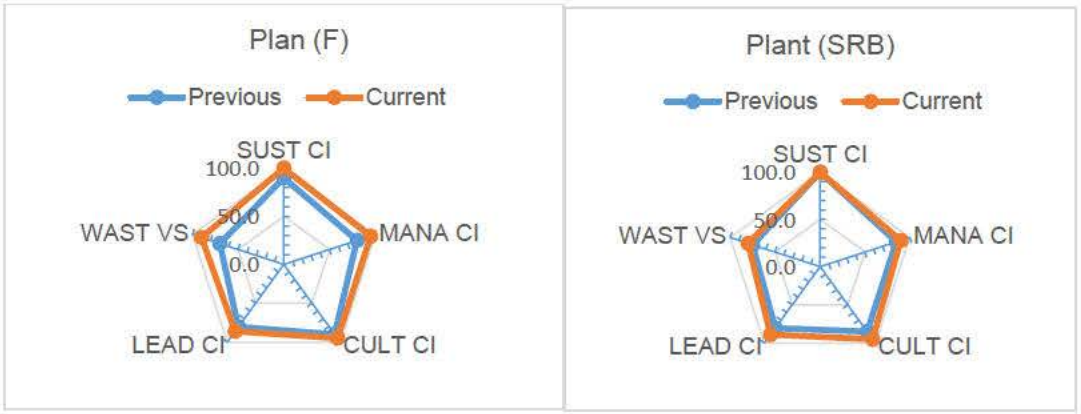

Table 47: Plant (F) & (SRB)

PLANT (D) & (A)

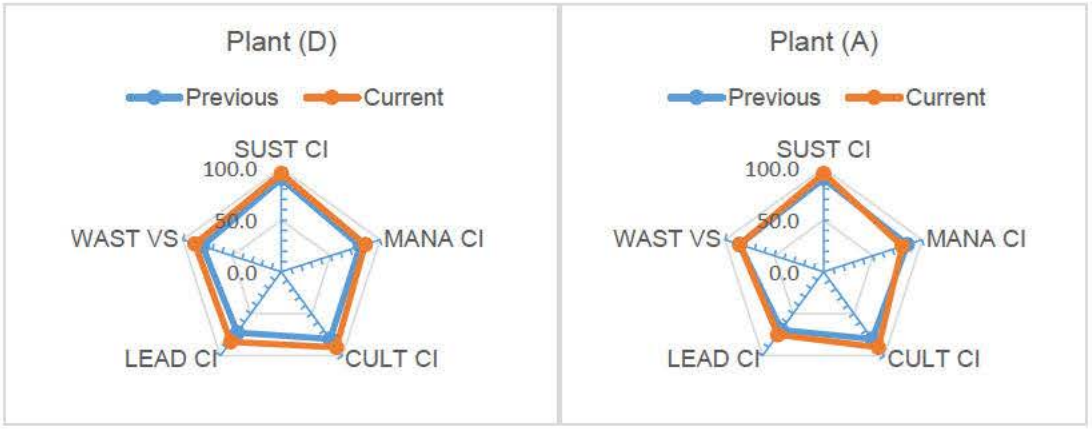

Table 48: Plant (D) & (A)

PLANT (CH) & (I)

Table 49: Plant (CH) & (I)

PLANT (E) & (FIN)

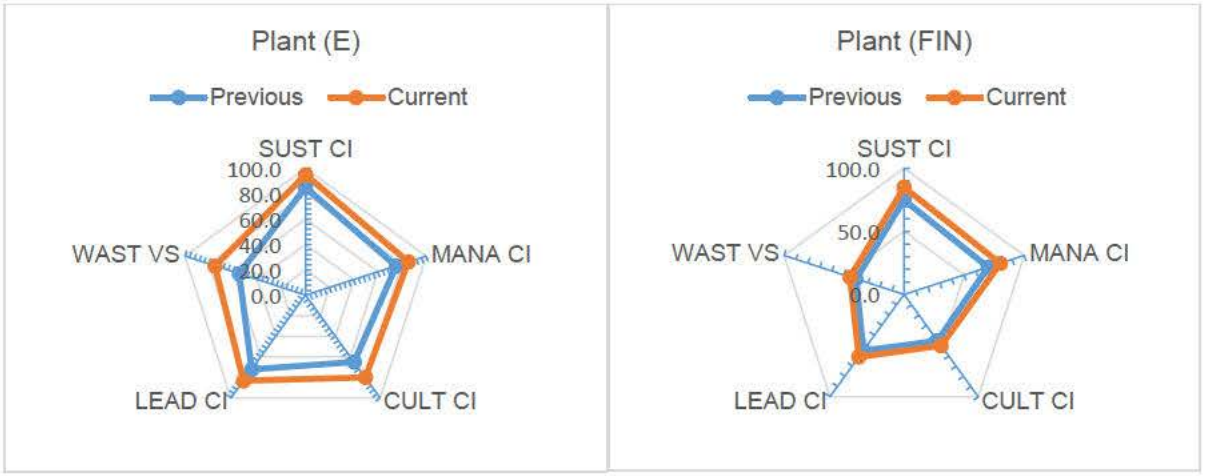

Table 50: Plant (E) & (FIN)

5.4 APPENDIX D, STRUCTURATION THEORY

Four central statements (Table 51, Table 52, Table 53, Table 54) on the structure of routines, systems, actors and social structures can be summarised in relation to Giddens and the OE-initiative investigated (Giddens, 1997).

Statement 1: Overall Understanding	
Structuration Theory	**OE-initiatives**
Social life is an overall view of systems (established routines), social structures and individually acting actors and their interactions. None of these elements completely dominates the others. The system's claim to totality over the individual is abandoned. These are rather under mutual influence and show manifold connections	Operational life is an overall view of established management and working methods (as a system), selected methods of an OE-programme (as social structures) and the actual implementation method (as a result of individually acting and interacting actors). None of these elements can independently dominate the others. The content of an OE-programme alone cannot change an organisation.

Table 51: Statement 1: Overall Understanding.

Statement 2: Process of Change	
Structuration Theory	**OE-initiatives**
Changes take place through a process of structuring between system, acting actors and social structure. Through interaction mechanisms, both systems and social structures are consciously and unconsciously reproduced and do not exist detached from this behavior.	Changes take place through connections between, for example, the dominant leadership style (as a system), the acting actors and the focus of the OE-initiative (as a social structure). The behaviour of the plant manager and OE-champion consciously and unconsciously reproduces both the dominant leadership style and the focus of the OE-initiative and does not exist independently of their behaviour.

Table 52: Statement 2: Process of Change

Statement 3: Duality of Change	
Structuration Theory	**OE-initiatives**
Social structures are at the same time medium and result of the change of the existing system and work through the process of structuring.	OE-programmes can be externally and ideally assigned to an external location (e.g. by the group), but can also be selected selectively by the location and adapted to internal conditions. The OE-contents are therefore both a medium for change and the result of an organisation.

Table 53: Statement 3: Duality of Change as medium and result.

Statement 4: Channels of Change	
Structuration Theory	**OE-initiatives**
The social structures and modalities as change work through different channels, which can be extremely diverse. In the categorization of Giddens, these are signification, domination and legitimation. The channels of change run between cognitive schemata, power, values and norms. In the process, it is not the individual category that counts, but the overall view.	The impact of an OE-programme has many key factors and can include aspects such as the interpretation of a change as an opportunity or risk, the enthusiasm of the OE-champion, the resources available or the way the program communicates. What counts is not the individual key factor, but the overall view of the OE-supporting organization.

Table 54: Statement 4: Channels of Change.