

**A Human Factors view of  
Organisational Change: Shifting  
mindset from success and failure to  
Resilience Engineering**

The thesis is submitted in partial fulfilment of  
the requirements for the award of the degree  
of Doctor of Business Administration  
of the University of Portsmouth

15<sup>th</sup> September 2019

Student No: 753837

Holger Kunzmann

## **Academic Declaration**

“Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.”

Holger Kunzmann – 15th September 2019.

**Word count: 39 468**

## **Acknowledgement**

I am very grateful to a small number of people for making this journey possible, which has started long before I took the decision to engage in a DBA programme. First and foremost, to my parents who provided the preconditions for me to access officer career and university studies. To Anand Krishna, a bright academic mind, and Alex Meehan, a good friend, who have helped me with proof-reading and academic writing in a foreign language.

Personally, I also wish to thank Dr. Manuel Sanchez Cuesta, a professor and philosopher, who not only taught me the Spanish language but also fuelled my academic interest long before I became aware that it exists. And, to Grandmaster Dr. Masaaki Hatsumi who apart from being a martial arts legend has the ability of seeing potential and allowing it to emerge over time. Both, from different perspectives, allowed me to see how things are connected and that in the end, both perspectives are much closer than one might think.

Academically I wish to thank my supervisory team, Professor Dr. James McCalman and Professor Dr. Hermann Lassleben, who have gone with me through the ups and downs of writing a DBA thesis.

Thank you.

Holger Kunzmann 15<sup>th</sup> September 2019

## **Abstract**

Insights from Human Factors and Ergonomics and Safety Science suggest that both success and failure must be studied to understand how to ensure safety. Applying this to change management, an explorative study is presented in which twelve experienced change managers from different German industries and organizations are interviewed about their experience with both of these outcomes.

The structure of the interviews is based on the four cornerstones of Resilience Engineering (monitoring, responding, anticipating and learning). In addition, organisational and individual perspectives are considered separately to better reflect the complexity of organisational systems.

The results showed that managers are an important interface between organisations and those affected by change, and relevant competencies were identified, such as a holistic and systemic perspective, designing structures and processes, and perceiving people-issues that are of relevance for managing projects.

However, changing structures and processes requires organisational support and design authority, which are often not sufficiently available. Furthermore, an over-reliance on existing managerial competencies and a lack of sustainable organisational learning from negative aspects of successful outcomes in particular were found.

These findings underline that Resilience Engineering and Human Factors and Ergonomics concepts (holistic/system understanding, design orientation, combined outcome of performance and human well-being) have great potential for making organisations more adaptive and pro-active, and therefore to increase the success rate of change projects.

# A Human Factors view of Organisational Change: Shifting mindset from failure and success to Resilience Engineering

## Contents

|   |           |
|---|-----------|
| Title .....   | i         |
| Academic Declaration.....   | ii        |
| Acknowledgement .....   | iii       |
| Abstract.....   | iv        |
| Contents.....   | v         |
| List of abbreviations .....   | ix        |
| List of figures .....   | x         |
| List of tables .....  | xi        |
| <b>1. INTRODUCTION .....</b>  | <b>1</b>  |
| <b>1.1 Structure .....</b>  | <b>4</b>  |
| <b>2. HUMAN FACTORS &amp; ERGONOMICS AND SAFETY SCIENCE.....</b>            | <b>5</b>  |
| <b>2.1 Human Factors &amp; Ergonomics defined.....</b>                      | <b>5</b>  |
| <b>2.2 Human Factors &amp; Ergonomics discipline and theory .....</b>       | <b>8</b>  |
| <b>2.3 STS theory and system thinking .....</b>                             | <b>11</b> |
| 2.3.1 Complexity and Systems Theory .....                                   | 12        |
| <b>2.4 Safety and failure .....</b>   | <b>15</b> |
| 2.4.1 Safety science and HFE .....  | 15        |
| 2.4.2 Making sense of failure.....  | 16        |
| 2.4.3 Between linear and complex approaches.....                            | 17        |
| <b>2.5 Resilience Engineering – the new paradigm in safety science.....</b> | <b>19</b> |
| 2.5.1 Safety 1 and safety 2 .....   | 19        |
| 2.5.3 Resilience Engineering .....  | 22        |
| 2.5.4 Research and gaps of Resilience Engineering .....                     | 24        |
| 2.5.5 The four cornerstones of Resilience Engineering .....                 | 26        |

|   |           |
|---|-----------|
| <b>2.6 Conclusion</b> .....   | <b>28</b> |
| <b>3. CHANGE MANAGEMENT</b> .....                                     | <b>29</b> |
| <b>3.1 The discipline and its main approaches</b> .....               | <b>29</b> |
| <b>3.2 Managing change in organisations</b> .....                     | <b>31</b> |
| <b>3.3 Research gaps and practitioner problems</b> .....              | <b>33</b> |
| 3.3.1 Distance between practitioners and theory .....                 | 33        |
| 3.3.2 The complexity challenge .....                                  | 34        |
| 3.3.3 Lack of systemic approaches .....                               | 34        |
| 3.3.4 People-related issues inadequately addressed.....               | 35        |
| 3.3.5 Failure of change initiatives .....                             | 36        |
| <b>3.4 Failure and its reasons</b> .....                              | <b>36</b> |
| 3.4.1 The definition of failure (and success).....                    | 36        |
| 3.4.2 Failure rates and the inconsistent evaluations of outcomes..... | 37        |
| 3.4.3 Reasons for failure.....  | 38        |
| 3.4.4 Summary.....  | 42        |
| <b>4. BRINGING THE DISCIPLINES TOGETHER</b> .....                     | <b>43</b> |
| <b>4.1 Considering safety thinking for Change Management</b> .....    | <b>43</b> |
| <b>4.2 Addressing the gaps</b> .....                                  | <b>44</b> |
| <b>4.3 Conclusion for the research</b> .....                          | <b>46</b> |
| <b>5. RESEARCH METHODOLOGY</b> .....                                  | <b>48</b> |
| <b>5.1 Research philosophy and research approach</b> .....            | <b>48</b> |
| 5.1.1 Research approach .....   | 51        |
| <b>5.2 Methodological choice and research strategy</b> .....          | <b>51</b> |
| <b>5.3 Population and sample</b> .....                                | <b>52</b> |
| 5.3.1 Context of the study.....                                       | 55        |
| <b>5.4 Data collection</b> .....                                      | <b>56</b> |
| <b>5.5 Quality of the research</b> .....                              | <b>57</b> |
| 5.5.1 Aspects of reliability .....                                    | 58        |
| 5.5.2 Aspects of validity .....                                       | 59        |

|   |            |
|---|------------|
| <b>5.6 Data analysis .....</b>  | <b>62</b>  |
| <b>5.7 Research ethics.....</b>   | <b>65</b>  |
| <b>5.8 Summary .....</b>  | <b>66</b>  |
| <br>  |            |
| <b>6. FINDINGS.....</b>   | <b>67</b>  |
| <br>  |            |
| <b>6.1 The Monitoring Perspective .....</b>   | <b>67</b>  |
| 6.1.1 The individual monitoring perspective .....   | 68         |
| 6.1.2 The organisational monitoring perspective.....  | 72         |
| 6.1.3 Summary.....  | 78         |
| <br>  |            |
| <b>6.2 The responding perspective .....</b>   | <b>79</b>  |
| 6.2.1 The individual responding perspective .....   | 79         |
| 6.2.2 The organisational responding perspective.....  | 87         |
| 6.2.3 Summary.....  | 94         |
| <br>  |            |
| <b>6.3 The anticipating perspective .....</b>   | <b>95</b>  |
| 6.3.1 Individual and organisational anticipation perspective .....                          | 95         |
| 6.3.2 General preparation by individuals and organisations .....                            | 104        |
| 6.3.4 Summary.....  | 106        |
| <br>  |            |
| <b>6.4 The Learning perspective .....</b>   | <b>107</b> |
| 6.4.1 The individual learning perspective .....   | 107        |
| 6.4.2 The organisational learning perspective.....  | 116        |
| 6.4.3 Summary.....  | 120        |
| <br>  |            |
| <b>6.5 Summary of findings .....</b>  | <b>121</b> |
| <br>  |            |
| <b>7. CONTRIBUTION TO THEORY AND PRACTICE.....</b>  | <b>122</b> |
| <br>  |            |
| <b>7.1 Successful change is safe change.....</b>  | <b>123</b> |
| <br>  |            |
| <b>7.2 Extending the concept of critical failure factors .....</b>                          | <b>124</b> |
| <br>  |            |
| <b>7.3 Successful change needs system understanding .....</b>                               | <b>125</b> |
| <br>  |            |
| <b>7.4 Successful change benefits from design and from understanding human aspects.....</b> | <b>126</b> |
| <br>  |            |
| <b>7.5 Successful change requires lessons learned.....</b>                                  | <b>127</b> |
| <br>  |            |
| <b>7.6 Successful change depends on managerial competencies .....</b>                       | <b>128</b> |
| 7.5.1 Shared Mental Model.....  | 129        |
| 7.5.2 Management of staff .....   | 129        |

|   |            |
|---|------------|
| <b>8. CONCLUSION AND LIMITATIONS .....</b>                                      | <b>130</b> |
| <b>9. PROFESSIONAL DEVELOPMENT .....</b>  | <b>132</b> |
| <b>REFERENCES .....</b>   | <b>134</b> |
| <b>APPENDICES .....</b>   | <b>157</b> |
| Appendix A – UPR 16.....  | 158        |
| Appendix B - Design principles for STS .....                                    | 159        |
| Appendix C - Difficulties and “myths” of safety.....                            | 162        |
| Appendix D – Training syllabus CRM.....   | 163        |
| Appendix E – Training syllabus Maintenance Human Factors.....                   | 165        |
| Appendix F - Resilience Engineering Principles.....                             | 167        |
| Appendix G – Change management methods .....                                    | 168        |
| Appendix H – Distribution of themes in the four cornerstones .....              | 171        |
| Appendix I – Definition of themes (Monitoring Cornerstone/Individual) .....     | 172        |
| Appendix J – Definition of themes (Monitoring Cornerstone/Organisation) .....   | 173        |
| Appendix K – Definition of themes (Responding Cornerstone/Individual) .....     | 174        |
| Appendix L – Definition of themes (Responding Cornerstone/Organisation).....    | 176        |
| Appendix M – Definition of themes (Anticipation Cornerstone/Individual) .....   | 178        |
| Appendix M – Definition of themes (Anticipation Cornerstone/Organisation) ..... | 180        |
| Appendix N – Definition of themes (Preparation) .....                           | 181        |
| Appendix O – Definition of themes (Learning cornerstone/Individual) .....       | 182        |
| Appendix P – Definition of themes (Learning cornerstone/Organisation) .....     | 184        |
| Appendix Q – Distribution of themes and their total count .....                 | 186        |
| Appendix R – Interview Questions.....   | 188        |
| Appendix S – Invitation letter .....  | 191        |
| Appendix T – Ethical Approval Final Letter .....                                | 194        |



## List of abbreviations

|      |   |
|------|---|
| CAA  | Civil Aviation Authorities                |
| CM   | Change management                         |
| CFF  | Critical failure factor                   |
| CSF  | Critical success factor                   |
| DBA  | Doctorate of Business Administration      |
| HFE  | Human Factors and Ergonomics              |
| HIS  | Human–system interface                    |
| HRO  | High reliability organisation             |
| ICAO | International Civil Aviation Organisation |
| IEA  | International Ergonomics Association      |
| KPI  | Key performance indicator                 |
| LSC  | Larger systemic change                    |
| MBA  | Master of Business Administration         |
| MEAD | Macroergonomic analysis and design        |
| NAT  | Normal accident theory                    |
| OD   | Organisational development                |
| OR   | Organisational Resilience                 |
| RE   | Resilience Engineering                    |
| SMM  | Shared mental model                       |
| STS  | Socio technical system                    |
| WAD  | Work as it is imagined                    |
| WAI  | Work as it is done                        |

## List of figures

|  |    |
|--|----|
| Figure 1: Basic Work System Model (Kleiner 2006)   | 10 |
| Figure 2: A timeline of the development of methods for sociotechnical systems and safety (Waterson et al., 2015) | 17 |
| Figure 3: Differences between safety 1 and safety 2 (Hollnagel, 2014d)   | 22 |
| Figure 4: The relation of safety 1 and safety 2 (Hollnagel, 2014d)   | 23 |
| Figure 5: Dependencies among resilience abilities (Hollnagel, 2014c)   | 27 |
| Figure 6: Taxonomy of organisational change literature (Al-Haddad & Kotnour, 2015)                               | 32 |
| Figure 7: Critical Failure Factors (Decker et al., 2012)   | 41 |
| Figure 8: Conceptional model of this study   | 46 |

## List of tables

|   |     |
|---|-----|
| Table 1: Defining features of systems (Wilson, 2014) .....  | 14  |
| Table 2: Comparing safety 1 and 2 from a research philosophy perspective based on Hollnagel (2014d) (summary by the author of this study) ..... | 50  |
| Table 3: Sample of this study .....   | 55  |
| Table 4: Initial categories and coding scheme .....   | 63  |
| Table 5: Final research structure .....   | 65  |
| Table 6: Themes identified within the individual monitoring perspective.....  | 69  |
| Table 7: Summary of findings within the individual monitoring perspective .....   | 72  |
| Table 8: Themes within the organisational monitoring perspective (successful projects) .  | 73  |
| Table 9: Themes within the organisational monitoring perspective (failed projects) .....  | 73  |
| Table 10: Common and different aspects of organisational monitoring functions .....   | 75  |
| Table 11: Summary of findings within the organisational monitoring perspective .....  | 77  |
| Table 12: Themes within the individual responding perspective (successful projects).....  | 80  |
| Table 13: Themes within the individual responding perspective (failed projects).....  | 81  |
| Table 14: Findings within the individual responding perspective .....   | 87  |
| Table 15: Themes within the organisational responding perspective (successful projects) .....   | 88  |
| Table 16: Themes within the organisational responding perspective (failed projects) .....   | 88  |
| Table 17: Findings within the organisational responding perspective .....   | 93  |
| Table 18: Themes within the individual anticipation perspective (successful projects) .....   | 96  |
| Table 19: Themes within the individual anticipating perspective (failed projects) .....   | 96  |
| Table 20: Themes within the organisational anticipating perspective (successful projects) .....   | 97  |
| Table 21: Themes within the organisational anticipating perspective (failed projects) .....   | 97  |
| Table 22: Findings from both anticipating perspectives.....   | 103 |
| Table 23: Themes about general preparation (individual and organisation) .....  | 104 |
| Table 24: Findings about individual and organisational preparation for change .....   | 106 |
| Table 25: Themes within the individual learning perspective (successful projects).....  | 108 |
| Table 26: Themes within the individual learning perspective (failed projects).....  | 109 |
| Table 27: Findings within the individual learning perspective .....   | 115 |
| Table 28: Themes within the organisational learning perspective (successful projects) .   | 116 |
| Table 29: Themes within the organisational learning perspective (failed projects) .....   | 117 |
| Table 30: Findings within the organisational learning perspective .....   | 120 |

# **1. Introduction**

This research explored the potential of Human Factors & Ergonomics (HFE) and safety science to increase the success rate of change projects by trying to better understand why and how such projects fail or succeed.

Much has been written about how change projects could or should be successfully performed (Al-Haddad & Kotnour, 2015), and yet less has been written about why and how these projects fail (Schwarz, Watson, & Callan, 2011). Very little literature exists that explicitly focuses on comparing and contrasting both outcomes (Decker et al., 2012). This research intends to fill that gap. In that context, there are several general gaps which affect this research endeavour. The challenges of increased complexity (Grady & Grady, 2013) require systemic considerations while no framework has yet been able to address such demand adequately (Thomas, George, & Rose, 2016; Todnem By, 2005). In addition, people-issues as well as the design of organisational structures and processes are under-researched but have been identified as relevant in the context of failed change (Latta, 2015; Maheshwari & Vohra, 2015) while theory and practice seem to be distant from each other (Appelbaum, Habashy, Malo, & Shafiq, 2012).

Research within high risk environments e.g. aviation and with a focus on explaining and preventing failure is connected to the two closely intertwined fields of Safety Science and HFE (Grote, 2014). A connecting element between both fields is Socio-Technical System Theory (STS) which has produced a wide body of research including the recent paradigm shift known as Organisational Resilience (OR) or Resilience Engineering (RE) (Waterson et al., 2015). This new paradigm seeks to understand how organisations can become more adaptive under varying conditions of an environment that is understood as having a high degree of complexity and uncertainty (Lundberg & Johansson, 2015).

A broadly accepted concept of OR is that of the four cornerstones by Erik Hollnagel (2011a). These four cornerstones (anticipating, monitoring, responding and learning) describe competencies that an organisation needs to be adaptive in the face of adverse events and disruptions (Lay, Branlat, & Woods, 2015). Within

the systemic view of OR and safety related HFE organisational design, human behaviour and practical application have received much attention (Dul et al., 2012; Nemeth & Herrera, 2015).

It is argued in this study that HFE and OR, via the four cornerstones, can provide new insight to counter the gaps relating to change project failure. The research rationale behind this argument is based on what HFE and OR have contributed to the body of knowledge: consideration of complexity as central challenge (Kantur, 2015), the systemic design orientation of HFE (Dul et al., 2012), the focus on the interface between human issues and organisational aspects (Kleiner, 2006) and bridging theory and practice with concepts like 'work as it is done' (WAD) (Hollnagel, 2014d; Lay et al., 2015). Whilst the research of Decker et al. (2012) has investigated failure for the purpose of anticipation, this research also covers monitoring, responding and learning but with the focus on both outcomes: failure and success. Such a focus has not been found in the reviewed literature.

As a result, the following research aim and subsequent research objectives (RO) are proposed:

What is the potential of safety science and HFE to increase our understanding of how change projects in German based organisations fail or succeed, and to improve outcomes?

**RO1:** To explore and report how failed and successful projects differ when regarded from the perspective of the four cornerstones of organisational resilience.

**RO2:** To investigate and understand various aspects of human behaviour and organisational phenomena that can be observed in failed and successful projects.

This focus on the different outcomes, systemic consideration (via the four cornerstones), human and organisational aspects as well as design and practitioner orientation are reflected further in research questions related to:

- How do successful projects differ from failed ones?
- To what extent are systemic aspects considered?
- Which topics emerge on the macro and on the micro level?
- To what extent are design aspects considered?
- What insights does the research provide as far as the difference between work as it is done (WAD) versus work as it is imagined (WAI) is concerned?

In order to study these twelve change managers from different industries and organizations were interviewed about their experiences within failed and successful projects led or partly led by each of them. This contrast of failure and success enabled a broader understanding of these phenomena.

Based on a qualitative and interpretative research methodology, semi-structured interviews were used for data collection. Qualitative interviews were deemed the most effective form of data collection because they allowed further exploration of change managers' experience within those projects via in-depth follow-up questions.

The rationale for this study is to be found within the specific aim of a DBA format. On the one hand it is meant as a contribution to the body of knowledge about change outcomes and how they come about. On the other hand, it provides a practitioner tangible insight in how to approach change projects and increase their success rate.

## **1.1 Structure**

This thesis is divided into nine chapters. Chapter two explores the two fields of HFE and safety science and how the paradigm-change of OR emerged from STS theory. Chapter three takes a more specific examination of failure and how it is understood and investigated in the field of change management. Finally, both views are contrasted in chapter four to identify the gaps that inform the research aim of this study.

The methodological framework is presented in chapter five, which is followed by the findings and their interpretation in chapter six. This first part of the analytical framework looks into each cornerstone separately. The second part of the analytical framework discusses the contribution to theory and practice in chapter seven and also contains the conclusion and addresses the research question in chapter eight. Finally, personal development is described in chapter nine.

## **2. Human Factors & Ergonomics and Safety Science**

This chapter will provide an overview of HFE and how it relates to Safety Science. It will lead to an understanding of STS theory and a resulting approach called Resilience Engineering (RE) that is a new paradigm in safety research. A well-established contribution to RE, the four cornerstones of organisational resilience, will be presented (Patriarca, Bergström, Di Gravio, & Costantino, 2018). These will serve as a lens through which change shall be regarded in this research.

### **2.1 Human Factors & Ergonomics defined**

The focus of HFE lies in the interaction between humans and the environment, where the environment is seen as a combination of the physical, the organisational and the social (Dul et al., 2012). Wilson (2014) stated that HFE seeks to understand the social, physical and cognitive characteristics of humans while interacting with the environment and therefore described the discipline as holistic. Karwowski (2005) described HFE as a unique and independent discipline that has evolved over the last 60 years and “..as the discipline that focuses on the science, engineering, design, technology, and management of human-compatible systems.” (Karwowski, 2012, p. 33)

The International Ergonomics Association (IEA) also considers HFE as a discrete discipline, as can be seen on its website:

“Ergonomics [or human factors] is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.” (IEA, 2014)

However, a discussion began around whether HFE is a foundational discipline or a hybrid science (Marras & Hancock, 2014). Norros (2014) therefore sees a challenge in creating a unique discipline identity because HFE is ontologically diverse, with psychology as a core discipline and many connections to physiology, neurosciences, social sciences and technology. Similarly, Badke-Schaub, Hofinger, and Lauche (2008) have described Human Factors as an



interdisciplinary science that makes use of several other basic disciplines e.g. management, psychology, ergonomics and engineering. From their perspective, ergonomics and human factors are related disciplines (Badke-Schaub et al., 2008), whereas Parker (2015) noted that “ergonomics” and “human factors engineering” are used synonymously and refer to the same discipline. However, a complete discussion of these definition issues is beyond the scope of this study. As the IEA as well as many authors (Chung & Williamson, 2018; Karlton, Karlton, Berglund, & Eklund, 2017; Karwowski, 2005, 2012; Salvendy, 2012; Wilson, 2014) currently use the term HFE, it has therefore also been used in this study.

Many objectives of HFE research can be found in the literature (Chapanis, 1995). Salvendy (2012) has identified two related and paramount objectives, on the one hand understanding interactions between humans and everything that surrounds them, and on the other optimizing human well-being and overall system performance. Effectiveness and efficiency of work as well as safety are also seen as aims of HFE (Sanders & McCormick, 1993). These are in line with the definition of the IEA.

Considering the aims and objectives of HFE as well as the mix of knowledge that the discipline uses, Karlton et al. (2017) have claimed that there is a strong basis for analysis, design and creation of individual, high quality work situations in addition to benefits for system performance in a large variety of operations. However, the discipline faces the risk of being perceived as unclear and superficial because of its' broad focus and diverse content (Karlton et al., 2017). Moreover, the focus on practical application raises the question of balance between theory and practice. There are different opinions on where the emphasis should be. Hollnagel (2014a) sees the main challenge in practical use as being that the nature of work is a rapidly moving target that makes constant adaptation necessary. Likewise, Wilson (2014) has argued that research should happen ‘in the wild’ rather than in the laboratory.

Several definitions have described HFE as a scientific discipline that applies theoretical principles and tests hypotheses (Sanders & McCormick, 1993). However, a content analysis of 621 published articles in Human Factors and the

Annual Meetings of the Human Factors and Ergonomics Society (HFES) between 1965 and 1995 found that most of the articles did not mention theory (Meister, 1999). A recent study found that while research often finds its way into practice, there seems to be a gap between theory and research and less emphasis is placed on theory and its development within HFE (Chung & Williamson, 2018). The authors of the study assumed that HFE seems to be primarily an applied science, and they argued that the link between theory and research needs more attention so that practice can be based on a strong scientific foundation.

HFE as a discipline faces several challenges that are related to establishing a clearer picture of its boundaries and its theoretical underpinnings. It cannot be said at this stage to what extent that challenge relates to unclear communication of research or the lack of it. The need to address such issues however, has not gone unnoticed and has led to the establishment of the Future of Ergonomics Committee by the IEA in 2010 and subsequently a white paper that was approved in 2012 which addressed the future of HFE and how the discipline and the profession could be maintained and strengthened (Wilson & Carayon, 2014).

The report of the committee described HFE as having a unique combination of three characteristics:

- HFE takes a systems approach,
- HFE is design driven, and
- HFE has a focus which rests on the two closely related outcomes of performance and human well-being (Dul et al., 2012).

This report has prompted considerable discussion, much agreement and triggered further work and research agendas, some of which can be seen in a special issue of the peer-reviewed journal *Ergonomics*, which is exclusively dedicated to this topic and discussion (Wilson & Carayon, 2014).

HFE faces challenges concerning a clearer definition of its boundaries and theory related research, which is why a wider picture of HFE research is needed in order to locate safety related HFE research within that wider picture and make it more tangible. Furthermore, there is a need to clarify where there are general overlaps with management literature and research to confront the threat of being perceived

as unclear and superficial as Karlton et al. (2017) have pointed out. Where is the contrast to management research, what is different in HFE research and where is the general benefit? To answer these questions, a short overview of the development of the HFE discipline will be given. In addition to narrowing the focus to safety-related HFE, this overview will also shed further light on the rationale behind the systems approach in HFE research together with the theoretical underpinnings of such an approach. Thereafter safety-related HFE research will be described. It will be shown how accidents and incidents are understood and explained from a theoretical perspective as well as dealt with from a practical perspective.

## **2.2 Human Factors & Ergonomics discipline and theory**

Looking into the origins of HFE, one immediately finds an overlap with management theory. For example, Taylor's scientific management is one of the roots of HFE, because the focus was on the nature of work and how it could be designed for optimization of results (Badke-Schaub et al., 2008). Karwowski (2012) also mentioned the relation to Taylor when he stated that there is a natural congruence between contemporary management and HFE. He referred to Griffin (2001), who described management as a set of activities that includes e.g. planning, decision making, organising, leading and controlling.

Karwowski (2012) has further argued that these aspects are also essential to HFE and has provided a detailed description of the exact overlaps. Most authors, however, see the period of the Second World War as the beginning of HFE (Hollnagel, 2014a; Karlton et al., 2017; Marras & Hancock, 2014; Meister, 1999; Salvendy, 2012) as this was the time when it became a recognized scientific discipline, introduced by Murrell who was one of the scientists that founded the Ergonomics Research Society (Edholm & Murrell, 1973).

Morel, Amalberti, and Chauvin (2009) differentiated between two lines of HFE research, Micro- and Macroergonomics. Microergonomics, as the first line, relates to human-machine interactions as well as to the interaction of user and interface (Hendrick, 1997; Kleiner, 2006) and relies on the fields of anthropometrics, physiology, and cognitive psychology (Morel et al., 2009). Karwowski (2005) has described Microergonomics as consisting of two domains of specialisation, which

are physical and cognitive ergonomics. Wilson (2000) stated that ergonomics, which has its roots in Europe, is commonly associated with physical ergonomics, whereas human factors, which has its roots in the US, is commonly associated with cognitive ergonomics (Waterson & Eason, 2009).

Macroergonomics, the second line according to Morel et al. (2009), is described by Karwowski (2005) as a domain of specialisation called organisational ergonomics and sometimes used synonymously with the term systems ergonomics (Kleiner, 2006).

As Hollnagel (2014a) pointed out, the effects of changing technologies on the nature of work has often created the need to modify existing approaches of explaining and dealing with such changes. Mismatches in human-machine interaction in aviation were some of the principal causes for the development of the field of microergonomics (Chapanis, 1995) and in the case of macroergonomics, new trends in the late 1970s, such as increased technology and global competition among others, again required a new approach to counter such trends (Murphy, Robertson, Huang, Jeffries, & Dainoff, 2018).

Macroergonomics extended the view to the interaction of humans with the job, the organisation and the environment, while focusing on the relationship of macro aspects like design, culture and structure with outcomes on the individual level such as performance and stress (Rivera-Rodriguez et al., 2013). This perspective on the organisation is related and influenced by organisational theory, namely by the Classical and the Human Relations School, which provided concepts like supervision, hierarchy and rewards on the one hand and a focus on teams and motivation on the other (Murphy, Robertson, & Carayon, 2014). Since these fields also focus on the nature and design of work, they overlap with HFE and serve the image of blurred borders towards other fields and disciplines. Karwowski (2005), in contrast, while describing the congruence between contemporary management and HFE, pointed out that what is unique to HFE is discovering knowledge of human characteristics in order to develop human–system interface (HSI) technology.

Hendrick and Kleiner (2001) characterised macroergonomics as the study of work systems, a term that was described (Karwowski, 2012, p. 27) as consisting of

“...people interacting with some form of (1) job design (work modules, tasks, knowledge, and skill requirements), (2) hardware (machines or tools) and/or software, (3) the internal environment (physical parameters and psychosocial factors), (4) the external environment (political, cultural, and economic factors), and (5) an organisational design (the work system’s structure and processes used to accomplish desired functions).”

The basic work system model, as it is described by Kleiner (2006), is shown in Figure 1.

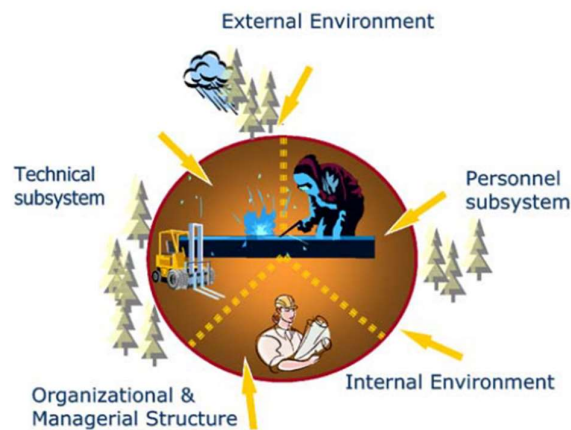


Figure 1: Basic Work System Model (Kleiner 2006)

Macroergonomics is therefore described by Haro and Kleiner (2008) as a comprehensive process that can assess the different subsystems as well as the interactions between those components. Changes in one subsystem can affect the other subsystems and the resulting interactions are within the scope of macroergonomics (Murphy, Robertson et al., 2018), which is why Wilson (2014) stated that HFE in general is explicitly adopting a ‘systems view’.

Apart from macroergonomic methods like MacroErgonomic Analysis and Design method (MEAD) and Macroergonomic Analysis of Structure (MAS) (Haro & Kleiner, 2008), the subdiscipline follows a theoretical framework which originated in the open systems theory from biological science and is called Socio-Technical Systems Theory (STS) (Kleiner, 2006; Waterson et al., 2015).

With regard to the above mentioned overlaps to contemporary management, Haro and Kleiner (2008, p. 450) described the uniqueness of macroergonomics as based on “...its special attention to organisational design and management factors within the multiple subsystem, sociotechnical perspective.”

A systems perspective in general and STS in particular are important for this thesis and the next section will focus on these topics. The next section will also start to narrow the HFE perspective down on safety, which will be the lens through which failed change shall be regarded later.

### **2.3 STS theory and system thinking**

STS theory forms the basis of macroergonomics and is used as the means through which complex systems are sought to be understood (Waterson et al., 2015). The theory dates back to work done at the UK Tavistock Institute of Human Relations, where productivity was explored in relation to changes in the nature of work, e.g. working methods but also to the effects of human properties and skills (Kleiner, 2006; Trist & Bamforth, 1951). Later, in the 1960s and 1970s, the focus shifted further towards new technologies and their effects on the system of work (Davis, 1971).

The main elements that make up a sociotechnical system are:

- a collective operational task,
- the existence of a social and technical subsystem,
- an open system influenced by the environment, and
- that it is unfinished due to constantly new emerging demands which require flexibility (Eason, 2011).

One of the aspects that STS theory is most recognized for are the principles offered by Clegg (2000) on how to design socio-technical systems (Murphy et al., 2014). Other aspects include criteria for well-designed jobs and the innovations of autonomous work groups (Emery, 1964). Furthermore, there are three phases in the development of STS systems that can be distinguished - design, implementation and operation (Clegg, 1988). These phases emphasise the dynamic perspective of STS theory and at the same time form a relation to change management in its broadest sense.

Although STS theory has been criticized for the apparent lack of specificity in its propositions (Grant, Fried, & Juillerat, 2011) and a lack of empirical and conceptual development (Parker, Axtell, & Turner, 2001), recent research has linked macroergonomics to safety climate (Murphy, Huang, Robertson, Jeffries, &

Dainoff, 2018; Murphy, Robertson et al., 2018) and to a better integration of macro- and microergonomics across different levels e.g. individual, group, organisation and industry (Karsh, 2006; Karsh, Waterson, & Holden, 2014). Klein (2014), on the one hand critically remarked that the terms 'sociotechnical' and 'system' are by definition inevitably imprecise, but on the other hand she stated that sociotechnical theory makes explicit that in a work system, technology and people are interdependent.

There are many models within the range of an STS view that try to explain the different elements and their interdependencies and interactions, as Carayon (2006) showed in an overview of different models. It is therefore the nature of HFE, as Wilson (2000) pointed out, to understand these interactions and the people involved as well as to improve them all in real settings. Yet defining the boundaries of systems and consequently the interactions and system elements on which to focus is a major challenge, as Klein (2014) remarked. This challenge is further increased as even the boundaries are subject to change (Choi, Dooley, & Rungtusanatham, 2001). This line of thought basically extends the above description of STS elements provided by Eason (2011) by adding an additional element: dynamic borders.

### 2.3.1 Complexity and Systems Theory

It has been said that HFE adopts a systems approach (Dul et al., 2012). While this seems obvious at first, based on the above summary of STS, it has raised criticism. Hollnagel (2014a), for example, has reflected on the term system, which for him seems to be a term much 'en vogue' but very rarely explicitly defined and hence there are different interpretations and applications of the term. He argued from a systems theory and cybernetic perspective, in which a system is characterized by its functions and therefore by what it does rather than by what it is. In his opinion HFE does not yet live up to the ambition of taking a systems approach (Hollnagel, 2014a).

To further clarify the term system within HFE research, Wilson (2014, p. 6) provided the following definition:

“A system is a set of inter-related or coupled activities or entities (hardware, software, buildings, spaces, communities and people), with a joint purpose, links between the entities which may be of state, form, function and causation, and which changes and modifies its state and the interactions within it given circumstances and events, and which is conceptualised as existing within a boundary; it has inputs and outputs which may connect in many-to-many mappings; and with a bow to the Gestalt, the whole is usually greater (more useful, powerful, functional etc) than the sum of the parts.”

The scientific theory that is concerned with systems is called systems theory and was created as an alternative to analytic reduction (Bertalanffy, 1969). This happened in a time during the 1940s and 1950s when traditional engineering approaches to system design became less and less effective, due to the increasing complexity of the systems being built (Leveson, 2017). Seven decades later the complexity of the systems that we live in is seen by Wilson (2014) as part of the rationale of the HFE discipline, where the need to understand can be achieved by means of a clear systems approach.

While being aware of the challenges that his demand makes for current research, Wilson (2014) has required that a HFE systems approach should consider six defining, significant and overlapping features: systems focus, context, interactions (including complexity), holism, emergence and embedding (Table 1).



| <b>The 6 defining features of systems to be considered in HFE research (Wilson 2014)</b> |   |
|--|---|
| <b>I. Systems focus</b>  | <ol style="list-style-type: none"> <li>1. Treats the focus of interest as a system</li> <li>2. Does not see systems as stable</li> <li>3. Includes the natural system as parent or sibling system to our socio-technical system</li> </ol>  |
| <b>II. Context</b>   | <ol style="list-style-type: none"> <li>1. Behaviour does not happen in a vacuum</li> <li>2. Needs to understand system boundaries and how they provide context</li> <li>3. Needs to define system boundaries and/or cross-overs</li> <li>4. Research should mainly be carried out 'in the wild' to consider the context.</li> </ol>   |
| <b>III. Interactions</b>   | <ol style="list-style-type: none"> <li>1. Consists of interacting parts</li> <li>2. Focuses on interactions rather than components</li> <li>3. Strongly relates to complexity of systems</li> <li>4. No applications of linear models (part of paradigm)</li> </ol>   |
| <b>IV. Holism</b>  | <ol style="list-style-type: none"> <li>1. HFE research cannot be easily partitioned</li> <li>2. Seeks to understand physical, cognitive and social characteristics of people and their interactions with artefacts, information, organisations and people</li> <li>3. The above aspects have to be considered in a project to an appropriate extent</li> <li>4. Input as well as output is considered holistically</li> </ol> |
| <b>V. Emergence</b>  | <ol style="list-style-type: none"> <li>1. Systems in real use will display unexpected characteristics and properties</li> <li>2. The impact of poor design may be mitigated by user abilities and overcome system shortcomings</li> <li>3. People can unexpectedly take advantage of systems and products or find uses not dreamed of by the designer</li> </ol>  |
| <b>IV. Embedding</b>   | <ol style="list-style-type: none"> <li>1. Considering how ergonomics fits within the organisational system and is embedded in practice</li> </ol>   |

Table 1: Defining features of systems (Wilson, 2014)

While these features shall be considered when undertaking research on complex systems, the question comes up of just when a system should actually be considered complex? Manser (2008) cited three criteria of complex systems: the number of elements, their variety and their interconnectivity. If all of them are high, the system is complex. An exact number or measure is not named but she pointed out that the demands, which for her are mainly cognitive, challenge or supersede the human ability to understand the dynamics and interactions of the system. From this definition, it becomes clear that any change intervention that addresses a complex system faces the challenge of dealing with this factor. However, complex tools and information systems have to be managed and the complexity of the work itself requires more and more abstract understanding (Reiman & Oedewald, 2007). What does that mean for the nature of work?

The recent understanding of HFE as a design discipline with a system approach (Dul et al., 2012), requires considering complexity in the design or re-design of STS. Although design principles exist and were reworked to consider the critique of the changed nature of work and its complex interdependencies (Clegg, 2000), these principles were formulated more than seventeen years ago (see appendix B). Complexity as a challenge has gained momentum since then, which is one reason why an area for further development within STS is the enhancement of its predictive utility (Carayon et al., 2015; Davis, Challenger, Jayewardene, & Clegg, 2014).

One approach that addresses predictive aspects and also adopts an STS perspective is Resilience Engineering, which is concerned with safety (Kleiner, Hettinger, DeJoy, Huang, & Love, 2015). One aspect of performance in relation to the dynamic activities between social and technical components of a system, is safety as Kleiner et al. (2015) stated. It is argued here that safety in general and RE in particular are worth investigating for their potential regarding organisational change.

What role do predictive aspects play in change management and to what extent could RE contribute? Could certain change initiatives actually be described as safe or unsafe and could their failure be predicted?

## **2.4 Safety and failure**

### **2.4.1 Safety science and HFE**

Several authors have referred to safety related research as safety science or the discipline of safety (Haavik, 2014; Kyriakidis, Kant, Amir, & Dang, 2017). Safety as a concept was characterised by Aven (2014) as possessing two predominant perspectives, one being a condition with absence of unwanted events or accidents and the other a condition with acceptable risks that should be as low as possible. Subsequently, two challenges are being faced: on the one hand predicting safety conditions in processes and industries with the goal of preventing accidents, and on the other, to find causes for accidents when they have happened (Haavik, 2014). Specifically, one major concern of work safety related HFE lies in

understanding failure (Norros, 2014) and ergonomic methods play a key role in the design of safe and efficient systems (Salmon, 2016):

“Human factors/ergonomics knowledge and methods have probably been employed most extensively for systems that entail major risks for humans and the environment.” (Grote, 2014, p. 37)

In order to understand failure and design safe systems, models for explaining accidents and incidents have always been used (Kleiner et al., 2015). As a new approach to deal with failure, Resilience Engineering is the theoretical underpinning for this study.

#### 2.4.2 Making sense of failure

The 1980s witnessed a series of large-scale industrial accidents and catastrophes such as the chemical catastrophe in Bhopal (1984), the reactor explosion in Chernobyl (1986) and the oil rig fire of Piper Alpha (1988). These created the momentum for increased research in safety related fields, including human factors (Badke-Schaub et al., 2008). Reason (1990) described in detail the complex events that led to some of these catastrophes, shifting the focus to organisational contributions while at the same time highlighting how human characteristics make the design and management of interfaces between man and machine a challenge.

Today, as a result of researching such events, organisations operating in high hazard industries are considered ultra-safe due to principles often found in the technical design such as ‘fail safe’ and ‘defences in depth’; as early as the design stage, failure is considered and minimized via barriers or redundancies (Fahlbruch, Schöbel, & Domeinski, 2008). That way, the reliability of a safety-critical organisation can be increased but by adding more elements to the system, the overall complexity of that system is also increased which in turn can lead to unpredictable consequences (Perrow, 1987).

Safety is therefore described by Murphy et al. (2014) as an outcome of a work system with cooperating components. Jointly optimised subsystems are hence key attributes of safer STS as Kleiner et al. (2015) argued and one reason for this is their tight coupling (Flach, Carroll, Dainoff, & Hamilton, 2015). Models that explain

accidents and catastrophes have always been used but many have recently focused on STS theory as Kleiner et al. (2015) has shown.

### 2.4.3 Between linear and complex approaches

Several theories have emerged to explain why organisations within a hazardous environment can be unsafe, develop dangerous states, experience near misses or even suffer accidents and catastrophes (Fahlbruch, Schöbel, & Domeinski, 2008). Drawing on the historical development of scientific safety studies analysed by Hale and Hovden (1998), Waterson et al. (2015) provided a broad overview of methods for STS and safety, where they differentiated between three ages: the age of technology (using technological methods to prevent accidents, e.g. safety valves), the age of human factors (integrating HFE methods into risk and safety analysis) and the age of complex socio-technical systems.

Figure 2 is taken from their article and gives a broad overview of methods and traditions concerning STS and safety.

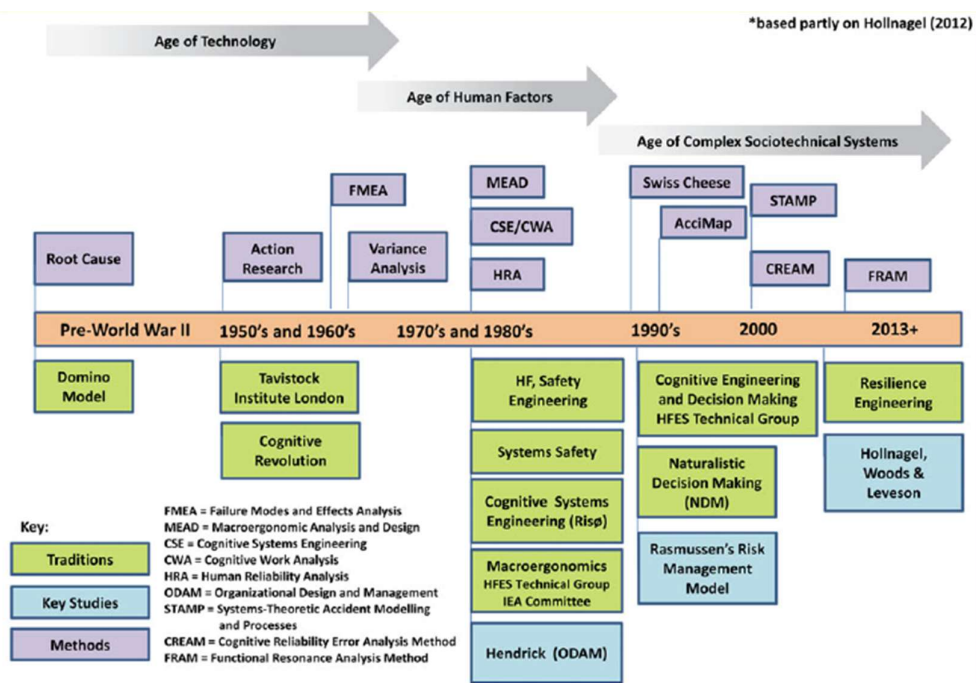


Figure 2: A timeline of the development of methods for sociotechnical systems and safety (Waterson et al., 2015)

Figure 2 shows the evolution from a focus on sequential and unambiguous relations between causes and effects, to acknowledging complexity and intractability with an increased emphasis on systemic approaches (Haavik, 2014).

Within this spectrum, Hollnagel (2007) sees three types of models used to analyse accidents: linear models (sequential), complex linear models (epidemiological) and non-linear or systemic models.

Heinrich's Domino model (1941) represents the first type of model and is seen by Haavik (2014, p. 37) as a prime example of a sequential and linear world view, with the accident as an adverse event in an otherwise stable system. The model provided an early understanding of accidents as having a root cause: safety can be enhanced by changing the sequence of elements, taking them out or placing them with more space in between (Hollnagel, 2007). However, in the case of US missile systems, complexity related design problems emerged between the 1950s and 1960s and analytic reduction used in the Domino model fell short in explaining accidents related to the interaction between system components and not the failure of single components (Leveson, 2017).

Prominent examples for the second type of model are NAT (natural accident theory) and HRO (high reliability organisations) as well as the Swiss cheese model of Reason (Hopkins, 2014). The latter represents a paradigm change in safety science (Hollnagel, 2014b). The age of human factors began (Waterson et al., 2015) because the existing models could not explain events like the Challenger space shuttle accident. His work put the emphasis on organisational failure (Reason, 1997) as well as on human error.

Safety management thus became popular in the 1980s because safety was recognised as a control or management problem and not just a technical issue of engineering safety into a system (Oedewald & Gotcheva, 2015) as the Domino model suggested. Based on analyses of different catastrophes in high risk environments, accidents are seen to be caused by a complex chain of events, like a projectile piercing through different layers of protective barriers (Reason, 1997).

The model is easy to comprehend which might be a reason why it has been used intensively in the literature on human factors training (CAA etc.). Hollnagel (2008) critically remarked that combining risks with barriers does not equal safety. Whilst this approach is still widely used in accident analysis although it has been

criticised as being too linear and the image of a net seems more appropriate than a chain of events (Hofinger, 2008). More criticisms of this type of model have been outlined by Hopkins (2014). Therefore, a new type of model seems necessary.

## **2.5 Resilience Engineering – the new paradigm in safety science**

### **2.5.1 Safety 1 and safety 2**

Starting from the two perspectives of safety as the absence of unwanted outcomes and acceptable risks, a generally agreed-upon definition of safety has been developed (Fahlbruch et al., 2008). Safety has been defined as a dynamic non-event with no dangerous events in its presence: instead of being a passive state the dynamic element stands for many activities happening at the same time (Weick & Sutcliff, 2001). This view on safety is called safety 1 by Hollnagel (2014b), who therefore critically asked if safety is actually a subject for science, because a non-event cannot be studied nor measured. Considering that a condition where nothing goes wrong is only described by the absence of adverse outcomes, he asked: “How to measure an increase in safety by counting how many fewer things go wrong?” (Hollnagel, 2014d, p. 95)

A process on the other hand, e.g. safe operation (Rochlin, 1999), is tangible and can be observed as how work is done and the characteristics it has, instead of a condition of safety that is difficult to define (Hollnagel, 2014b). Building on the definition of Weick and Sutcliff, Hollnagel (2014b) suggested replacing a sole focus on failure with an additional focus on success. Ensuring that things go right instead of just preventing them going wrong is called safety 2 and he defined it as “..the ability to succeed under expected and unexpected conditions alike, so that the number of intended and acceptable outcomes (in other words, everyday activities) is as high as possible.” (Hollnagel, 2014b, p. 23)

When things go wrong and accidents or even disasters happen, the traditional view on them from an epistemological perspective is to explain what happened by finding a cause-effect relationship (Dekker, 2015). The assumptions which sometimes come up in such a context, that great effects/accidents can always be traced back to great causes or that more details collected equal a higher accuracy of investigation was rejected by Dekker (2015).

The focus on causes is even more problematic within newer work environments because they are characterized by increasing complexity (see age of complex STS in Figure 2) where finding the factors that affect safety 1 is a challenge and root/cause types of explanations fall short (Kleiner et al., 2015). This linear cause-effect explanation is called causality-credo and, from a safety 2 perspective, it is a problematic assumption and hence, a myth (Hollnagel, 2014d) or delusion of safety (Pitzer, 2015) because systemic effects are ignored and consequently alternate causes or explanations not found (see Appendix 2 for further descriptions of this and other myths).

One purpose of an accident investigation is prevention of future accidents (Dekker, 2015). Looking back into the error chain through the cheese layers of Reason (1990), the assumption of reverse causality constitutes a simplistic safety 1 view of the complex interactions within adverse events, for example because countermeasures and additional barriers can have unintended side effects (Hollnagel, 2014d).

Many methods concerning STS and safety are rather old as Waterson et al. (2015) showed, but safety relevant work environments demand new approaches to deal with their increasing complexity (Kleiner et al., 2015). To move away from the causality-credo, system understanding is required which, within safety 2 type thinking, means to understand how work is done rather than how it is imagined (Havinga, Dekker, & Rae, 2018). Since work as it is done (WAD) represents the reality of people, work as imagined (WAI) might be inadequate, which is why Hollnagel (2014d, p. 122) demanded: "We must be willing to meet that challenge head-on. Otherwise we may inadvertently create the challenges of the future by trying to solve the problems of the present with the models, theories and methods of the past."

In order to understand accidents, the safety 2 methodology investigates daily or normal work (Havinga et al., 2018). As a consequence, the mindsets of the people investigating an accident might change due to the new perspective, but this is time consuming and might not always have a direct consequence for operations (Hollnagel, 2014d). In addition, as Hollnagel (2014d) further argued, breadth of investigation is more important than depth, because any event being studied is a

representation of normal or daily work. That work usually goes right, and in the context of accidents, looking at it can generate alternate or 'second stories' regarding the cause that can supplant the first cause or 'first story', however obvious it may seem or deeply it has been investigated in the first place.

The above illustrates a new perspective on incidents by use of the safety 2 methodology, where the role of humans is also seen differently. Towards the end of the age of human factors (see Figure 2), the term human error stood for the human contribution to accidents and disasters, giving this contribution a negative touch. At present, 'human error' is a set topic in the different human factors training syllabi within the high-risk environment of the aviation industry. The rationale is that pilot error is still denominated as the main cause of fatal accidents and incidents (Afrazeh & Bartisch, 2007; Oster, Strong, & Zorn, 2013). In aviation, such training is mandated but outside of high-risk industries no requirements exist for such training.

With a stronger focus on human error, humans suddenly became a central problem to be solved in safety, one counter to which was considered to be automation, leading to a significant decrease of accidents by using highly automated airplanes (Manzey, 2008). Unfortunately, Bainbridge (1983) showed that automation can lead to side effects such as decreased operator skills and a loss of awareness of what the system is actually doing, phenomena known as 'ironies of automation' in the field. This concern has not lost but rather gained momentum in the face of current complex and automated systems (Baxter, Rooksby, Wang, & Khajeh-Hosseini, 2012).

Safety 2 does not see humans as a problem but rather as an asset, because humans have the ability to adjust their performance and make things go right in the majority of cases (Hollnagel, 2014a). After all, if humans are the cause of the majority of unwanted events, they are very likely also the cause when things go right and hence an asset.

Both results have the same source: the variability of human behaviour (Hollnagel, 2014d), but positive results are rarely a matter of interest and hence not investigated (Oster et al., 2013).



The gap, identified by Hollnagel (2014d), is the relative lack of vocabulary for performance adjustments compared to when things go wrong (e.g. types of failure, event classification, causes etc.). Safety 1 is therefore not rejected but included in the wider perspective of safety 2, because an accident analysis is needed to understand what has happened as well as to identify hazards (Hollnagel, 2014d). Figure 3 summarizes and contrasts both perspectives.

|                                 | Safety-I   | Safety-II  |
|---------------------------------|--|--|
| Definition of safety            | As few things as possible go wrong.  | As many things as possible go right.   |
| Safety management principle     | Reactive, respond when something happens, or is categorised as an unacceptable risk.   | Proactive, continuously trying to anticipate developments and events.  |
| Explanations of accidents       | Accidents are caused by failures and malfunctions. The purpose of an investigation is to identify causes and contributory factors. | Things basically happen in the same way, regardless of the outcome. The purpose of an investigation is to understand how things usually go right as a basis for explaining how things occasionally go wrong. |
| Attitude to the human factor    | Humans are predominantly seen as a liability or a hazard.  | Humans are seen as a resource necessary for system flexibility and resilience.   |
| Role of performance variability | Harmful, should be prevented as far as possible.   | Inevitable but also useful. Should be monitored and managed.   |

Figure 3: Differences between safety 1 and safety 2 (Hollnagel, 2014d)

Since humans do not fail in a random fashion, the organisational context has to be considered (Leveson, 2017). The next section will therefore look at Resilience Engineering where the safety 2 perspective is meant to increase the adaptiveness of an organisation.

### 2.5.3 Resilience Engineering

The term resilience has received considerable attention in the safety science community in recent years since the start of its use at a conference in Söderköping, Sweden in 2006, and several authors have engaged in literature reviews to define the term because its meanings are multiple and they sometimes seem contradictory (Bergström, van Winsen, & Henriqson, 2015; Bhamra, Dani, & Burnard, 2011; Hosseini, Barker, & Ramirez-Marquez, 2016; Reid & Botterill, 2013; Righi, Saurin, & Wachs, 2015). Resilience Engineering is described by

Kleiner et al. (2015) as an approach towards system design and safety that has adopted an explicitly sociotechnical perspective. For Patriarca et al. (2018) it is a safety management paradigm with the focus on how systems cope with complexity and which tries to balance safety and productivity in a proactive way. The approach is thought of as a key concept with regards to safety and Norros (2014, p. 62) stated that:

“Central in the proposed new safety paradigm is acceptance of the variability and unexpected events in the system as inherent features of the system that cannot be fully eliminated.”

With a traditional understanding of safety, where adverse events are as low as possible, risk management seeks to maintain such a condition and stop things from going wrong (Hollnagel, 2014a). Resilience engineering, on the other hand, seeks to also understand why things go right with the underlying assumption that failure and success are two sides of the same coin.

Safety is therefore not seen as the absence of a condition that we do not want, but an emergent system property which allows the system to succeed under conditions that are constantly varying (Oedewald & Gotcheva, 2015). Resilience therefore includes safety 1 as a part of safety 2 (Figure 4).

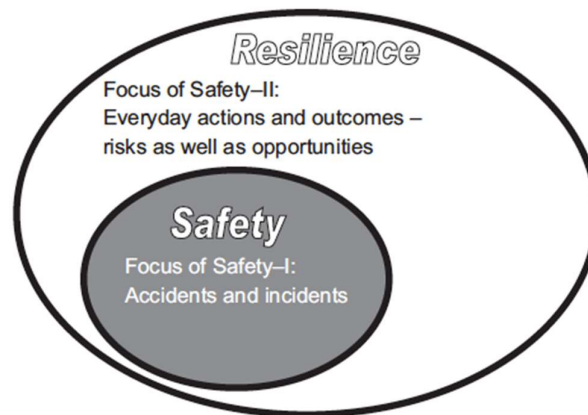


Figure 4: The relation of safety 1 and safety 2 (Hollnagel, 2014d)

Safety is therefore an ability of the system, something that the system does and not something that the system has, e.g. a good or bad safety record (Hollnagel, 2011a). Resilience in the context of this study is therefore defined as:

“The intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so it can sustain required operations under both expected and unexpected conditions.” (Hollnagel, 2011b, p. xxxvi)

Resilience Engineering studies how the characteristics of work systems make failure or success more likely when faced with disruptions and hence tries to understand and improve the adaptive capacity of the system (Branlat & Woods, 2010). Oedewald and Gotcheva (2015) argued that the system cannot be deconstructed and then locally improved but has to be understood in its complexity to achieve coping mechanisms for changing conditions. Based on the view of safety as a systemic construct stated by Kyriakidis et al. (2017), research and system design therefore have to consider systemic aspects like e.g. the design principles of Clegg (2000) and the system properties of Wilson (2014). Apart from this, the question of how RE increases the adaptive capacity of a system or an organisation has become a research topic.

#### 2.5.4 Research and gaps of Resilience Engineering

To approach the challenge of increasing the adaptive capacity of a system, Woods and Hollnagel (2006) have seen the need to identify core values. To guide the field of practice, Nemeth and Herrera (2015) proposed and explained in detail three values, which are observation, analysis and design. Other authors (Branlat & Woods, 2010; Woltjer, Pinska-Chauvin, Laursen, & Josefsson, 2015a) recently developed principles (see Appendix 6) for practical application and described how those were tested. Most of these principles refer to concepts which have already been described in the section about safety 2, e.g. reducing the gap between work as imagined versus work as actually done, adopting a system view to understand complex work and accept variability and uncertainty as inherent properties of complex work.

Woods (2015) identified four recurring concepts of resilience: (I) rebound (making reference to existing properties in place before a disruptive event, allowing the system to move back to a stable form afterwards), (II) robustness (making the system resistant to harming effects but only within expected parameters, being brittle without), (III) graceful extensibility (where the system is able to stretch when

surprised – a dynamic capability) and (IV) adaptability (balancing trade-offs and the ability to perform sustainable adaptation over several cycles). Since it is impossible to address general characteristics of resilience for each engineering purpose, it has to be explicitly defined which of these characteristics are under study when examining the resilience capacity of a system (Woods, 2015). Patriarca et al. (2018) noted that the interactions between these four concepts requires further research, especially when they are engineered into a system. However, the research just discussed leaves open the question of how to actually measure or assess the resilience of a system (Pęciłło, 2016), even though many attempts to do so have been carried out by different researchers (Demichela, Gallo, & Salzano, 2015; Dinh, Pasman, Gao, & Mannan, 2012; Saurin & Junior, 2012; Shirali, Mohammadfam, Motamedzade, Ebrahimipour, & Moghimbeigi, 2012; Shirali, Motamedzade, Mohammadfam, Ebrahimipour, & Moghimbeigi, 2012). Many of these attempts have too much focus on theory as Labaka, Hernantes, and Sarriegi (2015) stated. Addressing this gap is not easy because it is difficult to measure the adaptive capacity of an organisation without exposure to hazards in the first place, as Mendonça and Wallace (2015) remarked. Branlat and Woods (2010) concluded that research has to be carried out in practice with a middle-out approach, that it should seek acceptance of workers and management alike, and undertake and evaluate design activities.

Ultimately, there is a need for more evidence concerning the value for application of RE in a real context (Patriarca et al., 2018). The authors have also described RE as moving away from a strict adherence to safety, which can set the scene for broad applications in other fields. In order to do so, as Leveson (2017) argued, the research should focus more on interdisciplinary approaches.

It can be summarized that criticism of RE in general focuses mainly on two aspects, that it is nothing new (Hopkins, 2014) and that it is too broad and hence unclear (McDonald, 2008). Hopkins (2006) however also noted that RE has potential for further development compared to NAT and HRO, and Pęciłło (2016) sees the openness of the RE concept as a strength that allows integration in existing models and theories. All of the above suggests that applying RE to another field can be promising and is likely to create beneficial effects within such

fields. The question to be answered beforehand, however, is how and on which theoretical foundation?

### 2.5.5 The four cornerstones of Resilience Engineering

On his website ([http://erikhollnagel.com/onewebmedia/Resilience\\_Engineering.pdf](http://erikhollnagel.com/onewebmedia/Resilience_Engineering.pdf)) Erik Hollnagel, the leading author behind safety 2 and the resulting concept of RE, illustrated how the definition of RE has evolved over time and referred to the four cornerstones of resilience (anticipation, monitoring, responding and learning) that describe the adaptive or resilience capacity of an organisation (Hollnagel, 2014c). According to Pęciłło (2016), these four cornerstones are the fundamental ideas behind RE and have been widely used and integrated into research (Azadeh, Roudi, & Salehi, 2017; Hollnagel, Paries, Woods, & Wreathall, 2011; Lay et al., 2015; Pęciłło, 2016; van der Beek & Schraagen, 2015) and they have found broad acceptance.

After being proposed by Hollnagel, Woods, and Leveson (2007) and further refined by Hollnagel et al. (2011), the following description has evolved and will be used as the central theoretical basis for this study:

#### **Anticipation – ability to address the potential**

Knowing what to expect

Anticipating developments, threats and opportunities further into the future, such as potential changes, disruptions, pressures and their consequences.

#### **Monitoring – ability to address the critical**

Knowing what to look for

Monitoring that which is or can become a threat in the near term. Monitoring must cover both events in the environment and the performance of the system itself.

#### **Responding – ability to address the actual**

Knowing what to do

How to respond to regular and irregular disruptions and disturbances either by implementing a prepared set of responses or by adjusting normal functioning.

## Learning – ability to address the factual

Knowing what has happened

How to learn from experience, in particular how to learn the right lessons from the right experience – successes as well as failures.

Figure 5 shows the dependencies among these four abilities and the environment.

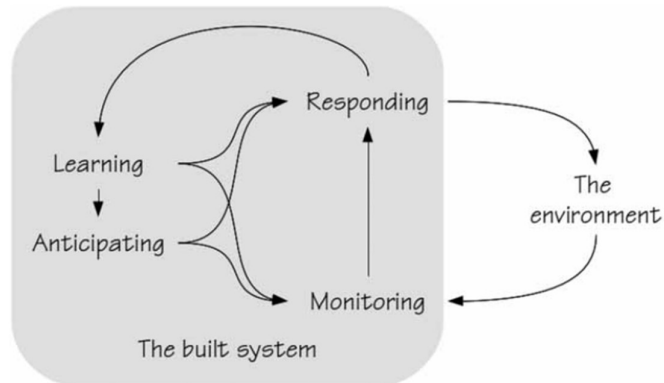


Figure 5: Dependencies among resilience abilities (Hollnagel, 2014c)

The most extensive literature review published so far about the field of RE has recently labelled the four cornerstones as a well-established contribution (Patriarca et al., 2018). One study has found some overlaps between the two cornerstones of monitoring and anticipation, but the validity of the concept of four cornerstones has partly been confirmed (van der Beek & Schraagen, 2015).

## 2.6 Conclusion

HFE and safety science have been discussed in this chapter with the focus on safety. The new paradigm of safety 2 is a central aspect of Resilience Engineering, which seeks to study and promote the adaptive capacity of an organisation or a system. Branlat and Woods (2010) pointed out that safety 1 is just one result or goal of the adaptive behaviour of a system which is why it can be concluded and is argued here that change management can profit from an RE approach.

Several authors have made a general connection to change management (Bahadur, Ibrahim, & Tanner, 2010; Davis et al., 2014; Nemeth & Herrera, 2015; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Peciullo, 2016) and see RE as an effective approach for business continuity in uncertain settings. The concept of 'work as it is done' (WAD) has for example been proved as relevant in the management of change in specific safety related areas (Morel et al., 2009). Moreover, the concept of resilience is also used in management literature, as Kantur (2015) described, but he also pointed out that much more solid research has been done in safety related areas.

It seems that RE as a concept, and especially the four cornerstones, are robust and solid enough to be used to investigate change projects that have worked well or failed. What would be the result if change projects involving the same manager that went both right and wrong were analysed using the four cornerstones of Resilience Engineering? This might provide an answer as to the usefulness of RE and an avenue to measure resilience in a way that has not yet been done. The next chapter will therefore focus on failure and success in change management and further pursue that question.

### **3. Change Management**

In this chapter a short overview of the discipline of change management (CM) is given. After highlighting gaps and actual challenges in the research about organisational change, the failure of change projects is reviewed as well as how failed change is explained theoretically and dealt with by practitioners. It has to be noted that this study focuses clearly on change as opposed to project management. Although many change management programmes will contain significant elements of project management within them this research is concerned with a more holistic notion of change. This may problematise the research in the sense that change management can be considered as “..a complex, dynamic and challenging process rather than a set of recipes” (Paton & McCalman, 2008, p. 4). However, this very nature of complexity makes the area worthy of study by comparison to project management which at its simplest level can be seen as methods or ‘recipes’ to manage resources like cost, time and performance. Aspects such as, staffing are not clearly delineated as a function of the project manager but of operations management (Havranek, 2017).

#### **3.1 The discipline and its main approaches**

What we know today as the discipline of change management is considered to have its origins almost sixty years ago with the work of Kurt Lewin (Burnes, 1996, 2004a). Lewin’s work resulted in research on group dynamics, leadership, culture and subsequently on how to change these, as Burnes (2004a) illustrated in a detailed description of his work and life. The result of Lewin’s work is nowadays considered the first main approach to change management and resulted in the model of action research (Lewin, 1951) and the three step model (Lewin, 1958) as well as field theory and group dynamics (Burnes, 2004a). Lewin’s thoughts have led to other models that further refined his planned approach to change, e.g. the seven phases of Lippitt, Watson, and Wesley (1958), the 8 phases of Cummings and Huse (1989), and the phases and processes of Bullock and Batten (1985). A more comprehensive overview is given by Cameron and Green (2015).

In the planned approach, change is seen as moving from an initial state to a new and desired state and thus as a process that has a beginning and an end



(Bamford & Forrester, 2003). Consequently, the environment is seen as relatively stable, change is triggered by the organisation in a top-down process where the manager is in control, and 'one best way' of performing the change process exists (Burnes, 1996).

In contrast to this planned approach, emergent change, puts more emphasis on the changing environment, which has to be constantly analysed in order to be understood (Dawson, 1994). In this approach the environment is seen as complex and as a source of uncertainty, which in contrast to the planned approach now triggers change as a result of external effects which are not necessarily understood completely by the organisation (Stickland, 1998).

Therefore, the rapid and complex pace of change does not allow senior management to recognize everything and plan all needed actions accordingly, which is why the emphasis changes from 'top down' control to 'bottom up' actions (Bamford & Forrester, 2003). The authors have further argued, that since the manager cannot react quickly enough his role shifts from being a controller to becoming a facilitator. Furthermore, there is no beginning and no end because change is seen as a continuous journey of learning and further need for change might come up spontaneously in the process (Burnes, 1996). The resulting models of this approach from authors such as Kanter, Stein, and Jick (1992), Hinings, Greenwood, Ranson, and Walsh (1988) and Pettigrew (1985) consider the dynamics, the processes, the context and the content of change, and as mentioned before the complexity of the environment. The planned and the emergent approach are also known as episodic and continuous change (McClellan, 2011).

The 1990's saw the development of another approach which could be seen as spanning the space between the two poles of planned and emergent change rather than naming it a third discrete approach. This is because some types of change, e.g. long marches, where change is slow but long lasting, and bold strokes, where change is sudden and drastic, could not be properly explained or described by the existing theories (Kanter et al., 1992). These two types of change are also called incremental and fundamental (Cameron & Green, 2015; Decker et al., 2012).

By aligning the internal and the external environment, the focus in the contingency model or contingency approach of change shifts to the specific situation and context, which are different for each organisation and require careful analysis to achieve optimal results as Dunphy and Stace (1993) have argued.

In a similar fashion, Burnes (1996) used the phrase 'one best for each' and stated that systemic thinking is required and that the relation to organisational culture has to be considered. In a more recent and very broad overview about organisational development (OD), which Burnes and Cooke (2012) described as strongly intertwined with change management, the authors elaborated on complexity and see it as a reason that the contingency approach is the successor of emergent change theory. Complexity has indeed received considerable attention within the field of change management in the past years. Cameron and Green (2015) in their book "Making sense of change management" have added a chapter on complexity as well as on uncertainty following the second edition from 2009. Newer approaches such as larger systemic change (LSC) have even began melding complexity with systemic perspective (Waddock, Meszoely, Waddell, & Dentoni, 2015).

### **3.2 Managing change in organisations**

How can change be explained in a comprehensive or holistic manner and which advice should be given to organisations and people involved in change initiatives?

Within the development of the discipline, complexity has become a topic with increasing relevance for science and practitioners alike (Collins & Porras, 1996; Duck, 1993), but has only recently been labelled as a complexity shift (Grady & Grady, 2013). The discipline itself and the proposed methods and models that help to manage change are in themselves complex and difficult to oversee. Al-Haddad and Kotnour (2015) have therefore integrated the existing literature of organisational change, resulting in a taxonomy that includes types (long, short, big or small), methods (systematic change methods and change management methods) and also results of change initiatives (see Figure 6).

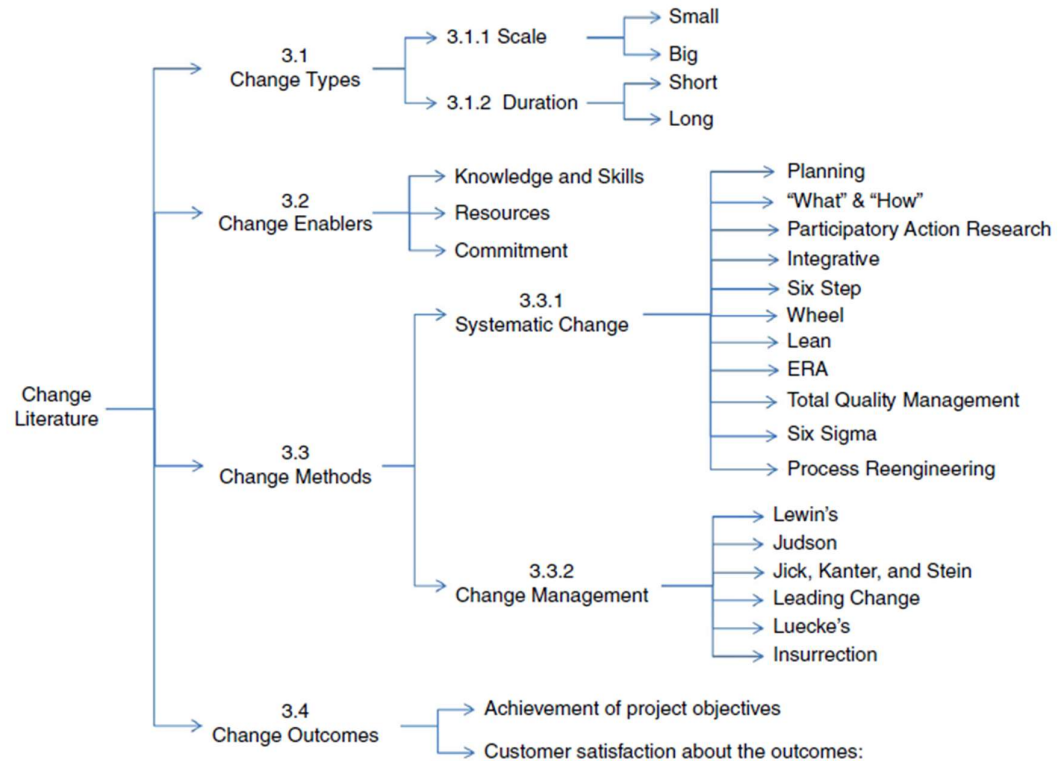


Figure 6: Taxonomy of organisational change literature (Al-Haddad & Kotnour, 2015)

The taxonomy is open and indications for further research are given (Al-Haddad & Kotnour, 2015). The change types for example, could also be expanded by naming the subject of change like structural change, specific projects, mergers or a change in strategy and culture (Cameron & Green, 2015), which ultimately are subcategories of scale and duration.

Al-Haddad and Kotnour (2015) differentiated between systematic change methods, that contain processes and tools for managerial decision making, and change management methods, which are broader, more conceptual and include a range of intervention strategies where alignment of the change initiative with the overall mission, the organisational strategy and its culture shall be achieved. Both overviews are found in appendix G for further comparison.

Even though a broad range of methods and models exist, Todnem By (2005) has described the discipline of CM as only having consensus and agreement on two aspects, that the pace of change has never been greater (Carnall, 2007; Okumus & Hemmington, 1998) and that it comes in all shapes and sizes while potentially affecting all organisations across all industries (Balogun & Hailey, 2008; Luecke,

2003). Apart from those, many disparities exist that do not provide a clear picture of how to explain or approach change, but instead highlight several gaps and topics without agreement. They will be described in the next section.

### **3.3 Research gaps and practitioner problems**

Moran and Brightman (2000) have defined change management as a process where the organisation's direction, structure and capabilities are continually renewed due to the constantly changing needs that are provided by external and internal customers. According to Burnes (2004b), change is present all the time and cannot be regarded as separate from organisational strategy. Furthermore, the ability to manage change is a fundamental skill for managers (Senior & Fleming, 2006).

While this is understandable and would suggest that much emphasis and effort goes into building such skills and abilities, there are several gaps and problems within the field of CM that draw a different picture. The paradox of the distance between theory and practitioners (Appelbaum et al., 2012), the challenge of increasing complexity (Grady & Grady, 2013) which is related to the struggle of finding a valid or systemic framework (Todnem By, 2005), inadequately addressed people-related issues (Maheshwari & Vohra, 2015) and the limited understanding of implementation failure (Schwarz et al., 2011) are some of the gaps and problems within the discipline. They are described in the following subsections.

#### **3.3.1 Distance between practitioners and theory**

There have been differences, sometimes even called boundaries, between the theoretical approach to organisational change and the practitioner side (Appelbaum et al., 2012; Buchanan, 1993; Pollack & Pollack, 2015; Saka, 2003). There is very little research on the effects of how practitioners approach change, even though a large amount of literature exists with advice on how to do it (Raineri, 2011). Bamford and Forrester (2003) found that managers tend to ignore the popular change literature because it is too simplistic and does not account for the complexity and uncertainties involved with emergent change in organisations.

One reason for this is, that what happens in organisations is seldom self-evident, clearly visible nor fixed (Pettigrew & Whipp, 1993).

The work of John Kotter has been widely applied (Cameron & Green, 2009, 2015) and is probably the best known model or set of advice. Hughes (2015) critically remarked that Kotter's advice for leading change lacks empirical evidence but at the same time has been cited over 5500 times and had a severe impact on the empirical debate. Some authors even described the surprisingly huge academic reliance on non-empirically tested findings as an enigma (Appelbaum et al., 2012). Pollack and Pollack (2015) examined the use of the 8 steps within a large Australian company facing major changes. Their findings revealed that instead of a linear approach, interventions had to happen at different levels and turned out to possess a higher complexity than expected. These findings support Bamford and Forrester's (2003) arguments concerning the increasing importance of complexity and uncertainty of emergent change.

### 3.3.2 The complexity challenge

The challenge of providing advice for practitioners and making sense of change has become a new and challenging facet with the shift towards complexity (Grady & Grady, 2013). Change initiatives not only fail to achieve intended outcomes but can also produce outcomes that were never intended (Balogun, 2006; Hughes, 2015). One reason for this, as Karp and Helgo (2008) argued, is that the complexity of change projects is underestimated by the very same managers who have to lead those projects. The majority of models follow a linear approach, mostly in the shape of defined steps that the change manager should follow (Al-Haddad & Kotnour, 2015). However, it is the linearity which is heavily criticized (Hughes, 2015). This critique extends to most of the existing change models as Thomas et al. (2016) pointed out.

### 3.3.3 Lack of systemic approaches

It is argued by Burnes (2004b) that many confusing and contradictory approaches and theories are available for practitioners and academics. Todnem By (2005), therefore suggested more research on the nature of change and how to manage it

because he critically pointed out the lack of a valid framework as a guideline for implementing and managing change. However, change management is beginning to include broader systemic changes, because our technological and human systems have developed a high level of complexity and humans have become more vulnerable to simultaneous and constant changes in their environment (Waddock et al., 2015). Unintended outcomes and the influence of different change initiatives on each other can only be understood from a systemic perspective (Hughes, 2011), since linear approaches fall short of providing explanations for such phenomena (Thomas et al., 2016). Ala-Laurinaho, Kurki, and Abildgaard (2017) therefore characterized the systemic nature of change as being dynamic, interrelated and non-linear.

Change implementation is a complex process with only a few predictive models and a general lack of holistic understanding via existing models (Decker et al., 2012). On top of this it is difficult to evaluate outcomes in the face of complexity because one can never be sure if all the relevant indicators or aspects were actually measured, and depending on what is measured the evaluation is likely to provide different results (Hughes, 2011).

#### 3.3.4 People-related issues inadequately addressed

Sense-making and culture are aspects that have been researched with regards to change and point towards the role of humans within change projects and initiatives (Ala-Laurinaho et al., 2017; Mallinger, Goodwin, & O'hara, 2009; Saran, Munoz, & Kalliny, 2008). Research indicates an impact of culture on different organisational variables (Caramelli & Briole, 2007), but the concrete relations are under-researched (Decker et al., 2012). In the literature there is much more focus on tools, strategy and structure than on the influence of human beliefs on change projects (Karp & Helgo, 2008). Several researchers complain that 'people issues' are not addressed adequately or that they are even partly neglected (Maheshwari & Vohra, 2015; Shum, Bove, & Auh, 2008). This is why Grady and Grady (2013) demanded to refocus research efforts and perspectives back on humans and their role within change initiatives.

### 3.3.5 Failure of change initiatives

A number of approaches exist which provide guidance on leading change initiatives towards a successful outcome (Al-Haddad & Kotnour, 2015). However, unsuccessful or failed change initiatives are not explored nor understood to the same degree (Schwarz et al., 2011). The question why this area has only attracted limited attention has been raised (Buchanan et al., 2005), but so far not answered in a satisfactory way. Inconsistencies exist within studies regarding definitions of failure, judging criteria, investigated industries, quality of the method and the unit of analysis e.g. project or strategy implementation (Cândido & Santos, 2015; Hutzschenreuter & Kleindienst, 2006).

Since failure is not only a central gap but also the central topic of this research, the next section provides an overview of this.

## 3.4 Failure and its reasons

When speaking about failure and success a common understanding of the meaning behind these evaluations cannot be assumed. Moreover, there is a need to investigate which definitions exist in the literature together with the reasons for failed change and how organisations deal with failure or how they try to avoid it.

### 3.4.1 The definition of failure (and success)

When investigating failure and success of change initiatives, one might think that success is the opposite of failure, that the dimension is bipolar. Since failure is not explored and understood to the same extent in the literature (Sandage, 2005), such an assertion remains to be confirmed and both dimensions have to be defined.

First of all, a project has to be finished, it has to have an end result in order to define the change project outcome (Al-Haddad & Kotnour, 2015). If that outcome is successful, predetermined objectives have been completed, e.g. to stay within budget and schedule, satisfy stakeholders, and fulfil customer requirements (Kendra & Taplin, 2004; Nicolas & Steyn, 2008). Miller (1997) defined successful implementation as completion of what was intended within the envisaged time,

that the intended performance was achieved and that the implementation method as well as the outcome find acceptance within the organisation. Nevertheless, Cândido and Santos (2015) remarked that different degrees of performance might be achieved and the acceptability within the organisation could also vary.

The above suggests an ambiguous understanding of success where a threshold is necessary in order to define where success is diminished and gradually turns into failure, in case different degrees of performance are assumed. This in turn would require clearly verbalized criteria at project start and not just a rough wish list, but research indicates that such a clear representation of envisaged goals are not always given (Schwarz et al., 2011).

Failure on the other hand offers two mutually exclusive definitions. Implementation failure has been considered by Cândido and Santos (2015) as a project that provided poor results or one that was formulated but not implemented. This line of thought was also followed by Decker et al. (2012) who understand failure as the opposite to the above definition of success by Miller (1997). The second definition refers to the process of poor or flawed execution and is defined by Schwarz et al. (2011) as not adapting adequately to change project pressure in spite of existing plans to do so.

### 3.4.2 Failure rates and the inconsistent evaluations of outcomes

Change projects do fail, there is no doubt about this fact in the literature, and for a long time the magical number of 70% was widely taken for granted as the rate at which it does (Beer, M., & Nohria, N, 2000; Keller & Aiken, 2009; Kotter, 2008; Senturia, Flees, & Maceda, 2008). When Hughes (2011) took a closer look and clearly demonstrated how this number developed and that it is in fact not grounded on solid research, a lack of understanding about failed change became visible. One review of the literature about failure rates has led to a range between 28% and 93% and the authors conclude that:

“No one really knows what the true rate of failure is in implementation of projects and strategies and there is no clear model of how to avoid failure.”  
(Decker et al., 2012, p. 42)



However, any estimation of the rate will have to be based on an evaluation process of either the outcome, the process or both. Since many inconsistencies exist in these evaluations (Cândido & Santos, 2015; Hutzschenreuter & Kleindienst, 2006) and failure in general is an under-researched topic, a wide range of different rates are a logical consequence. Moreover, it is not the intention of this research to provide a definitive rate but rather to understand how failure actually happens and how the evaluation process happens. The research of Thomas et al. (2016) ties in well to this perspective as it suggests that evaluation of failed change implementation is not consistent over time, affected by values and not always related to the result. The authors assume that the perception of failure or success changes over time through negotiation and is, among other variables, affected by sense-making and by exercising power (Thomas et al., 2016). The process of evaluation can also vary within one single organisation due to competing perceptions about failure and success (Hughes, 2011). Evaluators might have different and competing perceptions (Carnall, 1986), but also the personal interpretations and meanings that individuals have or give can greatly vary (Doyle, 2001), leading to the concept of 'perceived failure' introduced by Schwarz et al. (2011).

In summarizing the literature, it can be stated that an exact failure rate cannot be defined, that if it were defined it would be rather high (Cândido & Santos, 2015), that many change projects fail, and that what constitutes failure is based on volatile evaluations (Burnes & Jackson, 2011). To shed further light on these questions, reasons for failure have to be investigated and the next section provides an overview of what the literature has identified as leading to failed change.

### 3.4.3 Reasons for failure

The literature gives a wide variety of reasons and it is remarkable how many are the 'main' or the 'primary reason' but the main gap, as Decker et al. (2012) stated, is the absence of a systemic view on implementation failure that could incorporate all the existing knowledge on reasons for failure. A valid framework has been missing in the past (Todnem By, 2005) and so far none has been found.

Investigating the change process itself is one approach to make sense of the reasons for failure. Some researchers see poorly designed change initiatives as the reason, partly because they are designed with a closed system perspective (Cascio, 2005; Raelin & Cataldo, 2011). Other authors focus on the process of planning or execution in the search for reasons (Dent & Goldberg, 1999; Hoag, Ritschard, & Cooper, 2002; Huczynski & Buchanan, 2001).

Raelin and Cataldo (2011) further differentiated between a micro perspective, that includes values and motivation, and a macro perspective, with the focus on culture and climate. The interface between both is the middle manager and failure of change initiatives is attributed to the missing empowerment of these managers (Raelin & Cataldo, 2011). This perspective ties in well with the micro- and macroergonomic perspective of STS theory.

Seeing the role of humans as a cause for failure or as a contributing factor is a second aspect named by many authors as substantial. Rogiest, Segers, and van Witteloostuijn (2015) see the attitude of employees as a critical factor, others focus on a lack of competence and commitment (Boddy & Buchanan, 1992; Caldwell, 2003, 2007; Kirkman & Shapiro, 1997). Effects on humans, for example initiative fatigue, are also named (Bamford & Forrester, 2003).

The spectrum of possible behavioural reactions to change was outlined by Coetsee (1999), building on the work of Judson (1991), as ranging from active resistance to commitment. Some of the underlying assumptions of both Judson and Coetsee are the mutual exclusivity of both extremes and that people respond in a synchronic way along that continuum concerning emotions, behaviours and cognition. These assumptions on resistance have been challenged by several authors as too simplistic (Latta, 2006; Latta, 2009; Meyer, Hamilton, Oreg, Michel, & By, 2013). McDermott, Fitzgerald, and Buchanan (2013) for example, have argued to replace the dichotomy of acceptance-resistance with different responses to mandated policy that happen along a continuum. Furthermore, several researchers (Ford, Ford, & D'Amelio, 2008; Piderit, 2000) have started to view resistance from different perspectives: where it does not necessarily impact change negatively, where employees can have multidimensional attitudes towards change, and where their behaviour cannot be traced back to a specific attitude.

A third view on failure relates organisational and human properties. Latta (2015, p. 1020) for example has demanded the scientific community to leave what she called a 'fixation on resistance' and adopt a view that considers the complex ways in which organisations respond to change. In a theoretical framework, she linked resistance and facilitation to organisational culture while considering the different effects of cognition, emotion and behaviour (Latta, 2015). Reactions to change, according to her approach, comprise cognitive/affective facilitation or resistance on the change initiative side (content) and behavioural facilitation or resistance on the implementation strategy side (process). In her view it is cultural alignment or misalignment that determines the employee reaction to the way content or implementation is introduced by the organisation, so that failure happens "when a culturally consonant change initiative is paired with an implementation strategy that fails to accord with tenets of organisational culture." (Latta, 2015, p. 1028)

The three views (design of the process, human aspects and organisational effects) all address different facets. A valid framework (Todnem By, 2005) would have to incorporate them all in order to be holistic, and additionally it would have to provide guidance for the practitioner. Decker et al. (2012) stated that change implementation is a complex process with only a few models that provide guidance and have a predictive approach; their research has identified six perspectives in the literature for the purpose of predicting success and failure: decision making, risk analysis/assessment, organisational culture, organisational alignment, readiness to change and change management. Based on the concept of 'critical failure factors' (CFFs) by Wong, Scarbrough, Chau, and Davison (2005) and a broad literature review about failure, they have defined more than 60 CFFs in 17 proposed dimensions (see Figure 7) which "involve the individuals themselves, the processes and communication in the organisation, or the organisation itself." (Decker et al., 2012, p. 45) The authors state that a complete predictive model or taxonomy that explains change success/failure and incorporates different organisation types and situations does not exist, but they see the possibility of constructing some sort of marker analysis which uses employees and managers opinion to predict failure and success (Decker et al., 2012).

| PROCESS CFFs  |  | ORGANISATIONAL CFFs  | COMMUNICATION CULTURE CFFs   | PEOPLE CFFs   |
|---|--|--|--|---|
| <b>Goals, Metrics and Rewards</b>   | <b>Bureaucracy and Politics</b>  | <b>Culture</b>   | <b>Poor Community for Change</b>   | <b>Low Care Horizon</b>   |
| <ul style="list-style-type: none"> <li>No clear state of requirements, goals, objectives</li> <li>No clear vision &amp; objectives</li> <li>Little role definition &amp; presence of conflict</li> <li>No metrics/ monitoring/ feedback or not aligned</li> <li>Rewards not aligned to change</li> </ul>  | <ul style="list-style-type: none"> <li>Little interdepartmental cooperation/bureaucracy</li> <li>Too much bureaucracy and politics</li> </ul>  | <ul style="list-style-type: none"> <li>Unsupportive culture - grp &amp; balanced</li> <li>Not flexible/inability to adjust to changes</li> </ul> | <ul style="list-style-type: none"> <li>Little interdepartmental cooperation</li> <li>Little executive management support</li> <li>Few project champions perceived</li> <li>Lots of bureaucracy and politics</li> <li>Poor implementation manager's reputation</li> <li>Low commitment/ involvement</li> </ul>  | <ul style="list-style-type: none"> <li>Turnover of team/ leaders</li> <li>Don't see the change as real/ Not needed</li> <li>Unrealistic expectations from management perceived by employees</li> <li>Poor alignment of people's and org.'s values</li> <li>Little mgt. support Perceived</li> <li>Little individual readiness for change</li> </ul> |
|   | <b>Knowledge Transfer</b>  | <b>Initiative Overload</b>   |  |   |
|   | <ul style="list-style-type: none"> <li>Lack of training/poor knowledge transfer</li> <li>Inappropriate CM processes/strategy</li> </ul>  | <ul style="list-style-type: none"> <li>History of failed initiatives</li> <li>Too many competing initiatives</li> </ul>                          |  |   |
| <b>Decision Making &amp; Planning</b>   | <b>Staffing</b>  | <b>Alignment</b>   | <b>Poor Communication Culture</b>  | <b>Low Motivation to Change</b>   |
| <ul style="list-style-type: none"> <li>Poor decision making</li> <li>Continual changing customer requirements</li> <li>Poor project management competence/plan, schedule</li> <li>Little user involvement in DM or planning</li> <li>Overreliance on customization</li> <li>Improper Planning i.e. cost and time estimate</li> <li>Poor strategy/project fit</li> </ul> | <ul style="list-style-type: none"> <li>Lack of competent staff</li> <li>Inadequate staffing</li> <li>Poor IT/ERP system misfit</li> <li>Poor consultant performance</li> <li>Not commercially profitable for the contractor</li> </ul> | <ul style="list-style-type: none"> <li>No alignment - org./vertical &amp; horizontal</li> <li>No alignment of supply chain</li> </ul>            | <ul style="list-style-type: none"> <li>Poor communication and connection</li> <li>Unrealistic expectations of Employees</li> <li>Conversation/participation not allowed</li> <li>Employees cannot express doubt</li> <li>High sense of vulnerability</li> <li>No clear &amp; consistent expression of vision &amp; objectives</li> <li>Transparency &amp; trust</li> <li>Prior negative experiences</li> <li>No transparency</li> <li>Recent change of leadership/management</li> <li>Lack of trust</li> </ul> | <ul style="list-style-type: none"> <li>Interpersonal resistance</li> <li>Too much change coming</li> <li>Little motivation to change</li> <li>Little buy-in/passion</li> <li>Large status change expected from change</li> <li>No fun/hard work expected</li> <li>User resistance</li> </ul>  |
|   |  | <b>Process Issues</b>  |  |   |
| <ul style="list-style-type: none"> <li>Processes not in place</li> <li>Mechanistic processes</li> <li>Poor business process reengineering</li> </ul>  |  | <ul style="list-style-type: none"> <li>Inadequate infrastructure</li> <li>Inadequate resources and funding</li> <li>Inadequate CM</li> </ul>     |  | <ul style="list-style-type: none"> <li>Avoidance of accountability</li> <li>High need for control</li> <li>High need for predictability</li> <li>Little personal flexibility</li> </ul>   |
|   |  |  |  | <b>Low Ability to Change</b>  |

Figure 7: Critical Failure Factors (Decker et al., 2012)

### 3.4.4 Summary

This chapter started with a basic description of organisational change management. The complexity shift (Grady & Grady, 2013) has become a challenge and little overall agreement exists (Todnem By, 2005), but would be needed to face such challenge effectively. With regard to the failure of change projects the image does not become brighter as many gaps and practical problems have been identified. Apart from the high rate of failure, it is obvious that much potential for improvement exists in the field. However, how to approach that challenge is not at all obvious.

Three views on failure became apparent which focus on the design of the process, on human aspects and on organisational effects. From a safety related HFE perspective they could be understood as a micro perspective, due to the view on humans and its lack in CM failure literature, and a macro perspective, where organisational effects come into the focus. In addition the systemic design orientation of HFE (Dul et al., 2012; Wilson, 2014) could be applied when investigating change failure.

Chapter four explores the potential of HFE and RE by contrasting them with the gaps and challenges in the area of organisational change. The work of Decker et al. (2012) provides a starting point for a more holistic and systemic understanding of change failure via the identification of critical failure factors, whereas the RE focus on 'why things go right' could provide additional insight and continue their research efforts.

## **4. Bringing the disciplines together**

This chapter contrasts the results of chapter two and three and outlines how a safety perspective in general and RE and HFE approaches in particular might provide more insight into failed and successful change. A combined three-step perspective of explorative research is suggested to explore these insights. It considers failed and successful change along the four cornerstones of resilience under a micro-ergonomic and macro-ergonomic STS theory perspective.

### **4.1 Considering safety thinking for Change Management**

If we compare the very low accident and incidents rate in safety-related high-risk environments, e.g. aviation with only five fatal accidents in 2017 as reported by the ICAO on their homepage (International Civil Aviation Organisation – [www.icao.int/safety/safety reports](http://www.icao.int/safety/safety%20reports)), with the comparably high rates of organisational change failure, safety-related HFE thinking would be embraced by CM, but this has only sporadically been the case (Buchanan, 2011). While there are legal and institutionalised approaches in safety-related areas, none exist in CM. The transfer of insights of HFE and safety science to other fields is not as obvious as it would appear at first sight and medicine is witness to this, as the research of Parker (2015) has indicated. She pointed out that unlike disasters in other industries, where they happen on a large scale, in medicine they are local and personalised, such that

“[t]his relative isolation has led to difficulties in understanding systemic contributions to error, because incidents tend to be seen as the failure of an individual and not the failure of some other element, such as inadequate equipment design or procedural shortcomings.” (Parker, 2015, p. 392)

In the field of organisational change, the consequences of failure neither result in large-scale disasters nor human victims according to the literature review. The high failure rate and the under-researched topic of failure (Schwarz et al., 2011) suggest including safety 1 approaches (Hollnagel, 2014d). The work of Decker et al. (2012) on predictive CFF can be regarded as an initiative in such a direction. However, complexity puts a limit to identifying all relevant variables, a challenge that could be addressed by RE and safety 2 because of their specific focus on that

challenge (Lay et al., 2015). Although complexity has also become an important topic in change-related research (Grady & Grady, 2013), existing research in safety-related areas could be used to inform this direction (Grant, Salmon, Stevens, Goode, & Read, 2018; Waterson et al., 2015). Therefore, the benefit of complexity theories for CM needs more research to be applicable and useful for improving organisational change (Burnes, 2005). By addressing the existing gaps, this research contributes to this issue.

## **4.2 Addressing the gaps**

The challenges that complexity provides are probably the main reasons for systemic approaches in HFE (Dul et al., 2012) and RE (Branlat & Woods, 2010), together with the limitations of linear approaches of error causation in the tradition of safety 1 (Haavik, 2014; Hollnagel, 2014b). This insight is beginning to emerge in CM as well (Hughes, 2015; Thomas et al., 2016), which is why RE and HFE have the potential of improving the success rate of organisational change (Kantur, 2015).

The design orientation of HFE under a systemic perspective (Dul et al., 2012) and the STS focus on design principles (Clegg, 2000; Davis et al., 2014) offer promising tools to address the problems of poorly designed change initiatives and could also address the shortcomings in planning (Cascio, 2005; Huczynski & Buchanan, 2001; Raelin & Cataldo, 2011). Are they considered in successful projects and neglected in the failed ones?

The distance between practitioners and science is advocated as smaller in HFE and safety science (Appelbaum et al., 2012; Karwowski, 2005, 2012; Raineri, 2011). Moreover, RE puts a special focus on reducing the gap between work as it is imagined (WAI) and work as it is done (WAD) (Hollnagel, 2014d; Lay et al., 2015). In challenging different assumptions about how change happens, Jansson (2013) required to put more focus on the context in which it happens. This line of thought relates to the contingency approach (Cameron & Green, 2015; Dunphy & Stace, 1993) The research focus of RE on work as done (Woltjer, Pinska-Chauvin, Laursen, & Josefsson, 2015b) could therefore provide momentum for understanding success and failure of change initiatives.

The micro-ergonomic and macro-ergonomic perspectives of STS theory in HFE specifically address human issues which are said to be neglected in organisational change (Maheshwari & Vohra, 2015). By exploring change failure and success from such a perspective the call for refocusing on human aspects (Grady & Grady, 2013) and hence the gaps described in sections 3.3. and 3.4.3 could be addressed. Such an approach would be in line with recent research by Durand, Decker, and Kirkman (2014), who emphasised the benefit of crowd knowledge, as well as with Latta (2015), who put the focus on the positive contribution of people instead of the problems they cause. Moreover, seeing people in an organisation as an asset for pro-active behaviour instead of a cause for failure is a central consideration of safety 2 and RE (Hollnagel, 2014d). The micro and macro perspectives are not new to CM. To a certain extent, they also appear in the research of Ala-Laurinaho et al. (2017) and with regards to failure and success also in Raelin and Cataldo (2011). However, the explicit application of safety related HFE and RE thinking to such perspectives is yet missing.

Much has been written on the notion of organisational culture (Schein, 2010) and it has also been addressed by some authors with regards to failure and success (Bamford & Forrester, 2003; Latta, 2006; Latta, 2009, 2015). In safety science, the term safety culture has become famous since the Chernobyl incident and has increased the awareness of safe behaviour within organisations (Buerschaper, 2008). The concept has received criticism and safety climate is seen as a more tangible concept (Murphy et al., 2014), but many different definitions of both concepts exist (Hopkins, 2006; Reiman & Rollenhagen, 2014; Wiegmann, Zhang, Thaden, Sharma, & Gibbons, 2004). Comparing the understanding of culture in RE, HFE and CM is not within the scope of this research. However, it will be of interest whether interviewees elaborate on the topic and that way provide indications for further research.

All of the above ties in well to what Buchanan (2011) has described as a novel and challenging research agenda, that among other aspects should seek more understanding on the context of change initiatives, the theory-practice gap and how the process evolves over time and is affected by other events and circumstances. This relates to the paradigm change in safety science where so-



called concurrences are seemingly unrelated aspects that can affect each other and lead to unforeseeable effects (Hollnagel, 2007).

To investigate change initiatives over time would mean putting the focus on preparation or design, communication to employees, execution and the final evaluation of the outcome, which also includes the chance of learning from that result. The literature review on failed change has identified reasons for failure which could be allocated along such a timeline or process. Regardless, the view on success also plays a major role, as RE suggests, and applying both micro and macro perspectives should also contribute to a more holistic understanding of change processes.

### 4.3 Conclusion for the research

Based on the literature and the identified gaps and overlaps, there is a need to explore failure and success of organisational change along the four cornerstones of resilience in a three-level approach as shown in Figure 8.

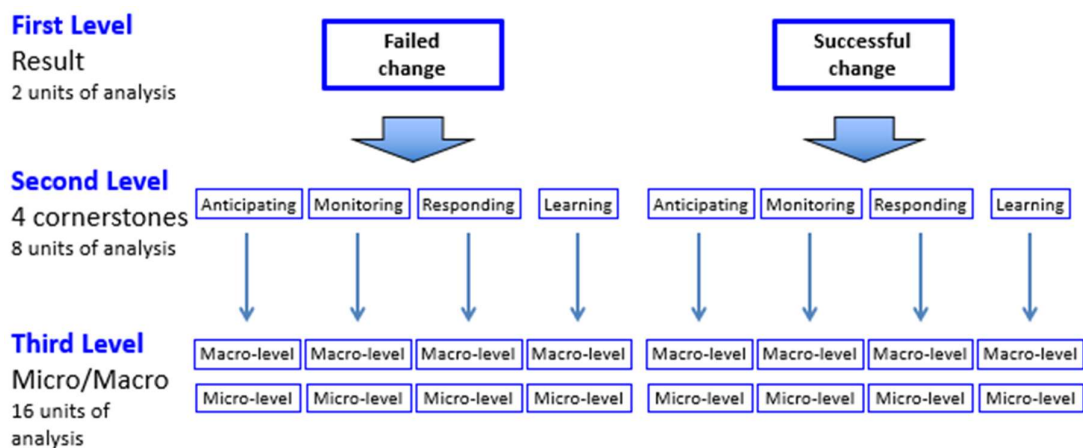


Figure 8: Conceptual model of this study

This approach allows to investigate failure and success in relation to the four cornerstones and via considering the differentiation between micro-ergonomic (individual) and macro-ergonomic (organisational) aspects. Assuming this perspective, this thesis addresses the following questions:

- How do successful projects differ from failed ones?
- To what extent are systemic aspects considered?
- Which topics emerge on the macro and on the micro level?

- To what extent are design aspects considered?
- What insights does the research provide as far as the difference between work as it is done (WAD) versus work as it is imagined (WAI) is concerned?

Chapter five explores what methodological approaches were appropriate in understanding research into these questions.

## **5. Research Methodology**

Since research is dedicated to creating new knowledge, Saunders, Lewis, and Thornhill (2012) have argued that what is considered acceptable knowledge will determine the design of research projects. The design of this study was based on an interpretative stance and hence a qualitative methodology. This chapter describes the underlying decisions for that choice, what the considerations were for data collection, sampling, research quality, data analysis and ethical considerations.

### **5.1 Research philosophy and research approach**

Johnson and Clark (2006) have argued that reflecting on philosophical choices and being able to explain or defend them adds to the rigour of a solid research project. In this study, it is the paradigm change in safety science which has mainly determined these choices. Niglas (2010) sees research philosophies as continua rather than as fixed positions and the decision for a specific philosophy will therefore depend on the 'best fit' because all positions have their supporting arguments. The best fit for this study is an interpretative stance because its epistemological position is mainly determined by the paradigm change of safety 1 towards safety 2 and hence a shift from a positivist towards an interpretivist philosophy. There are several reasons for this argument:

1. HFE research has been dominated for a long time by a positivist or reductionist approach (Nathanael & Marmaras, 2012). Examples of this are the search for root causes and the Domino model (Waterson et al., 2015), which belong to the safety 1 paradigm (Hollnagel, 2014d). In positivism, hypotheses are tested rather than new areas explored, mostly quantitative research approaches are used and the focus rests on an observable reality as well as on causal relationships (Gill & Johnson, 2010). Nathanael and Marmaras (2012) suggested leaving this practice because of the HFE research shift to a systemic perspective (Dul et al., 2012) where positivism would fit with the search for a root cause but not with concepts like emergence (Wilson, 2014) (see Table 1) or the RE focus on the intractable nature of complex systems (Hollnagel, 2014d). Haavik (2014) added that a fundamental feature of RE ontology is a constructivist stance, which according to

Saunders et al. (2012) relates to the philosophical position of interpretivism, in which the world is seen from the point of view of the research subject, where the world is complex and each situation unique.

2. The paradigm change in safety (see section 2.5) puts emphasis on 'how work is done' (WAD) and on how humans adapt their performance in order to make 'things go right'. Knowledge that is acceptable from an epistemological point of view is therefore knowledge about how work is done and is a preferred approach since the lack of adequate vocabulary of performance adjustments is described as an important gap by Hollnagel (2014d, p. 156).

The philosophical and methodological aspects of safety 1 and 2 are compared by Hollnagel (2014d, p. 128) with regards to ontology (the nature of things), aetiology (why and how they work) and phenomenology (their representation in the world) by stating that "the aetiology is the way of explaining the phenomenology in terms of the ontology". Table 2 provides a summary of this extensive comparison.

| <b>Description</b>  | <b>Safety 1</b><br>(Best fit: Positivism)   | <b>Safety 2</b><br>(Best fit: Interpretivism)   |
|---|---|---|
| <b>Phenomenology</b><br><br>The observable characteristics or manifestations. The safety phenotype. | Adverse outcomes and situations where things go wrong, e.g. incidents, near misses and accidents. Safety is present when nothing unwanted happens.  | As many acceptable and intended outcomes as possible while succeeding under expected and unexpected conditions. Safety is present when things go right and can be examined by observing normal work. The adequate vocabulary of performance adjustments is missing. |
| <b>Aetiology</b><br><br>The origin or cause of the observable phenomena. The safety genotype.       | Assumptions about causality. Results (manifestations) can be explained by decomposition and referring to characteristics of components. Represented by models, e.g. Swiss cheese model.   | Emergence serves as an explanation to make sense of how something happens because linear causality does not work. Emergence arises from unintended combinations of performance variability. Resonance replaces pure causality as a concept.                         |
| <b>Ontology</b><br><br>The nature and essential characteristics of safety. What 'really' goes on.   | The nature of failure includes several assumptions: <ul style="list-style-type: none"> <li>- Systems are decomposable.</li> <li>- Function of components can be described in bimodal terms.</li> <li>- The order in which events develop can be determined in advance.</li> </ul> | Human performance is variable, making the bimodality principle obsolete. In STS, work situations can be intractable and require performance adjustments while accepting performance variability as the norm, not as failure of humans or human error.               |

Table 2: Comparing safety 1 and 2 from a research philosophy perspective based on Hollnagel (2014d) (summary by the author of this study)

3. The decision to adopt an interpretative stance can also be explained because the two remaining options do not provide the best fit. On the one hand, realism would be problematic because it sees reality as independent of the mind (Crotty, 1998), while this study puts the emphasis on how the research subject sees the world. Pragmatism on the other hand would fit the 'work as done' (WAD) concept of RE, the design orientation of HFE and it could further consider complexity by stating that multiple realities allow for different interpretations to exist because none gives the entire picture (Kelemen & Rumens, 2008). However, Kelemen and Rumens (2008) have also highlighted that pragmatism allows research to move between positions like positivism and interpretivism, as e.g. a mixed method research can. Considering the above mentioned continua (Niglas, 2010),

pragmatism could be used for research with rather unclear borders. However, the previous table shows that in this research the borders were not unclear. Moreover, this study was approached from the point of view of the change manager (see section about population and sample) and as such was based on their understanding and experience. Therefore, the best fit was an interpretive stance.

### 5.1.1 Research approach

This study did not work inductively, with data as a starting point to build new theory (Ketokivi & Mantere, 2010), but incorporated existing knowledge from HFE and RE and examined it for application or possible testing in order to explain outcomes of change initiatives and at the same time add to or modify existing theory in the field of CM. It put emphasis on the context and allowed different views, as an interpretivist research framework does, and hence elements of an inductive approach were used (Easterby-Smith, Thorpe, & Jackson, 2008). Likewise, it also did not work purely deductively by for example comparing and testing premises in relation to the collected data (Blaikie, 2009). One reason for this is that reductionism is a central principle of a purely deductive approach (Saunders et al., 2012) and one that RE rejects because of its shortcomings in considering systemic aspects like, for example, emergence (Nathanael & Marmaras, 2012).

Therefore, this study adopted an abductive approach containing both deductive as well as inductive elements. Instead of moving from theory to data as in deduction or from data to theory as in induction, moving between both is a characteristic of an abductive approach (Suddaby, 2006). Hence, when the borders appear blurred, such an approach seems reasonable and as Saunders et al. (2012) argued, it fits research where existing knowledge from one domain is applied to another.

## 5.2 Methodological choice and research strategy

Methodological choices do not just refer to a chosen method, as the words might suggest, but also to the underlying ontological and epistemological assumptions (Jamal & Hollinshead, 2001). One characteristic of good social science, according to Flyvbjerg (2006), is a problem-driven methodology. The problem on which this study was based is a high rate of failed change initiatives. Seeing this problem in the new light of safety 2 and RE meant shifting the focus from just failure to

everyday work and 'how things go right' and exploring the dynamics of performance adjustments. If research intends to investigate dynamics, Bowen (2005) argued that a qualitative approach is needed because it is highly sensitive to context (Gephart, 2004) and looks into how respondents interpret and make sense of situations and in that way construct their reality (Taylor & Bogdan, 1998). Hence, because of the selected subjective philosophical position of interpretivism and the explorative nature of the research question, a qualitative methodology was indicated.

In order to explore failed and successful change projects and also being able to further investigate unexpected topics that come up during the research, semi-structured qualitative interviews seemed appropriate because they combine the flexibility of exploration with the rigour of following identified topics from the literature review in each interview (King, 2004).

### **5.3 Population and sample**

Change managers were the population for this study because they are the interface between those affected by change and the organisation, while at the same time coordinating activities within the change initiative (Raelin & Cataldo, 2011). As the explorative nature of this research suggested adopting a broad perspective, the focus was not limited to a single industry but rather was as wide as possible. It was assumed that change projects would be different in each industry as far as the content or project type was concerned, but the process of change and its challenges, e.g. resistance, might be similar.

Following the conceptual framework of this study, the managers should be able to talk about a successful and a failed project. Hence, they should have experience with both outcomes and be willing to talk about them. For the analysis to contrast 'what goes wrong' with 'what goes right', this criterion was the most important. With regard to failure of change, the work of Raelin and Cataldo (2011) suggested focusing on middle managers. It was therefore favourable to aim for experienced managers because they were likely to have been in the position of a middle manager at the time of the projects as opposed to at the time of the interview.

Buchanan, Boddy, and McCalman (2013) have suggested that research should be opportunistic because even though as a researcher one strives to obtain an ideal sample, the reality of business and organisational constraints often dictates otherwise and requires lowering one's sights. Hence and because it has obviously been impossible to identify the complete population, convenience sampling (Quinlan, Babin, Carr, Griffin, & , 2015) was selected initially. However, not every project seemed suitable, which shifted the focus from the interviewees to the projects and extreme or deviant case sampling was used (Patton, 2002). This method is used when no typical cases exist and researchers look for 'what not to do' and for 'best practice' (Etikan, Musa, & Alkassim, 2016). This is not only meets the demands of an explorative approach but also ties in well with investigating failed and successful projects. Those projects, a failed and a successful one from each interviewee, should pose sufficient challenges to allow their investigation based on the research questions of this study. Therefore, the manager should have had enough leverage on design, enough interfaces between micro and macro-level needed to be present, complexity and systemic aspects must have led to decision making under uncertainty, and project failure should have or did have unpleasant consequences. Overall, aspects of organisational resilience and adaptiveness could have made or did make a difference, as this is the lens through which those projects are investigated. Hence, several interviewees had to be excluded due to their projects being inadequate.

In order to derive relevant topics or identify phenomena with relevance, Jansen (2010) argued that a sample should consist of at least ten interviewees. This study fulfils that requirement, using twelve, but since the focus is on the projects, those should be representative. Based on the above described criteria it is argued that 24 projects or 12 pairs provided the required density to allow a thick description of relevant phenomena. To achieve this, the sample size will also be determined by saturation, which in the context of this research means that there are no new or just isolated random new codings when in addition other topics and codings are repeatedly mentioned (Padgett, 2016). The interviews were conducted between December 2016 and July 2017. All interviewees were native German speakers, allowing the interviews to be conducted in German.

Table 3 describes the sample in more detail.



| No. | Industry  | Position, age at time of interview and background   | Project type and outcome  |
|-----|---|---|---|
| 1   | Chemical, US corporation with several sites in Germany. At the time of the interview one small site was to be closed and a restructuring process was about to start.                  | Quality Manager (54), had different positions in the company over last twenty years, was in charge of quality department for several years while also going through a merger, received training on lean and six sigma but would have liked more on change management  | <p><u>Successful:</u> Introduction of a new technology to become innovation leader</p> <p><u>Failed:</u> Changing cost structure/prizing with the consequence of losing important customers</p>               |
| 2   | Automotive, large German enterprise.  | Managing Partner in a Consulting Firm for leadership coaching (67), former Senior Manager in the automotive industry while company was going through structural change of management system and staffing, got more and more interested in training on human issues and change which was reported as not provided at career start (end of 70')   | <p><u>Successful:</u> Removing one hierarchical /management level</p> <p><u>Failed:</u> Implementation of a new time tracking system for employees</p>  |
| 3   | Defence; Electronics, aviation and security division of a multinational corporation. The organisation was recently sold to an American investor and many processes had to be adapted. | Head of Quality Department (57), spent last 10+ years in the company, which went through several restructuring processes and was being sold at time of interview, had several management positions before being appointed as quality manager, reflected much on additional training which managers apparently have not enough time for nowadays, values experiences and theory to be balanced   | <p><u>Successful:</u> Restructuring of order management for the entire production</p> <p><u>Failed:</u> Changing processes and reducing number of employees</p>   |
| 4   | Airline, subsidiary for cargo/transportation of goods. Organisation of about 150 employees. The management structure was entirely changed two years before the interview took place.  | CEO of subsidiary (46), while company was going through financial difficulties all management positions were reassigned with the help of an external consulting firm, based on their assessment he went from head of sales to CEO and had to deal with several internal conflicts from other managers but was backed up by shareholders, received additional training e.g. intercultural training in preparation for a project and coaching, which was much valued, would have liked training for more holistic leadership competencies and best practice | <p><u>Successful:</u> Business Reengineering due to continuous decrease of revenue (subproject)</p> <p><u>Failed:</u> Large cooperation project with several competitors (confidential topic and content)</p> |
| 5   | Defence; Electronics, aviation and security division of a multinational corporation. The organisation was recently sold to an American investor and many processes had to be adapted. | Senior Quality Manager (57), spent several years in this position and experienced same developments as R3, was provided with regular training over the last years and throughout his career, this was to a large part due to proactively demanding training and actively searching the market for adequate courses fitting the needs and interests  | <p><u>Successful:</u> Reduction of quality cost for production-wide deviations/faulty products</p> <p><u>Failed:</u> Restructuring of department organisation involving replacement of employees</p>          |
| 6   | Defence, Aviation, large corporation  | Senior Manager, Vice President (55), several positions in higher management including head of business unit and head of site, was in charge of some critical projects with political implications, did not receive specific training on change management but rather for managing projects but has been using consultants as advisors and values their contribution as far as experience is concerned   | <p><u>Successful:</u> Organisational change (confidential topic and content)</p> <p><u>Failed:</u> Organisational change (confidential topic and content)</p>   |
| 7   | Defence, Aviation, large corporation  | Senior Manager, Vice President (58), several positions as senior manager including change projects in different countries, has received senior management training program but would have preferred more specific and theoretical content on change   | <p><u>Successful:</u> Integration of two systems into firm's portfolio (confidential topic and content)</p> <p><u>Failed:</u> Reorganisation of several divisions into a new corporate structure</p>          |

|    |  |   |   |
|----|--|---|---|
| 8  | IT, multinational corporation  | Senior Manager, Vice President (55), from a senior management position he was appointed to the board of a subsidiary/business unit abroad and during an economically hard time, from there two sites on other continents had to be managed, company has provided extensive training and much was done on soft skills and human issues, R8 has a strong emphasis on cooperation and ethical considerations | <u>Successful</u> : Turning a business unit of a large corporate into an independent firm listed at the stock market  |
|    |  |   | <u>Failed</u> : General account of difficulties in several projects – respondent stated during the interview that he has no specific failed project to talk about, however, he provided many in depth-descriptions of problematic projects (longest interview of all) |
| 9  | Financial, large national bank. The interviewees department is one of several regional business units, coordinating the branches in those regions. The bank was in the process of closing branches in order to adapt to the changing financial business. | Senior Manager (VP) in charge of business unit (56), has spent his career in the bank accessing different management positions, much experience with change projects which led R9 to be convinced of the need to consider human issues and subtle aspects in their behaviour  | <u>Successful</u> : Change of entire structure of the organisation including mergers and closing of branches  |
|    |  |   | <u>Failed</u> : Large reorganisation of process structure within a business unit with significant involvement of an external consulting firm  |
| 10 | Automotive, multinational German based supplier. The plant had around 400 employees and rumours existed about closing it. It was in fact closed 2 years after the interview took place.  | Plant Manager (54), has received much training in preparation for the different management positions, no training was specifically focused on change, R10 would have put more emphasis on CM and mainly on the consideration of human issues and corresponding tools  | <u>Successful</u> : Implementation of lean-management methods in one plant  |
|    |  |   | <u>Failed</u> : Reducing sickness absence rate  |
| 11 | European Agency. Large organisation of the EU that went through a restructuring process.   | Manager (41), has led different projects and called own preparation as 'over-qualified' due to extensive training history on project management and soft skills, senior management is critiqued for neglecting human issues while R10 put much emphasis on cooperation with others to counter structural constraints  | <u>Successful</u> : Implementation of changed legal framework   |
|    |  |   | <u>Failed</u> : Reorganisation and cultural change  |
| 12 | Defence, Aviation, large corporation   | Senior Manager (51), after managing different critical projects and not receiving any kind of change management training during their career R12 concluded that such skills and knowledge should be a standard training with specific focus on managing conflicts of interest   | <u>Successful</u> : Reorganisation of a department while retaining key personnel  |
|    |  |   | <u>Failed</u> : Reorganisation of 20 central business processes   |

Table 3: Sample of this study

### 5.3.1 Context of the study

All the organisations of the sample are located in Germany. All of them either have branches in other countries or belong to large multinational enterprises or conduct business on an international level. However, the cultural background of the interviewees is German even though many international interfaces exist within the projects. A larger scope would have been difficult to achieve within the time frame of a DBA programme and due to a then increased challenge of gaining access (Buchanan et al., 2013). Table 3 provides background about the organisations. Most of them were undergoing larger systemic changes at the time of the interview

or had to deal with the effects of recent change, which had significant effects on organisation structures and business situations. As a result, within all of the change projects, multiple internal and external interfaces had to be considered because they affected the project or were expected to do so. Systemic effects and complexity could therefore be observed in all projects. Project failure therefore had the potential of significantly affecting business or the organisational structure. This was most dramatically observed in the case of R10. His plant was closed two years after the interview took place. A common characteristic for all projects was that with regard to safety and resilience, no respective legal aspects or regulations had to be followed.

#### **5.4 Data collection**

The structure of the interviews followed the four cornerstones of resilience in the same order for the successful as well as for the failed project. The whole interview was introduced with a warm-up question, asking what the managers associate with change projects in general. Then specific questions concerning the four cornerstones were asked. These questions first addressed general aspects in a very open way. Such an approach also allowed making use of the flexibility of semi-structured interviews by asking follow-up questions (Corbin & Strauss, 2008).

The cornerstones were addressed in the opposite way as they are usually described by starting with learning and then going backwards to responding, monitoring and anticipating. This approach was cognitively more demanding and did not allow for one topic to be followed from beginning to end in a consistent way, countering confirmation bias (Kahneman, 2011).

The last interview question closed the loop by going back to learning again and allowed for a summary by elaborating on received training, how useful this training was for the two projects in general and what the managers would have needed additionally in their role at the time of running the project. Appendix Q lists all questions in German language (as they were asked) and in their English translation.

Acknowledging framing effects, but also to overcome possible reluctance to share negative details about their failed project, it was decided to start with the successful project. However, the interviewees were surprisingly open with regard to their failed project. One reason for this could be the confidentiality provided by an ethically supervised and clearly documented research process in addition to a consistent demonstration of responsible data handling and a visible effort to create mutual trust. Another reason could be the interest of interviewees in understanding failure and seeking insight for further projects. This argument is supported by the fact that most interviewees not only asked for the finished thesis but also for a chance to discuss the results.

As a result of the above, no objections towards audio recording of the interviews came up. The total duration of the recordings ranged between 38 and 114 minutes, with most of them lasting between 60 and 80 minutes. Transcription of each interview was performed by a professional service with eighteen years of experience at the time and following transcription rules as laid down by Dresing and Pehl (2011). Each audio file was sent for transcription within 36h of its recording and transcribed not later than five days after receiving the file.

## **5.5 Quality of the research**

Raimond (1993) pointed out that at the end of a research project results like evidence or conclusions will have to stand up against a test of scrutiny, therefore every researcher has to allow the critical question of how he or she actually knows that what was found is not affected by how he or she sees the research subject. It is the aim of this section to show which criteria were used to assure the quality of this research project and to describe how these criteria have been applied.

Reliability and validity serve the above purpose but are applied differently in qualitative and quantitative research (Quinlan et al., 2015). According to Corbin and Strauss (2008) these terms cannot be applied well to qualitative research and therefore other concepts should be used. Lincoln and Guba (1985) suggested credibility instead of internal validity, transferability instead of external validity and dependability instead of reliability. An interpretivist approach might use these alternative criteria but could also adapt reliability and validity (Saunders et al., 2012), which is the position of this study and in line with the suggestion of

Peräkylä (2011), that the nature of the research determines which qualitative methods are appropriate to test its quality.

### 5.5.1 Aspects of reliability

According to Kirk and Miller (1986), reliability refers to the level of independence of findings from accidental circumstances of the research. This makes reference to the rigour of the research process. If other researchers were to repeat the procedure they should obtain consistent results (Quinlan et al., 2015). One element that determines the quality of interpretivist research in particular is the transparency of the process and design (Leitch, Hill, & Harrison, 2010). Providing a detailed description of how data collection was undertaken as well as a detailed account of the data analysis procedures serves that purpose. All of the above circle around a consistent point of reference, which are the four cornerstones of organisational resilience and its underlying micro- and macroergonomic aspects of safety, against which a phenomenon (failed change) in a different field (CM) is being explored. This point of reference is also reflected in the coding scheme which adds to the transparency criterion by clearly illustrating how sense was made of the raw data, a relevant aspect of assessing reliability of a study according to Easterby-Smith et al. (2008).

Robson (2004) has warned of threats to reliability of which three were of relevance for this study: participant error and bias as well as observer bias. To avoid falling victim to participant error, careful emphasis was placed on scheduling time slots when the interviewee was not under tension due to preceding or following periods of high workload. This also meant avoiding any time constraints that would have made the participant want to rush through the interview questions. To counter participant bias via saying what interviewees think their bosses want them to say or that which is socially accepted or expected, carefully following guidelines of ethical scrutiny was paramount. Finally, the countermeasures for observer bias included not relying on notes but only the recorded spoken word and following the consistent point of reference provided by the four cornerstones of resilience.

## 5.5.2 Aspects of validity

According to Saunders, Lewis, and Thornhill (2009), validity is present when the findings are really about what they intend to be about. Other authors have asked if what the researcher is measuring is actually called by the right name (Kirk & Miller, 1986; Peräkylä, 2011; Silverman, 2015). Explorative research that tries to make sense of accounts from respondents and interpret their meanings will therefore have to define categories first, and another researcher might come up with different categories while describing the same phenomenon.

Qualitative research also has to overcome the criticism of not being generalisable, which in the case of small samples can be done by demonstrating that judgements are transferable to other contexts (Guba & Lincoln, 1994). This is achieved by developing a 'thick description' of experiences within the social world (Geertz, 1973). The task of a qualitative researcher is therefore to provide "credible, i.e. truthful and authentic, accounts of the experiences of research participants" (Quinlan et al., 2015, p. 259). In order to provide such a thick description, this study made use of communicative, pragmatic and transgressive validity, which was meant to justify knowledge that was produced with an interpretive approach (Sandberg, 2005).

### 5.5.2.1 Communicative validity

A first aspect of communicative validity refers to what Apel (1972) described as a community of interpretation and is achieved in the first phase of the interview process when the relation with the respondent is being built. When a relation is established which is not one-sided, but where an openness to the project exists, this criterion is present. In this study almost all respondents were business contacts of the researcher's firm and a professional relationship of trust was present in combination with full transparency about the research project. This turned out to be a huge asset and added to establishing a community of interpretation. All the participants showed interest in the project and most of them asked for the opportunity to read the finished result.

A second aspect of communicative validity is coherent interpretation (Sandberg, 2005). This criterion would for example not be fulfilled if isolated quotes were used. In such a case, conflicting interpretations might come up if the context of any

preceding dialogue is ignored by the researcher. What happened in some of the interviews of this study was that some questions were understood differently by the interviewees. This was due to a different meaning that the respondent attributed to a certain term e.g. 'preparation for change' or what they consider 'a problem' in their understanding. Consequently, the question was answered from a different perspective, a perspective that made sense for that particular person. Awareness of such a meaning is of course sought, since the approach is interpretative. However, the coherence within the statements has to be assured in order to not interpret quotes in isolation based on one's own method of sense-making. The semi-structured approach allowed the interviewer to clarify such questions immediately. Nevertheless, conflicting interpretations came up and had to be compared to the situational context described in the interview. The focus on the criterion of coherent interpretation therefore increased the awareness for the situational context and clarifying questions were asked.

The last aspect of communicative validity that Sandberg (2005) mentioned is the discussion with other researchers and relates to Gadamer (1994), who sees truth as something that is achieved through dialogue with people and via the discussion with different interpreters in order to allow intersubjective meanings to emerge and validate results. Thus, the research findings were discussed with a group of DBA students from the same cohort as the researcher and with researchers from other fields, for example psychology.

#### **5.5.2.2 Pragmatic validity**

The fact that interviewees often report their experience in a distorted way led Alvesson (2003) to see discrepancies between interviewees' accounts and their actual experience as a threat to validity. Therefore, knowledge that has been produced in action can be tested by using the concept of pragmatic validity (Kvale, 1989). One possibility for this is to ask follow-up questions (Sandberg, 2005), which as has already been argued above, is a strength of using semi-structured interviews.

Kvale (1989) suggested a second method to achieve pragmatic validity via confronting interview partners with an interpretation of a particular statement and

then observing their behaviour in order to check that statement. The following excerpt, translated by the researcher from German to English, belongs to respondent R6 and illustrates how this technique was applied and thus served to clarify statements and seek coherence:

**R6:** ....and the constant wondering at year's end was nothing new at that time, but then usually safety margins were used, well this was not 'face to reality'.

**I:** Do you mean that buffers were used instead of the real numbers?

**R6:** Yes exactly. And everyone used such a buffer, which was not transparent to the others.

**I:** Because of fear that one would not get enough or why was that?

**R6:** No, buffers are used to, let me put it this way, have options, well actually mitigating risks, but, if everyone does that the buffer adds up and gets too large."

Sandberg's (2005) third way of validating interpretations, observation, could not be applied in this research.

### **5.5.2.3 Transgressive validity**

The focus on communicative and pragmatic validity includes the risk of overlooking aspects of complexity, ambiguity and multiple meanings within the investigation of peoples' lived experience (Sandberg, 2005). Transgressive validity therefore looks for inconsistencies and contradictions, allowing the researcher to become aware of the taken-for-granted framework of respondents and their resulting assumptions and interpretations (Lather, 1995; Richardson, 1993). Thus, follow-up questions in the interviews strove not only for coherent interpretation (communicative validity) but also for inconsistencies in order to access respondents' view of the world from a different perspective.

In addition to the search for inconsistencies, Lather (1993) suggested emphasising female perspectives where possible because in the author's opinion producing scientific knowledge in western culture is to a large extent primed by male



influence. This, as a consequence, has motivated the researcher of this study to look for a female interviewee because initially all of the participants were men.

## **5.6 Data analysis**

The data analysis of this study is presented in chapter six and seven, and contains the description and interpretation of findings (chapter 6) as well as the conclusion and theorisation (chapter 7), which together comprise the analytical framework as proposed by Quinlan et al. (2015). The research uses qualitative content analysis to make sense of the interview data in a systematic way, a procedure that allows flexible adaptation since it is not bound by rigid techniques (Mayring, 2014). This approach offers an understanding of social reality in a subjective and yet scientific manner where valid inference and interpretation condense raw interview data into categories or themes (Zhang & Wildemuth, 2009).

Qualitative content analysis allows making use of inductive as well as deductive reasoning (Mayring, 2008) and therefore seems the best fit for the abductive and explorative nature of this study. The degree to which inductive reasoning is involved in a study's analysis has been discussed by Hsieh and Shannon (2005) with three different approaches (conventional, directed and summative), from which the directed approach best describes this study. In this approach categories are not just emerging via careful analysis of the content (conventional approach) but are deductively based on existing theory (of the four cornerstones) while at the same time staying flexible for inductive reasoning when new categories emerge or existing ones are changed (Zhang & Wildemuth, 2009).

This study followed the eight steps for qualitative content analysis described by Zhang and Wildemuth (2009), starting with preparing the data (step 1) as transcripts and defining the units of analysis (step 2) as quotes consisting of single words, sentences or even paragraphs as long as they are expressing an idea (Minichiello & Aroni, 1990). The initial categories and coding scheme (step 3) have emerged from the literature review or the theoretical framework (Quinlan et al., 2015), which are mainly the four cornerstones of resilience and the safety perspective with its focus on success and failure. The directed approach uses existing theory or research as coding categories (Potter & Levine-Donnerstein,

1999) and has thus been called deductive category application by Mayring (2008). The initial categories for this study together with the coding scheme are described in

Table 4 and were based on Hollnagel (2011a).

| Category  | Sub-category  | Coding scheme   |
|---|---|---|
| Learning [ L ]  |   | The 'factual'. How the organisation or its members create knowledge about what has happened   |
|   | Individual (success) [ L-1-S ]                              | Evaluation of the change project from the individual perspective of the interviewee.  |
|   | Individual (failure) [ L-1-F ]                              |   |
|   | Organisation (success) [ L-2-S ]                            | How the organisation gets insights from change initiatives e.g. how reporting works in general/ this project or consequences for processes and organisational structure.                          |
| Organisation (failure) [ L-2-F ]                        |   |   |
| Responding [R]  |   | The 'actual'. The competencies of the organisation on what to do, e.g. activate ready-made responses, have the resources to do it and adjust the way things are done.                             |
|   | Organisation, actions (success) [ R-1-S ]                   | What was done by the organisation, why there was a need to act and how it was triggered.  |
|   | Organisation, actions (failure) [ R-1-F ]                   |   |
|   | Individual, actions (success) [ R-2-S ]                     | What was done by the change manager, why there was a need to act and how it was triggered.  |
| Individual, actions (failure) [ R-2-F ]                 |   |   |
| Monitoring [M]  |   | The 'critical'. The competencies of the organisation to know what to look for.  |
|   | Organisational indicators (success) [ M-1-S ]               | Institutionalized indicators determined by processes, rules, procedures and organisational structure indicators and how they are measured.  |
|   | Organisational indicators (failure) [ M-1-F ]               |   |
|   | Individual indicators (success) [ M-2-S ]                   | Indicators based on individual experience or of significance to the interviewee.  |
| Individual indicators (failure) [ M-2-F ]               |   |   |
| Anticipating [A]  |   | The 'potential'. The competencies of the organisation to know what to expect e.g. perception range of the organisation concerning threats, hazards and risks.                                     |
|   | Organisational awareness for the future (success) [ A-1-S ] | Which procedures exist to identify future events, developments and changes of state that affected the system in a positive or negative way and how were they applied (independent of the result)? |
|   | Organisational awareness for the future (failure) [ A-1-F ] |   |
|   | Individual awareness for the future (success) [ A-2-S ]     | How did the interviewee approach and anticipate future developments and how did this contribute to the project result?  |
| Individual awareness for the future (failure) [ A-2-F ] |   |   |
|   | Individual preparation [ P-1 ]                              | Competencies or training activities beneficial for managing change initiatives.   |
|   | Organisational preparation [ P-2 ]                          | Application of organisational support and resources.  |

Table 4: Initial categories and coding scheme

The coding scheme was tested (step 4) on a sample, which in this case was two complete interview transcripts, a procedure that ensures coding consistency (Miles

& Huberman, 1994; Weber, 1990), before all remaining interviews were coded (step 5) and then checked again for coding consistency (step 6). The last two steps are presentation and discussion of findings (step 7) and finally reporting the method together with the result of the study (step 8) (Zhang & Wildemuth, 2009). Zhang and Wildemuth (2009) see step 7 as most critical and depending heavily on the reasoning abilities of the researcher, this is mainly because step 7 makes reference to all four parts of the analytical framework of Quinlan et al. (2015).

Hsieh and Shannon (2005) argued that the directed approach can refine, extend or enrich existing theory when the findings are discussed in the light of prior research or theory. The coding procedure therefore needs careful consideration as existing theory might bias the coding process. So instead of directly using the initial coding scheme, which is one of two methods described by Hsieh and Shannon (2005), a second method was used in this study where quotes were marked or highlighted first and then coded when the transcript was read for the second time while any text that did not fit the existing categories would then be assigned with a new category. This procedure adds to neutrality or confirmability of trustworthiness which according to Lincoln and Guba (1985) corresponds to the concept of objectivity in quantitative studies.

The resulting structure of research, based on steps 4,5 and 6, is shown in Table 5. This structure differentiates between individual and organisational aspects of failed and successful projects along the four cornerstones. The quotes within these sixteen different boxes were then analysed by an open coding approach to identify themes for the different combinations e.g. individual responding in failed projects. Several categories of themes emerged, e.g. “adaptive behaviour”, and some of the themes within them could be further grouped. Step 6 (checking for consistency) had to be applied to all the themes as well, which resulted in several iterative cycles until a level of consistency was achieved that allowed comparing successful and failed projects as well as identifying patterns of similar themes along the four cornerstones.

|              | Successful projects                          | Failed projects                              |
|--------------|--|--|
| Monitoring   | Individual aspects<br>Organisational aspects | Individual aspects<br>Organisational aspects |
| Responding   | Individual aspects<br>Organisational aspects | Individual aspects<br>Organisational aspects |
| Anticipating | Individual aspects<br>Organisational aspects | Individual aspects<br>Organisational aspects |
| Learning     | Individual aspects<br>Organisational aspects | Individual aspects<br>Organisational aspects |

Table 5: Final research structure

The description of data, as the first part of the analytical framework, presents the findings about failed and successful projects from a safety perspective. These are then interpreted in the second part via the identification of patterns among failed and successful projects as well as between them. The contents of chapter six are the findings and their interpretations. The conclusion (part three of the analytical framework) intends to answer the research question and is found in chapter seven together with the contribution to theory (part four).

## 5.7 Research ethics

Lee (2008) argued that ethical considerations have to underpin all research in order to not hurt participants nor anyone else, which is why research has to be undertaken in an open and honest way. In order to gain insights about outcomes and processes of change projects from managers that were in charge of these projects, ethical issues were a central consideration. Aspects like consent, anonymity, organisational data and confidentiality play an important role if the results of these projects are circulated.

The study sought consent from all interviewees as well as their organisations. Each interviewee was given background information as well as an invitation letter (appendix R) and a copy of the consent form. Copies of these consent forms have been retained. Since the study is interested in the general aspects of failed and successful change initiatives under a safety perspective, no need exists to identify individuals nor organisations. Some of the projects, however, deal with a

significant economic dimension as well as security related aspects. For this reason, careful emphasis was placed on making it impossible to identify specific project or organisational knowledge from the presentation of research findings. Consent was formally granted in writing by the ethics committee of the University of Portsmouth on 12<sup>th</sup> December 2016. The ethics application can be found under reference number E418 (appendix T).

## **5.8 Summary**

The paradigm shift occurring in the field of HFE leading away from the safety 1 approach towards the safety 2 approach, such as RE, suggests a field in flux. Given this, the resulting lack of coherent scientific vocabulary, the tradition of constructivism in HFE and the focus on lived experience (work as done), a qualitative approach was determined to be most effective for this study. In light of the theoretical grounding offered by the four cornerstones of RE, a purely inductive approach appeared suboptimal, but the aforementioned lack of clear scientific terms as well as the desired systemic approach precluded the use of deductive, reductionist methods, leading to an abductive approach for the current study.

Twelve semi-structured interviews were conducted with change managers on the subject of one failed and one successful past project each. The resulting interview text was analysed for content matching to the four cornerstones of RE per project, which was in turn categorized as either from an organisational (macro) or individual (micro) perspective, resulting in a total of sixteen subcategories. Thereafter, the individual contents of each subcategory were further analysed using an open coding approach to generate themes pertaining to the respective subcategory. The process was iterated until all themes were consistent. Finally, patterns in the presence or absence of themes for the subcategories were sought out and interpreted with a view to the stated research questions.

## **6. Findings**

This chapter presents the findings of the research and constitutes the first part of the analytical framework. The findings within the four cornerstones (monitoring, responding, anticipating and learning) are described and interpreted. The differences and similarities between failed and successful projects from two perspectives, the individual and the organisational, are highlighted.

The themes that were found for each cornerstone are organized into categories of themes that support analysis and are all explained in respective tables (appendices I - P). In addition, similar themes within those categories were grouped to further identify patterns between failed and successful projects and between the individual and the organisational perspectives.

In cases where interviewees were asked about the organisational perspective but responded by taking the individual one, or vice versa, the themes resulting from their responses are presented under the section fitting to that perspective, rather than the one the interviewer asked about.

### **6.1 The Monitoring Perspective**

The monitoring cornerstone focuses on the awareness of relevant changes in the environment and the organisation. This awareness can have an effect on the development and the outcome of a change project. The monitoring perspective is concerned with the question of what needs to be looked at and the indicators of a positive or negative project development. It also looks at how those indicators are used and acted upon by the organisation or the change manager. The combined analysis of failed and successful projects also allowed a focus on aspects that were not perceived, not examined or actually ignored.

Appendix H shows the breakdown in distribution of quotes and themes, analysed by project outcome. Several quotes were assigned to more than one theme because they were sometimes intertwined and therefore hard to separate.

The distribution to either failed or successful projects reveals a tendency to focus on success at the organisational level. As interviewees were open about both kinds of projects, it is unlikely that active attempts to conceal failure are responsible for this tendency. It could be due to an unconscious aversion to failure or an unconscious attraction towards success, or post-hoc rationalization (Kahneman, 2011).

### 6.1.1 The individual monitoring perspective

The themes identified within the individual perspective are organized into five categories (Table 6). Four of these describe indicators that relate to the manager themselves (individual aspects), as well as other people (human aspects), the organisation including higher management (organisational aspects) and the project itself (project aspects).

These four represent the 'what' and symbolize what was of relevance for the interviewees and hence, what they were looking for. The fifth category has a dynamic or systemic orientation and describes the processes or 'how' things and indicators were monitored and made sense of by each interviewee. The numbers in brackets behind the themes indicate how often each theme was found.

While exploring the monitoring aspects, three findings surfaced that unveil new facets about some of the gaps discussed in the literature review. These findings concern (i) change managers' unbalanced view about outcomes, (ii) their ability to consider people issues for monitoring and (iii) their limited ability to self-criticise.

| Monitoring (Individual perspective)   |  |                        |  |  |
|---|--|------------------------|--|--|
| Individual aspects  | Human aspects (others/staff)   | Organisational aspects | Project aspects  | Monitoring process and interpretation aspects  |
| <b>Successful projects</b>  |  |                        |  |  |
| Low stress (1)<br>Limited awareness of human aspects (1)                              | Active participation of staff (7)<br>Visible competence (2)  | Lack of knowledge (1)  | Confirmed planning (1)<br>Difficulties overcome (1)<br>Increased KPI measurement (1)<br>Rumours about difficulties (1) | Open communication (1)<br>Perceived cooperation (4)<br>Seeking regular feedback/exchange (6)                 |
| <b>Failed projects</b>  |  |                        |  |  |
| Self-critique (1)<br>Difficulties not recognized (1)<br>Take for granted attitude (1) | Human limitations (2)<br>Humans as indicators for difficulties (3)<br>No active reporting (1)<br>Reduced participation (3) | Lack of knowledge (1)  | Inappropriate design (2)<br>Lack of strategic focus (1)<br>Target(s) not reached (1)                                   | Delayed negative effects (3)<br>Insufficient implementation (1)<br>Lack of cooperation and communication (4) |

Table 6: Themes identified within the individual monitoring perspective

The first finding relates to an imbalance in the negative aspects of successful projects and the positive aspects of failed projects. Interviewees were asked which indicators they were looking for. Indicators that refer to outcomes dominate while those that refer to the process appear much less often. In addition, the interviewees had a strong tendency to mention negative aspects of failed projects and positive aspects of successful projects. Since the interviews refer to events in the past this can be due to a simple case of outcome bias that could be clarified via research during an actual project. However, there are some indications for additional effects related to this phenomenon: (i) lack of monitoring competencies and (ii) delayed effects which are difficult to monitor.

**Lack of monitoring competencies.** One of the few comments about negative indications in a successful project that showed a lack of monitoring competencies came from R12, who had difficulties in recognizing information conveyed by means of rumours:

“As far as the problematic aspects of this project are concerned, rumours were actually the only indicators. This is bad because you have to react to



them and they came up because we were unable to deal with setbacks and difficulties in the first place.”

**Delayed effects.** The second aspect relates to the delayed effects of interventions, surfacing at a time when a simple cause-effect relationship was hard to identify or when the lag was very long. R9 named an example involving delayed effects of consultants:

”...after some time, at least one year after the consulting firm left, we noted that sustainability was missing.“

This quote shows an example of the gaps described in section 3.3. It is illustrative of the long-term effects of intervention, in combination with an underestimation of the complexity involved in systemic thinking. This goes beyond mere cause-effect relations.

The second and most surprising finding surrounds change managers’ ability to monitor people issues and by doing so, gain access to predictive information. It was interesting to note descriptive rather than blaming language when interviewees were referring to other people and employees, mainly as far as their performance and limitations were concerned. One of the interviewees (R7) described behaviour of employees, in retrospect, as the most important indicator for difficulties. One should be wary of the outcome bias when seeing past behaviour as an indication for failure. However, the above suggests that employees can serve as early warning indicators, allowing management to become aware of existing difficulties within change projects.

With regard to the managers’ ability to perceive people aspects, two themes recurred throughout the individual monitoring aspects of the dataset: (i) participation of employees and (ii) their level of cooperation as perceived by the managers. It seems that both can serve as predictive indicators for success as well as for failure.

**Participation of employees.** On the one hand active participation was described by R5 in his successful project by saying:

“... that the colleagues were present every Friday afternoon in the meeting ... that they took the topic seriously and that they pushed the change forward within their departments.”

On the other hand, it was reduced participation that indicated to the then senior manager R6 that the project was heading in a negative direction:

“You perceive it via the enthusiasm during meetings ... when only two or three show up ... than you are just about to bury that topic.”

**Level of cooperation.** A positive example of cooperation was mentioned by R7 who described becoming aware that a project suddenly seemed to have positive flow:

“Me and my team sat down early, and we defined roles and responsibilities and an overall project plan. It was this moment when I realised, ok, trust is present”

A contrasting effect was experienced by R5 in a failed project, when he had to shift employees between departments and was confronted with a lack of cooperation the moment he tried to get qualified staff from another unit:

“...the department which had to provide those people constantly had excuses about why it was not possible ... “

Participation of employees and their level of cooperation seem to have indicative potential for positive as well as for negative outcomes of projects. In addition, managers have been shown to possess the skills or the potential ability to recognize such aspects.

The last finding in this section highlights a discrepancy. The respondents reported their experience about both types of projects openly, yet only put a limited focus on their own negative contributions. R3's quote was one of only two where managers expressed a critical view of their own performance, perception or attitude. In his position as senior quality manager he appeared to have a 'take for granted' attitude that things would work out. He assumed that his decision would be implemented correctly and that kept him from monitoring events. The project

involved changing processes while also cutting the workforce. After explaining the situation and being asked if he had realised what was going on, he said:

“No absolutely not. Because there was one thing I did not do, continue considering this aspect. I mean, I initiated the whole thing by launching the project and did not check on it afterwards but only realised weeks or even months later, that it is absolutely not working.”

It cannot be deduced from the interview data why managers apparently lack a critical monitoring focus on themselves or why they did not speak about it. The high rate of failure, however, suggests that there is more to this.

| <b>Findings within the individual monitoring perspective</b>   |
|--|
| 1. Change managers' focus rests mainly on outcomes. Two difficulties seem related to this observation: (i) indicators that are available but not within their scope of monitoring and (ii) long-term effects and relations are sometimes overlooked. |
| 2. Change-managers are sensitive to human performance and the limitations of staff with two striking aspects that seem to serve as bi-directional predictive indicators for both success and failure: cooperation and active participation of staff. |
| 3. Change-managers talk openly about projects but do not apply much self-criticism.  |

Table 7: Summary of findings within the individual monitoring perspective

### 6.1.2 The organisational monitoring perspective

The themes of the organisational monitoring perspective are organized into three categories. They are presented in Table 8 and Table 9 below (split in two tables for better comprehension). The previous distinction between the ‘what’ and the ‘how’ was also used for the organisational perspective, but only two categories of indicators (for the ‘what’) seemed appropriate, those that were institutionalised as key performance indicators (KPI) and those which were not (perceived aspects). Some categories contain themes surrounding similar ideas. Those themes were grouped e.g. into soft and hard KPI. As some KPIs were mentioned as positive factors in successful projects and as negative factors in failed projects depending on their specific values, a (+) or (-) behind some KPI indicates a positive or negative evaluation of that KPI.

The findings of the organisational monitoring perspective show (i) what organisations are monitoring, (ii) that qualitative indicators are often neglected and (iii) that a shared understanding contributes to project success.

| <b>Monitoring in successful projects (organisational perspective)</b>  |   |  |
|--|---|--|
| <b>Measured indicators (institutionalized)<br/>The “What”</b>  | <b>Perceived indicators (non-institutionalized)<br/>The “What”</b>              | <b>Process and interpretation<br/>The “How”</b>  |
| Planning confirmed (1)<br>Targets reached/positive results (5)   | Significant positive external feedback (2)<br>Active participation of staff (2) | Focus on opportunities (1)<br>Follow standards (1)   |
| <b>KPI (hard)</b>  |   | <b>Social processes</b>  |
| Absence rate (+) (1)<br>Break-even (+) (1)<br>Cost (+) (3)<br>Economic non-specified (+) (5)<br>Milestones/deadlines (+) (4)<br>Number of customers (+) (1)<br>Quality of data (+) (1)<br>Regulation adherence (1)<br>Revenue (+) (1)<br>Stock (+) (1) |   | Aim for SMM (3)<br>Regular/high rate of exchange (3)<br>Seeking feedback (2)                                   |
| <b>KPI (soft)</b>  |   | <b>Aspects of higher management</b>  |
| Customer satisfaction (+) (2)<br>Passion score staff (+) (1)   |   | Management support (1)<br>Open upward reporting (1)<br>Insufficient information/support mgt. (1)               |
|  |   | <b>Measurement and process</b>   |
|  |   | Automated measurement/interpretation (1)<br>Improved measurement tool (1)<br>Increased rate of measurement (1) |

Table 8: Themes within the organisational monitoring perspective (successful projects)

| <b>Monitoring in failed projects (organisational perspective)</b> |  |  |
|---|--|--|
| <b>Measured indicators (institutionalized)<br/>The “What”</b>     | <b>Perceived indicators (non-institutionalized)<br/>The “What”</b> | <b>Process and interpretation<br/>The “How”</b>                                |
| <b>KPI (hard)</b>   | Culture/goal misalignment (2)<br>Difficulties not recognized (3)   | <b>Aspects of higher management</b>  |
| Absence rate (-) (3)<br>Economic non-specified (-)(3)             | Informal/semiformal reporting (1)<br>Limited social awareness (1)  | Insufficient information/support mgt. (2)                                      |
| Targets not reached/insufficient results (5)                      |  | <b>Measurement and process</b>   |
|   |  | Ignoring discrepancies (2)<br>KPI/Indicators without enough interpretation (3) |

Table 9: Themes within the organisational monitoring perspective (failed projects)

The first major finding of the organisational monitoring perspective relates to what is being measured by the organisation. Both types of projects showed a set of common and different monitoring aspects: (i) the type of indicator and (ii) the project outcome.

**Type of indicator.** Leading indicators, those that show in what direction a project is heading, are significantly scarce and were hardly mentioned at all. Basically, all indicators that were mentioned by the interviewees were lagging indicators with varying lags between events in the past and the moments of measurement. It is very interesting to note that of these indicators, some were perceived but not formally measured.

A good example of a concurrent but not formally measured indication is active participation of staff. This example was mentioned by R11, who works for a European agency:

“...we had people, who identified themselves with the project to such a degree that we had to send them home when they were ill...”.

Another indication that was not formally measured was cultural misalignment, described in the quote of R9, a senior manager in a large financial institute:

“I could see how the desired speed and the envisaged rate of new contracts and revenue caused much trouble among employees. This relates to the culture. Every branch has a different one and also a unique understanding of how to position themselves in the market. A project like this can have a huge effect on that. But nobody wanted that. Sure, they had the will to become better but not at the cost of their culture.”

If a formal measurement had been available, these aspects would have allowed concurrent (real time) and even predictive assertions about the project.

The second interesting observation about indicator types is the tendency towards hard facts in successful projects. Six times more hard KPIs were named there. Organisations seem to be better at measuring success or they rather are looking for success and its confirmation.

**Project outcome.** The focus on the project result seems to be equally important regardless of whether it was successful or failed. An equal number of quotes addressed the result for both types of project outcomes. However, R3, a senior quality manager in the defence industry, literally stated that success has many fathers but failure has only one. What is echoed in this quote seems to be a general aversion to failure as far as monitoring its' development is concerned. A potential negative project outcome seemingly reduces the monitoring intensity. This is evidenced by twice as many quotes, three times more KPIs and six times more different themes in successful projects.

An explanation for the low intensity of measuring negative indications could be that they are being suppressed or even repressed. However, it seems more likely that organisations have limited awareness or inadequate detecting instruments for perceiving difficulties and threats of failure within change projects. This argument is supported by the fact that many different KPIs were mentioned in successful projects, but none indicated negative or critical elements. Interestingly, no positive indicators were mentioned in the failed projects.

The overreliance on lagging indicators ties in well with the strong focus on results because both refer to the past. The generally low number of perceived aspects indicate yet unexploited potential for recognizing difficulties within change projects. This study has shown a low emphasis on this type of monitoring function. Organisations could benefit from exploiting the potential of perceived aspects if they were to be measured by any means. The following table summarises the above findings.

| <b>Successful change projects</b>                        | <b>Failed change projects</b>   |
|--|---------------------------------|
| No focus on negative indicators                          | No focus on positive indicators |
| Overreliance on outcomes                                 |                                 |
| Overreliance on hard facts (KPIs) and lagging indicators |                                 |

Table 10: Common and different aspects of organisational monitoring functions

The second finding of this section sheds light on some organisational shortcomings. They refer to the ability to recognize difficulties and the will to act

upon them. In some of the failed projects, relevant indications were noticed but not interpreted or acted upon. Talking about this issue, a senior manager in the defence industry (R12) said:

“The risks of this project were indeed identified correctly, also the mitigation actions, but they were not put into practice ... So, everybody was pleased that it was dead calm, and all of them have interpreted that silence, knowingly or unknowingly or even in spite of knowing better, as if saying all is going well, isn't it?”

R12 does not explicitly mention reasons for this behaviour except for one comment about not being politically adequate. This could imply conflicting goals or sparing additional effort.

The data set provided a second explanation why indicators are not interpreted and that is a lack of competencies. This is condensed into a short quote by a plant manager in the automotive industry (R10) who noted:

“So, there actually were indicators, but I think they could not be grasped well.”

This view of lacking competencies also surfaced in the project of R7, a senior vice president who faced a corporate restructuring project that never delivered the desired results and was finally stopped:

“If anyone would have taken a close look into the information about risks and opportunities, implying of course that one could even read or interpret them correctly, and then combine this with the results that did or did not come, it was obvious that this structure will fail due to economic reasons.”

Both aspects mentioned above, ignoring indicators and lack of competencies, are to some extent named as critical failure factors by Decker et al. (2012) e.g. ‘lack of competent staff’ and ‘alignment’ but are not made explicit as an organisational phenomenon.

The third and final finding of the organisational monitoring perspective describes the positive effects of a high rate of communicative exchange in combination with the effort to achieve a shared mental model (SMM) of the project. Given that the appropriate aspects are being monitored, two preconditions are required to trigger activities: (i) exchange and (ii) shared understanding. One of the interviewees (R4) was confronted in his new position as sales director with a series of internal conflicts and declining revenue while having to restructure the business model. He pointed out the combined need for exchange and shared understanding:

“We had many regular meetings, a meeting structure and regular exchange. Twice per year there was a worldwide meeting for all of us, to talk about problems, new directions, what goes wrong and what goes right. We put much effort into face to face meetings even though it consumed time that cannot be spent with customers. But all of this was much needed because we had to bring people back together and give them a shared understanding of the situation.”

| <b>Findings within the organisational monitoring perspective</b>  |
|---|
| 1. The awareness of negative aspects in successful projects and positive aspects in failed projects is low. Organisations have an overreliance on lagging indicators, hard facts (KPIs) and outcomes but no formalised monitoring function for considering some aspects that are perceivable by employees.  |
| 2. Organisations seem to have a tendency of neglecting and not addressing qualitative indicators for difficulties even though they were correctly identified. Those indicators have the potential to predict a negative project development. Two reasons were found: (i) ignoring due to conflicting political interests and (ii) a lack of monitoring ability. |
| 3. The effort of creating a shared mental model (SMM) via project related communication seems to be a factor for predicting project success.  |

Table 11: Summary of findings within the organisational monitoring perspective



### 6.1.3 Summary

Roughly dividing this cornerstone into the 'what' and the 'how' has helped to describe the monitoring function of an organisation as one element of its adaptive capacity. The main finding seems to be that humans and human activity, mainly through the rate of participation and cooperation, has a large potential to indicate the direction that a project is taking. However, the organisation seems to focus much more on hard and formalized indications and their measurement neglects the potential that people have in recognising difficulties or in serving as indicators for difficulties. Part of this stems from the seemingly unexploited capacity that the change manager seems to have of recognising what is going on as far as 'people issues' are concerned. While the literature review about CM failure has shown that such irregularities exist, no tool nor method seems to exist to grasp or operationalise this phenomenon. Furthermore, the idea of having success factors together with relations and interdependencies among them shall be investigated within the remaining cornerstones, particularly with regard to their potential as a contributor to the concept of critical failure factors.

## **6.2 The responding perspective**

The responding cornerstone is about detecting the need to act and taking adequate actions. The responding perspective in a change project is concerned with the adaptive capacity of both the change manager and the organisation. Responding can be triggered by a disruptive event or when monitored aspects suddenly become critical.

This cornerstone delivered a high number of quotes and themes (Appendix H). Although adaptive activities can in principle be present in failed projects and non-adaptive ones in successful projects, the tendency to focus towards success seen in the monitoring perspective was observed here as well.

### **6.2.1 The individual responding perspective**

The themes within the individual perspective are organized into three categories (Table 12, Table 13). The first two contain themes describing adaptive and non-adaptive behaviour of interviewees. The third category contains themes describing the relation of the interviewees towards their management.

The findings of this section cover (i) management support, (ii) what managers are aware of, (iii) the proactive attitude of the change manager, (iv) the consideration of other people and (v) design-oriented adjustments.

| <b>Responding in successful projects (individual perspective)</b>   |   |   |
|---|---|---|
| <b>Adaptive behaviour/capacity</b>  | <b>Non-adaptive behaviour/capacity</b>  | <b>Relation to management</b>   |
| <b>Awareness</b>  |   | <b>Positive effects</b>   |
| Re-evaluate current approach (2)<br>Awareness of social dynamics (7)<br>Awareness of own emotions (1)<br>SMM on difficulties (2)<br>Awareness on human resources (1)<br>Long-term thinking (1)  | Lack of awareness of social dynamics (1)  | Request direct management support (1)<br>Open upward reporting (3)<br>Top management support (1)<br>Direct management support (2) |
| <b>Coordination and leadership</b>  |   |   |
| Pursue goals determinedly (3)<br>Active participation (hands on) (2)<br>Seek lateral cooperation (1)<br>Managing needs of stakeholder (2)<br>Establish shared vocabulary (1)<br>Adapting structures and processes (10)<br>Realise failure and take corrective action (2)<br>Proactive adjustment (competent risk taking) (3)<br>Cooperative decision making (1) | Lack of lateral coordination/cooperation from others (1)<br>Proactive adjustments but risking negative outcomes (1) |   |
| <b>Management of staff</b>  |   | <b>Negative effects</b>   |
| Show trust to employees (1)<br>Empower staff (2)<br>Competence based allocation of staff (3)<br>Keep staff updated (2)<br>Direct interaction with affected staff (8)  | Culture of fear (1)   | Lack of direct management support (2)   |
| <b>Helpful activities and support</b>   |   |   |
| Objective approach (1)<br>External help (coaching) (3)<br>Accepting and dealing with uncertainty (2)  |   |   |

Table 12: Themes within the individual responding perspective (successful projects)

| <b>Responding in failed projects (individual perspective)</b>  |   |   |
|--|---|---|
| <b>Adaptive behaviour/capacity</b>   | <b>Non-adaptive behaviour/capacity</b>  | <b>Relation to management</b>   |
| <b>Awareness</b>   |   | <b>Positive effects</b>   |
| Awareness of social dynamics (2)<br>Re-evaluate current approach (1)<br>Awareness of failure /not reaching goal (1)<br>Awareness/management of negative emotions (1) | Lack of awareness of social dynamics (1)<br>Lack of awareness of culture (2)<br>Not understanding dynamics/problem (1)<br>Negative emotions (3) | Direct management support (1)   |
| <b>Coordination and leadership</b>   |   |   |
| Realise failure and take corrective action (1)<br>Seek coordination with affected parties (2)<br>Keep going attitude (perseverance) (2)                              | Lack of lateral coordination/cooperation from others (4)<br>Keep going attitude (firefighting) (3)  |   |
| <b>Management of staff</b>   |   | <b>Negative effects</b>   |
| Direct interaction with affected staff (4)<br>Support cooperation within team (2)<br>Consider needs of staff (1)   |   | Lack of direct management support (2)<br>Lack of top management support (1) |
| <b>Helpful activities and support</b>  |   |   |
| Motivation and proactive behaviour (1)   |   |   |

Table 13: Themes within the individual responding perspective (failed projects)

The first finding in this section concerns management support, a recurring topic in the CM literature. Themes about support were found independently of the project result. Management support was consistently described as having positive effects when present and negative effects when missing, unsurprisingly the former more in successful projects and the latter in failed.

However, the surprising finding is that the change manager can activate that support by adopting an active role. An example of this is how R12 actively requested support and concluded:

“...because many stakeholders are not aware of their role and the influence they have, right? They, for whatever reason, do not see the need for it...They underestimate their effect to reinforce and amplify.”

This active role of the manager is reflected in open upward reporting. R4 describes the relationship to higher management in a critical business reengineering project:

“Well, I always had a large forum and could report directly to the shareholders, they could ask direct questions in return and there was no whispering down the lane.”

Although the lack of management support may cause failure, an active change manager can influence whether such support occurs. Blaming upper management alone is short-sighted.

The remaining findings in this section are all related to adaptive responding as reflected in the first two categories. A general observation is that 'adaptive behaviour/capacity' significantly predominates in the successful projects as compared to the failed ones. The opposite relationship can be observed for failed projects. A good example is group 'coordination and leadership' for successful projects. While the total count for adaptive behaviour is 25, it is only 2 for non-adaptive behaviour (see appendix Q for detailed breakdown).

The second finding shows how awareness contributes to adaptive responding. The first aspect, the awareness about social dynamics, was described as beneficial when present and detrimental when missing. Unsurprisingly, it is mentioned more often in successful projects, seeming most effective when linked to subsequent action. R6's quote illustrated the above:

"It was obvious that there would be a clash of hardened fronts, and it was necessary to dissolve them."

The second aspect of awareness indicates that dealing with negative emotions seems to be a challenge for change managers, having negative consequences like frustration, as described by R7:

"We focused on the daily work. On the goals we wanted to reach and had to reach. But the external motivation got lost, for example to acquire new business."

The third and final aspect about awareness to some extent contradicts the expectation of the researcher that project-related aspects would be more in focus, instead it was social dynamics as described above. Social dynamics-related themes were mentioned at least twice as often, independent of the result.

The third finding highlights the proactive attitude of the change manager. Several themes characterize their responding activities: pursuing goals determinedly,

having a hands-on approach and proactively adjusting activities which involved competent risk-taking. The latter is illustrated by R1, who reduced safety margins in a production process in spite of a general fear about producing waste:

”We literally forced them to lower the margins. We had to convince them to take that risk even though there was a remote chance that a series of let’s say twentyfive parts could be wasted, but that never happened. Instead we were optimizing the process in a calculated way and based on our experience. Actually, there was never really any relevant risk.”

A ‘keep going attitude’ that was exclusively observed in failed projects contrasts the above described proactive behaviour. While one would assume that not giving up when facing difficulties is a positive characteristic, the failed projects paint a different picture. R10, a plant manager in the automotive industry, described an arduous process towards success with many difficulties but the project finally failed:

”Disillusionment, partly also helplessness and asking what else should we do. And yes, also a lack of understanding, but to give up was no option. There is always a way. A little bit of hope here and there helps to regain some motivation and indicates a step in the right direction. But after all it was a very tough process.”

This keep going attitude did in some cases manifest as reactive fire-fighting. For example, in the project of R4 where several organisations had to be coordinated to realise a joint business model, new difficulties emerged on a regular basis:

”In my area of responsibility we tried to somehow identify those newly upcoming problems. We then found that there were problems with access to transportation capacity as well as with the distribution of revenue. For the problems that we could identify, we tried to find solutions that everybody could agree on. In the mean time we came up with some sort of auction-model to distribute transport capacity among partners, when we realised that those planes were full anyway. So, we thought about pricing and how to generate more revenue by selling that capacity to one of the partners instead. Our intention was trying to develop and establish such procedures,

so that we could identify those areas that will definitely turn critical and at least stop the fire there.”

Whether it manifests as firefighting or as perseverance, the keep going attitude in failed projects stands in contrast to the proactive attitude in successful ones.

The fourth finding illustrates that considering other people’s concerns and viewpoints pays out for the success of the project. Managing their staff and coordinating with other people were both positively affected when change managers made the effort to consider others. R5 had to consider the different interests of stakeholders when he reorganized an entire production facility:

”Yes, we realised how the different manufacturing units had their particular concerns. They all put their focus on different aspects. Components manufacturing has a different focus than those from integration or logistics. All of them were arguing to get their interests covered.”

Consideration for others also led to the development of a shared vocabulary in the project of R11. That shared vocabulary set the scene for successfully coordinating activities during the project:

”I think, having the opportunity for discussions at the beginning, almost like small conflicts, is highly beneficial in the long run. Defining terms is a good example. We had many communication problems at the start, forcing us to establish definitions and to create our common glossary. It went well after that and even though there were challenges, we managed them by discussing them critically and with a focus on solutions. There was no fighting nor were there any conflicts later on.”

With regard to the management of staff, it was expected that managers would perform significantly worse in failed projects, but apparently this is not the case. The analysis showed a high count of the theme ‘direct interaction with affected staff’ in both types of projects (8 vs 4). Thus, it can be stated that consideration for staff is not lacking in failed projects. However, there is a qualitative difference. The successful projects contain a series of themes that describe how the potential of staff was activated. This includes trust and empowerment as well as an adequate

use of their skills by means of competence-based allocation and providing relevant knowledge about the project through updates. Hence, what makes the difference is not only to consider staff and to pay attention but additionally to act in a supportive way. To interact in such ways can be described as a competency of managers. This is for example illustrated by R12 in her critical but successful project where empowerment was beneficial but the challenge consisted of overcoming the tendency to exercise more direct control:

“...it was helpful for me to allow more self-organisation within the project but that wasn't easy at the same time, because normally in a crisis people react by looking for more control.”

Apparently, staff have to be provided with competencies and the freedom to act, whilst mere interaction and even consideration of needs as well as fostering cooperation within the team is not sufficient.

It is interesting to note that several interviewees mentioned external support to improve their competencies of interacting with others. In particular they named consulting and coaching. In the case of R3, coaching was explicitly named as one of the keys to success and for R2, coaching provided the necessary competencies for social interaction and understanding:

“For the project it was coaching that helped me to deal with those difficulties that I just described, that way I learned to handle the social aspects and relationships.”

The fifth and final finding shows that successful projects differ significantly from failed ones as far as adjustments are concerned and several themes refer to this central topic of RE. Examples are 'realise failure and take corrective actions', 'proactive adjustments and 'adapting structures and processes' which came up with a total count of ten. When managers have the authority or the competency to perform such adjustments, it seems that dealing with difficulties in change projects becomes more successful. This finding indicates that successful change benefits from design activities. To design the interface between humans and systems, as advocated in HFE, seems to have much relevance for change projects. Having the



flexibility to adjust structures and processes alike was reported by R3 as beneficial and illustrated how such interfaces are considered:

“We actually trained around 300 employees and that had very positive effects. Most important was sustainability. It was crucial to keep those changed processes flexible. We did not have the attitude of saying, now we have a stable but rigid system. Instead, we were convinced and prepared for constant adaptation during the introduction stage. The moment employees showed criticisms, we immediately converted those into implementation and training activities.”

A further example was provided by R6:

“The results were changed processes, some partially others completely. A positive side effect consisted of facing reality and saying goodbye to what I would call dreams and fantasy ideas. Simply putting the whole construct on solid ground and basically opening our eyes to the fact that individual performance of some employees is high, but frustration is too. Because the acknowledgement got completely lost in daily fire-fighting and in order to consider that in the future, we also developed measures.”

| <b>Findings within the individual responding perspective</b>   |
|--|
| 1. The change manager can influence management support by means of requesting it as well as by open upward reporting.  |
| 2. Adaptive responding predominates in successful projects.  |
| 2a. The managers' awareness mainly focuses on social dynamics, their own emotions and project related-aspects. The role of the latter is surprisingly small.   |
| 2b. Proactive actions and attitudes, e.g. competent risk-taking, are often found in successful projects whilst a keep going attitude (perseverance and constant reactive fire-fighting) is often found in failed projects.   |
| 2c. Considering others is an important aspect of adaptive responding. It relates to coordination via shared vocabulary and consideration of interests, and also to the management of staff. The latter is a competency that was also present in failed projects but is performed in a more supportive and activating way in the successful projects. |
| 2d. A significant difference in successful projects is the amount of adjustments, including design activities, as long as the manager has the competence and the authority to perform them.  |

Table 14: Findings within the individual responding perspective

## 6.2.2 The organisational responding perspective

The themes within the organisational perspective are organized into three categories (Table 15, Table 16). The first two are equal to those of the individual perspective and describe responding behaviour and capacity, which are either adaptive or non-adaptive. The third category describes the behaviour and reactions of staff.

The findings of the organisational perspective cover (i) the behaviour of staff and different aspects of adaptiveness: (ii) systemic understanding, (iii) adapting structures and processes, (iv) the management of staff and (v) the provision of resources.

| <b>Responding in successful projects (organisational perspective)</b>   |   |   |
|---|---|---|
| <b>Adaptive behaviour and capacity</b>  | <b>Non-adaptive behaviour and capacity</b>  | <b>Behaviour and reactions of staff</b>   |
| <b>Awareness</b>  |   | <b>Positive effects</b>   |
| SMM of difficulties (2)   |   | Cooperative attitude (1)<br>Increased cooperation (1)<br>Pressure experienced as positive (1)                     |
| <b>Coordination and leadership</b>  |   | Motivation and proactiveness (4)  |
| Pursue goals consistently (9)<br>Proactive external communication (1)<br>Adapting structures and processes (6)  | End and restart without redesign (1)<br>Reactive adaptation (firefighting) (4)<br>Decision process too slow (2) |   |
| <b>Management of staff</b>  |   | <b>Negative effects</b>   |
| Just leadership (1)<br>Flexible reduction of staff (2)<br>Empower staff (1)<br>Competence based allocation of staff (4)<br>Direct interaction (2)<br>Keep staff updated (3) | Inadequate allocation of staff (1)<br>Ignoring feedback and competence (1)                                      | Lack of commitment (1)<br>Resistance (loss of privileges) (1)<br>Culture of low engagement (1)<br>Frustration (3) |
| <b>Helpful activities and support</b>   |   |   |
| Provide resources (5)<br>Cooperative attitude (3)   | Not providing enough resources (1)  |   |

Table 15: Themes within the organisational responding perspective (successful projects)

| <b>Responding in failed projects (organisational perspective)</b>  |  |  |
|--|--|--|
| <b>Adaptive behaviour and capacity</b>   | <b>Non-adaptive behaviour and capacity</b>   | <b>Behaviour and reactions of staff</b>  |
| <b>Awareness</b>   |  | <b>Positive effects</b>  |
|  | Lack of analytical action and systemic awareness (6)   | Keep motivation up (1)<br>Initial supportive attitude (2)  |
| <b>Coordination and leadership</b>   |  |  |
| Realise failure and take corrective action (3)<br>Re-evaluate actual approach (2)<br>Adapting structures and processes (1) | Disruptive event not compensated (1)<br>Single non-systemic intervention (5)<br>Reactive adaptation (firefighting) (1)<br>Non-goal-oriented activities (1)<br>Repeat failure without adjustment (1)<br>Passive behaviour (14)<br>Inadequate coordination with others (1) |  |
| <b>Management of staff</b>   |  | <b>Negative effects</b>  |
| Keep staff updated (1)   | Not responding to social dynamics (2)<br>Competencies not understood (1)<br>Blaming culture (1)  | Frustration (3)<br>Lack of commitment (1)<br>Egoistic protective actions (1)<br>Biased by past negative experience (2)<br>Resistance (2) |
| <b>Helpful activities and support</b>  |  |  |
|  | Inadequate structures (3)<br>Not providing enough resources (1)  |  |

Table 16: Themes within the organisational responding perspective (failed projects)

The first finding of the organisational perspective shows that successful outcomes cloud the view on negative aspects and that how outcomes are achieved needs to be better investigated. A general observation is that more positive themes were identified in successful projects and more negative themes in the failed ones, but the themes are similarly independent of the project outcome. Positive aspects are cooperation, proactiveness and motivation. Negative aspects are frustration, lack of commitment and resistance. However, when the outcomes are contrasted more indications for motivation and proactiveness were found in successful projects. And while the negative aspects in failed projects are very high, it has to be critically remarked that the number of positive and negative themes are the same for successful projects and their total counts are almost equal (8 versus 7). This finding reflects the inconsistent evaluation of project outcomes and the strong focus on results, which were both identified as gaps in the literature on failed change. Hence, when a project is classified as successful it cannot be concluded that the result was achieved in a positive fashion.

The remaining findings all relate to the organisations' adaptive capacity, where the distinction between success and failure is much sharper than on the individual level (see appendix Q for breakdown of themes). It seems that those themes relating to adaptiveness have the potential to indicate in which direction a project is heading and seem to be success factors.

The second finding brings up a central topic of OR and HFE, and a gap in CM. In contrast to the individual perspective there seems to be a general lack of systemic understanding and approaches on the organisational level as far as responding to difficulties is concerned. R12 illustrates how this observation was reflected in her failed project when the organisation tried to solve problems by spreading funds instead of first understanding the dynamics of the problems:

“A lot of money was injected. In hindsight I think that was not helpful but rather problematic and we did not have the possibility to change the course as we did in the other project, to analyse in small groups or with certain individuals why this project is not working. We were rather distracted from the problems.”

The theme 'single non-systemic intervention', receiving a count of five in the failed projects, can be seen as a consequence of missing system understanding.

The statement of R12 reveals that such an intervention was performed without system understanding beforehand. In addition, the effects of that intervention were not properly understood afterwards. This exact same combination was also found in the projects of R6 and R1. Several further themes in both project types indicated a lack of system understanding, e.g. 'end and restart without redesign' and 'lack of analytical action and system understanding'. Yet, no theme explicitly focuses on efforts to achieve a better understanding.

In most cases activities were reactively triggered, for example by severe difficulties, as R6 explains:

"It was helpful that this project had a very critical status. That resulted in the awareness of the need to change. The famous 'pain', as I would call it, was definitely there. Because of how we tried to manage it, it worked out and no department opposed or resisted. In theory, if one unit or department resists, we have a huge problem, and in this case for once no one did."

The third finding suggests that the capacity to adapt requires flexible structures and processes, as well as a clear will to reach the set goal. Two themes emerged where successful and failed projects significantly differed: 'pursue goals consequently' and 'adapting structures and processes'. Both themes came up in combination in one quarter of the successful projects.

R5 describes how structures and processes were adapted by the organisation, partly as a consequence of the change project content but also to support implementation:

"The responsibilities were reduced and it was clearly defined who would be responsible for specific topics. The processes were simplified and the employees received the appropriate qualifications. Above all we made sure that all aspects would be considered early enough in the future."

The aim of the project was reducing the cost of poor quality and as such was not just an intervention but a change in how the system was functioning as a whole. This finding ties in well to the prior finding about system understanding. Together they emphasize that to change structures, system understanding is beneficial, and

if we consider the gaps found in the CM literature (lack of system understanding, complexity challenge) it is probably a *conditio sine qua non*. The above two themes were found in both perspectives, but while reaching the goal fast and determinedly seems more important for the organisation, flexible processes and structures were of higher relevance for the interviewed change managers. The most striking aspects of this third finding are the negative versions of those two themes. Passive behaviour and inadequate structures were found to a significant extent in failed projects. The theme 'passive behaviour' has the highest count (14) of the entire study. R7 describes how inactivity was the result of a very complex restructuring project that caused much confusion among employees:

"And as a result nothing was moving forward. You could neither see corrective measures nor any improvements. That was the moment when I realised that this will not function. Meaning, we have actually been burning money. Every day. And that was painful."

Passive behaviour was also experienced by R5, who described it the following way:

"It is constantly being delayed. Will be done next week, then the week after that, and it has been going like this for half a year now."

The reason for passive behaviour in his project were conflicts of interests, as the organisation had to switch employees between units and one department apparently did not want skilled people to leave. Instead of arguing, they just became passive.

Difficulties with inadequate structures were a problem for R11 who passionately described how competencies of individuals were not understood in his project, hindering organisational adaptiveness:

"We had three project phases before and it worked out. The difference then was a flat hierarchy. One group of people were responsible for coordinating that and they always said to us: 'we are there for you, so that you can have an ideal environment to work in'. That way one always had direct access to talk to a specialist. After the last phase, four out of six of them retired and

additional hierarchical levels were introduced. Now, if you need them, you first have to fill out a form.”

The fourth finding shows that staff was managed differently by the organisation when the project had a positive outcome. That group of themes (management of staff) contains many positive themes whilst focus on staff and interactions seems absent in failed projects. It appears as if the passive behaviour from the previous finding is also an issue for how organisations manage their staff. This is for example evidenced by the two themes ‘not responding to social dynamics’ and ‘competencies not understood/used’, and vividly described by R12:

” I call them energy dementors, like in Harry Potter, because they suck the energy out of employees. They started early, while the project started late. At that stage an unhealthy dynamic was already reached among employees and could not be recovered.“

The final finding highlights that the provision of various organisational resources can help ensure success. Five interviewees mentioned this aspect as relevant. In the case of R8 that support consisted of financial resources:

“The clear commitment of the parent company made sure that we started with no debts on day one. Indeed, we went into the market in a healthy state.”

Another set of quotes mentioned coaching and consulting. One example is provided by R8 who was adding to the above quote that providing consultants was another organisational response to project difficulties. Several interviewees were provided with coaching and one of the interviewees who spoke about its positive effects was R4:

”What they did was to give me a coach. I could discuss with him many of the challenges that I have mentioned so far (...) So this was done additionally, to not leave me alone with those challenges but to provide professional support, and that was good.”

| <b>Findings within the organisational responding perspective</b>   |
|--|
| 1. Negative reactions of staff were very common in successful projects and suggest evaluating results more critically.   |
| 2. The distinction between failed and successful projects, as far as adaptive responding is concerned, is much sharper on the organisational level than on the individual.                           |
| 2a. Organisations often displayed a general lack of systemic understanding in failed projects, which caused side-effects and unintended outcomes.  |
| 2b. Adapting structures and processes and pursuing goals determinedly contribute to positive project outcomes. Inadequate structures and passive behaviour significantly affect outcomes negatively. |
| 2c. While successful projects are characterized by adaptive and proactive management of staff, failed projects are characterized by the absence of such behaviour.                                   |
| 2d. Providing expertise via coaching and consultants are effective methods of organisational support.  |

Table 17: Findings within the organisational responding perspective



### 6.2.3 Summary

This second cornerstone investigated the ability of managers and organisations to detect the need to act within change projects. It also looked at the way responsive actions were performed and what those actions revealed about adaptive response capacity.

It was found that adaptive capacity generally predominates in successful projects and that the spread between failure and success is not as wide in the individual perspective. Adaptive capacity in the individual perspective was mainly reflected in two central topics. The first is the consideration of others, which is something that managers equally do in failed projects, but, considering others is a competency that could be better exploited by organisations. The second topic is related to adjustments that often require the manager to successfully perform design activities. A precondition for those competencies to have an effect is empowerment by the organisation. However, the support that managers need from management is based on a bi-directional relationship and requires the manager to provide sufficient information and actively request such support.

Another aspect that mainly surfaced in the organisational perspective was to understand how systems function. This would allow adequate responses without obtaining unintended side-effects. There is also evidence that organisations can profit from critically evaluating positive results.

Hence, non-adaptive responding of an organisation can be characterized by not understanding or not making the effort to understand systemic dynamics in combination with passive behaviour and not following goals determinedly enough while having inadequate structures and processes. Adaptive responding behaviour of an organisation can be described as consistently following goals with flexible structures and processes while avoiding passive and non-systemic behaviour.

## 6.3 The anticipating perspective

This anticipating cornerstone allows to look into a more distant future than monitoring does, identifying possible events and conditions that could affect change projects. The combined analysis of failed and successful projects also allowed a focus on those aspects that were anticipated but not acted upon or not anticipated although all information to do so was present.

The tendency to focus towards success was not clearly delineated for the organisation but for the individual perspective (see respective tables in appendix H). Two aspects, however, are different to the other cornerstones. The first relates to a very similar structure of themes and findings in both perspectives, which is why they are examined in one section. Second, some statements by the interviewees were very general and could not be allocated to either a successful or a failed project. Since they offer much insight about general preparations for change of managers and organisation, they are presented in the second subsection of this chapter.

### 6.3.1 Individual and organisational anticipation perspective

Three categories have been identified within both perspectives. The first two describe actions and behaviours that were either helpful or not helpful and the third category is named 'warning signs and anticipated risks/difficulties'. It was surprising that the allocation of themes is also very similar in both perspectives and the challenges of predicting future difficulties are seemingly the same, which is reflected in several similar findings.

Two findings emerged equally in both perspectives: (i) risks were perceived differently depending on the outcome and (ii) anticipation competencies were lacking in failed projects. Additional findings of the individual perspective relate to (iii) the attitude of the change manager and (iv) those aspects that were beneficial for anticipating difficulties. Finally, for the organisational perspective, one additional finding covers (v) the role of safety in anticipating.

| <b>Anticipating in successful projects (individual perspective)</b>  |   |  |
|--|---|--|
| <b>Helpful (proactive) actions and behaviour</b>   | <b>Non-helpful actions and behaviour</b>            | <b>Warning signs and anticipated risks, difficulties</b>   |
| <b>Awareness and assessment</b>  |   | <b>Internal</b>  |
| Analyse/plan before acting (3)<br>Evaluation of own competencies (5)<br>Compare with past figures (2)<br>Project evaluated as useful (1)<br>Large perception range (1) | Wrong assumptions about SMM (2)                     | Management pressure/unclear support (3)<br>Inadequate structure/design (2) Project not attractive (1)<br>Social/human challenges (4)<br>Uncertainty (2)<br>Warning signs based on experience (1) |
| <b>Actions</b>   |   | <b>External</b>  |
| Request support (1)<br>Communicate/manage social acceptance (3)  |   | Volatile environment (1)   |
| <b>Attitude</b>  |   |  |
| Positive attitude (4)<br>Management commitment (2)<br>Critical perspective (9)<br>Resourceful perspective seeking opportunities (1)                                    | Positive perspective but not enough preparation (1) |  |

Table 18: Themes within the individual anticipation perspective (successful projects)

| <b>Anticipating in failed projects (individual perspective)</b> |  |   |
|---|--|---|
| <b>Helpful (proactive) actions and behaviour</b>                | <b>Non-helpful actions and behaviour</b>       | <b>Warning signs and anticipated risks, difficulties</b>  |
| <b>Awareness and assessment</b>                                 |  | <b>Internal</b>   |
|   | Recognized but doubted (1)                     | Inadequate structure/design (2)<br>Inadequate process (1)<br>Lack of experience/system knowledge (3)<br>Not enough resources (1)<br>Passive behaviour of staff (1)<br>Hidden agenda (2)<br>Lack of need to act (3)<br>Scope too large (2) |
| <b>Actions</b>  |  | <b>External</b>   |
|   | Recognized without enough relevance to act (3) |   |
| <b>Attitude</b>   |  |   |
|   | Concerns not considered by others (2)          |   |

Table 19: Themes within the individual anticipating perspective (failed projects)

| <b>Anticipating in successful projects (organisational perspective)</b>  |  |   |
|--|--|---|
| <b>Helpful (proactive) actions and behaviour</b>   | <b>Non-helpful actions and behaviour</b> | <b>Warning signs and anticipated risks, difficulties</b>  |
| <b>Awareness and assessment</b>  |  | <b>Internal</b>   |
| Use expert knowledge (1)<br>Consider different perspectives (1)<br>Consider uncertainty/complexity (2)<br>Request feedback (2)<br>Allow emergence of people knowledge (1)<br>Active awareness of risk/threat (8) |  | Fear of mistakes/failure (2)<br>Minor risks/precautions (1)<br>Not able of managing complexity (1)<br>Not meeting target (2)<br>Reduced cooperation (1) |
| <b>Actions</b>   |  | <b>External</b>   |
| Provide enough resources (1)<br>Contingency planning (3)<br>Competent risk taking (1)<br>Proactive communication (internal/external) (6)   |  | Loss of customer (1)<br>Threat of unemployment (1)  |
| <b>Attitude and context</b>  |  |   |
|  |  |   |

Table 20: Themes within the organisational anticipating perspective (successful projects)

| <b>Anticipating in failed projects (organisational perspective)</b> |   |   |
|---|---|---|
| <b>Helpful (proactive) actions and behaviour</b>                    | <b>Non-helpful actions and behaviour</b>  | <b>Warning signs and anticipated risks, difficulties</b>  |
| <b>Awareness and assessment</b>                                     |   | <b>Internal</b>   |
| Good perception range (1)   | Lack of experience about system dynamic (2)<br>No system/forward thinking (3)         | Inadequate structure/design (3)<br>Inadequate tools/approach (2)<br>Not enough system understanding (1)<br>Overambitious goals (1)<br>High level of difficulty (1)<br>No contingency planning (1) |
| <b>Actions</b>  |   | <b>External</b>   |
|   | Risks and concerns ignored (2)<br>Recognized without enough relevance for action (10) |   |
| <b>Attitude and context</b>   |   |   |
|   |   |   |

Table 21: Themes within the organisational anticipating perspective (failed projects)

The first finding provides some surprising facts about how risks are perceived, and they seem to mainly originate from internal sources. From the organisational perspective they are more widespread in successful projects and no real pattern emerges, whilst in failed projects they mainly address inadequate structures and

approaches. A good example for inadequate design became apparent in the joint venture project of R4. That cooperation was flawed right from the start because the three participating companies were aiming for different goals:

”And that is why little by little the different goals were not reached. During the project many occasions allowed that conclusion. It would have actually been possible to say stop, reconsider and realise that something does not fit.”

The risks in the individual perspective cover organisational structure, management support, staff and the competencies of change managers, which are dealt with individually in the following paragraphs. The interviewed managers, independent from the outcome, focused more on the way projects were managed than on external conditions.

**Organisational structure.** Inadequate structure, a recurring theme from the responding cornerstone, was anticipated for both type of projects as a possible risk. R6 named organisational silos as a threat for project success:

”On the other hand, there was that very obvious risk of having to unite different organisational silos. Generally, most people prefer to work in silos instead of working in a transversal structure. Also, because nobody really liked that program, it was having massive impact on the firms’ financial situation.”

A further example is the failed project of R7 described by him as ‘designed to fail’. The new structure of the organisation was anticipated as problematic by R7 because it led to unclear responsibilities.

**Management support.** Pressure from management or unclear support was anticipated as a risk in some cases but nevertheless did not convert into difficulties for any of the managers who considered it as a risk. The individual responding perspective revealed that change managers can influence support. In the failed projects however, missing support was not anticipated even though it came up as a negative aspect in the individual responding perspective. Consequently, predicting it might require additional competencies.

**Staff.** A very interesting difference was found in the way that staff-related risks were handled. The successful projects only contained descriptions of anticipated challenges that the managers faced in order to achieve cooperation by or amongst staff. R8 for example described the challenge of asking employees to perform far above the average to succeed with the project, whilst being forced to inform them about planned layoffs at the same time. In contrast, the anticipated difficulties and risks within the failed projects were described as problems of the people. R5 named their 'hidden agenda' and R11 their 'lack of need to act'. One possible explanation is that the previously identified tendency to focus towards success caused managers to fall for the bias of externalising difficulties.

**Competencies of change managers.** Some interviewees, e.g. R2 and R11, named their own lack of experience and system knowledge as a constraint in their failed projects. It was very interesting to see that when this was the case in successful projects, the managers had assessed their lack of competencies early enough to compensate. This is evidenced by the theme 'evaluation of own competencies' receiving a count of five. One example came from R3, who described how he critically evaluated his abilities and drew a conclusion for his approach:

“You will be in front of 600 people receiving 600 arguments the first day and you have to deal with them, that requires some skill. Then you have to think realistically, and also consider that you are a technical person and not a psychologist.”

The failed projects contain no such accounts.

The second finding illustrates an interesting distinction between themes about helpful and non-helpful aspects of anticipation. This distinction was found to be highly bipolar in both the individual and the organisational perspective. It seems that anticipation is performed effectively in successful projects whilst negative projects are full of difficulties. These difficulties seem to be more intense on the organisational level because the total count of themes is much higher there (see appendix Q). The above is in strong contrast to the previous findings about monitoring and responding, because in those cornerstones positive aspects were

found in failed projects and negative aspects in successful projects. Competencies for anticipation, however, seemed to be either present or absent.

Apparently, it was difficult for the managers in the failed projects to anticipate and then act upon what was recognized. Several quotes illustrate how managers sometimes do not believe or act upon what they recognised. This is evidenced by the themes in the second category of failed projects. R9 described such a situation where hints were found but did not trigger further action:

"Maybe in some areas. But when you have a project like this, it will be split in several sub-projects. Based on experience you would say, well that sub-project over there is very demanding as many difficult things are happening, but the others are ok, maybe demanding too but can be done relatively well. Otherwise you would not engage, right? And then there were some that needed careful tracking. But finally, it failed across all segments."

Such passive behaviour was similar for the organisational perspective and reflected in themes like 'risks and concerns ignored' and 'recognised without enough relevance to act'. Both add up to a total count of twelve. R9 also described that phenomenon on the organisational level:

"It was identified that these results are very ambitious but nobody was against ambitious targets. That should be a given. From that perspective, yes, it was anticipated as a project with a large impact - but should that have triggered any action?"

Rather than ignoring facts, one explanation seems to be that not acting in spite of difficulties is a matter of missing competencies to make sense of what was perceived. Several themes in the successful projects indicate what type of competencies would be needed: 'analyse/plan before acting', 'compare with past figures' and 'large perception range'.

One recurring aspect within the quotes that contained those themes was understanding how the themes relate to each other, which was well illustrated by R6, who described a mechanism causing large and unneeded inventories:

“It was practiced like this for many years and towards the end of the year everybody was wondering why, again, it did not work out. Finally, all parties had to realise how they jointly contributed to that effect. So, we had to change it, and in that way match the real needs of the project with our expectations.”

To grasp such relations requires systemic understanding, a competency that is needed for anticipative behaviour and this is one reason to allocate experienced managers to change projects.

How the lack of systemic understanding became problematic on the organisational level was explicitly commented on by R11:

“Foresight or an understanding of the relations were not there, not at that level of the organisation where an impactful decision could have been made.”

Understanding relations as an organisational competency manifested in themes like ‘use expert knowledge’, ‘consider different perspectives’, ‘request feedback’ and ‘allow emergence of people knowledge’.

Shared understanding on the organisational level can apparently counter passivity, which is evidenced by the themes ‘proactive communication’ and ‘active awareness of risk/threat’. Both have a high count and emphasise the relation between awareness and becoming active, a combination present in the projects of R3 and R8. Furthermore, R9 illustrated how proactive communication created activity:

“Yes, that could have become an obstacle, if we had not done a lot of persuading. Indeed, we started very early to inform employees, let them participate, include their ideas. The result was that they adopted that position and defended it out of their own belief.”

The third finding concerns attitudinal prerequisites of change managers for anticipating developments. It was found that a ‘critical perspective’ and a ‘positive attitude’ supported successful anticipation. Those two themes together reached a



total count of thirteen in projects with a positive outcome. Half of the sample showed this critical perspective and all interviewees who showed a positive attitude also adopted a critical perspective at the same time. That the two themes 'critical perspective' and 'positive attitude' apparently should be balanced, is echoed in a quote of R4:

“There was a lot of respect from my side about facing this task and at the same time I was looking forward to getting things moving.”

The fourth finding highlights a behaviour that supports anticipation, which is sharing concerns and risks with employees because it seemingly activates employees' potential. This is illustrated by R8 in a socially very demanding project involving lay-offs:

“Those that stayed did not react by saying 'thank God'. Instead, their wish was for the leaving colleagues to be treated fairly. The fact that this was the case increased motivation for the remaining employees. I think it would have been inhuman to tell them that they should just be happy to keep their jobs or that someone else had to leave and not them.”

The final finding shows that safety considerations, from the moment that organisations were dealing with identified risks, were identified only in successful projects. This is evidenced by the themes 'contingency planning' and 'competent risk taking', and also in the consideration of R10:

“When changing production lines and processes, there was always a test done beforehand and stock was built in order to assure that the customers would get their deliveries.”

Contingency planning is based on classical risk management and therefore a critical element of any safety 1 approach. However, the failed projects show that the threshold for taking action is high and therefore these themes did not appear.

| <b>Findings from both anticipating perspectives</b>  |
|--|
| 1. Almost all anticipated risks (in both perspectives) relate to internal risks, e.g. inadequate structure and design. Individual difficulties with staff were often seen as problems of the people in failed projects, while regarded as a challenge when projects were successful. Assessing necessary competencies (of the interviewees) was also more effective when the outcome was positive. |
| 2. Passive behaviour can to some extent be explained by not understanding underlying relations of anticipated difficulties. Positive outcomes seem more likely when change managers have developed system understanding and organisations shared an understanding of constraints and risks.  |
| 3. Individual anticipation seems to benefit from a positive attitude combined with a critical perspective.   |
| 4. A positive outcome from the individual perspective is more likely if concerns are shared with employees, since the will to address constraints is increased.  |
| 5. Safety considerations at the organisational level were not found in anticipative activities of failed projects.   |

Table 22: Findings from both anticipating perspectives

### 6.3.2 General preparation by individuals and organisations

Some quotes describe aspects that were anticipated without referring to a specific project. Interviewees spoke for example about what they usually do or what they experience as a general difficulty. Those quotes contain valuable insights about preparation for change and address what the literature denominates as change readiness (Decker et al., 2012). The ideas expressed in those quotes can be regarded as unspecified anticipation or general precautions.

Three interrelated findings emerged: (i) how preparation is evaluated, (ii) how the organisation uses and provides expertise and (iii) how all of the above are affected by structural design.

| <b>General preparation (individual and organisation)</b>  |   |
|---|---|
| <b>Individual (Manager)</b>   | <b>Organisation</b>   |
| <b>Training</b>   |   |
| <b>Helpful aspects:</b><br>Dense training history (8)<br>Will for continuation training (2)                             | <b>Helpful aspects:</b><br>Adequate amount of training provided (2)<br>Adequate amount of training provided to management (2) |
| <b>Non-helpful aspects:</b><br>Not enough adequate training received (4)<br>No training received (1)                    | <b>Non-helpful aspects:</b><br>Lack of adequate amount of training (10)   |
| <b>Expertise/Experience</b>   |   |
| <b>Helpful aspects:</b><br>Past experience available (4)<br>Availability of experts (1)<br>Availability of coaching (1) | <b>Helpful aspects:</b><br>Availability of external experts (2)   |
|   | <b>Non-helpful aspects:</b><br>Lack of management expertise (2)<br>Experts not used (1)                                       |
| <b>Approach</b>   |   |
|   | <b>Non-helpful aspects:</b><br>Lack of lessons learned (4)<br>Lack of awareness/attitude (5)                                  |
| <b>Structure</b>  |   |
|   | <b>Helpful aspects:</b><br>Framework/support provided (3)   |
|   | <b>Non-helpful aspects:</b><br>Lack of framework/support (5)  |

Table 23: Themes about general preparation (individual and organisation)

The first finding highlights that there is a strong discrepancy in how managers evaluated their own preparation versus the one of the organisations. Two thirds of the interviewees described their own preparation as adequate but that of the organisation as not sufficient. There are very few quotes about organisational expertise.

The second finding shows that organisations apparently prefer external help over internal experts when preparing change projects. R7 for example mentioned that the availability of internal experts was helpful for him but critically remarked that the organisation did not make use of them. As far as the expertise of change managers is concerned, it seems that organisations do rely on that expertise, but they fall short of providing that expertise by means of training. Apparently, organisations do not see a strong need for this as the quote of R11 shows. He requested certain qualifications and additional training in a change project, based on his lessons learned from another project, but management denied him:

“...and this is why I said that for the next project we need ‘this and that’ as well as the following qualifications. And they said no, and that happened several times.”

R12 is of the opinion that whoever has the authority in a project should provide all necessary resources. With regard to management, she then critically added:

“...and finally, from an executive perspective, this responsibility should not be delegated to anyone within the project.”

The third finding unveils that organisational structure contributes to what the above two quotes describe. R4 commented how the structure of his organisation does not provide the framework for thoroughly anticipating the needs of change projects. He explicitly named training and lessons learned as something that such a framework should provide. Finally, for R11, decision-makers lacked the necessary expertise to provide adequate preparation and with a smile he added:

“...and my biggest wish at that point, was having the decision-makers sitting in those courses ... to actually get them trained.”

| <b>Findings about individual and organisational preparation for change</b>   |
|--|
| 1. Individual preparation for change (change readiness) seems to be adequate in the majority of projects while organisational preparation apparently is not.   |
| 2. Organisations prefer external expertise over internal. At the same time organisations do rely on the expertise of change managers while failing to develop those competencies by means of training. |
| 3. One reason why organisations do not provide enough training seems to be structural (design) deficiencies when having to identify required change competencies.                                      |

Table 24: Findings about individual and organisational preparation for change

### 6.3.4 Summary

This third cornerstone investigated the ability of managers and organisations to look into a more distant future and showed that there is a sharp contrast between successful and failed projects. The most interesting finding is that the identified risks mostly related to internal aspects. This weakens the anticipation capacity of the organisation. Inadequate structures and processes were named to a significant extent across all perspectives and outcomes.

A phenomenon in failed projects, mainly from the organisational perspective, is passive behaviour. It could be traced back to a lack of system understanding and confirms what has been identified as a gap in the literature. The themes illustrating discrepancies between recognising and acting reached a total count of twenty-six from half of the sample. It has also been shown as generally beneficial to draw on different sources of information. They support shared understanding and maintain a critical, safety-oriented attitude.

Finally, from what has been reported about general preparation, it seems that expertise and individual competencies are a principal precondition for successful change projects. Additional evidence for the important role of the middle manager was found. The organisation benefits from them but apparently does not provide adequate training. The structure that is needed for developing competencies is seemingly insufficient.

## 6.4 The Learning perspective

The learning cornerstone focuses on understanding what has happened. The learning perspective looks at how change managers and organisations make sense of outcomes. This perspective also considers that positive and negative learning experiences are independent of the project result. A learning process requires more than the simple acknowledgment of the result. As a consequence, structures, processes, procedures and approaches can be changed. The learning perspective does not simply repeat the content from the other cornerstones. Instead it aims to understand what is learned, how learning takes place, which conclusions are drawn for future projects and how those are put into practice. It is also important to understand how and why difficulties may not lead to a learning process.

In general, it can be observed that learning from success happens more often (Appendix H) while failure leads to more drastic changes.

### 6.4.1 The individual learning perspective

Four categories emerged after analysing the accounts of the interviewees about how they make sense of what happened in their project. Learning of the change managers concerned reasons for the project outcomes (first category), helpful and non-helpful aspects (second and third category) and conclusions about how to handle future projects (fourth category).

The large number of themes and quotes indicates that the interviewees obviously tried to make much sense of the results and frequently adapted their activities. However, when asked explicitly about which aspects were helpful in failed projects, only 'self-critique' and 'past negative experiences' were named. It seems that once a project is labelled a failure it is hard to find positive aspects, whilst the opposite seems easier because descriptions of non-helpful aspects were more equally distributed.

Six findings were identified and cover what was learned about (i) management support, (ii) use of consultants, (iii) reaching a shared understanding, (iv) system understanding, (v) management of staff and (vi) pursuing goals.

| <b>Learning in successful projects (individual perspective)</b>  |   |   |  |
|--|---|---|--|
| <b>Reason for result</b>   | <b>Evaluation of aspects as helpful</b>   | <b>Evaluation of aspects as not helpful</b>   | <b>Conclusions for future projects</b>   |
| <b>Attitude and behaviour</b>  |   |   |  |
| Knowledge about WAD (1)  | Competent risk-taking (1)<br>Proactiveness (1)  |   | Adequate preparation (2)<br>Better perception range (1)<br>Competent risk taking (1)<br>Seek system understanding (4)<br>Maintain open/adaptive attitude (3) |
| <b>Coordination and communication</b>  |   |   |  |
| Adapt process to humans (1)<br>Decisive leadership/pursue goals consequently (5)<br>Internal cooperation (1)<br>Open internal/external communication (3)<br>Stop project (1) | Decisive leadership (3)<br>SMM (1)  | Base success on result (1)<br>Lack of SMM (1)<br>Project too big (1)<br>Reactive adaptation (1)<br>Inexperienced management (1) | Communicate content and benefit (9)<br>Communicate method (2)<br>Develop SMM (1)<br>Use expertise of staff (3)   |
| <b>Staff</b>   |   |   |  |
| Active participation of staff (10)<br>Broad/shared acceptance of project (6)<br>Visible commitment of management (7)   | Autonomy/controversy in teams (2)<br>Active participation of staff (2)<br>Direct interaction (3)<br>Evaluate engagement (3)<br>Visible commitment of management (1) | Negative effects on people (1)  | Active participation of staff (4)<br>Direct interaction (4)<br>Show visible commitment (2)   |
| <b>External or project</b>   |   |   |  |
| Consultant support (4)   | Trusting experts (3)  |   |  |

Table 25: Themes within the individual learning perspective (successful projects)

| <b>Learning in failed projects (individual perspective)</b>   |  |  |  |
|---|--|--|--|
| <b>Reason for result</b>  | <b>Evaluation of aspects as helpful</b>                        | <b>Evaluation of aspects as not helpful</b>                  | <b>Conclusions for future projects</b>   |
| <b>Attitude and behaviour</b>   |  |  |  |
| Not realizing/accepting failure (1)   | Self-critique (1)<br>Experience from past negative project (5) | Passive behaviour (1)<br>History of failure/difficulties (1) | Success starts with humans (2)<br>Relate theory to practice (1)<br>Apply self-critique/evaluation (3)                    |
| <b>Coordination and communication</b>   |  |  |  |
| Inadequate structure/process (4)<br>Wrong assumptions (3)<br>Lack of system understanding (4)<br>No visible management commitment (3) |  | No understanding of context (1)<br>No management support (2) | Seek system understanding (4)<br>Smart use of resources (1)<br>Seek resources/support (6)<br>Seek management support (1) |
| <b>Staff</b>  |  |  |  |
| Project not accepted (4)<br>Resistance (1)<br>Not addressing needs (3)<br>No reporting by staff (1)                                   |  | No direct interaction with staff (1)                         | Seek direct interaction (6)<br>Create commitment through sense-making (5)  |
| <b>External or project</b>  |  |  |  |
| Inadequate use of external support (consultants) (2)<br>Lack of cooperation towards partners (1)                                      |  | Poor consultant performance (1)<br>Increased complexity (1)  |  |

Table 26: Themes within the individual learning perspective (failed projects)

The first finding reiterates the importance of management support. Beyond what the findings in the responding cornerstone would suggest, five interviewees discussing successful projects and two interviewees discussing failed projects saw management support as a key factor in their respective outcomes. Management support is seemingly a success factor if it is there and a failure factor if it is missing.

The essence of this finding is that not much was said about how to approach this aspect in future projects. Instead, some managers reflected about their own role. R6 resolved to make sure that managers working under him support their respective teams:



“It did only work because people were backed by their bosses. So, what actually makes the difference? You have to really take on board all those levels that are of any relevance for a project, right.”

The second finding relates to the use of consultants, which was named as a reason for successful and also for failed projects by several interviewees. R10, the plant manager of a large automotive supplier, drastically changed his evaluation from being sceptical towards commenting how much value was added by consultants:

“We started with external support. A consultant came in and based on my experience I thought... well, just another one. But now, I have to admit he was well worth his price. I would even say he was one of the top three I ever knew in my career. He set the right course for us, with his attitude, with his performance, with his train-the-trainer approach, quickly enabling us to do everything on our own.”

A negative experience with consultants was reported by R9. Inadequate off-the-shelf solutions caused the project to fail:

“This project was not only supported by external consultants, but they basically dictated the desired result based on benchmark studies. The assumptions they used were not correct and because they were unaware of many documents they didn't realise (...) My understanding is, that they just applied an approach that maybe has been successful in several other cases, but because the basic assumptions were not correct, the desired result did not happen and acceptance was very low.”

Even though the interviewees see consultants as receiving strong organisational support, as discussed in the responding section, they themselves remain sceptical. However, they neither internalise the benefits of a good consultant nor the drawbacks of a bad consultant sufficiently to draw explicit conclusions for the future.

The third finding is about two seemingly related ideas, which are reflected in several themes. On the one hand it is the acceptance of the projects, that can

determine the degree of resistance ('broad shared acceptance of project', 'project not accepted', 'resistance'). On the other hand, several themes describe how shared understanding is affected by the quality of communication and cooperation ('shared mental model', 'open internal/external communication', 'internal cooperation' – 'lack of SMM', 'lack of cooperation towards partners', 'no reporting by staff'). Several themes illustrated respective conclusions that the interviewees drew: 'communicate content and benefit', 'communicate method', 'create commitment by sense-making' and 'develop SMM'.

All but one interviewee mentioned at least one theme concerning either acceptance or shared understanding. One third spoke about both. The interviewees seemingly learned and concluded that those two ideas are success factors, illustrated by R11 for example:

"The individual motivation of many people who took part was helpful. They were having that will because they had identified themselves with the cause and made it their own, also because they realised that the idea behind is good."

R9, the bank manager, commented how shared understanding about the project allowed a smooth start:

"But if the whole organisation sees this, how important these topics are, that they make sense, that they leave basically no alternative and everybody knows he is allowed to participate. That's when you have the big chance."

As far as the shared understanding is concerned, comments on communication, cooperation, and coordination were strongly intertwined in the quotes.

R3, a head of quality, further linked shared understanding with the way an idea is convincingly communicated:

"That is another conclusion. To convince my team and have these middle managers convince their own teams. That is an insight for me, if the leader communicates convincingly, and has the desire to get there too, the employees will make the same effort."

The fourth finding provides concrete touchpoints for system understanding, which emerged in the preceding cornerstones, but has so far only been vaguely defined. R11 for example named discrepancies between 'work as done' and 'work as imagined':

“A mature organisation needs many steps to get from the actual state to a desired state, and you need time for that. The current maturity level and what is happening in the environment are often very different to what management imagines. Of course, everybody wants the ideal result immediately but normally you need more steps than that.”

More specifically, wrong assumptions were seen as a reason for failure by several interviewees. While R3 referred to assumptions of stakeholders, R9 focused on his own. The following conversation about a large reorganisation project took place during the interview:

“R9: I just joined the organisation and did not have a reliable gut-feeling for the numbers yet, but then I realised what was going on and this is an experience I will carefully consider in future projects.

I: Do you mean the gut-feeling?

R9: Well, actually to question existing assumptions about what is going on.”

The ability to question existing assumptions therefore appears to be one element that makes up system understanding in change projects. A second element is reported by R2. He spoke about understanding the dynamics involving his own role, how others perceive it and then act:

“You are on a stage and you are playing your role while you speak. Then you leave and the role changes. I only realised afterwards that as managers we are playing a role for some time. There is no director and there is no script. We are interpreting ourselves and have to play that role well, so that the audience for whom we play accepts our part. It took a while for me to realise this.”

The fifth finding illustrates that interviewees were seemingly concerned about putting more emphasis on direct interaction with staff and more active participation of employees at all stages of a project. Several quotes illustrated what they learned and concluded.

**Direct interaction.** Directly interacting with those affected by change was reported as beneficial and convinced R4 to seek more:

"It is about being with the people, not just making statements about how important that is. You have influence by empowering them and motivating them to do what is needed. You need to be there and not sit somewhere in an office or on the upper floor. You have to go out there, to the people or have them come to you. This is something I can do well and I enjoy doing it."

It was in retrospect that R12 learned that the biggest challenge in her project was to become aware of underlying tensions:

"Looking back I am not sure if we could have become aware of the fact that we needed one-to-one interactions and that we had to look out for commitment again. This is a big 'what if'. Looking back at all the money that was used, it feels like paying an extra round on the rollercoaster for everybody while sitting on an active volcano."

The monitoring function of staff and the resulting benefits were identified in the respective cornerstone. R6 concluded that direct interaction is a precondition to make use of employees' abilities to detect critical aspects in change projects:

"You always have to feel the mood of employees and get their perspective. Are they seeing it positively and have the will to engage or are they of the opinion that this matter will just pass by on its own? Because then you are heading in the wrong direction and you should react immediately. But what you need to become aware of is to have enough interaction with them."

**Active participation.** From how the interviewees evaluated their projects, it seems as if active participation triggers competencies of staff which would otherwise remain unused. For R9, this turned out to be the key for project success:

“The main reasons were, first of all that we allowed those employees concerned to contribute to the conceptual planning. Right from the first draft with the first brainstorming. It was all based on how much they wanted to commit themselves, and the big asset was that the most important topics that were of relevance in the market, were identified by them and not by external sources.”

An important precondition for R9 was to assure the staff had the chance to actively participate throughout the whole project:

“And the second critical point is to make sure that they stay until the project is finished and to not replace them with consultants at any point.”

That active participation also contributes to shared understanding is evidenced by a quote of the plant manager R10:

“I am absolutely confident that we have right from the start included all employees. We did not just inform and communicate but had all employees take part in a two-day training session where they could literally touch and also comprehend everything. This simulation was done with all people from all hierarchical levels. And every time since then, if a problem occurred or anyone had a good but critical argument why something should not be performed as planned, they had a common basis to refer to. They reminded each other of the success factors they encountered in that simulation where everybody participated.”

This quote in particular ties this finding to the last finding on shared understanding and emphasises further possible relations between the themes.

The sixth and last finding confirms what has already surfaced in the individual responding perspective regarding the determined pursuit of goals and a decisive leadership-role. Five interviewees named those as reasons for positive outcomes

and three described them as helpful. R8, for example, described making hard decisions as helpful:

”A main reason was that we got clear decisions from management. Mainly painful decisions that hurt but also quick decisions, fast implementation and integration of affected employees. To win people over and include them. Especially for the tough aspects of change that affected employees. This relates for example to cutting jobs or shifting them to other places. For this, the foundation is obvious, honest and early communication.”

However, as the example of R3 illustrates, such processes need time:

”Starting from day one, when we stood around that planning chart with the employees, until now, almost two years have passed. So, you really need a sustainable and strong breath.”

It is interesting to note that again, no specific conclusions on the above were drawn for future projects. The managers have clearly understood what has happened, which is the emphasis of the learning cornerstone, but a reason for not mentioning specific conclusions was not found.

| <b>Findings within the individual learning perspective</b>  |
|---|
| 1. Management support was found to be an impactful factor when it was present and also when it was missing. Yet no explanation was found why interviewees did not explicitly conclude anything for future projects.                 |
| 2. The managers learned that consultants are beneficial for change projects if they are properly used, but managers did not take away specific conclusions for future projects from their use.                                      |
| 3. The two themes acceptance of the project and shared understanding emerged as strongly intertwined.   |
| 4. A lack of systemic understanding is a significant factor for project failure. Two preconditions for systemic understanding were identified: questioning assumptions and the effort of understanding the dynamics of a situation. |
| 5. Management of staff in successful projects is characterised by direct interaction with affected staff and by fostering their active participation.   |
| 6. Decisive leadership and pursuing goals determinedly contributes to positive project outcomes.  |

Table 27: Findings within the individual learning perspective

## 6.4.2 The organisational learning perspective

The analysis of the organisational learning perspective provided three categories of themes. The accounts of the interviewees contain their observations of organisational adaptive behaviour (first category), what conclusions the organisation drew (second category) and their critical evaluations (third category). The themes mainly focus on what was done and how change was approached.

A general observation in the learning perspective is that individual and organisational learning is very different. This is reflected in the number and variety of themes shown in Table 28 and Table 29 below as well as in the three findings that surfaced. The first two concern (i) how failed change triggered more activities as well as new approaches for making sense of outcomes and (ii) how structures and processes were changed afterwards. The third finding is about organisational learning and was completely unexpected because at first sight it contradicts the previous findings. Further analysis has revealed a very illuminating contrast between reactive short-term adaptation and long-term sustainable learning.

| <b>Learning in successful projects (organisational perspective)</b>   |   |  |
|---|---|--|
| <b>Observed adaptive behaviour (due to learning)</b>  | <b>Observed conclusion</b>  | <b>Critical evaluation</b>   |
| <b>Approach</b>   |   |  |
| Competent risk taking (2)   | Understand problem first (1)<br>Competent risk taking (1)<br>Know when to stop (1)                      | Not considering critical feedback (2)<br>No lesson learned (6)<br>No lesson learned/selective confirmation (1)<br>No lesson learned (frustrated staff) (2) |
| <b>Activities</b>   |   |  |
| Adapt structures and processes (10)<br>Seek SMM (1)<br>Trust experts about WAD (2)<br>Repeat successful procedure (2) | Request external feedback (1)<br>Accept/consider uncertainty (1)<br>Define role/task of consultants (2) | Restart without redesign (1)<br>Documented but not evaluated (1)<br>No documentation (2)<br>Difficulties with change from within (1)                       |

Table 28: Themes within the organisational learning perspective (successful projects)

| <b>Learning in failed projects (organisational perspective)</b>  |   |   |
|--|---|---|
| <b>Observed adaptive behaviour (due to learning)</b>   | <b>Observed conclusion</b>  | <b>Critical evaluation</b>                        |
| <b>Approach</b>  |   |   |
| Change of approach/mindset (2)   | Change mindset to constant unease/forward thinking (4)  | No lesson learned (3)<br>Mindset of arrogance (1) |
| <b>Activities</b>  |   |   |
| More direct interaction with staff (2)<br>Change of structures/processes (3)<br>Increased perception range (1) | Analyse failure (1)<br>Critically evaluate external support (1)<br>Communicate/act visible and consistent (1) | Not using resources/support/experience (2)        |

Table 29: Themes within the organisational learning perspective (failed projects)

The first finding in the organisational perspective indicates that it is mainly the failed projects that triggered changes in approach and mindset. Their total number of quotes, however, is much lower. These changes led to more long-term thinking and to generally seeking better understanding of the change situation. Almost all of the themes in the first two categories are evidence of this. One reaction to a recently failed project is of particular interest because it illustrates the monitoring function of employees. R10 described how the organisation tried to adapt by increasing interaction with employees with the intention of deepening general understanding:

"Yes, definitely, it seems silly but we could have come up with that idea earlier. To work closer to the people and closer with the people. Of course, we had conversations but how we are conducting them, that is what we want to change and what we are changing at the moment."

The common idea reflected in the above and similar quotes is that after disruptive events, organisations see a need to understand what has happened and how to adjust. R9 commented for example how external support was being reconsidered and referred to a more adequate use of consultants in the future. The successful projects barely contain quotes where activities are critically reflected or questioned. To deal with positive outcomes in such a way could lead to better learning from what went right, as safety 2 advocates, but the quotes do not contain much evidence for this taking place.



The second finding relates to the recurring theme of adapting structures and processes, occurring three times more often in the successful projects because the organisations realised the need for adaptation. The purposes behind structural changes are often connected to other themes. Coordination and shared understanding are some of those important themes and the organisation of R10 tried to improve them by adapting related structures and processes:

“In daily business we now have much more of those small gatherings. I would not call them meetings but rather organized gatherings where anyone can raise their hand and point out problems. That person can then initiate a process for understanding that problem and then for developing solutions.”

Some of these changes had long-lasting positive effects. This may be due to structural changes triggering other changes, for example causing employees to change their routines or the way they perform their work. Such a cascading effect was described by R9:

“The project that I am thinking about right now involved changing the whole structure of the organisation. It was reduced, several sites have been combined and we reduced costs. But we also opened new doors for new businesses, new activities, and that has much to do with change, like changing the mindset of employees for instance. Especially when they have been working with a certain topic for years, to then start going in new directions with a positive attitude like saying yes, ok, this topic is relevant for the whole organisation and I will actively support it.”

It is noteworthy that the majority of structural changes, mentioned by the interviewees, were reactive adaptations to sometimes critical events. One example is portrayed by R6. His organisation was confronted with problematic and critical events beforehand:

“Looking back at those drastic experiences we launched the first joined cooperation with the armed forces. We had that severe incident before, right. In a coordinated move, basically in secret but with authorization by the next level, we did incorporate those XXX [note: confidential]. Many were

involved on both sides. So, we simply said, that there is a necessity, we have to adapt. And that is what we did, against all odds.”

Almost all of these changes are based on a problem, a challenge or even previous failure. In contrast, adaptation with a forward-looking perspective is not so common.

The investigation of positive outcomes unveiled the final and most relevant finding about organisational learning. It was found that one aspect was critically evaluated above all others: that the organisation does not engage with lessons learned, and especially not in projects with a positive outcome. Almost all the themes in the third category refer to this topic. Expressed in numbers, there are seven themes about a lack of lessons learned in the successful and two in the failed projects, and they received an overall total count of fifteen and four. Some of the quotes expressing these themes are general statements about the project while others address specific aspects. A general comment from R12 provides reason for this lack of learning, and that is cost-cutting:

”We have similar projects where lessons learned from change management were often sacrificed to save costs. It is in the work packages of change projects where the cutting starts. We have repeatedly included this as a lesson learned, telling top management that doing the lessons learned in change projects should not be affected by cost-cutting. But it is always the first thing that is sacrificed.”

R12 also reported that documentation to prepare lessons learned was done but an evaluation never happened and hence, learning could not take place. Common to most of the quotes is that attitude and approach are the main elements being criticised. Hence, it seems that proactive behaviour and adaptation is mainly a matter of awareness and will. This is evidenced by R11 who describes how feedback is being ignored:

”The lessons learned, our individual ones, were presented and underpinned with facts and reasons for why their implementation is necessary. But two management levels further up, it was evaluated as being too work-intensive.

The aftermath of a change project, the lessons learned, is the preparation for the next project. In my opinion. But nobody wants to do it.“

| <b>Findings within the organisational learning perspective</b>  |
|---|
| 1. Changes in attitudes and the effort to understand what has happened is mainly found in learning that takes place as a consequence of failed projects. Successful projects contain little evidence for such organisational behaviour.   |
| 2. Adapting structures and processes was a learning effect in many successful projects. Despite the positive results, learning was mainly a reactive and not a forward looking and proactive activity. Conclusions were drawn and structures adapted to prevent similar problems in the future. |
| 3. The successful projects contain a surprisingly high number of critically evaluated lessons learned, that were either not adopted, not documented or were even ignored.   |

Table 30: Findings within the organisational learning perspective

### 6.4.3 Summary

The individual learning perspective has revealed several connections between themes and they all emphasise system understanding. This mainly concerns the relations between two pairs of success factors: acceptance of the project and shared understanding as well as direct interaction with staff and their active participation. The individual perspective has also revealed more insight into three elements that contribute or partly constitute system understanding and could serve as advice on how to develop such an understanding: to question assumptions, to make the effort of grasping the dynamics within a change situation, and to reflect on one's own role in relation to others. The latter is related to self-critique which has been identified as a competency of change managers even though it did not lead to sustainable conclusions for future projects. In general, the managers reflected much about their projects in order to understand what has happened (RE definition of learning cornerstone), however, conclusions for the future were not always drawn.

It seems to be an organisational phenomenon that critically reflecting on attitudes and approaches is mainly triggered by negative results, whilst positive outcomes are often followed by a lack of lessons learned. This happened in spite of

structures and processes being changed and successful outcomes being achieved. This appears to be a paradox of successful change outcomes. Hence, these changes cannot be described as adaptive behaviour of an organisation in the sense of RE because they had the focus on 'what goes wrong' (safety 1). The proactive and forward-thinking focus of safety 2 would reflect an understanding of 'what goes right', but lessons learned from successful projects were not performed to a significant extent. Learning from successful projects seems to be the bottleneck for sustainable CM success and offers large potential for increasing the success rate of change projects.

## **6.5 Summary of findings**

This chapter, by applying the perspective of the four cornerstones to change projects, has revealed that differences do exist in how managers and organisations deal with projects, and how results come about. These results now need to be contrasted with existing theory and practical challenges.

## **7. Contribution to theory and practice**

Failure and success of change projects are the principal subjects of this study. While exploring them from a safety science and HFE perspective, several links to the research gaps and practitioner problems of CM have emerged (see section 3.3). This chapter answers the research question and illustrates how the research objectives were accomplished. It has to be noted that aspects concerning failure and success (outcome), the four cornerstones (stages), human (micro) and organisational (macro) aspects are much intertwined and cannot be dealt with entirely separate. Therefore, the first two sections will describe the central contribution of this study, which set out with the aim of exploring the potential of RE to impact change success. It is therefore argued that the combined perspective of HFE and safety science via the four cornerstones and safety 2 has the potential to contribute to the valid framework Todnem By (2005) has argued is missing from CM.

The remaining sections will focus on those aspects that could be identified via the lens of the four cornerstones and relate to both research objectives. It will be shown how organisational design benefits from system understanding and improves the interface between humans and the organisation, all of which is related to a set of critical competencies. While all of the above is closely intertwined, the last cornerstone, learning, provides some unique insights into successful and failed projects on the organisational level.

It is finally argued that the results of this study contribute to the body of knowledge in CM, namely to the research of Raelin and Cataldo (2011) and Decker et al. (2012), and that practitioners can profit from the research results by considering critical failure and success factors along the different stages of a project. Those stages are reflected in the four cornerstones, which can serve as a structured approach similar to checklists in aviation.

## 7.1 Successful change is safe change

When projects fail, an active process of trying to understand what happened is usually initiated. In contrast to an accident investigation, where causes and recommendations are sought, no structured approach is found in CM. Moreover, that process is often found to happen rather intuitively and with huge qualitative differences. CM can therefore profit from structured reactive approaches like those based in safety 1. In that context it can be concluded that consistent guidelines, a universal terminology and best practice for investigating failure are lacking in CM. The research results have largely confirmed what the literature review revealed to be gaps.

The weaknesses of not having universality of approaches in CM, shown in the lack of consensus on all but the high pace of current change that comes in all shapes and sizes while triggered by external and internal factors (Todnem By, 2005), could be addressed by safety 1 approaches. Several aspects to be addressed were identified: the fixation on monitoring mostly lagging indicators and hard facts, inadequate organisational preparation, reluctance in changing structures even though that is anticipated as a potential constraint, and finally not performing lessons learned. The central challenge as opposed to e.g. aviation is that universal regulations do not exist in CM. A plane would for example never depart without enough fuel for the planned journey. This is because of regulated safety measures and the existence of a safety attitude that originates in specific training, neither of which is present in CM. It is therefore suggested that a future research agenda could investigate how the lack of regulation might be compensated for with other measures.

Beyond the issue of universal standards for CM, the strong focus on outcomes was found to be a weakness in the monitoring functions of organisations. The outcome clouds the view on the process in cases of failed projects and often leads to ignoring the process in cases of successful projects. That same weakness can also be found in high risk environments and has been criticized as the so-called bipolar perspective of safety 1 (Hollnagel, 2014d), where only the dichotomy of safe/unsafe counts. The perspective of safety 2 and RE, in contrast, focuses not only on the outcome but specifically on the process, with a view to examining the

variability of human behaviour to find out when and how things go right. Making use of this, valuable insights into both successful and failed change projects were obtained. It has been shown how successful aspects of failed projects and problematic elements of successful projects are often ignored.

Furthermore, most insight was gained from researching successful projects through the lens of safety 2. In those instances, difficulties were overcome and as a result of learning from them processes and structures were changed. But, similar to the failed projects, this mostly happened as a reactive process of learning and adaptation. Subsequently, sustainable learning on the basis of lessons learned was rarely observed, which is further discussed below.

Finally, it is suggested that a shift of emphasis away from an over-reliance on results in favour of better understanding the process would be beneficial. This is mainly related to aspects that go wrong in successful projects since the study found that interest in those is very low once the desired results are obtained. And that cannot be considered as safe from the perspective of RE.

## **7.2 Extending the concept of critical failure factors**

An important additional contribution of this work comes from its focus on predicting success using a safety 2 approach. Up to now, the most influential framework for the prediction of project outcomes in CM comes from the work of Decker et al. (2012). They list so-called critical failure factors (CFF) in an attempt to formulate leading indicators for change project failure. As has been discussed in this research, this approach is inadequate from an HFE perspective, especially when adopting the framework of safety 2 and its corresponding focus on ensuring positive outcomes. As this study has shown, there are indeed critical factors that can contribute actively to a positive outcome, or 'critical success factors' (CSF). Furthermore, the interplay of these different factors is likely to be influential based on the data from this study.

Therefore, this study argues that an extension of the framework provided by Decker et al. (2012) is a necessary next step for the discipline of CM. By augmenting the concept of CFF with CSF, it becomes easier for practitioners to achieve adaptably designed systems at the outset of any CM enterprise,

increasing the likelihood of success. In addition, both the CFF and CSF identified in this study show tendencies towards more complex interactions that belie their categorisation as independent items on a checklist. This underlines the need for research to better investigate such possible interactions, possibly building on some of the conclusions from this study.

### **7.3 Successful change needs system understanding**

The analysis not only confirmed the lack of systemic approaches as a gap in CM but also provided more knowledge about what system understanding means in the context of successful change. The research results contribute to a better grasp of systemic understanding from a theoretical perspective and yet indicate how to improve the work of practitioners at the same time.

This study has found that system understanding from the perspective of the change manager is reflected in a set of competencies. The first two contribute to better understanding the system by questioning existing assumptions as a default strategy and seeking to understand existing relations. Explicitly trying to understand those relations improves anticipation and, when considering their dynamics, the effectiveness of responding. Two helpful competencies could be identified at the design stage: to explicitly look out for and consider side-effects and increasing the awareness for inadequate structures before initiating a change project. Both require the organisation to support the manager, who might otherwise fail with the implementation in spite of possessing such competencies. However, it has been found that the manager's leverage in attracting such support involves taking some responsibility on their part.

At the organisational level, system understanding is reflected within several aspects of the four cornerstones, and as such generally increases the adaptive capacity of an organisation. While this is intertwined with the above described competencies of managers, some aspects are unique to the organisation. The analysis revealed inadequate structures and processes as principal constraints at the moment of anticipating difficulties in change projects. In contrast to this, constraints that originate in the environment were rather rare. When such difficulties occurred, the organisations showed a tendency to respond passively, a



fact that the interviewees noted. Therefore, it is argued here that the presence of observable passivity in organisational responses can be interpreted as an indicator of a lack of systemic understanding. Such an indicator would allow practitioners to respond in an actual situation, as it is derived from a perspective of how work is done, rather than how it is imagined (Hollnagel, 2014d). Practitioners could then move to improve organisational system understanding.

#### **7.4 Successful change benefits from design and from understanding human aspects**

The analysis has identified that successful change benefits from adapting structures and processes. However, the managers were often either not empowered or simply didn't understand them. Based on the definition of HFE by the IEA, it is necessary to understand humans and system components in order to design adequate interfaces. How can CM do better?

Two requirements have been discovered that enable the change manager to perform adequate structural and process design: relevant competencies and support by the organisation. The aspect of competencies is discussed elsewhere (see last section and below). However, organisational support has more to do with human aspects.

The first aspect of organisational support relates to activities, processes and structures that support a shared understanding of the project and hence a SMM. System understanding, as discussed in the previous section, is needed to create those preconditions and yet is increased at the same time by the existence of a SMM.

The second aspect of organisational support concerns the provision of consultants or other specialized personnel. Whilst reported as helpful within several project phases and along most cornerstones, effective use is not a given and requires a thorough understanding of how consultants can contribute to the specific project requirements.

The third and final aspect of organisational support is granting authority to the change manager that allows him or her to apply their design competencies and perform adequate structural and process adaptations. This is by far the most important precondition because the lack of alignment between managerial competencies, the constraints of the project and missing authority to adapt structures can result in frustration and reduced motivation. This was observed in many of the projects. Creating such alignment is basically a matter of designing adequate interfaces. This final aspect, the design orientation and underlying competencies, highlights the contribution of HFE and RE to successful change. It also highlights the contribution of this research to the field of HFE, because Grote (2014) claimed that safety via the management of risk will provide momentum to the field of HFE and has the potential to provide benefit to other industries not immediately associated with safety concerns.

## **7.5 Successful change requires lessons learned**

Lessons learned was and is a huge topic within the field of CM (Burnes, 2004a; Cameron & Green, 2015). Therefore, it is one of the most striking findings of this study that lessons learned are often not embraced. One might think that organisations do indeed learn from past processes but the data showed that this is most consistently the case only when the outcome of that process is a failure. However, as discussed above, RE and safety 2 approaches point out the potential of learning from successful processes, potential that is not tapped according to the results of this study. Therefore, lessons learned appears to be mostly reactive rather than forward adaptive.

Sustainable learning is a precondition for successful future change projects. This study therefore concludes that the lack of learning from successful projects together with the reactive nature of many lessons learned constitutes the bottleneck of successful future change. In a sense, successful projects doom future projects to fail. This has an especially grievous effect on the capability of an organisation to design its structures in preparation for future projects. Therefore, this bottleneck prevents organisations from achieving adaptiveness as advocated by RE. This study argues that future research should investigate how to optimize

lessons learned, such that the potential of a forward adaptive approach could be exploited by practitioners and academics alike.

## **7.6 Successful change depends on managerial competencies**

So far it has been demonstrated that the design orientation of HFE can be a useful tool for CM, mainly because it addresses the interface function of the change manager. This role as an interface was researched by Raelin and Cataldo (2011) and they demanded more empowerment for middle managers. Not only has this claim been confirmed in this study but it has been enriched with further details.

The gap between CM theory and practice, identified in the literature, leads managers to largely ignore theory (Bamford & Forrester, 2003). This aspect was largely confirmed by this research. The interviewees did not mention any explicit theory as a basis for their activities in change projects. More often than not it seemed that experience determined their approach. They made use of a broad bundle of skills that were accumulated over the years but not explicitly related to CM. Whenever they spoke about helpful aspects within their projects, they were asked to further elaborate on them. When follow-up questions addressed theory in its broadest sense, no specific references were given.

It seems that even if competencies are well developed, they are detached from theory. A future research agenda should therefore not only address the development of a valid framework but also identify how such a framework could be applied in practice, or in other words, how those that need it could become aware of its existence.

This research has provided two aspects that add to the claim of Raelin and Cataldo (2011) for empowerment. On the one hand it is the provision of competencies for CM, which has just been described as a weakness of the organisation. On the other hand, it is the design of adequate structures and processes which are needed to allow the manager to make use of their competencies. This second aspect is closely linked to organisational design. A future research agenda should therefore address the identification of additional competencies as well as finding potential structural constraints for their effective application.

The competencies and beneficial behaviours that emerged, apart from system understanding (see sections above), concern the creation of an SMM and the management of staff.

### 7.5.1 Shared Mental Model

A shared understanding or Shared Mental Model has been identified as a central competency with multiple and intertwined relations to many of the themes found in this study. It can serve as a link through which the effectiveness of other competencies is increased. Relations were found in: acceptance of the project, passive behaviour, consideration of others, a shared vocabulary and finally in cooperation and active participation. It can further be concluded that the manager not only needs these competencies themselves but should also make sure to increase shared understanding of others.

### 7.5.2 Management of staff

With the relevance of human aspects for designing interfaces, it is most interesting that one of the managers' competencies is being sensitive to people aspects. This mainly concerns the monitoring function and can also uncover difficulties before the project starts (anticipation) and of course while it is in progress (responding). It was highly beneficial to consider others (staff and external stakeholders) and to recognize dynamics among those people. Interacting with employees on a regular basis and fostering their active participation is a combination that was observed to a significant extent in successful projects and was often missing in failed projects. However, empowerment is needed for those competencies to become effective.

It is argued that organisations could better exploit this potential of managers. From a design perspective this would mean to institutionalise or somehow formalise the use of those competencies and to examine how they could be acquired more effectively. Additional research could shed light on how best to achieve this.

## **8. Conclusion and limitations**

This study set out with the aim of exploring the benefit of HFE and safety science applications to change projects via investigating them through the lens of the four cornerstones of RE. It further asked for the organisational and individual perspective. Several conclusions can now be drawn on the basis of these research aims.

1. HFE and safety science have the potential to deliver theoretical and practical contributions to CM. The study showed that their knowledge can in fact be adapted and that new knowledge has been created. This is due to the stronger and more mature theoretical framework of both disciplines and to their intense application in practical settings of high-risk environments. An example for this argument is how complexity has been embraced as a concept for several decades whilst CM has only recently explicitly focused on the shift to complexity.
2. The dissociation of success and failure, organisational versus individual perspective, and the four cornerstones were each essential for reaching the findings of this study. Several core findings would not have been achieved if any had been left out, for example those discussed under the following point.
3. One specific and counterintuitive finding relates to the shortcomings of organisational learning and confirms the benefits of the explorative safety 2 perspective that this research has adopted. The dissociation of failure and success allowed identifying the shortcomings of learning from successful projects. Only the safety 2 focus made this possible. The dissociation of organisational and individual perspectives allowed the study to show that successful learning from projects of all kinds is mainly limited by the structural constraints of the organisation in question. Only this approach prevented the more effective individual learning from outshining the organisational one. Finally, the dissociation of the four cornerstones of RE allowed locating this learning challenge. Only by using such a framework

was it possible to see the specific learning aspect in the repeated themes and topics which otherwise would have merged into a more general picture. Explicitly asking for how learning happens and how it leads to understanding what has happened was a prerequisite.

However, it has to be admitted that this study has limitations, mainly the relatively low number of twelve professionals interviewed. The in-depth exploration of their projects and more than 360 pages of transcribed interview data counter-balances this weakness. The possible relations between CFF and CSF that this study has shed some light on, have to be further investigated.

Furthermore, drawing an exact line between the organisational and the individual perspectives can be regarded as a second limitation. Although this might reduce the strength of the respective findings, it has to be clearly noted that such a clear distinction was not found in the literature. It appears to be a general challenge that this study alone cannot solve.

Finally, the context of this study, industries and organisations located in Germany, could also be considered as a limitation. Further studies are suggested to execute similar research in others contexts, which can support the development of comparative studies

However, the explorative nature of this research and its contributions from its novel view on familiar problems outweighs the above limitations and offers a large potential to inform future research.

## **9. Professional development**

Embarking on a journey with the goal of obtaining a doctoral qualification and providing new knowledge to science is demanding. However, everybody experiences different challenges. My abilities to meet these challenges were grounded in my career up to the point of engaging in the DBA and yet were also the reason to start the programme in the first place.

My background as an officer and helicopter pilot in the German army, in combination with a university degree in pedagogics and an MBA in international management set the scene for founding my own company, offering training and consulting in high risk environments. An interest in interdisciplinary approaches has been helpful ever since and in combination with my past work has fuelled my professional interest of engaging in a DBA, of which the more practically oriented framework was the most important reason for joining the programme.

Several challenges were identified in the first-year assignment about professional development. They can now be reflected upon in light of the experience collected during the past four years.

1. The time demands of a part-time program had to be aligned with the challenges of a full working schedule, where serving the aviation industry required much flexibility. This challenge was not underestimated but turned out to be as demanding as foreseen. To counter the negative effects of periods with high work load, which partly prevented focused work on the thesis, time-slots for full-time DBA work were identified. Although they had to be shortened sometimes due to the aforementioned flexibility, major milestones could only be achieved in this way. However, one challenge had to be constantly faced: the reserved time for specific tasks was always paired with the risk of underestimating how much time these tasks actually require. The type of work on a doctoral level can therefore by no means be compared with that of an MBA and one should always consider more buffers. Even though the challenge of required time allocation was considered, this specific aspect was underestimated.

2. Thinking in a scientific way was never experienced as a big challenge but putting that manner of thinking in writing definitely was. Bringing across thoughts, understandably and at the same time readably, such that the reader is guided along the relevant ideas to a result that makes sense was the central challenge. This was to a large part due to the fact that I am not a native English speaker. Much was learned by sitting down with native speakers and academics to forge that skill. I would probably consider this challenge to be more demanding than conducting the research or identifying relevant literature. This has to do with the fact that creating new knowledge is a challenge on its own, where help can only be offered in an indirect way since nobody has walked that specific way before.



## **References**

- Afrazeh, A., & Bartisch, H. (2007). Human Reliability and Flight Safety. *International Journal of Reliability, Quality and Safety Engineering*, 14(05), 501–516. <https://doi.org/10.1142/S0218539307002763>
- Ala-Laurinaho, A., Kurki, A.-L., & Abildgaard, J. S. (2017). Supporting sensemaking to promote a systemic view of organizational change—contributions from activity theory. *Journal of Change Management*, 17(4), 367–387. <https://doi.org/10.1080/14697017.2017.1309566>
- Al-Haddad, S., & Kotnour, T. (2015). Integrating the organizational change literature: a model for successful change. *Journal of Organizational Change Management*, 28(2), 234–262. <https://doi.org/10.1108/JOCM-11-2013-0215>
- Alvesson, M. (2003). Beyond neopositivists, romantics, and localists: A reflexive approach to interviews in organizational research. *Academy of Management Review*, 28(1), 13–33. <https://doi.org/10.2307/30040687>
- Apel, K. O. (1972). The a priori of communication and the foundation of the humanities. *Man and World*, 5(1), 3–37. <https://doi.org/10.1007/bf01253016>
- Appelbaum, S. H., Habashy, S., Malo, J., & Shafiq, H. (2012). Back to the future: Revisiting Kotter's 1996 change model. *Journal of Management Development*, 31(8), 764–782. <https://doi.org/10.1108/02621711211253231>
- Aven, T. (2014). What is safety science? *Safety Science*, 67, 15–20. <https://doi.org/10.1016/j.ssci.2013.07.026>
- Azadeh, A., Roudi, E., & Salehi, V. (2017). Optimum design approach based on integrated macro-ergonomics and resilience engineering in a tile and ceramic factory. *Safety Science*, 96, 62–74. <https://doi.org/10.1016/j.ssci.2017.02.017>
- Badke-Schaub, P., Hofinger, G., & Lauche, K. (2008). Human Factors. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 3–18). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg. [https://doi.org/10.1007/978-3-540-72321-9\\_1](https://doi.org/10.1007/978-3-540-72321-9_1)
- Bahadur, A. V., Ibrahim, M., & Tanner, T. (2010). *The resilience renaissance? Unpacking of resilience for tackling climate change and disasters*. Brighton: Institute of Development Studies.

- Bainbridge, L. (1983). Ironies of automation. *Automatica*, 19(6), 775–779.  
[https://doi.org/10.1016/0005-1098\(83\)90046-8](https://doi.org/10.1016/0005-1098(83)90046-8)
- Balogun, J. (2006). Managing change: Steering a course between intended strategies and unanticipated outcomes. *Long Range Planning*, 39(1), 29–49.  
<https://doi.org/10.1016/j.lrp.2005.02.010>
- Balogun, J., & Hailey, V. H. (2008). *Exploring strategic change*. 3rd edition. London: Pearson Education.
- Bamford, D. R., & Forrester, P. L. (2003). Managing planned and emergent change within an operations management environment. *International Journal of Operations & Production Management*, 23(5), 546–564.  
<https://doi.org/10.1108/01443570310471857>
- Baxter, G., Rooksby, J., Wang, Y., & Khajeh-Hosseini, A. (2012). The ironies of automation: still going strong at 30? // The ironies of automation. *Proceedings of the 30th European Conference on Cognitive Ergonomics*, 65–71.  
<https://doi.org/10.1145/2448136.2448149>
- Beer, M., & Nohria, N (2000). Cracking the code of change. *Harvard Business Review*, 78(3), 133–141. [https://doi.org/10.1007/978-1-137-16511-4\\_4](https://doi.org/10.1007/978-1-137-16511-4_4)
- Bergström, J., van Winsen, R., & Henriqson, E. (2015). On the rationale of resilience in the domain of safety: A literature review. *Reliability Engineering & System Safety*. (141), 131–141. <https://doi.org/10.1016/j.res.2015.03.008>
- Bertalanffy, L. von (1969). *General system theory: foundations, development, applications (Revised Edition)*. New York: George Braziller Inc.
- Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: The concept, a literature review and future directions. *International Journal of Production Research*, 49(18), 5375–5393. <https://doi.org/10.1080/00207543.2011.563826>
- Blaikie, N. (2009). *Designing social research* (2nd ed.). Medford, MA: Polity Press.
- Boddy, D., & Buchanan, D. A. (1992). *Take the lead: interpersonal skills for project managers*. London: Prentice Hall.
- Bowen, G. A. (2005). Preparing a qualitative research-based dissertation: Lessons learned. *The Qualitative Report*, 10(2), 208–222. Retrieved from <http://www.nova.edu/ssss/QR/QR10-2/bowen.pdf>
- Branlat, M., & Woods, D. D. (2010). *How do systems manage their adaptive capacity to successfully handle disruptions? A resilience engineering*

- perspective*: In Proceedings of the 2010 AAAI Fall Symposium Series - Complex Adaptive Systems, Arlington, VA, USA, pp. 26–34. Retrieved from <http://www.aaai.org/ocs/index.php/FSS/FSS10/paper/viewPaper/2238>
- Buchanan, D. A. (1993). *A strategy of change-concepts and controversies in the management of change*. Oxford, England: Blackwell Publishing.
- Buchanan, D., Boddy, D., & McCalman, J. (2013). Getting in getting on getting out and getting back. In A. Bryman (Ed.), *Doing Research in Organizations* (pp. 63–77). London: Routledge.
- Buchanan, D., Fitzgerald, L., Ketley, D., Gollop, R., Jones, J. L., Lamont, Sharon Saint, Neath, Annette, Whitby, E. (2005). No going back: A review of the literature on sustaining organizational change. *International Journal of Management Reviews*, 7(3), 189–205. <https://doi.org/10.1111/j.1468-2370.2005.00111.x>
- Buchanan, D. A. (2011). Reflections: Good Practice, Not Rocket Science – Understanding Failures to Change After Extreme Events. *Journal of Change Management*, 11(3), 273–288. <https://doi.org/10.1080/14697017.2011.597571>
- Buerschaper (2008). Organisationen - Kommunikationssystem und Sicherheit. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 155–175). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Bullock, R. J., & Batten, D. (1985). It's just a phase we're going through: a review and synthesis of OD phase analysis. *Group & Organization Management*, 10(4), 383–412. <https://doi.org/10.1177/105960118501000403>
- Burnes, B., & Cooke, B. (2012). Review Article: The past, present and future of organization development: Taking the long view. *Human Relations*, 65(11), 1395–1429. <https://doi.org/10.1177/0018726712450058>
- Burnes, B. (1996). No such thing as ... a “one best way” to manage organizational change. *Management Decision*, 34(10), 11–18. <https://doi.org/10.1108/00251749610150649>
- Burnes, B. (2004a). Kurt Lewin and the planned approach to change: a re-appraisal. *Journal of Management studies*, 41(6), 977–1002. <https://doi.org/10.1111/j.1467-6486.2004.00463.x>

- Burnes, B. (2004b). *Managing change: A strategic approach to organisational dynamics*. Harlow: Pearson Education.
- Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, 7(2), 73–90. <https://doi.org/10.1111/j.1468-2370.2005.00107.x>
- Burnes, B., & Jackson, P. (2011). Success and failure in organizational change: An exploration of the role of values. *Journal of Change Management*, 11(2), 133–162. <https://doi.org/10.1080/14697017.2010.524655>
- Caldwell, R. (2003). Models of change agency: a fourfold classification. *British Journal of Management*, 14(2), 131–142. <https://doi.org/10.1111/1467-8551.00270>
- Caldwell, R. (2007). Agency and change: Re-evaluating Foucault's legacy. *Organization*, 14(6), 769–791. <https://doi.org/10.1177/1350508407082262>
- Cameron, E., & Green, M. (2009). *Making sense of change management: a complete guide to the models, tools and techniques of organizational* (2nd edition). London: Kogan Page Publisher.
- Cameron, E., & Green, M. (2015). *Making sense of change management: a complete guide to the models, tools and techniques of organizational change* (4th edition). London: Kogan Page Publishers.
- Cândido, C. J. F., & Santos, S. P. (2015). Strategy implementation: What is the failure rate? *Journal of Management & Organization*, 21(2), 237–262. <https://doi.org/10.1017/jmo.2014.77>
- Caramelli, M., & Briole, A. (2007). Employee stock ownership and job attitudes: Does culture matter? *Human Resource Management Review*, 17(3), 290–304. <https://doi.org/10.1016/j.hrmr.2007.07.002>
- Carayon, P. (2006). Human factors of complex sociotechnical systems. *Applied ergonomics*, 37(4), 525–535. <https://doi.org/10.1016/j.apergo.2006.04.011>
- Carayon, P., Hancock, P., Leveson, N., Noy, I., Sznelwar, L., & van Hootegeem, G. (2015). Advancing a sociotechnical systems approach to workplace safety—developing the conceptual framework. *Ergonomics*, 58(4), 548–564. <https://doi.org/10.1080/00140139.2015.1015623>

- Carnall, C. A. (1986). Toward a theory for the evaluation of organizational change. *Human Relations*, 39(8), 745–766.  
<https://doi.org/10.1177/001872678603900803>
- Carnall, C. A. (2007). *Managing change in organizations*. Harlow: Pearson Education.
- Cascio, W. F. (2005). Strategies for responsible restructuring. *The Academy of Management Executive*, 19(4), 39–50.  
<https://doi.org/10.5465/ame.2005.19417906>
- Chapanis, A. (1995). *Human Factors in System Engineering*. New York: Wiley.
- Choi, T. Y., Dooley, K. J., & Rungtusanatham, M. (2001). Supply networks and complex adaptive systems: control versus emergence. *Journal of operations management*, 19(3), 351–366. [https://doi.org/10.1016/s0272-6963\(00\)00068-1](https://doi.org/10.1016/s0272-6963(00)00068-1)
- Chung, A. Z. Q., & Williamson, A. (2018). Theory versus practice in the human factors and ergonomics discipline: Trends in journal publications from 1960 to 2010. *Applied ergonomics*, 66, 41–51.  
<https://doi.org/10.1016/j.apergo.2017.07.003>
- Clegg, C. (1988). Appropriate technology for manufacturing: Some management issues. *Applied ergonomics*, 19(1), 25–34. [https://doi.org/10.1016/0003-6870\(88\)90195-0](https://doi.org/10.1016/0003-6870(88)90195-0)
- Clegg, C. W. (2000). Sociotechnical principles for system design. *Applied ergonomics*, 31(5), 463–477. [https://doi.org/10.1016/s0003-6870\(00\)00009-0](https://doi.org/10.1016/s0003-6870(00)00009-0)
- Coetsee, L. (1999). From resistance to commitment. *Public Administration Quarterly*, 23(2), 204–222. Retrieved from  
<https://www.jstor.org/stable/40861780>
- Collins, J. C., & Porras, J. I. (1996). Building your company's vision. *Harvard Business Review*, 74(5), 65. Retrieved from  
<https://www.cin.ufpe.br/~if275/material/artigos/BuildingYourCompanysVision.pdf>
- Corbin, J., & Strauss, A. (2008). *Basics of qualitative research*. 2008: Thousand Oaks: Sage Publications.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. London: Sage.
- Cummings, T., & Huse, E. (1989). *Organisation Development and Change*. St. Paul, Minn.: West Pub. Co.

- Davis, L. E. (1971). The coming crisis for production management: technology and organization. *the International Journal of Production Research*, 9(1), 65–82.  
<https://doi.org/10.1080/00207547108929862>
- Davis, M. C., Challenger, R., Jayewardene, D. N. W., & Clegg, C. W. (2014). Advancing socio-technical systems thinking: A call for bravery. *Applied ergonomics*, 45(2), 171–180. <https://doi.org/10.1016/j.apergo.2013.02.009>
- Dawson, P. (1994). *Organizational Change: A Processual Approach*. London: Paul Chapman Publishing.
- Decker, P., Durand, R., Mayfield, C. O., McCormack, C., Skinner, D., & Perdue, G. (2012). Predicting Implementation failure in organization change. *Journal of Organizational Culture, Communications & Conflict*, 16(2), 39.
- Dekker, S. W. A. (2015). The psychology of accident investigation: epistemological, preventive, moral and existential meaning-making. *Theoretical Issues in Ergonomics Science*, 16(3), 202–213.  
<https://doi.org/10.1080/1463922X.2014.955554>
- Demichela, M., Gallo, M., & Salzano, E. (2015). A review of the methodologies for the resilience assessment in the process industry. *Journal of Polish Safety and Reliability Association*, 6(3), 39–44. Retrieved from  
<http://jpsra.am.gdynia.pl/upload/SSARS2015PDF/Vol3/JPSRA2015-3-Demichela.pdf>
- Dent, E. B., & Goldberg, S. G. (1999). Challenging “resistance to change”. *The Journal of Applied Behavioral Science*, 35(1), 25–41.  
<https://doi.org/10.2139/ssrn.2326329>
- Dinh, L. T. T., Pasman, H., Gao, X., & Mannan, M. S. (2012). Resilience engineering of industrial processes: principles and contributing factors. *Journal of Loss Prevention in the Process Industries*, 25(2), 233–241.  
<https://doi.org/10.1016/j.jlp.2011.09.003>
- Doyle, M. (2001). Dispersing change agency in high velocity change organisations: issues and implications. *Leadership & Organization Development Journal*, 22(7), 321–329. <https://doi.org/10.1108/01437730110404951>
- Dresing, T., & Pehl, T. (2011). *Praxisbuch Transkription. Regelsysteme, Software und praktische Anleitungen für qualitative ForscherInnen*. 3. Auflage. Marburg.

- Duck, J. D. (1993). Managing change: The art of balancing. *Harvard Business Review*, 71(6), 109–118.
- Dul, J., Bruder, R., Buckle, P., Carayon, P., Falzon, P., Marras, W., Wilson, J., van der Doelen, B. (2012). A strategy for human factors/ergonomics: developing the discipline and profession. *Ergonomics*, 55(4), 377–395.  
<https://doi.org/10.1080/00140139.2012.661087>
- Dunphy, D., & Stace, D. (1993). The strategic management of corporate change. *Human Relations*, 46(8), 905–920.
- Durand, R., Decker, P. J., & Kirkman, D. M. (2014). Evaluation methodologies for estimating the likelihood of program implementation failure. *American Journal of Evaluation*, 35(3), 404–418. <https://doi.org/10.1177/1098214014523824>
- Eason, K. (2011). Before the internet: the relevance of socio-technical systems theory to emerging forms of virtual organisation. In *Knowledge Development and Social Change through Technology: Emerging Studies* (pp. 85–96). IGI Global.
- Easterby-Smith, M., Thorpe, R., & Jackson, P. R. (2008). *Management research*, London: SAGE Publications.
- Emery, F. (1964). *Report on the Hunsfoss project*. London: Tavistock.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, 5(1), 1–4. <https://doi.org/10.11648/j.ajtas.20160501.11>
- Fahlbruch, B., Schöbel, M., & Domeinski, J. (2008). Sicherheit. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 19–35). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Flach, J. M., Carroll, J. S., Dainoff, M. J., & Hamilton, W. I. (2015). Striving for safety: communicating and deciding in sociotechnical systems. *Ergonomics*, 58(4), 615–634. <https://doi.org/10.1080/00140139.2015.1015621>
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry*, 12(2), 219–245. <https://doi.org/10.4135/9781473915480.n40>
- Ford, J. D., Ford, L. W., & D'Amelio, A. (2008). Resistance to change: The rest of the story. *Academy of Management Review*, 33(2), 362–377.  
<https://doi.org/10.5465/amr.2008.31193235>

- Gadamer, H.-G. (1994). *Truth and Method*, Vol. 2. *New York, NY: Continuum*.
- Geertz, C. (1973). *The interpretation of cultures* (Vol. 5043). New York: Basic books.
- Gephart, R. P. (2004). Qualitative research and the Academy of Management Journal. *Academy of Management Journal*, 47(4), 454–462.  
<https://doi.org/10.5465/amj.2004.14438580>
- Gill, J., & Johnson, P. (2010). *Research methods for managers*. Washington DC.: SAGE Publications.
- Grady, V. M., & Grady, J. D. (2013). The Relationship of Bowlby's Attachment Theory to the Persistent Failure of Organizational Change Initiatives. *Journal of Change Management*, 13(2), 206–222.  
<https://doi.org/10.1080/14697017.2012.728534>
- Grant, A. M., Fried, Y., & Juillerat, T. (2011). Work matters: Job design in classic and contemporary perspectives. In S. E. Jackson, A. Joshi, & S. Zedeck (Eds.), *APA handbook of industrial and organizational psychology, Vol 1: Building and developing the organization* (Vol. 10, pp. 417–453).
- Grant, E., Salmon, P. M., Stevens, N. J., Goode, N., & Read, G. J. (2018). Back to the future: What do accident causation models tell us about accident prediction? *Safety Science*. (104), 99–109. <https://doi.org/10.1016/j.ssci.2017.12.018>
- Griffin, R. W. (2001). *Management, 7th ed*. Boston, MA: Houghton Mifflin.
- Grote, G. (2014). Adding a strategic edge to human factors/ergonomics: principles for the management of uncertainty as cornerstones for system design. *Applied Ergonomics*, 45(1), 33–39. <https://doi.org/10.1016/j.apergo.2013.03.020>
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, 2(163-194), 105.
- Haavik, T. K. (2014). On the ontology of safety. *Safety Science*, 67, 37–43.  
<https://doi.org/10.1016/j.ssci.2013.09.004>
- Hale, A. R., & Hovden, J. (1998). Management and culture: the third age of safety. A review of approaches to organizational aspects of safety, health and environment. *Occupational injury: Risk, prevention and intervention*, 129–165.  
<https://doi.org/10.1201/9780203212493.ch11>



- Haro, E., & Kleiner, B. M. (2008). Macroergonomics as an organizing process for systems safety. *Applied ergonomics*, 39(4), 450–458.  
<https://doi.org/10.1016/j.apergo.2008.02.018>
- Havinga, J., Dekker, S., & Rae, A. (2018). Everyday work investigations for safety. *Theoretical Issues in Ergonomics Science*, 19(2), 213–228.  
<https://doi.org/10.1080/1463922X.2017.1356394>
- Havranek, T. (2017). *Modern project management techniques for the environmental remediation industry*. Boca Raton: CRC Press.
- Heinrich, H. W. (1941). *Industrial Accident Prevention. A Scientific Approach*: New York & London: McGraw-Hill Book Company, Inc.
- Hendrick, H. W., & Kleiner, B. M. (2001). *Macroergonomics: An introduction to work system design (HFES issues in human factors and ergonomics book series volume 2)*. Santa Monica, CA: Human Factors and Ergonomics Society.
- Hendrick, H. W. (1997). Organizational design and macroergonomics. *Handbook of human factors and ergonomics*. (2), 594–627.
- Hinings, C. R., Greenwood, R., Ranson, S., & Walsh, K. (1988). *The dynamics of strategic change*. Oxford, England: Blackwell.
- Hoag, B. G., Ritschard, H. V., & Cooper, C. L. (2002). Obstacles to effective organizational change: The underlying reasons. *Leadership & Organization Development Journal*, 23(1), 6–15. <https://doi.org/10.1108/01437730210414526>
- Hofinger, G. (2008). Fehler und Unfälle. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 38–55). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Hollnagel, E. (2007). Resilience - the Challenge of the Unstable. In E. Hollnagel, D. D. Woods, & N. Leveson (Eds.), *Resilience engineering: Concepts and precepts* (pp. 9–17). Aldershot: Ashgate Publishing, Ltd.
- Hollnagel, E. (2008). Risk+barriers=safety? *Safety Science*, 46(2), 221–229.  
<https://doi.org/10.1016/j.ssci.2007.06.028>
- Hollnagel, E. (2011a). Epilogue: RAG - The Resilience Analysis Grid. In E. Hollnagel, J. Paries, D. D. Woods, & J. Wreathall (Eds.), *Resilience Engineering in Practice: A Guidebook* (pp. 275–296). Farnham: Ashgate Publishing Limited.

- Hollnagel, E. (2011b). Prologue: The Scope of Resilience Engineering. In E. Hollnagel, J. Paries, D. D. Woods, & J. Wreathall (Eds.), *Resilience Engineering in Practice: A Guidebook* (pp. XXIX–XXXIX). Farnham: Ashgate Publishing Limited.
- Hollnagel, E. (2014a). Human factors/ergonomics as a systems discipline? "The human use of human beings" revisited. *Applied Ergonomics*, *45*(1), 40–44.  
<https://doi.org/10.1016/j.apergo.2013.03.024>
- Hollnagel, E. (2014b). Is safety a subject for science? *Safety Science*. (67), 21–24.  
<https://doi.org/10.1016/j.ssci.2013.07.025>
- Hollnagel, E. (2014c). Resilience engineering and the built environment. *Building Research & Information*, *42*(2), 221–228.  
<https://doi.org/10.1080/09613218.2014.862607>
- Hollnagel, E. (2014d). *Safety-I and Safety-II: The past and future of safety management*. Farnham u.a.: Ashgate.
- Hollnagel, E., Paries, J., Woods, D. D., & Wreathall, J. (Eds.) (2011). *Resilience Engineering in Practice: A Guidebook*. Farnham: Ashgate Publishing Limited.
- Hollnagel, E., Woods, D. D., & Leveson, N. (Eds.) (2007). *Resilience engineering: Concepts and precepts*. Aldershot: Ashgate Publishing, Ltd.
- Hopkins, A. (2006). Studying organisational cultures and their effects on safety. *Safety Science*, *44*(10), 875–889. <https://doi.org/10.1016/j.ssci.2006.05.005>
- Hopkins, A. (2014). Issues in safety science. *Safety Science*. (67), 6–14.  
<https://doi.org/10.1016/j.ssci.2013.01.007>
- Hosseini, S., Barker, K., & Ramirez-Marquez, J. E. (2016). A review of definitions and measures of system resilience. *Reliability Engineering & System Safety*. (145), 47–61. <https://doi.org/10.1016/j.ress.2015.08.006>
- Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, *15*(9), 1277–1288.  
<https://doi.org/10.1177/1049732305276687>
- Huczynski, A., & Buchanan, D. (2001). *Organizational Behaviour: An Introductory Text (Instructor's Manual)*. Harlow, UK: FT-Prentice Hall, Pearson Education Ltd.

- Hughes, M. (2015). Leading changes: Why transformation explanations fail. *Leadership*. Advance online publication. <https://doi.org/10.1177/1742715015571393>
- Hughes, M. (2011). Do 70 Per Cent of All Organizational Change Initiatives Really Fail? *Journal of Change Management*, 11(4), 451–464. <https://doi.org/10.1080/14697017.2011.630506>
- Hutzschenreuter, T., & Kleindienst, I. (2006). Strategy-process research: What have we learned and what is still to be explored. *Journal of management*, 32(5), 673–720. <https://doi.org/10.1177/0149206306291485>
- Jamal, T., & Hollinshead, K. (2001). Tourism and the forbidden zone: The underserved power of qualitative inquiry. *Tourism management*, 22(1), 63–82. [https://doi.org/10.1016/s0261-5177\(00\)00020-0](https://doi.org/10.1016/s0261-5177(00)00020-0)
- Jansen, H. (2010). The logic of qualitative survey research and its position in the field of social research methods. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 11(2). <https://doi.org/10.17169/fqs-11.2.1450>
- Jansson, N. (2013). Organizational change as practice: a critical analysis. *Journal of Organizational Change Management*, 26(6), 1003–1019. <https://doi.org/10.1108/JOCM-09-2012-0152>
- Johnson, P., & Clark, M. (2006). Mapping the terrain: an overview of business and management research methodologies. In P. Johnson & M. Clark (Eds.), *Business and management research methodologies*. London: Sage.
- Judson, A. S. (1991). *Changing behavior in organizations: Minimizing resistance to change*. Cambridge, MA: Basil Blackwell.
- Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY: Farrar, Straus and Giroux.
- Kanter, R., Stein, B., & Jick, T. (1992). *The Challenge of Organisational Change*. New York, NY.: Free Press.
- Kantur, D. (2015). Measuring Organizational Resilience: A Scale Development. *Pressacademia*, 4(3), 456. <https://doi.org/10.17261/Pressacademia.2015313066>
- Karlton, A., Karlton, J., Berglund, M., & Eklund, J. (2017). HTO—A complementary ergonomics approach. *Applied ergonomics*. (59), 182–190. <https://doi.org/10.1016/j.apergo.2016.08.024>

- Karp, T., & Helgo, T. I. T. (2008). From change management to change leadership: Embracing chaotic change in public service organizations. *Journal of Change Management*, 8(1), 85–96.  
<https://doi.org/10.1080/14697010801937648>
- Karsh, B. (2006). *Meso-ergonomics: a new paradigm for macroergonomics research*: In Proceedings of the International Ergonomics Association, Maastricht, July 10–14.
- Karsh, B.-T., Waterson, P., & Holden, R. J. (2014). Crossing levels in systems ergonomics: a framework to support 'mesoergonomic' inquiry. *Applied ergonomics*, 45(1), 45–54. <https://doi.org/10.1016/j.apergo.2013.04.021>
- Karwowski, W. (2005). Ergonomics and human factors: the paradigms for science, engineering, design, technology and management of human-compatible systems. *Ergonomics*, 48(5), 436–463.  
<https://doi.org/10.1080/00140130400029167>
- Karwowski, W. (2012). The Discipline of human factors and ergonomics. In G. Salvendy (Ed.), *Handbook of human factors and ergonomics* (4th ed., pp. 3–37). Hoboken, NJ: Wiley.
- Kelemen, M. L., & Rumens, N. (2008). *An introduction to critical management research*. London: SAGE Publications.
- Keller, S., & Aiken, C. (2009). The inconvenient truth about change management. Retrieved from  
[http://www.companyrestructure.com.au/pdf/The\\_Inconvenient\\_Truth\\_About\\_Change\\_Management.pdf](http://www.companyrestructure.com.au/pdf/The_Inconvenient_Truth_About_Change_Management.pdf)
- Kendra, K., & Taplin, L. J. (2004). Project success: A cultural framework. *Project management journal*, 35(1), 30–45.  
<https://doi.org/10.1177/875697280403500104>
- Ketokivi, M., & Mantere, S. (2010). Two strategies for inductive reasoning in organizational research. *Academy of Management Review*, 35(2), 315–333.  
<https://doi.org/10.5465/amr.2010.48463336>
- King, N. (2004). Using Interviews in Quatitative Research. In C. Cassell & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 11–22). London: SAGE Publications.
- Kirk, J., & Miller, M. L. (1986). *Reliability and validity in qualitative research*: Sage.

- Kirkman, B. L., & Shapiro, D. L. (1997). The impact of cultural values on employee resistance to teams: Toward a model of globalized self-managing work team effectiveness. *Academy of Management Review*, 22(3), 730–757.  
<https://doi.org/10.2307/259411>
- Klein, L. (2014). What do we actually mean by 'sociotechnical'? On values, boundaries and the problems of language. *Applied ergonomics*, 45(2), 137–142.  
<https://doi.org/10.1016/j.apergo.2013.03.027>
- Kleiner, B. M. (2006). Macroergonomics: analysis and design of work systems. *Applied ergonomics*, 37(1), 81–89. <https://doi.org/10.1016/j.apergo.2005.07.006>
- Kleiner, B. M., Hettinger, L. J., DeJoy, D. M., Huang, Y.-H., & Love, P. E. D. (2015). Sociotechnical attributes of safe and unsafe work systems. *Ergonomics*, 58(4), 635–649. <https://doi.org/10.1080/00140139.2015.1009175>
- Kotter, J. P. (2008). *A sense of urgency*. Boston, MA: Harvard Business Press.
- Kvale, S. (1989). To validate is to question. In S. E. Kvale (Ed.), *Issues of validity in qualitative research* (pp. 73–92). Lund, Sweden: Chartwell Bratt.
- Kyriakidis, M., Kant, V., Amir, S., & Dang, V. N. (2017). Understanding human performance in sociotechnical systems—Steps towards a generic framework. *Safety Science*, 107, 202–215. <https://doi.org/10.1016/j.ssci.2017.07.008>
- Labaka, L., Hernantes, J., & Sarriegi, J. M. (2015). Resilience framework for critical infrastructures: An empirical study in a nuclear plant. *Reliability Engineering & System Safety*, 141, 92–105.  
<https://doi.org/10.1016/j.ress.2015.03.009>
- Lather, P. (1993). Fertile obsession: Validity after poststructuralism. *The sociological quarterly*, 34(4), 673–693. <https://doi.org/10.1111/j.1533-8525.1993.tb00112.x>
- Lather, P. A. (1995). The validity of angels: Interpretive and textual strategies in researching the lives of women with HIV/AIDS. *Qualitative inquiry*, 1(1), 41–68.  
<https://doi.org/10.1177/107780049500100104>
- Latta, G. F. (2009). A Process Model of Organizational Change in Cultural Context (OC3 Model) The Impact of Organizational Culture on Leading Change. *Journal of Leadership & Organizational Studies*, 16(1), 19–37.  
<https://doi.org/10.1177/1548051809334197>

- Latta, G. F. (2015). Modeling the cultural dynamics of resistance and facilitation: Interaction effects in the OC3 model of organizational change. *Journal of OrgChange Mgmt*, 28(6), 1013–1037. <https://doi.org/10.1108/JOCM-07-2013-0123>
- Latta, G. F. (2006). *Understanding organizational change in cultural context* (unpublished doctoral dissertation). University of Nebraska, Lincoln, NE.
- Lay, E., Branlat, M., & Woods, Z. (2015). A practitioner's experiences operationalizing Resilience Engineering. *Reliability Engineering & System Safety*. (141), 63–73. <https://doi.org/10.1016/j.ress.2015.03.015>
- Lee, N.-J. (2008). *Achieving your professional doctorate*. Maidenhead, UK: McGraw-Hill.
- Leitch, C. M., Hill, F. M., & Harrison, R. T. (2010). The philosophy and practice of interpretivist research in entrepreneurship: Quality, validation, and trust. *Organizational research methods*, 13(1), 67–84. <https://doi.org/10.1177/1094428109339839>
- Leveson, N. G. (2017). Rasmussen's legacy: A paradigm change in engineering for safety. *Applied ergonomics*. (59), 581–591. <https://doi.org/10.1016/j.apergo.2016.01.015>
- Lewin, K. (1958). Group Decisions and Social Change'in EE Maccoby (ed.) *Readings in Social Psychology*. New York: Holt, Rinehart and Winston.
- Lewin, K. (1951). *Field theory in social science*. New York: Harper.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). Beverly Hills, CA: Sage.
- Lippitt, R., Watson, J., & Wesley, B. (1958). *The Dynamics of Planned Change*. New York: Har-court, Brace & World: Inc.
- Luecke, R. (2003). *Managing change and transition* (Vol. 3). Boston, MA: Harvard Business Press.
- Lundberg, J., & Johansson, B. J. E. (2015). Systemic resilience model. *Reliability Engineering & System Safety*. (141), 22–32. <https://doi.org/10.1016/j.ress.2015.03.013>
- Maheshwari, S., & Vohra, V. (2015). Identifying critical HR practices impacting employee perception and commitment during organizational change. *Journal of*

*Organizational Change Management*, 28(5), 872–894.

<https://doi.org/10.1108/JOCM-03-2014-0066>

- Mallinger, M., Goodwin, D., & O'hara, T. (2009). Recognizing organizational culture in managing change. *Graziadio Business Review*, 12(1), 1–7. Retrieved from <https://gbr.pepperdine.edu/2010/08/recognizing-organizational-culture-in-managing-change/>
- Manser, T. (2008). Komplexität handhaben - Handeln vereinheitlichen - Organisationen sicher gestalten. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 273–288). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Manzey, D. (2008). Systemgestaltung und Automatisierung. In P. Badke-Schaub, G. Hofinger, & K. Lauche (Eds.), *Human Factors: Psychologie sicheren Handelns in Risikobranchen* (pp. 307–324). Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Marras, W. S., & Hancock, P. A. (2014). Putting mind and body back together: A human-systems approach to the integration of the physical and cognitive dimensions of task design and operations. *Applied ergonomics*, 45(1), 55–60. <https://doi.org/10.1016/j.apergo.2013.03.025>
- Mayring, P. (2008). *Qualitative Inhaltsanalyse. Grundlagen und Techniken* (Vol. 6). Weinheim: Beltz.
- Mayring, P. (2014). Qualitative content analysis: theoretical foundation, basic procedures and software solution. Retrieved from [https://www.ssoar.info/ssoar/bitstream/handle/document/39517/ssoar-2014-mayring-Qualitative\\_content\\_analysis\\_theoretical\\_foundation.pdf](https://www.ssoar.info/ssoar/bitstream/handle/document/39517/ssoar-2014-mayring-Qualitative_content_analysis_theoretical_foundation.pdf)
- McClellan, J. G. (2011). Reconsidering Communication and the Discursive Politics of Organizational Change. *Journal of Change Management*, 11(4), 465–480. <https://doi.org/10.1080/14697017.2011.630508>
- McDermott, A. M., Fitzgerald, L., & Buchanan, D. A. (2013). Beyond Acceptance and Resistance: Entrepreneurial Change Agency Responses in Policy Implementation. *British Journal of Management*. (24), S93-S115. <https://doi.org/10.1111/1467-8551.12012>
- McDonald, N. (2008). Challenges facing resilience engineering as a theoretical and practical project. In E. Hollnagel, F. Pieri, & E. Rigaud (Chairs),

*Proceedings of the third resilience engineering symposium, Antibes-Juan-Les-Pins, France.*

- Meister, D. (1999). *The history of human factors and ergonomics*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Mendonça, D., & Wallace, W. A. (2015). Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001. *Reliability Engineering & System Safety*, (141), 83–91. <https://doi.org/10.1016/j.ress.2015.03.017>
- Meyer, J. P., Hamilton, L. K., Oreg, S., Michel, A., & By, R. T. (2013). Commitment to organizational change: Theory, research, principles, and practice. In S. Oreg, A. Michel, & R. T. By (Eds.), *The psychology of organizational change: Viewing change from the employee's perspective* (pp. 43–64). Cambridge, UK: Cambridge university press.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- Miller, S. (1997). Implementing strategic decisions: Four key success factors. *Organization studies*, 18(4), 577–602. <https://doi.org/10.1177/017084069701800402>
- Minichiello, V., & Aroni, R. (1990). *In-depth interviewing: Researching people*. Melbourne, Australia: Longman Cheshire.
- Moran, J. W., & Brightman, B. K. (2000). Leading organizational change. *Journal of Workplace Learning*, 12(2), 66–74. <https://doi.org/10.1108/13665620010316226>
- Morel, G., Amalberti, R., & Chauvin, C. (2009). How good micro/macro ergonomics may improve resilience, but not necessarily safety. *Safety Science*, 47(2), 285–294. <https://doi.org/10.1016/j.ssci.2008.03.002>
- Murphy, L. A., Huang, Y.-h., Robertson, M. M., Jeffries, S., & Dainoff, M. J. (2018). A sociotechnical systems approach to enhance safety climate in the trucking industry: Results of an in-depth investigation. *Applied ergonomics*, (66), 70–81. <https://doi.org/10.1016/j.apergo.2017.08.002>
- Murphy, L. A., Robertson, M. M., & Carayon, P. (2014). The next generation of macroergonomics: Integrating safety climate. *Accident Analysis & Prevention*, (68), 16–24. <https://doi.org/10.1016/j.aap.2013.11.011>



- Murphy, L. A., Robertson, M. M., Huang, Y.-h., Jeffries, S., & Dainoff, M. J. (2018). A sociotechnical systems approach to enhance safety climate in the trucking industry: Development of a methodology. *Applied ergonomics*, (66), 82–88. <https://doi.org/10.1016/j.apergo.2017.08.001>
- Nathanael, D., & Marmaras, N. (2012). A question of our marketing or our preconceptions: commentary on the paper 'a strategy for human factors/ergonomics: developing the discipline and profession'. *Ergonomics*, 55(12), 1612–1617. <https://doi.org/10.1080/00140139.2012.741716>
- Nemeth, C. P., & Herrera, I. (2015). Building change: Resilience Engineering after ten years. *Reliability Engineering & System Safety*, (141), 1–4. <https://doi.org/10.1016/j.ress.2015.04.006>
- Nicolas, J. M., & Steyn, H. (2008). *Project Management for Business, Engineering, and Technology: Principles and practice*. 3rd ed. Burlington, MA: Burlington: Butterworth-Heinemann.
- Niglas, K. (2010). The multidimensional model of research methodology: an integrated set of continua. In A. Tashakkori & C. Teddlie (Eds.), *Sage handbook of mixed methods in social & behavioral research* (2nd ed., pp. 215–236). Thousand Oaks: Sage.
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American journal of community psychology*, 41(1-2), 127–150. <https://doi.org/10.1007/s10464-007-9156-6>
- Norros, L. (2014). Developing human factors/ergonomics as a design discipline. *Applied Ergonomics*, 45(1), 61–71. <https://doi.org/10.1016/j.apergo.2013.04.024>
- Oedewald, P., & Gotcheva, N. (2015). Safety culture and subcontractor network governance in a complex safety critical project. *Reliability Engineering & System Safety*, 141, 106–114. <https://doi.org/10.1016/j.ress.2015.03.016>
- Okumus, F., & Hemmington, N. (1998). Barriers and resistance to change in hotel firms: an investigation at unit level. *International Journal of Contemporary Hospitality Management*, 10(7), 283–288. <https://doi.org/10.1108/09596119810240906>

- Oster, C. V., Strong, J. S., & Zorn, C. K. (2013). Analyzing aviation safety: Problems, challenges, opportunities. *Research in Transportation Economics*, 43(1), 148–164. <https://doi.org/10.1016/j.retrec.2012.12.001>
- Padgett, D. K. (2016). *Qualitative methods in social work research* (Vol. 36): SAGE Publications.
- Parker, S. H. (2015). Human Factors Science: Brief History and Applications to Healthcare. *Current Problems in Pediatric and Adolescent Health Care*, 45(12), 390–394. <https://doi.org/10.1016/j.cppeds.2015.10.002>
- Parker, S. K., Axtell, C. M., & Turner, N. (2001). Designing a safer workplace: importance of job autonomy, communication quality, and supportive supervisors. *Journal of Occupational Health Psychology*, 6(3), 211. <https://doi.org/10.1037/1076-8998.6.3.211>
- Paton, R. A., & McCalman, J. (2008). *Change management: A guide to effective implementation*. London: Sage.
- Patriarca, R., Bergström, J., Di Gravio, G., & Costantino, F. (2018). Resilience engineering: Current status of the research and future challenges. *Safety Science*. (102), 79–100. <https://doi.org/10.1016/j.ssci.2017.10.005>
- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oakes, CA: Sage.
- Pęciło, M. (2016). The resilience engineering concept in enterprises with and without occupational safety and health management systems. *Safety Science*. (82), 190–198. <https://doi.org/10.1016/j.ssci.2015.09.017>
- Peräkylä, A. (2011). Validity in research on naturally occurring social interaction. In D. Silverman (Ed.), *Qualitative Research: 3rd ed.* (pp. 365–382). London: Sage.
- Pettigrew, A., & Whipp, R. (1993). Understanding the environment. In C. Mabey, B. Mayon-White, & W. M. Mayon-White (Eds.), *Managing change* (pp. 65–76). London: Sage.
- Pettigrew, A. M. (1985). *Awakening giant: continuity and change in imperial chemical industries*. New York: Basil Blackwell.
- Piderit, S. K. (2000). Rethinking resistance and recognizing ambivalence: A multidimensional view of attitudes toward an organizational change. *Academy of Management Review*, 25(4), 783–794. <https://doi.org/10.2307/259206>

- Pitzer, C. (2015). The New Era of Resilience Engineering. *Professional Safety*, 60(4), 33–38.
- Pollack, J., & Pollack, R. (2015). Using Kotter's Eight Stage Process to Manage an Organisational Change Program: Presentation and Practice. *Systemic Practice and Action Research*, 28(1), 51–66. <https://doi.org/10.1007/s11213-014-9317-0>
- Potter, W. J., & Levine - Donnerstein, D. (1999). Rethinking validity and reliability in content analysis. *Journal of Applied Communication Research*, 27(3), 258–284. <https://doi.org/10.1080/00909889909365539>
- Quinlan, C., Babin, B., Carr, J., Griffin, M., & Zikmund, W. G. (2015). *Business Research Methods: First Edition*. Hampshire: Cengage Textbooks.
- Raelin, J. D., & Cataldo, C. G. (2011). Whither Middle Management? Empowering Interface and the Failure of Organizational Change. *Journal of Change Management*, 11(4), 481–507. <https://doi.org/10.1080/14697017.2011.630509>
- Raimond, P. (1993). *Management projects: design, research and presentation*. London: Chapman & Hall.
- Raineri, A. B. (2011). Change management practices: Impact on perceived change results. *Journal of Business Research*, 64(3), 266–272. <https://doi.org/10.1016/j.jbusres.2009.11.011>
- Reason, J. (1990). *Human error*. Cambridge, England: Cambridge university press.
- Reason, J. (1997). *Managing the risks of organizational accidents*. Aldershot: Ashgate.
- Reid, R., & Botterill, L. C. (2013). The Multiple Meanings of 'Resilience': An Overview of the Literature. *Australian Journal of Public Administration*, 72(1), 31–40. <https://doi.org/10.1111/1467-8500.12009>
- Reiman, T., & Oedewald, P. (2007). Assessment of Complex Sociotechnical Systems—Theoretical issues concerning the use of organizational culture and organizational core task concepts. *Safety Science*. (45), 745–768. <https://doi.org/10.1016/j.ssci.2006.07.010>
- Reiman, T., & Rollenhagen, C. (2014). Does the concept of safety culture help or hinder systems thinking in safety? *Accident Analysis and Prevention*, 68, 5–15.

- Richardson, L. (1993). Poetics, dramatics, and transgressive validity: The case of the skipped line. *The sociological quarterly*, 34(4), 695–710.  
<https://doi.org/10.1111/j.1533-8525.1993.tb00113.x>
- Righi, A. W., Saurin, T. A., & Wachs, P. (2015). A systematic literature review of resilience engineering: Research areas and a research agenda proposal. *Reliability Engineering & System Safety*. (141), 142–152.  
<https://doi.org/10.1016/j.ress.2015.03.007>
- Rivera-Rodriguez, A. J., McGuire, K., Carayon, P., Kleiner, B., Wears, R., Robertson, M., Holden, R., Waterson, P. (Eds.) (2013). *Multi-Level Ergonomics: Determining How To Bound Your System*. : Vol. 57. Los Angeles, CA: SAGE Publications.
- Robson, C. (2004). *Real world research. 2nd edition*. Oxford: Blackwell Publishing.
- Rochlin, G. I. (1999). Safe operation as a social construct. *Ergonomics*, 42(11), 1549–1560. <https://doi.org/10.1080/001401399184884>
- Rogiest, S., Segers, J., & van Witteloostuijn, A. (2015). Climate, communication and participation impacting commitment to change. *Journal of Organizational Change Management*, 28(6), 1094–1106. <https://doi.org/10.1108/JOCM-06-2015-0101>
- Saka, A. (2003). Internal change agents' view of the management of change problem. *Journal of Organizational Change Management*, 16(5), 480–496.  
<https://doi.org/10.1108/09534810310494892>
- Salmon, P. M. (2016). Bridging the gap between ergonomics methods research and practice: Methodological Issues in Ergonomics Science Part II. *Theoretical Issues in Ergonomics Science*, 17(5-6), 459–467.  
<https://doi.org/10.1080/1463922X.2016.1200693>
- Salvendy, G. (Ed.) (2012). *Handbook of human factors and ergonomics* (4. ed.). Hoboken, NJ: Wiley. Retrieved from  
<http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10546531>
- Sandage, S. A. (2005). *Born Losers*. Cambridge, Ma: Harvard University Press.
- Sandberg, J. (2005). How do we justify knowledge produced within interpretive approaches? *Organizational research methods*, 8(1), 41–68.  
<https://doi.org/10.1177/1094428104272000>

- Sanders, M. S., & McCormick, E. J. (1993). Applied anthropometry, work-space design and seating. In M. S. Sanders & E. J. McCormick (Eds.), *Human Factors in System Design 7th ed.* (pp. 415–455). New York: McGraw-Hill.
- Saran, A., Munoz, L., & Kalliny, M. (2008). Corporate culture, organizational dynamics, and implementation of innovations: A conceptual framework.
- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students. 5th edition.* Harlow: Pearson Education.
- Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students. 6th edition.* Harlow: Pearson Education.
- Saurin, T. A., & Junior, G. C. C. (2012). A framework for identifying and analyzing sources of resilience and brittleness: a case study of two air taxi carriers. *International Journal of Industrial Ergonomics*, 42(3), 312–324.  
<https://doi.org/10.1016/j.ergon.2011.12.001>
- Schein, E. H. (2010). *Organizational culture and leadership 4th ed.* San Francisco, CA: Jossey-Bass.
- Schwarz, G. M., Watson, B. M., & Callan, V. J. (2011). Talking up failure: how discourse can signal failure to change. *Management Communication Quarterly*, 25(2), 311–352. <https://doi.org/10.1177/0893318910389433>
- Senior, B., & Fleming, J. (2006). *Organizational change*: Pearson Education.
- Senturia, T., Flees, L., & Maceda, M. (2008). Leading change management requires sticking to the PLOT. *London: Bain & Company.*
- Shirali, G., Mohammadfam, I., Motamedzade, M., Ebrahimipour, V., & Moghimbeigi, A. (2012). Assessing resilience engineering based on safety culture and managerial factors. *Process Safety Progress*, 31(1), 17–18.  
<https://doi.org/10.1002/prs.10485>
- Shirali, G., Motamedzade, M., Mohammadfam, I., Ebrahimipour, V., & Moghimbeigi, A. (2012). Challenges in building resilience engineering (RE) and adaptive capacity A field study in a chemical plant: A field study in a chemical plant. *Process Safety and Environmental Protection*, 90(2), 83–90.  
<https://doi.org/10.1016/j.psep.2011.08.003>
- Shum, P., Bove, L., & Auh, S. (2008). Employees' affective commitment to change: The key to successful CRM implementation. *European journal of marketing*, 42(11/12), 1346–1371. <https://doi.org/10.1108/03090560810903709>

- Silverman, D. (2015). *Interpreting qualitative data*. Thousand Oaks, CA: Sage.
- Stickland, F. (1998). *The dynamics of change: Insights into organisational transition from the natural world*. London: Routledge.
- Suddaby, R. (2006). From the editors: What grounded theory is not. *Academy of Management Journal*, 49(4), 633–642.  
<https://doi.org/10.5465/amj.2006.22083020>
- Taylor, S. J., & Bogdan, R. (1998). *Introduction to qualitative methods: A guide and resource*. New York: Wiley.
- Thomas, J., George, S., & Rose, T. (2016). Deciphering value discourse's role in explaining the persistent perception of change failure. *Journal of Change Management*, 16(4), 271–296. <https://doi.org/10.1080/14697017.2016.1230335>
- Todnem By, R. (2005). Organisational change management: A critical review. *Journal of Change Management*, 5(4), 369–380.  
<https://doi.org/10.1080/14697010500359250>
- Trist, E. L., & Bamforth, K. (1951). Some social and psychological consequences of the Longwall method of coalgetting. *Human Relations*. (4), 3–38.  
<https://doi.org/10.1177/001872675100400101>
- Van der Beek, D., & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience: Analysing and developing adaptability and performance in teams to enhance resilience. *Reliability Engineering & System Safety*. (141), 33–44.  
<https://doi.org/10.1016/j.ress.2015.03.019>
- Waddock, S., Meszoely, G. M., Waddell, S., & Dentoni, D. (2015). The complexity of wicked problems in large scale change. *Journal of Organizational Change Management*, 28(6), 993–1012. <https://doi.org/10.1108/jocm-08-2014-0146>
- Waterson, P., & Eason, K. (2009). '1966 and all that': Trends and developments in UK ergonomics during the 1960s. *Ergonomics*, 52(11), 1323–1341.  
<https://doi.org/10.1080/00140130903229561>
- Waterson, P., Robertson, M. M., Cooke, N. J., Militello, L., Roth, E., & Stanton, N. A. (2015). Defining the methodological challenges and opportunities for an effective science of sociotechnical systems and safety. *Ergonomics*, 58(4), 565–599. <https://doi.org/10.1080/00140139.2015.1015622>
- Weber, R. P. (1990). *Basic content analysis*. Beverly Hills, CA: Sage.

- Weick, K. E., & Sutcliff, K. M. (2001). *Managing the unexpected*. San-Francisco: Jossey-Bass.
- Wiegmann, D. A., Zhang, H., Thaden, T. L. von, Sharma, G., & Gibbons, A. M. (2004). Safety culture: An integrative review. *The International Journal of Aviation Psychology*, 14(2), 117–134.  
[https://doi.org/10.1207/s15327108ijap1402\\_1](https://doi.org/10.1207/s15327108ijap1402_1)
- Wilson, J. R. (2000). Fundamentals of ergonomics in theory and practice. *Applied ergonomics*, 31(6), 557–567. [https://doi.org/10.1016/s0003-6870\(00\)00034-x](https://doi.org/10.1016/s0003-6870(00)00034-x)
- Wilson, J. R. (2014). Fundamentals of systems ergonomics/human factors. *Applied Ergonomics*, 45(1), 5–13. <https://doi.org/10.1016/j.apergo.2013.03.021>
- Wilson, J. R., & Carayon, P. (2014). Systems ergonomics: Looking into the future—Editorial for special issue on systems ergonomics/human factors. *Applied ergonomics*, 1(45), 3–4. <https://doi.org/10.1016/j.apergo.2013.08.007>
- Woltjer, R., Pinska-Chauvin, E., Laursen, T., & Josefsson, B. (2015a). Towards understanding work-as-done in air traffic management safety assessment and design. *Reliability Engineering & System Safety*. (141), 115–130.  
<https://doi.org/10.1016/j.ress.2015.03.010>
- Woltjer, R., Pinska-Chauvin, E., Laursen, T., & Josefsson, B. (2015b). Towards understanding work-as-done in air traffic management safety assessment and design. *Reliability Engineering & System Safety*. (141), 115–130.  
<https://doi.org/10.1016/j.ress.2015.03.010>
- Wong, A., Scarbrough, H., Chau, P., & Davison, R. (2005). Critical failure factors in ERP implementation. *Proceedings of the 9th Pacific Asia Conference on Information Systems*, 492–505.
- Woods, D. D. (2015). Four concepts for resilience and the implications for the future of resilience engineering. *Reliability Engineering & System Safety*. (141), 5–9. <https://doi.org/10.1016/j.ress.2015.03.018>
- Woods, D. D., & Hollnagel, E. (2006). *Joint cognitive systems: Patterns in cognitive systems engineering*. Boca Raton, FL: CRC Press.
- Zhang, Y., & Wildemuth, B. M. (2009). Qualitative analysis of content. In B. M. Wildemuth (Ed.), *Applications of social research methods to questions in information and library science* (pp. 308–319). Westport: Libraries Unlimited.

## **Appendices**



## Appendix A – UPR 16


### FORM UPR16

#### Research Ethics Review Checklist

Please include this completed form as an appendix to your thesis (see the Research Degrees Operational Handbook for more information)



|   |  |                                |  |
|---|--|--------------------------------|--|
| <b>Postgraduate Research Student (PGRS) Information</b>   |  | <b>Student ID:</b>             | 753837   |
| <b>PGRS Name:</b>   | Holger Kunzmann  |                                |  |
| <b>Department:</b>  | Business School  | <b>First Supervisor:</b>       | Prof. James McCalman                                       |
| <b>Start Date:</b><br><small>(or progression date for Prof Doc students)</small>  | October 2014   |                                |  |
| <b>Study Mode and Route:</b>  | Part-time <input checked="" type="checkbox"/>  | MPhil <input type="checkbox"/> | MD <input type="checkbox"/>                                |
|   | Full-time <input type="checkbox"/>   | PhD <input type="checkbox"/>   | Professional Doctorate <input checked="" type="checkbox"/> |
| <b>Title of Thesis:</b>   | A Human Factors view on the safety of organizational change: A shift of managerial mindset from failure and success towards resilience engineering |                                |  |
| <b>Thesis Word Count:</b><br><small>(excluding ancillary data)</small>  | 39468  |                                |  |
| <p>If you are unsure about any of the following, please contact the local representative on your Faculty Ethics Committee for advice. Please note that it is your responsibility to follow the University's Ethics Policy and any relevant University, academic or professional guidelines in the conduct of your study</p> <p>Although the Ethics Committee may have given your study a favourable opinion, the final responsibility for the ethical conduct of this work lies with the researcher(s).</p> |  |                                |  |

|   |   |
|---|---|
| <b>UKRIO Finished Research Checklist:</b>   |   |
| <small>(If you would like to know more about the checklist, please see your Faculty or Departmental Ethics Committee rep or see the online version of the full checklist at: <a href="http://www.ukrio.org/what-we-do/code-of-practice-for-research/">http://www.ukrio.org/what-we-do/code-of-practice-for-research/</a>)</small> |   |
| a) Have all of your research and findings been reported accurately, honestly and within a reasonable time frame?  | YES <input checked="" type="checkbox"/><br>NO <input type="checkbox"/>              |
| b) Have all contributions to knowledge been acknowledged?   | YES <input checked="" type="checkbox"/><br>NO <input type="checkbox"/>              |
| c) Have you complied with all agreements relating to intellectual property, publication and authorship?   | YES <input checked="" type="checkbox"/><br>NO <input type="checkbox"/>              |
| d) Has your research data been retained in a secure and accessible form and will it remain so for the required duration?  | YES <input checked="" type="checkbox"/><br>NO <input type="checkbox"/>              |
| e) Does your research comply with all legal, ethical, and contractual requirements?   | YES <input checked="" type="checkbox"/><br>NO <input type="checkbox"/>              |
| <b>Candidate Statement:</b>   |   |
| I have considered the ethical dimensions of the above named research project, and have successfully obtained the necessary ethical approval(s)  |   |
| <b>Ethical review number(s) from Faculty Ethics Committee (or from NRES/SCREC):</b>   | E418 12 <sup>th</sup> December 2016   |
| If you have <i>not</i> submitted your work for ethical review, and/or you have answered 'No' to one or more of questions a) to e), please explain below why this is so:   |   |
| <div style="border: 1px solid black; height: 20px; width: 100%;"></div>   |   |
| <b>Signed (PGRS):</b>   |  |
| <b>Date:</b>  | 15 <sup>th</sup> September 2019   |

## Appendix B - Design principles for STS

| <b>Principles of sociotechnical design (Clegg 2000)</b>                                  |  |
|--|--|
| <b>Meta Principles (1-7)</b>   |  |
| <b>(1) Design is systemic</b>  | Systems are interconnected and exclusive emphasis on single elements should be avoided. Awareness on unintended consequences should be kept up even though some might only be seen when the system is in operation. The impact of design choices should be considered and tracked (tools and processes for review and amendment).  |
| <b>(2) Values and mind-sets are central to design</b>                                    | They can be articulated in different ways but include core ideas that guide the design process. Therefore, existing practices should be challenged and critical questions should be asked. In general, the assumption that humans are error prone and should be designed out of the system if possible, should be questioned. Humans are seen as an asset and technology is there to deliver complementary skills and abilities to meet system requirements. |
| <b>(3) Design involves making choices</b>  | This relates to the sociotechnical arrangements to be designed as well as to the processes through which they are designed. These choices are not independent and might affect each other, but they are also not deterministic and different degrees of freedom remain. Choices therefore constrain other choices.   |
| <b>(4) Design should reflect the needs of the business, its users and their managers</b> | Even though obvious all too often the design does not meet all the needs, which is why it is explicitly stated as a principle. Dangers are that the latest fad or fashion might affect design or technological aspects might determine agendas for change.   |
| <b>(5) Design is an extended social process</b>  | Design continues beyond implementation and is affected and affects the people involved in implementation, use, management and maintenance. In addition, many stakeholders might have an effect on (the social nature of) system design. Hence design and its meaning can be interpreted in different ways.   |
| <b>(6) Design is socially shaped</b>   | Wider social factors should also be considered. Design choices are thus partly social phenomena and socially shaped. This includes fads and fashion.   |
| <b>(7) Design is contingent</b>  | No 'one best way' exists and design choices do not have universal application because they are contingent. Their nature is however not well understood. Context, competing demands and their opportunity costs have to be considered. But an optimum choice might not be found nor understood.   |

| <b>Principles of sociotechnical design (Clegg 2000)</b>                                    |  |
|--|--|
| <b>Content Principles (8-13)</b>   |  |
| <b>(8) Core processes should be integrated</b>   | Splitting core process across artificial organisational boundaries should be avoided. People should be able to manage complete processes and have the resources and authority for that. Structures have to fit the appropriate process (no delays, repetitions etc.). Fragmentation of production, design and user is a good example.  |
| <b>(9) Design entails multiple task allocation between and amongst humans and machines</b> | Multiple task allocations are the core of sociotechnical design. The principle refers to criteria and guidelines of well-designed jobs and e.g. how or if team-work is an effective choice. A difficulty is that there is little work about establishing the contingencies under which certain forms of work organisation are optimal. |
| <b>(10) System components should be congruent</b>  | New systems might change existing one but they can also be assimilated. Accommodation then becomes a catalyst for change. The design of control and information systems is highlighted and a set of further criteria is given in Clegg (2000). Information should support those taking action.   |
| <b>(11) Systems should be simple and make problems visible</b>                             | If systems are simple their ease of use is promoted. Further concerns are ease of understanding and learnability. By allocating resources to problem solution addressing difficulties is more likely.  |
| <b>(12) Problems should be controlled at source</b>  | Variances should be controlled at source. Time and resources are saved, motivated people can act and cognitive people can learn. Empowerment and semi-autonomous work-groups are methods. It has to be checked if the principle is applicable (see No 7). This principle works best with higher levels of uncertainty.                 |
| <b>(13) The means of undertaking tasks should be flexibly specified</b>                    | Work systems should not over-specified in order to stay flexible. Local experts are seen as assets and have to be allowed, especially in bureaucratic organisations. Complexity of systems might put natural borders to this principle. Local tailorability has to be checked against costs from a technical perspective.              |

| <b>Principles of sociotechnical design (Clegg 2000)</b>                                |  |
|--|--|
| <b>Process Principles (14-19)</b>  |  |
| <b>(14) Design practice itself is a sociotechnical system</b>                          | Design processes are increasingly subject to sociotechnical changes and have to be designed as well. Sociotechnical thinking and principles have to be applied to them as well.  |
| <b>(15) Systems and their design should be owned by their managers and their users</b> | This relates to No 8 and the end-user should be included in the design as well as the managers that will be responsible for its management, use and support. This is a turnaround on the “user participation” as the expert should have an assisting function.   |
| <b>(16) Evaluation is an essential aspect of design</b>                                | New systems often do not provide the expected performance improvements because systematic evaluation is rarely undertaken. Many reasons exist e.g. over-optimistic estimates due to political statements for persuasion to release capital. Avoiding exposure to failure is another reason. When new projects wait the past becomes less interesting. Evaluation is a requirement for learning and thus has to be pluralistic. |
| <b>(17) Design involves multidisciplinary education</b>                                | If design is undertaken by people with partial knowledge it can only be partially effective. Pluralism is the goal and a means to address complexity. Creative and innovative solutions are more likely to emerge. Drawing on the social and the technical side requires considerable resources and support.   |
| <b>(18) Resources and support are required</b>   | Expertise, knowledge and expertise require time and money. Timeline and budget are constraints. Time and expertise are considered the most important since application of the principles so far consumes time. Support through methods and tools and through structures and mechanisms has also to be provided. Not only during but also after the design process (se No 5).   |
| <b>(19) System design involves political processes</b>                                 | The principles highlight the political nature of change. Stakeholders will not see the requirements involved in these principles as trivial. Senior Managers need to give support and cannot just abrogate their responsibilities to the “technical guys”. Mechanisms for this need to be in place.  |

## Appendix C - Difficulties and “myths” of safety

| Difficulties and “myths” of safety approaches based on Hollnagel (2014) and Pitzer (2015) |   |   |
|---|---|---|
| Difficulty  | Description   | Problematic assumption  |
| <b>Causality credo</b>  | The logic of forward causality, from cause to effect, is equally applied to observed effects. The result is backwards causality, from effect to cause. While this is possible in relatively uncomplicated systems, it is impossible in complicated or complex systems.  | <ol style="list-style-type: none"> <li>1. Assumption of reverse causality</li> <li>2. Rationality assumption: It is logically possible to reason backwards.</li> </ol>  |
| <b>The pyramid of problems</b>  | Also called accident pyramid. Parts from the assumption that an increasing level of severity of an event equals to a smaller number of occurrences e.g. for every major injury there is a higher number of minor injuries and an even greater number of near misses.  | <ol style="list-style-type: none"> <li>1. Categories of events can be defined in an unambiguous way.</li> <li>2. There is a relationship between categories e.g. the more near misses the more injuries</li> </ol>  |
| <b>The 90% solution (Human Error)</b>   | Human error has been seen as the possible cause for 90% of accidents and is used as explanation for adverse outcomes. Human error is used as a catch-all category and not a meaningful term, since it can denote a cause, an event or an outcome. There is a lack of agreement about what “human error” is. The 90% suggest that something is fundamentally wrong with the design and operation of socio-technical systems. | <ol style="list-style-type: none"> <li>1. If humans are 90% responsible when something rarely goes wrong, are they also responsible when it goes right in most other cases?</li> <li>2. Who or what is responsible for the remaining 10%.</li> </ol>  |
| <b>Root cause</b>   | Suggests to find a definitive cause for an adverse outcome while ruling out alternate explanations and stopping the motivation to look further.   | <ol style="list-style-type: none"> <li>1. There is one or several basic or first causes.</li> <li>2. Eliminating the cause makes failure impossible.</li> <li>3. The system can be decomposed into basic elements.</li> <li>4. The dynamic of the system can be explained on the level of decomposed elements.</li> </ol> |
| <b>Causation</b>  | The lack of data on events in near-zero organisations makes quantification of risk nearly impossible and turns it into a guess. Risks have a certain probability and through analysis it can be found and precautions can be taken.   |   |
| <b>Compliance</b>   | Compliance is advocated as a way to prevent negative outcomes when procedures that shall guarantee safety are followed. Compliance makes people less responsible to threats and its signals. It also reduces attention.   | <ol style="list-style-type: none"> <li>1. Procedures consider all possible outcomes in complex systems and thus guarantee safety</li> </ol>   |
| <b>Risk control</b>   | Organisations with risk control systems create a complexity of their own. The risk control itself can create unwanted side effects e.g. risk homeostasis, where risks are perceived as controlled and thus might increase risk propensities because people think they are safe.   | <ol style="list-style-type: none"> <li>1. No negative side effects of risk control systems.</li> </ol>  |

## Appendix D – Training syllabus CRM

Training syllabus for Crew Resource Management Training (CRM)

Commission Regulation (EU) No 965/2012 - AMC1 ORO.FC.115 Crew resource management (CRM) training – Flight crew

| CRM training elements  | Initial operator's CRM training | Operator conversion course when changing aircraft type | Operator conversion course when changing operator | Annual recurrent training | Command course |
|--|---------------------------------|--|---|---------------------------|----------------|
| General principles   |                                 |  |   |                           |                |
| Human factors in aviation;<br>General instructions on CRM principles and objectives;<br>Human performance and limitations;<br>Threat and error management.   | In-depth                        | Required   | Required  | Required                  | Required       |
| Relevant to the individual flight crew member  |                                 |  |   |                           |                |
| Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-critique;<br>Stress and stress management;<br>Fatigue and vigilance;<br>Assertiveness, situation awareness, information acquisition and processing. | In-depth                        | Not required   | Not required                                      | Required                  | In-depth       |
| Relevant to the flight crew  |                                 |  |   |                           |                |
| Automation and philosophy on the use of automation   | Required                        | In-depth   | In-depth  | In-depth                  | In-depth       |

| CRM training elements   | Initial operator's CRM training | Operator conversion course when changing aircraft type | Operator conversion course when changing operator | Annual recurrent training | Command course |
|---|---------------------------------|--|---|---------------------------|----------------|
| Specific type-related differences   | Required                        | In-depth   | Not required                                      | Required                  | Required       |
| Monitoring and intervention   | Required                        | In-depth   | In-depth  | Required                  | Required       |
| Relevant to the entire aircraft crew  |                                 |  |   |                           |                |
| Shared situation awareness, shared information acquisition and processing;<br>Workload management;<br>Effective communication and coordination inside and outside the flight crew compartment;<br>Leadership, cooperation, synergy, delegation, decision-making, actions;<br>Resilience development;<br>Surprise and startle effect;<br>Cultural differences. | In-depth                        | Required   | Required  | Required                  | In-depth       |
| Relevant to the operator and the organisation   |                                 |  |   |                           |                |
| Operator's safety culture and company culture, standard operating procedures (SOPs), organisational factors, factors linked to the type of operations;<br>Effective communication and coordination with other operational personnel and ground services.  | In-depth                        | Required   | In-depth  | Required                  | In-depth       |
| Case studies  | In-depth                        | In-depth   | In-depth  | In-depth                  | In-depth       |

## Appendix E – Training syllabus Maintenance Human Factors

Training syllabus for human factors training in aviation maintenance organisations based on Commission Regulation (EU) No 1321/2014 Appendix II (Part 145) – AMC 145.30(e)

1. General/Introduction to human factors
  - 1.1. Need to address human factors
  - 1.2. Statistics
  - 1.3. Incidents
2. Safety Culture/Organisational factors
3. Human Error
  - 3.1. Error models and theories
  - 3.2. Types of errors in maintenance tasks
  - 3.3. Violations
  - 3.4. Implications of errors
  - 3.5. Avoiding and managing errors
  - 3.6. Human reliability
4. Human performance & limitations
  - 4.1. Vision
  - 4.2. Hearing
  - 4.3. Information-processing
  - 4.4. Attention and perception
  - 4.5. Situational awareness
  - 4.6. Memory
  - 4.7. Claustrophobia and physical access
  - 4.8. Motivation
  - 4.9. Fitness/Health
  - 4.10. Stress
  - 4.11. Workload management
  - 4.12. Fatigue
  - 4.13. Alcohol, medication, drugs
  - 4.14. Physical work
  - 4.15. Repetitive tasks/complacency
5. Environment
  - 5.1. Peer pressure
  - 5.2. Stressors
  - 5.3. Time pressure and deadlines
  - 5.4. Workload
  - 5.5. Shift Work
  - 5.6. Noise and fumes



- 5.7. Illumination
- 5.8. Climate and temperature
- 5.9. Motion and vibration
- 5.10. Complex systems
- 5.11. Hazards in the workplace
- 5.12. Lack of manpower
- 5.13. Distractions and interruptions
- 6. Procedures, information, tools and practices
  - 6.1. Visual Inspection
  - 6.2. Work logging and recording
  - 6.3. Procedure - practice/mismatch/norms
  - 6.4. Technical documentation - access and quality
  - 6.5. Critical maintenance tasks and error-capturing methods (independent inspection, reinspection, etc.)
- 7. Communication
  - 7.1. Shift/Task handover
  - 7.2. Dissemination of information
  - 7.3. Cultural differences
- 8. Teamwork
  - 8.1. Responsibility
  - 8.2. Management, supervision and leadership
  - 8.3. Decision making
- 9. Professionalism and integrity
  - 9.1. Keeping up to date; currency
  - 9.2. Error provoking behaviour
  - 9.3. Assertiveness
- 10. Organisation's HF program
  - 10.1. Reporting errors
  - 10.2. Disciplinary policy
  - 10.3. Error investigation
  - 10.4. Action to address problems
  - 10.5. Feedback

## Appendix F - Resilience Engineering Principles

### **Resilience Engineering Principles (Lay et al., 2015)**

Principle 1: Variability and uncertainty are inherent in complex work.

Principle 2: Expert operators are sources of reliability.

Principle 3: A system view is necessary to understand and manage complex work.

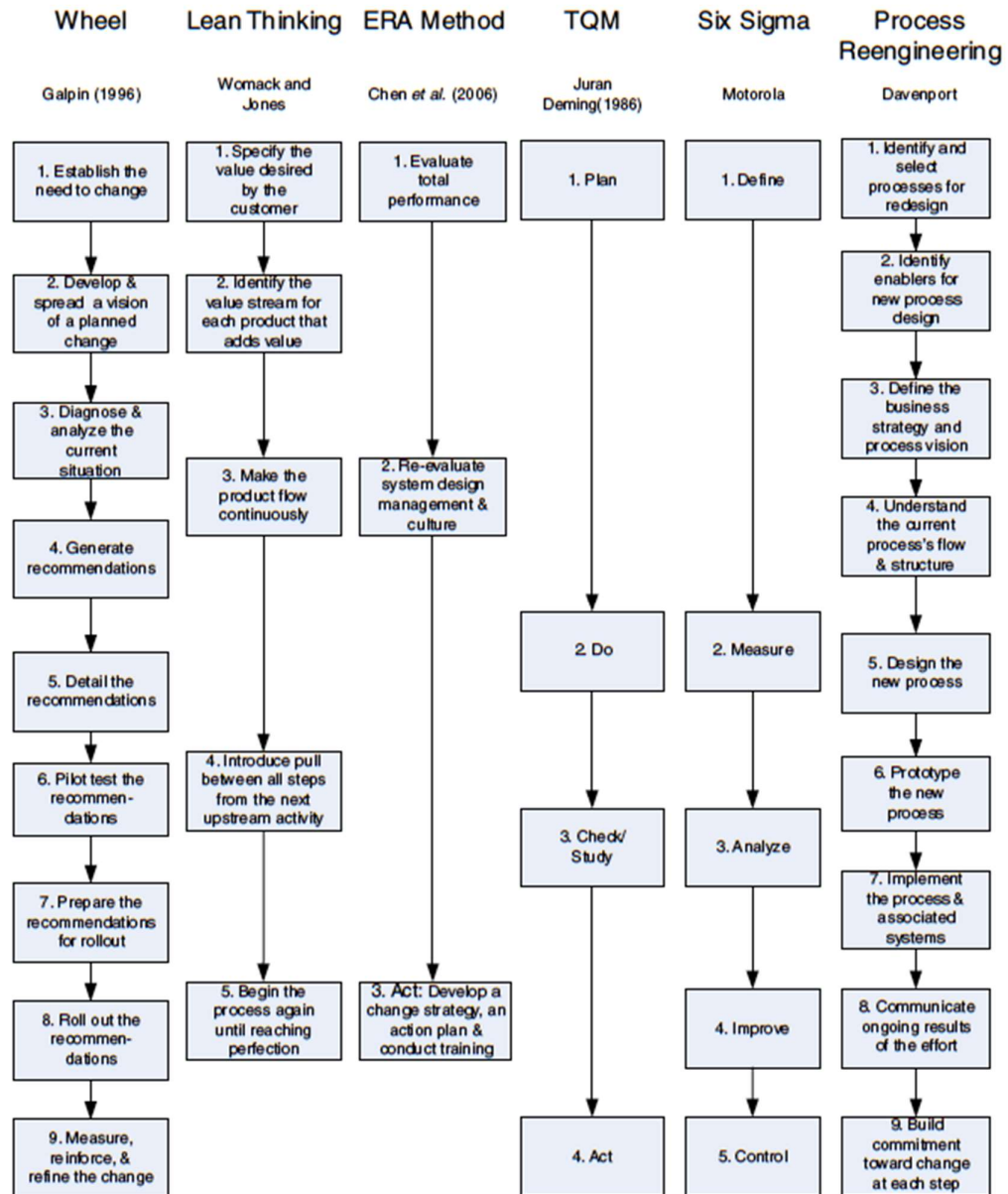
Principle 4: It is necessary to understand “normal work”.

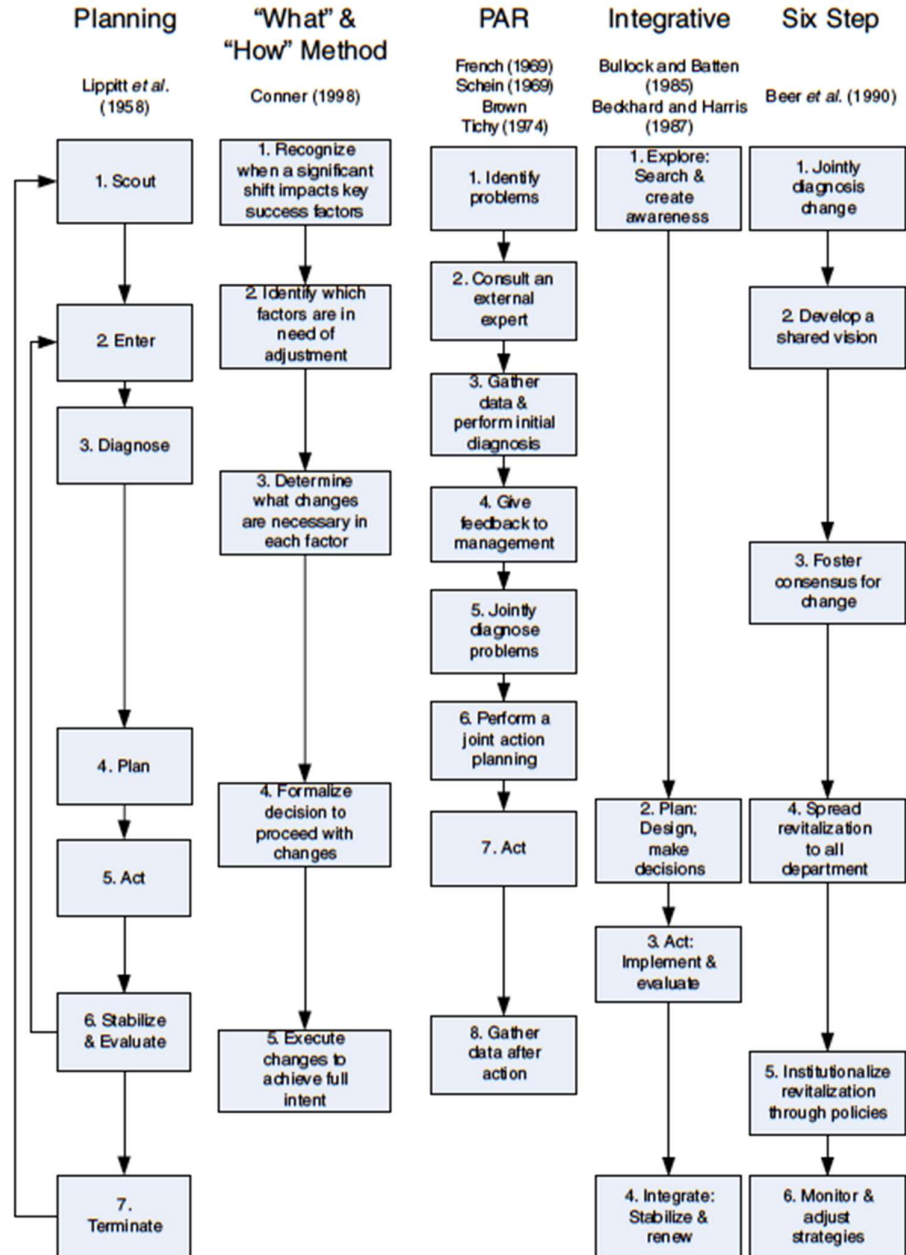
Principle 5: Focus on what we want: to create safety.

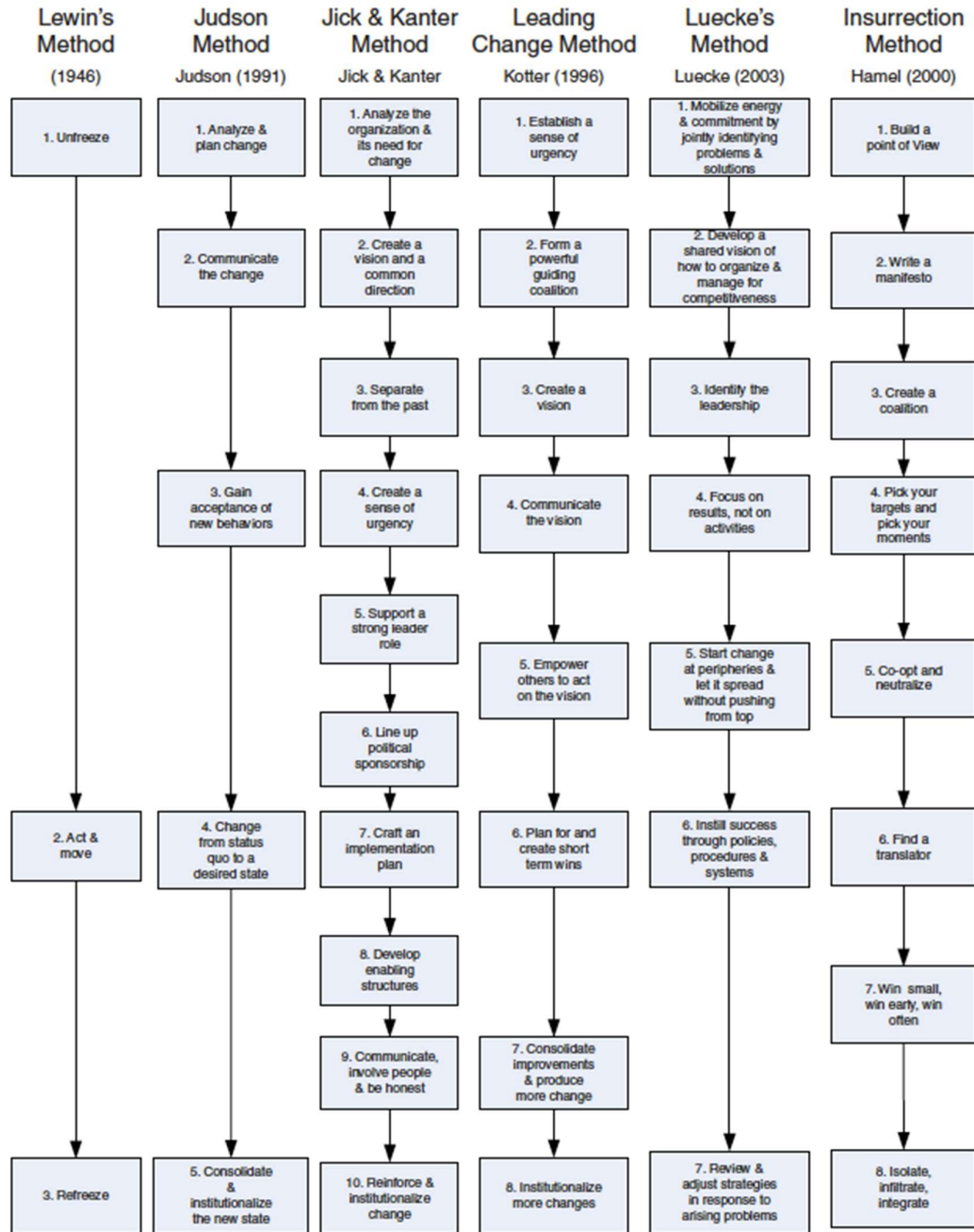
### **Resilience Engineering Principles (Woltjer et al., 2015b)**

1. work-as-done,
2. varying conditions,
3. signals and cues (for anticipation, monitoring, response),
4. goal trade-offs,
5. adaptive capacity,
6. coupling and interactions,
7. timing, pacing, and synchronization,
8. under-specification and approximate adjustments.

## Appendix G – Change management methods







## Appendix H – Distribution of themes in the four cornerstones

| <b>Monitoring</b>     | <b>Successful Projects</b> |                            | <b>Failed Projects</b> |                            |
|-----------------------|----------------------------|----------------------------|------------------------|----------------------------|
|                       | Individual perspective     | Organisational perspective | Individual perspective | Organisational perspective |
| Number of quotes      | 21                         | 35                         | 19                     | 17                         |
| Number of themes      | 12                         | 27                         | 14                     | 10                         |
| Total count of themes | 27                         | 48                         | 25                     | 25                         |

| <b>Responding</b>     | <b>Successful Projects</b> |                          | <b>Failed Projects</b> |                          |
|-----------------------|----------------------------|--------------------------|------------------------|--------------------------|
|                       | Individual perspective     | Organisation perspective | Individual perspective | Organisation perspective |
| Number of quotes      | 60                         | 47                       | 27                     | 46                       |
| Number of themes      | 32                         | 24                       | 20                     | 24                       |
| Total count of themes | 75                         | 61                       | 36                     | 57                       |

| <b>Anticipating</b>   | <b>Successful Projects</b> |                          | <b>Failed Projects</b> |                          |
|-----------------------|----------------------------|--------------------------|------------------------|--------------------------|
|                       | Individual perspective     | Organisation perspective | Individual perspective | Organisation perspective |
| Number of quotes      | 33                         | 24                       | 21                     | 18                       |
| Number of themes      | 20                         | 17                       | 11                     | 11                       |
| Total count of themes | 46                         | 37                       | 22                     | 27                       |

| <b>Learning</b>       | <b>Successful Projects</b> |                          | <b>Failed Projects</b> |                          |
|-----------------------|----------------------------|--------------------------|------------------------|--------------------------|
|                       | Individual perspective     | Organisation perspective | Individual perspective | Organisation perspective |
| Number of quotes      | 83                         | 37                       | 55                     | 17                       |
| Number of themes      | 38                         | 19                       | 29                     | 11                       |
| Total count of themes | 98                         | 40                       | 70                     | 21                       |

## Appendix I – Definition of themes (Monitoring Cornerstone/Individual)

| Theme                                 | Description  | Category  |
|---------------------------------------|--|---|
| Low stress                            | The interviewee does not experience the project as stressful   | Individual aspects (s)                            |
| Limited awareness on human aspects    | The interviewee lacks awareness of human-related aspects of his colleagues or subordinates                                       |   |
| Active participation of staff         | Indications for active employee participation, e.g. supportive behaviour and extra work  | Human aspects (s)                                 |
| Visible competence                    | The competence of other people as an indicator for performance   |   |
| Lack of knowledge                     | The organisation or higher management lacks specific knowledge related to and important for the project                          | Organisation aspects (s)                          |
| Confirmed planning                    | The project develops according to plan   | Project aspects (s)                               |
| Difficulties overcome                 | Difficulties and insecurities well managed   |   |
| Increased KPI measurement             | More measurement of KPI or shorter intervals   |   |
| Rumours about difficulties            | Rumours as an indicator for unnoticed difficulties   |   |
| Open communication                    | Problems and concerns openly addressed   | Monitoring process and interpretation Aspects (s) |
| Perceived cooperation                 | A general feeling of good cooperation between employees and teams that was helpful and that everybody enjoyed                    |   |
| Seeking regular feedback/exchange     | The effort to exchange information and get feedback from others  |   |
| Self-critique                         | A critical view of the interviewee of his own performance  | Individual aspects (f)                            |
| Difficulties not recognized           | Realizing difficulties within the project too late or by surprise  |   |
| Taken for granted attitude            | Assumptions that were taken for granted and not verified   |   |
| Human limitations                     | Reaching or crossing limits of human performance, e.g. frustration   | Human aspects (f)                                 |
| Humans as indicators for difficulties | Realizing problems within the project through awareness of human behaviour, e.g. reduced motivation or increased critique        |   |
| No active reporting                   | Information had to be looked for and was not communicated  |   |
| Reduced participation                 | Like a negative version of the theme “active participation of staff” where employees reduce their level of active participation. |   |
| Lack of knowledge                     | See above  | Organisation aspects (f)                          |
| Inappropriate design                  | Processes and structures were inappropriate or hindered project success  | Project aspects (f)                               |
| Lack of strategic focus               | Lack of focus on the main goal and purpose of the project  |   |
| Target(s) not reached                 | Important milestones of the project were not reached   | Monitoring process and interpretation aspects (f) |
| Delayed negative effects              | Negative effects, results and side effects of activities (e.g. of consultants) were not or could not be recognized immediately   |   |
| Insufficient implementation           | The implementation process was not carried out with enough effort  |   |
| Lack of cooperation and communication | Not providing relevant and necessary information and support   |   |

## Appendix J – Definition of themes (Monitoring Cornerstone/Organisation)

| Theme  | Description   | Category/group  |
|--|---|---|
| Absence rate (+)                             | The absence rate was evaluated as positive  | Indicators/KPI (hard) (s)                                   |
| Break-even (+)                               | Break-even was reached  |   |
| Cost (+)                                     | Costs were evaluated as positive/not too high   |   |
| Economic non-specified (+)                   | The interviewee referred to economic benchmarks in a positive way, but did not specify exactly which numbers    |   |
| Milestones/deadlines (+)                     | Milestones and deadlines were met   |   |
| Number of customers (+)                      | The number of customers was evaluated as positive   |   |
| Quality of data (+)                          | The collected data provided enough information  |   |
| Regulation adherence                         | Business practice was within regulatory limits  |   |
| Revenue (+)                                  | Revenue was evaluated as positive   |   |
| Stock (+)                                    | Stock level was evaluated as positive   |   |
| Customer satisfaction (+)                    | Customers were largely satisfied with performance   | Indicators/KPI (soft) (s)                                   |
| Passion score staff (+)                      | Staff motivation commitment was good or high  | Indicators (s)  |
| Planning confirmed                           | The project develops without significant changes  |   |
| Targets reached/positive results             | The aim of the project was reached or the results evaluated as positive   | Perceived/noticed aspects (s)                               |
| Significant positive external feedback       | Customers and external sources were satisfied with performance and procedures                                   |   |
| Active participation of staff                | Indications for active employee participation, e.g. supportive behaviour and extra work                         | Process and interpretation/social processes (s)             |
| Aim for SMM                                  | Effort to achieve a shared mental model (SMM) of the project for stakeholders                                   |   |
| Regular/high rate of exchange                | High rate of exchange of information relevant to the project, e.g. many meetings in person                      |   |
| Seeking feedback                             | Feedback was collected actively   | Process and interpretation/Aspects of higher management (s) |
| Management support                           | Support by higher management, e.g. providing data   |   |
| Open upward reporting                        | Open communication towards higher management  |   |
| Insufficient information/support mgt.        | Not enough higher management monitoring support, e.g. lack of understanding or difficulty aversion              | Process and interpretation/Measurement and process (s)      |
| Automated measurement/interpretation         | Data collection and interpretation was automated  |   |
| Improved measurement tool                    | The quality of the monitoring tool was increased  |   |
| Increased rate of measurement                | More measurement or shorter intervals   | Process and interpretation (s)                              |
| Focus on opportunities                       | Positive perspective on achieving additional business   |   |
| Follow standards                             | Norms and standards were used   | Indicators/KPI (hard) (f)                                   |
| Absence rate (-)                             | Absence rate was too high   |   |
| Economic, non-specified (-)                  | The interviewee referred to economic benchmarks in a negative way, but did not specify exactly which numbers    | Indicators (f)  |
| Targets not reached/insufficient results     | The aim of the project was not reached or the results were evaluated as insufficient                            |   |
| Culture/goal misalignment                    | Clash of culture and aim of the project   | Perceived/noticed aspects (f)                               |
| Difficulties not recognized                  | Difficulties were not identified soon enough  |   |
| Informal/semiformal reporting                | Information was collected in a non-formal way through interaction   |   |
| Limited social awareness                     | No awareness of morale and climate  | Process and interpretation/Aspects of higher management (f) |
| Insufficient information/support mgt.        | Not enough monitoring support by higher management e.g. lack of understanding or difficulty aversion            |   |
| Ignoring discrepancies                       | Information/Indicator discrepancies not addressed   | Process and interpretation/Measurement and process (f)      |
| KPI/Indicators without enough interpretation | Information collected but not interpreted or not interpreted consistently enough, even though this was possible |   |



## Appendix K – Definition of themes (Responding Cornerstone/Individual)

### Success

| Theme   | Description   | Category/group                     |
|---|---|------------------------------------|
| Re-evaluate current approach                        | The actual approach within the project was questioned   | 1 / Awareness                      |
| Awareness of social dynamics                        | The manager was considering social dynamics of stakeholders and the team(s) or department(s)  |                                    |
| Awareness of own emotions                           | The manager was aware of the emotional impact that the project had on himself   |                                    |
| SMM on difficulties                                 | A shared mental model (SMM) of the difficulties within the project existed with others  |                                    |
| Awareness on human resources                        | The availability and limitations of human related resources was considered  |                                    |
| Long-term thinking                                  | Long-term effects and side-effects were considered  |                                    |
| Pursue goals determinedly                           | The goals of the project were in the focus all the time   | 1 / Coordination and leadership    |
| Active participation (hands on)                     | The manager was involved in activities and hence had an active and concurrent understanding of related aspects                      |                                    |
| Seek lateral cooperation                            | Cooperation with units on the same organisational level   |                                    |
| Managing needs of stakeholder                       | The needs of stakeholders were considered   |                                    |
| Establish shared vocabulary                         | Using terms that are common to everybody  |                                    |
| Adapting structures and processes                   | The manager was able to change structures and processes according to project requirements   |                                    |
| Realise failure and take corrective action          | The manager realised that something went wrong or failed and took corrective measures   |                                    |
| Proactive adjustment (competent risk taking)        | Activities that are based on a forward-looking perspective, involving consciously taking risks without endangering project elements |                                    |
| Cooperative decision making                         | The manager was taking decisions and included other stakeholder and employees in the process  |                                    |
| Show trust to employees                             | The manager visibly exhibited trust towards employees   |                                    |
| Empower staff                                       | Employees receive freedom to take decisions and act   |                                    |
| Competence based allocation of staff                | Staffing and allocation of employees is based on required and available competencies  |                                    |
| Keep staff updated                                  | Employees are provided with continuous updates on project progress  |                                    |
| Direct interaction with affected staff              | Communication with staff by the manager happens constantly  |                                    |
| Objective approach                                  | The visible effort of collecting and analysing facts neutrally  | 1 / Helpful activities and support |
| External help (coaching)                            | Using external help e.g. by consultants or coaches  |                                    |
| Accepting and dealing with uncertainty              | Project planning and management considers uncertainty   | 2 / Awareness                      |
| Lack of awareness of social dynamics                | Not enough consideration of social dynamics between employees   |                                    |
| Lack of lateral coordination from others            | Lateral cooperation between units/departments is low  | 2 / Coordination and leadership    |
| Proactive adjustments but risking negative outcomes | A forward-looking perspective is applied but the manager accepts the risk of identified negative results                            |                                    |
| Culture of fear                                     | Employees associated mistakes with blaming  | 2/ Management of staff             |
| Request direct management support                   | Support from the next management level was sought   | 3 / Positive effects               |
| Open upward reporting                               | Open and regular flow of information to next management level without holding back negative aspects                                 |                                    |
| Top management support                              | Support from the C-Level and board  |                                    |
| Direct management support                           | Support from the next management level  |                                    |
| Lack of direct management support                   | Not enough support from the next management level   | 3 / Negative effects               |

## Failure

| Theme                                      | Description  | Category/group                      |
|--|--|-------------------------------------|
| Awareness of social dynamics               | Consideration of social dynamics between employees   | 1. / Awareness                      |
| Re-evaluate current approach               | The manager re-evaluates the approach taken in the project   |                                     |
| Awareness of failure /not reaching goal    | The manager is aware that failure is happening and the goal likely not being achieved                |                                     |
| Awareness/management of negative emotions  | The manager is aware of his own negative emotions and engages in coping                              |                                     |
| Realise failure and take corrective action | The manager realises that important project elements have failed and is adjusting them               | 1. / Coordination and leadership    |
| Seek coordination with affected parties    | Coordination with those affected by the change project is sought                                     |                                     |
| Keep going attitude (perseverance)         | The manager keeps up with constraints and slow progress or a lack of results                         |                                     |
| Direct interaction with affected staff     | Communication with staff by the manager happens constantly   | 1. / Management of staff            |
| Support cooperation within team            | Cooperation with the project team is supported by the manager  |                                     |
| Consider needs of staff                    | The needs of staff are considered by the manager   |                                     |
| Motivation and proactive behaviour         | Behaviour can be described as proactive while the motivation for the project is high                 | 1. / Helpful activities and support |
| Lack of awareness of social dynamics       | Not enough consideration of social dynamics between employees  | 2. / Awareness                      |
| Lack of awareness of culture               | Not enough consideration of organisational culture   |                                     |
| Not understanding dynamics/problem         | The difficulties and how they affect the project are not understood properly                         |                                     |
| Negative emotions                          | Negative emotions about or due to the project  |                                     |
| Lack of lateral cooperation from others    | Lateral cooperation between units/departments is low   | 2. / Coordination and leadership    |
| Keep going attitude (firefighting)         | The manager is keeping up with constraints and slow progress and has to react to short-term problems | 3. / Positive effects               |
| Direct management support                  | Support from the next management level   |                                     |
| Lack of management support                 | Lack of support from the next management level   |                                     |
| Lack of top management support             | Not enough support from the top management level   | 3. / Negative effects               |

## Appendix L – Definition of themes (Responding Cornerstone/Organisation)

### Success

| Theme                                | Description   | Category/group                     |
|--------------------------------------|---|------------------------------------|
| SMM on difficulties                  | A shared mental model (SMM) of the difficulties within the project existed                            | 1 / Awareness                      |
| Pursue goals consistently            | Goals were followed fast and without deviating  | 1 / Coordination and leadership    |
| Proactive external communication     | Communication with external stakeholders was proactive  |                                    |
| Adapting structures and processes    | The organisation was able to change structures and processes according to project requirements        |                                    |
| Just leadership                      | Leadership was fair and treated employees equally   | 1 / Management of staff            |
| Flexible reduction of staff          | It was possible to reduce staff with flexible measures  |                                    |
| Empower staff                        | Employees received freedom to take decisions and act  |                                    |
| Competence based allocation of staff | Staffing and allocation of employees is based on required and available competencies                  |                                    |
| Direct interaction                   | Regular communication and interaction with employees  |                                    |
| Keep staff updated                   | Employees are provided with continuous updates on project progress                                    |                                    |
| Provide resources                    | The required resources are provided   |                                    |
| Cooperative attitude                 | Stakeholders are willing to cooperate   | 1 / Helpful activities and support |
| End and restart without redesign     | The project was stopped but then reinitiated without adjustment                                       | 2 / Coordination and leadership    |
| Reactive adaptation (firefighting)   | Adaptations were reactive and based on upcoming problems and difficulties                             |                                    |
| Decision process too slow            | It took very long to take decisions   |                                    |
| Inadequate allocation of staff       | Staffing and allocation of employees is not based sufficiently on required and available competencies | 2 / Management of staff            |
| Ignoring feedback and competence     | Feedback and competences are not considered and not made use of                                       | 2 / Helpful activities and support |
| Not providing enough resources       | The organisation did not provide enough or no adequate resources                                      |                                    |
| Cooperative attitude                 | Staff responded with the will to cooperate  | 3 / Positive effects               |
| Increased cooperation                | The project was accepted by employees and led to an increase in cooperation                           |                                    |
| Pressure experienced as positive     | Performance pressure was experienced as helpful   |                                    |
| Motivation and proactiveness         | Employees accepted the project and acted in a proactive way   |                                    |
| Lack of commitment                   | Employees had not enough commitment   | 3 / Negative effects               |
| Resistance (loss of privileges)      | Some employees reacted with resistance when their privileges were reduced                             |                                    |
| Culture of low engagement            | The general will for engagement within the project was low  |                                    |
| Frustration                          | Employees reacted with frustration to how the project went  |                                    |

## Failure

| Theme  | Description  | Category/group                     |
|--|--|------------------------------------|
| Realise failure and take corrective action       | The actual approach within the project was questioned and adapted                                    | 1 / Coordination and leadership    |
| Re-evaluate actual approach                      | The actual approach within the project was reconsidered  |                                    |
| Adapting structures and processes                | The organisation was able to change structures and processes according to project requirements       |                                    |
| Keep staff updated                               | Staff was provided with current updates  | 1 / Management of staff            |
| Lack of analytical action and systemic awareness | The organisation did not evaluate and consider systemic aspects enough e.g. not considering feedback | 2 / Awareness                      |
| Disruptive event not compensated                 | A disruptive event did not trigger corrective adjustments  | 2 / Coordination and leadership    |
| Single non-systemic intervention                 | An intervention was performed without considering side-effects                                       |                                    |
| Reactive adaptation (firefighting)               | Adaptations were reactive and based on upcoming problems and difficulties                            |                                    |
| Non-goal-oriented activities                     | Activities without focus on the goal   |                                    |
| Repeat failure without adjustment                | The same approach that led to failure was applied  |                                    |
| Passive behaviour                                | No activities or adjustments in spite of difficulties  |                                    |
| Inadequate coordination with others              | Coordination with other stakeholders was not adequate  |                                    |
| Not responding to social dynamics                | Social dynamics of staff were recognized but not acted upon  | 2 / Management of staff            |
| Competencies not understood                      | The benefit of available competencies of employees was not comprehended by the organisation          |                                    |
| Blaming culture                                  | Difficulties were often approached with blaming behaviour  |                                    |
| Inadequate structures                            | Available structures were not beneficial for the project   | 2 / Helpful activities and support |
| Not providing enough resources                   | The organisation did not provide enough or no adequate resources                                     |                                    |
| Keep motivation up                               | Employees showed their will to perform despite difficulties  | 3 / Positive effects               |
| Initial supportive attitude                      | The initial reaction to the project was supportive   |                                    |
| Frustration                                      | Employees reacted with frustration   | 3 / Negative effects               |
| Lack of commitment                               | Employees did not have enough commitment   |                                    |
| Egoistic protective actions                      | Staff tried to secure their personal ground  |                                    |
| Biased by past negative experience               | Past negative projects influenced the current project  |                                    |
| Resistance                                       | Some employees reacted with resistance to the project  |                                    |

## Appendix M – Definition of themes (Anticipation Cornerstone/Individual)

### Success

| Theme   | Description   | Category/group               |
|---|---|------------------------------|
| Analyse/plan before acting                      | Forward looking perspective, seeking to understand before actions are taken                                   | 1 / Awareness and assessment |
| Evaluation of own competencies                  | Reflecting on the own competencies versus the requirements  |                              |
| Compare with past figures                       | Compare past results from similar projects  |                              |
| Project evaluated as useful                     | The manager is convinced of the project benefit   |                              |
| Large perception range                          | Considering distant aspects and events  |                              |
| Request support                                 | Requesting support for the project from management  | 1 / Actions                  |
| Communicate/manage social acceptance            | The manager is engaged in activities that increases employee acceptance of the project                        | 1 / Attitude                 |
| Positive attitude                               | The manager has a positive attitude regarding the project   |                              |
| Management commitment                           | The manager expects management commitment   |                              |
| Critical perspective                            | The manager reflects on the project situation critically  |                              |
| Resourceful perspective seeking opportunities   | The manager knows about the ability to perform and seeks to exploit opportunities                             |                              |
| Wrong assumptions about SM                      | The assumptions about shared understanding are not correct  | 2 / Awareness and assessment |
| Positive perspective but not enough preparation | A positive attitude towards the project is not reflected in adequate preparation, underestimating the project | 2 / Attitude                 |
| Management pressure/unclear support             | The manager expects pressure from management and is unsure about their support                                | 3 / Internal                 |
| Inadequate structure/design                     | Existing structures are expected to provide difficulties  |                              |
| Project not attractive                          | It seems that people will not look forward to the project   |                              |
| Social/human challenges                         | Difficulties between groups and single employees are expected   |                              |
| Uncertainty                                     | Several project aspects cannot be calculated or have a high variability                                       |                              |
| Warning signs based on experience               | The manager recognizes potential risks that he knows from other projects                                      |                              |

## Failure

| Theme                                      | Description   | Category/group               |
|--|---|------------------------------|
| Recognized but doubted                     | The manager has recognized difficulties but does not believe they are real                    | 2 / Awareness and assessment |
| Recognized without enough relevance to act | The manager has recognized difficulties but sees no need to act                               | 2 / Actions                  |
| Concerns not considered by others          | The concerns of the manager are not shared by others  | 2 / Attitude                 |
| Inadequate structure/design                | Existing structures are expected to provide difficulties                                      | 3 /Internal                  |
| Inadequate process                         | Existing processes are expected to provide difficulties                                       |                              |
| Lack of experience/system knowledge        | The manager evaluates his experience and understanding of the organisation as not high enough |                              |
| Not enough resources                       | The manager expects a lack of resources   |                              |
| Passive behaviour of staff                 | The manager expects staff to behave passively   |                              |
| Hidden agenda                              | The manager expects conflicting and hidden goals from stakeholders                            |                              |
| Lack of need to act                        | The manager expects stakeholders to underestimate difficulties                                |                              |
| Scope too large                            | The manager evaluates the project as having a too large scope                                 |                              |

## Appendix M – Definition of themes (Anticipation Cornerstone/Organisation)

### Success

| Theme                                       | Description   | Category/group               |
|---|---|------------------------------|
| Use expert knowledge                        | Expertise of skilled employees was used for preparation   | 1 / Awareness and assessment |
| Consider different perspectives             | Different perspectives were considered when assessing the project   |                              |
| Consider uncertainty/complexity             | Uncertainty and complexity were considered in the assessment of the project                                     |                              |
| Request feedback                            | Feedback from others was sought   |                              |
| Allow emergence of people knowledge         | The organisation created an atmosphere that allowed knowledge to emerge without being requested                 |                              |
| Active awareness of risk/threat             | The organisation was actively trying to consider and be aware of risks and threats                              | 1 / Actions                  |
| Provide enough resources                    | The organisation provided necessary resources to anticipate developments  |                              |
| Contingency planning                        | The organisation is prepared for negative developments  |                              |
| Competent risk taking                       | Risks were taken without risking significant negative effects   |                              |
| Proactive communication (internal/external) | Communication (internal and external) was performed in a proactive way on the basis of anticipated developments |                              |
| Fear of mistakes/failure                    | The fear of mistakes and failure was too high   | 3 /Internal                  |
| Minor risks/precautions                     | Only minor risks were identified and minor precautions necessary  |                              |
| Not able of managing complexity             | The ability to deal with complex situations and developments was identified as too low                          |                              |
| Not meeting target                          | The probability of not reaching the target was too high   |                              |
| Reduced cooperation                         | Cooperation has been diminishing to a point where it was seen as a risk   |                              |
| Loss of customer                            | The risk of losing customers was identified   | 3 /External                  |
| Threat of unemployment                      | The project could involve job-cutting   |                              |

### Failure

| Theme   | Description  | Category/group               |
|---|--|------------------------------|
| Good perception range                               | Forward thinking and consideration of distant aspects  | 1 / Awareness and assessment |
| Lack of experience about system dynamic             | Not enough understanding about the dynamic interactions within the organisation                                    | 2 / Awareness and assessment |
| No system/forward thinking                          | Not considering systemic effects and/or their possible future developments   |                              |
| Risks and concerns ignored                          | Deliberately not considering risks and concerns brought up by employees and/or managers                            | 2 / Actions                  |
| Recognized without enough relevance for action (10) | Recognized aspects were underestimated and no need for precautions seen  |                              |
| Inadequate structure/design                         | Structures and processes were expected to be inadequate for the project  | 3 /Internal                  |
| Inadequate tools/approach                           | Methods and procedures for anticipation are seen as inadequate and/or expected to not provide required performance |                              |
| Not enough system understanding                     | Not understanding the dynamics of interactions within the system is seen as a risk or difficulty                   |                              |
| Overambitious goals                                 | The goals are seen as too difficult to reach   |                              |
| High level of difficulty                            | Competencies and skills will have to be at a high level to manage the project                                      |                              |
| No contingency planning                             | Not preparing enough for possible negative events is seen as a risk  |                              |

## Appendix N – Definition of themes (Preparation)

| Theme  | Description  | Category/group                      |
|--|--|-------------------------------------|
| <b>Helpful aspect:</b><br>Dense training history                             | The managers have access to a broad selection of helpful competencies and skills   | Individual / Training               |
| <b>Helpful aspect:</b><br>Will for continuation training                     | The managers are willing to increase their skill-set   |                                     |
| <b>Non-helpful aspect:</b><br>Not enough adequate training received          | Not enough of the required skills and competencies have been provided to the managers so far                               |                                     |
| <b>Non-helpful aspect:</b><br>No training received                           | None of the required skills and competencies have been provided to the managers in the past                                |                                     |
| <b>Helpful aspect:</b><br>Past experience available                          | The managers have experience from past projects  | Individual / Expertise-Experience   |
| <b>Helpful aspect:</b><br>Availability of experts                            | The managers have access to experts  |                                     |
| <b>Helpful aspect:</b><br>Availability of coaching                           | The managers have access to coaching   |                                     |
| <b>Helpful aspect:</b><br>Adequate amount of training provided               | The adequate amount of training was provided by the organisation to employees and/or managers                              | Organisation / Training             |
| <b>Helpful aspect:</b><br>Adequate amount of training provided to management | The adequate amount of training was provided by the organisation for the management  |                                     |
| <b>Non-helpful aspect:</b><br>Lack of adequate amount of training            | Not enough training was provided by the organisation to employees and/or managers  |                                     |
| <b>Helpful aspect:</b><br>Availability of external experts                   | External experts were available or made available for the organisation   | Organisation / Expertise-Experience |
| <b>Non-helpful aspect:</b><br>Lack of management expertise                   | Management was not having enough expertise for the requirements of change projects   |                                     |
| <b>Non-helpful aspect:</b><br>Experts not used                               | Experts were available but not used by the organisation  |                                     |
| <b>Non-helpful aspect:</b><br>Lack of lessons learned                        | The organisation has not made enough or little use of past projects as far as preparation for future projects is concerned | Organisation / Approach             |
| <b>Non-helpful aspect:</b><br>Lack of awareness/attitude                     | Relevant aspects or developments are not noticed by the organisation   |                                     |
| <b>Helpful aspect:</b><br>Framework/support provided                         | The required framework (e.g. structures, processes and resources) and/or support are provided                              | Organisation / Structure            |
| <b>Non-helpful aspect:</b><br>Lack of framework/support                      | The required framework (e.g. structures, processes and resources) and/or support are not provided or too little            |                                     |



## Appendix O – Definition of themes (Learning cornerstone/Individual)

### Success

| Theme   | Description   | Category/group                     |
|---|---|------------------------------------|
| Knowledge about WAD                           | The manager has a detailed understanding of the background and content of the project; WAD (work as done)       | 1 / Attitude and behaviour         |
| Adapt process to humans                       | Human needs are considered when processes are being designed  | 1 / Coordination and communication |
| Decisive leadership/pursue goals determinedly | Goals are being followed determinedly and with the will to achieve results                                      |                                    |
| Internal cooperation                          | Cooperation between different units had significant positive effects  |                                    |
| Open internal/external communication          | Exchange between units and towards external contacts/partners is open and relevant information is not held back |                                    |
| Stop project                                  | A relevant part of the project/sub-project was stopped and had positive effects on the overall success          |                                    |
| Active participation of staff                 | Staff was empowered to take part in planning and decision-making during the entire project                      | 1 / Staff                          |
| Broad/shared acceptance of project            | The content/goal/process was broadly accepted by affected people  | 1 / External or project            |
| Visible commitment of management              | It was visible that the management supported the project  |                                    |
| Consultant support                            | Consultants had a significant effect on the result  |                                    |
| Competent risk-taking                         | Risks were taken without compromising or endangering relevant aspects but achieving improved results            | 2 / Attitude and behaviour         |
| Proactiveness                                 | Taking actions before anticipated difficulties could arise  | 2 / Coordination and communication |
| Decisive leadership                           | Taking required decisions without unnecessary waiting time or inactivity  |                                    |
| SMM   | A shared mental model (SMM) about the project was given   | 2 / Staff                          |
| Autonomy/controversy in teams                 | Teams were allowed with a large amount of autonomy and controversial opinions were tolerated                    |                                    |
| Active participation                          | See above (here: not as reason but helpful aspect)  |                                    |
| Direct interaction                            | Direct interaction with employees of the project or with those affected by the project                          |                                    |
| Evaluate engagement                           | Evaluate engagement of employees (critically) as a basis for adequate action e.g. replacement                   |                                    |
| Visible commitment of management              | See above (here: named as support not as reason for result)   |                                    |
| Trusting experts                              | Experts (internal or external) were consulted and advice followed   | 2 / External or project            |
| Base success on result                        | The evaluation of success was solely based on the result  | 3 / Coordination and communication |
| Lack of SMM                                   | No shared mental model about the project  |                                    |
| Project too big                               | Scope of project to large   |                                    |
| Reactive adaptation                           | Actions were taken reactively without foresight or anticipation   |                                    |
| Inexperienced management                      | Management did not have enough experience   |                                    |
| Negative effects on people                    | A variety of negative effects e.g. frustration, loss of credibility   | 3 / Staff                          |
| Adequate preparation                          | To prepare adequately based on knowledge about the project  | 4 / Attitude and behaviour         |
| Better perception range                       | More forward looking  |                                    |
| Competent risk taking                         | Taking more risks without compromising or endangering relevant aspects but achieving improved results           |                                    |
| Seek system understanding                     | More efforts to understand system dynamics  |                                    |
| Maintain open/adaptive attitude               | More consideration of alternative approaches and staying flexible   |                                    |
| Communicate content and benefit               | Explain how the project will be performed and which benefits it will have                                       | 4 / Coordination and communication |
| Communicate method                            | Explain which method will be used   |                                    |
| Develop SMM                                   | Create a shared mental model  |                                    |
| Use expertise of staff                        | Use available expertise of employees  |                                    |
| Active participation of staff                 | Seek to empower staff to take part in planning and decision-making during the entire project                    | 4 / external or project            |
| Direct interaction                            | Seek direct interaction with affected employees in the project  |                                    |
| Show visible commitment                       | Show visible commitment when responsible for a future project   |                                    |

## Failure

| Theme  | Description  | Category/group                     |
|--|--|------------------------------------|
| Not realizing/accepting failure                  | Failure was not accepted or realised while in progress   | 1 / Attitude and behaviour         |
| Inadequate structure/process                     | Inadequate processes and structures had a significant effect on the result                               | 1 / Coordination and communication |
| Wrong assumptions                                | Wrong assumptions had a significant effect on the result   |                                    |
| Lack of system understanding                     | A lack of system understanding had a significant effect on the result                                    |                                    |
| No visible management commitment                 | That the management not visibly supported the project had a significant effect on the result             |                                    |
| Project not accepted                             | The project was rejected by employees and that had a significant effect on the result                    | 1 / Staff                          |
| Resistance                                       | Employees did work against the project, affecting the outcome  |                                    |
| Not addressing needs                             | Needs of staff were not addressed and partly affected the outcome  |                                    |
| No reporting by staff                            | Staff did not communicate enough and the lack of information affected the result significantly           |                                    |
| Inadequate use of external support (consultants) | External resources e.g. consultants were not used properly and affected the outcome                      | 1 / External or project            |
| Lack of cooperation towards partners             | Cooperation with business partners was named as a reason for failure                                     |                                    |
| Self-critique                                    | The manager critically questioned his performance  | 2 / Attitude and behaviour         |
| Experience from past negative project            | Experience from past negative project had positive effects on managing the current project               |                                    |
| Passive behaviour                                | Actions were not taken and decisions not made when needed  | 3 / Attitude and behaviour         |
| History of failure/difficulties                  | Past difficulties and failure affected the managers approach negatively                                  |                                    |
| No understanding of context                      | The context of the project was not sufficiently understood by the manager                                |                                    |
| No management support                            | Management did not sufficiently support the project  | 3 / Coordination and communication |
| No direct interaction with staff                 | Not enough direct interaction with employees of the project or with those affected by the project        |                                    |
| Poor consultant performance                      | Performance of consultants was low   | 3 / External or project            |
| Increased complexity                             | The complexity of the content and the project situation was high   |                                    |
| Success starts with humans                       | Humans are seen as the main reason for success and shall be considered more                              | 4 / Attitude and behaviour         |
| Relate theory to practice                        | The gap between theory and practical application shall be reduced  |                                    |
| Apply self-critique/evaluation                   | More self-critique and critical reflections shall be made  |                                    |
| Seek system understanding                        | More efforts shall be made to understand system dynamics   | 4 / Coordination and communication |
| Smart use of resources                           | More sustainable use of resources  |                                    |
| Seek resources/support                           | Seeking support and resources access more actively   |                                    |
| Seek management support                          | Seeking management support and resources access more actively  |                                    |
| Seek direct interaction                          | Seeking more direct interaction with employees of the project or with those affected by the project      | 4 / Staff                          |
| Create commitment through sense-making           | More efforts shall be made to increase the understanding of employees about why the project is necessary |                                    |

## Appendix P – Definition of themes (Learning cornerstone/Organisation)

### Success

| Theme                                    | Description  | Category/group |
|--|--|----------------|
| Competent risk taking                    | Risks were taken without compromising or endangering relevant aspects but achieving improved results                 | 1 / Approach   |
| Adapt structures and processes           | Adapting processes, procedures and structures  | 1 /Activities  |
| Seek SMM                                 | Seeking a shared mental model  |                |
| Trust experts about WAD                  | Consider and follow advice of experts about how work is done   |                |
| Repeat successful procedure              | Repeat what lead to success in a prior project   |                |
| Understand problem first                 | Seek to understand problems before acting with side-effects  | 2 / Approach   |
| Competent risk taking                    | Seek taking risks without compromising or endangering relevant aspects but achieving improved results                |                |
| Know when to stop                        | Seek stopping a project or sub-project in time when a defined threshold is passed                                    |                |
| Request external feedback                | Seek more external feedback  | 2 /Activities  |
| Accept/consider uncertainty              | Increase acceptance and consideration of uncertainty   |                |
| Define role/task of consultants          | Roles and tasks of consultants shall be defined more accurately  |                |
| Not considering critical feedback        | Critical feedback was not considered   | 3 / Approach   |
| No lesson learned                        | No lessons learned were done but no specific reason was named  |                |
| No lesson learned/selective confirmation | No lessons learned were done because isolated positive aspects were used for confirmation                            |                |
| No lesson learned (frustrated staff)     | No lessons learned were done and resulted in a high level of employee frustration                                    |                |
| Restart without redesign                 | The project was stopped and restarted without changing the design  | 3 /Activities  |
| Documented but not evaluated             | Documentation was performed but no evaluation done   |                |
| No documentation                         | No documentation was performed   |                |
| Difficulties with change from within     | The organisation was having difficulties to initiate needed change from within (without external trigger or problem) |                |

## Failure

| Theme  | Description   | Category/group |
|--|---|----------------|
| Change of approach/mindset                         | The result led to a change in the approach towards change   | 1 / Approach   |
| More direct interaction with staff                 | More direct interaction with employees of the project or with those affected by the project was done                          | 1 /Activities  |
| Change of structures/processes                     | Processes and structures were change as a result of the failed project  |                |
| Increased perception range                         | The perception range was increase because of the negative project outcome   |                |
| Change mindset to constant unease/forward thinking | The organisation is trying to use more forward thinking and to constantly maintain a critical attitude                        | 2 / Approach   |
| Analyse failure                                    | The organisation wants to improve the quality of the analysis (of failure)  | 2 /Activities  |
| Critically evaluate external support               | The organisation will put more emphasis on critically evaluating the need for external support as well as the support as such |                |
| Communicate/act visible and consistent             | The organisation will put more emphasis on consistent and visible communication and action                                    |                |
| No lesson learned                                  | No lessons learned were done  | 3 / Approach   |
| Mindset of arrogance                               | The organisation behaved as if they could not fail  | 3 /Activities  |
| Not using resources/support/experience             | The organisation had resources, support and/or experience available but made no use of them                                   |                |

## Appendix Q – Distribution of themes and their total count

### Individual responding: Distribution of themes and their total count

|   |                                | Successful projects | Failed projects |
|---|--------------------------------|---------------------|-----------------|
| <b>First category:</b>  | Number of themes               | 23                  | 11              |
| <b>Adaptive behaviour/capacity</b>  | Total count                    | 61                  | 18              |
| <b>Second category:</b>   | Number of themes               | 4                   | 6               |
| <b>Non-adaptive behaviour/capacity</b>  | Total count                    | 4                   | 14              |
| <b>Comparing the total count between groups of themes in the first vs. in the second category</b> | Awareness                      | 14 - 1              | 5 - 7           |
|   | Coordination and leadership    | 25 - 2              | 7 - 7           |
|   | Management of staff            | 16 - 1              | 7 - 0           |
|   | Helpful activities and support | 6 - 0               | 1 - 0           |

### Organisational responding: Distribution of themes and their total count

|  |                                | Successful project | Failed project |
|--|--------------------------------|--------------------|----------------|
| <b>First category:</b>   | Number of themes               | 12                 | 4              |
| <b>Adaptive behaviour/capacity</b>   | Total count                    | 39                 | 7              |
| <b>Second category:</b>  | Number of themes               | 6                  | 13             |
| <b>Non-adaptive behaviour/capacity</b>   | Total count                    | 10                 | 38             |
| <b>Comparing the <u>total count</u> between groups of themes in the first vs. in the second category</b> | Awareness                      | 2 - 0              | 0 - 6          |
|  | Coordination and leadership    | 16 - 7             | 6 - 24         |
|  | Management of staff            | 13 - 2             | 1 - 4          |
|  | Helpful activities and support | 8 - 1              | 0 - 4          |

**Individual anticipating:** Distribution of themes and their total count

|   |                  | <b>Successful project</b> | <b>Failed project</b> |
|---|------------------|---------------------------|-----------------------|
| <b>First category: Helpful (proactive) actions and behaviour</b>                                  | Number of themes | 11                        | 0                     |
|   | Total count      | 32                        | 0                     |
| <b>Second category: Non-helpful actions and behaviour</b>   | Number of themes | 2                         | 3                     |
|   | Total count      | 3                         | 6                     |
| <b>Comparing the total count between groups of themes in the first vs. in the second category</b> | Awareness        | 12 - 2                    | 0 - 1                 |
|   | Actions          | 4 - 0                     | 0 - 3                 |
|   | Attitude         | 16 - 1                    | 0 - 2                 |

**Organisational anticipating:** Distribution of themes and their total count

|   |                  | <b>Successful project</b> | <b>Failed project</b> |
|---|------------------|---------------------------|-----------------------|
| <b>First category: Helpful (proactive) actions and behaviour</b>                                  | Number of themes | 10                        | 1                     |
|   | Total count      | 26                        | 1                     |
| <b>Second category: Non-helpful actions and behaviour</b>   | Number of themes | 0                         | 4                     |
|   | Total count      | 0                         | 17                    |
| <b>Comparing the total count between groups of themes in the first vs. in the second category</b> | Awareness        | 15 - 0                    | 1 - 5                 |
|   | Actions          | 11 - 0                    | 0 - 12                |
|   | Attitude         | 0 - 0                     | 0 - 0                 |

## Appendix R – Interview Questions

### **Question 1 (warm up)**

Could you tell me what comes to your mind when you think about change projects?

### **Question 2-A (successful project)**

Please think about a particular challenging project that went well and achieved the desired results. What were the main reasons that it went well?

### **Question 3-A 1 (cornerstone – learning)**

Did you or the organisation change anything after this project went so well?

### **Question 3-A 2 (cornerstone – learning)**

Did you or the organisation take any lessons learned from this project and what were concrete consequences from those learnings?

### **Question 4-A 1 (cornerstone – responding)**

How did you become aware of the challenges?

### **Question 4-A 2 (cornerstone – responding)**

How were the challenges handled by you, by the involved people and by the organisation?

### **Question 4-A 3 (cornerstone – responding)**

What were the results?

### **Question 4-A 4 (cornerstone – responding)**

What was helpful and what wasn't?

### **Question 5-A 1 (cornerstone – monitoring)**

What made you think that everything went well or as it was planned?

### **Question 5-A 2 (cornerstone – monitoring)**

Were there any indicators that you were looking for, in order to check if everything went right?

### **Question 5-A 3 (cornerstone – monitoring)**

Where did you get this information from, other people, observations or from the organisation?

**Question 6-A 1 (cornerstone – anticipating)**

What were your expectations before the project began?

**Question 6-A 2 (cornerstone – anticipating)**

Where there any risks or dangers to the project and if there were, how were they dealt with by you other people or the organisation?

**Question 6-A 3 (cornerstone – anticipating)**

Did you or other people take any general precautions?

-----

**Question 2-B (failed project)**

Please think about a project that did not go well, did not achieve the desired results or even failed. What were the main reasons for these results?

**Question 3-B 1 (cornerstone – learning)**

Did you or the organisation change anything after this project went that way?

**Question 4-B 1 (cornerstone – responding)**

How did you become aware of the challenges?

**Question 4-B 2 (cornerstone – responding)**

How were the challenges handled by you, by the involved people and by the organisation?

**Question 4-B 3 (cornerstone – responding)**

What were the results?

**Question 4-B 4 (cornerstone – responding)**

What was helpful and what wasn't?

**Question 5-B 1 (cornerstone – monitoring)**

When and how did you realise that the project would not go as planned or that difficulties were ahead?

**Question 5-B 2 (cornerstone – monitoring)**

Looking back, what indicated or could have indicated those difficulties and challenges?

**Question 6-B 1 (cornerstone – anticipating)**

Which of the difficulties were anticipated by you, other people or the organisation?



**Question 6-B 2(cornerstone – anticipating)**

Did everybody who was involved in the project know about these difficulties?

**Question 6-B 3(cornerstone – anticipating)**

What were the consequences to these anticipations, how did you and others act upon them?

**Question 7**

What kind of preparation/training for the role of change manager did you receive and was it helpful or would you have needed any other preparation/training?

## Appendix S – Invitation letter

### **Dear Mrs./Mr. XXXXX**

As I previously informed you, I am a doctorate student at the University of Portsmouth / Portsmouth Business School and I would like to invite you to participate in the research study:

### **A human factors view on the safety of organisational change – a shift of managerial mindset from failure and success towards resilience engineering**

Your participation of this study is entirely up to you. This letter will explain why the study is being done. This information sheet will help you to decide whether you wish to be a part of this study or not. This would take approximately 15 minutes. Please do not hesitate to contact me in case you have any questions.

### **Purpose of the study?**

The research intends to explore the potential of high-risk industry-related human factors and safety knowledge to the field of organisational change.

There is also a lot of research still to be done in order to get to a systemic understanding of failed change or even finding a common language for failure reasons (Decker et al. 2012). Such an understanding would be needed in order to provide the basis for a similar approach as in high risk industries. In other words, there is a wide range of research gaps that all come with the promise of reducing the failure rate of change projects.

The study wants to find out what we can learn from these fields in order to increase the success rate of change projects?

### **Why have I been invited?**

You have been invited because of your experience with change projects. This experience could help to improve the success of change projects in the future.

### **Do I have to take part?**


No. Your participation is entirely up to you. If you agree to participate, please sign the consent form attached to this invitation. Version number V02.

### **What will happen to me if I take part?**

If you agree to take part in this study, you will be interviewed for a maximum time of 2 hours. The interview will be conducted in German language. It will be digitally recorded and transcribed afterwards. The interview will take place in your local office or any other location that you prefer.

The questions will mainly be about your experience with change projects. Of special interest are those factors that you consider as relevant for success or for failure.

### **Expenses and payments**

The participation on this research study does not involve any recompense or cost compensation. I will undertake any travel necessary to be able to interview you. I will also use as little time as possible. After acceptance of the thesis at the University of Portsmouth, I will get you a copy of the final version on request. 

### **What will I have to do?**

As participant you will be asked to be interviewed for up to 120 minutes regarding your experience with change projects.

### **What are the possible disadvantages and risks of taking part?**

The only commitment from your side will be your time and there are no risks involved because all information will be confidential. Moreover it is entirely up to you which information you want to share.

**What are the possible benefits of taking part?**

In order to improve the success rate of change projects, the results of the study might be of interest to you and will be shared with you on request, via sending you a copy of the thesis or, if preferred, a summary. If the results will inform an innovative business training and you or your firm are interested in its implementation, your company will receive a discount due to your participation in the interview.

**Will my taking part in the study be kept confidential?**

The interview is absolute anonymous and all information will be treated strictly confidential. The data from interviewed persons will therefore be stored in a password protected file on a password protected computer. For later access this data will be secured in several redundant hard drives, stored in closed areas where only the researcher has access. Any paper-based material will also be stored in the same place and recordings will be stored there as well. The names of the interviewees as well as their organisation will not be noted in the data, instead numbers and codes will be assigned.

The research data will be kept for 10 years after completing the research in line with UoP Retention Schedule for Research Data. Original consent forms will be kept securely by the researcher for 30 years after completing the research. If no longer required it will be securely destroyed. Paper based data, records and notes will be scanned and then destroyed as well.

The original consent forms will be stored in a personal locked and secure archive at the researcher's premises. The data will only be used for this study.

If you join the study, it is possible that some of the data collected will be looked at by authorised people to check that the study is being carried out correctly. All will have a duty of confidentiality to you as a research participant and we will do their best to meet this duty.

It is very unlikely, due to the subject of the study, but still possible that authorities might request access to the research data. In this very unlikely case the identity of the interviewees might have to be disclosed to the authorities. Even in such a case data security as well as confidential handling will still be respected.

**What will happen if I don't want to carry on with the study?**

As a volunteer you can stop your participation at any time and you do not have to give any reasons. In that case all data and information will be destroyed and will not be included in this study. If data analysis has already started or one week has passed after data collection, then this will not be possible and the data will be used in the study.

**What if there is a problem?**

If you have any concerns, queries, or complaints about any aspects of this study, please contact the researcher first.<sup>[SEP]</sup>The contact details of the researcher:

Holger Kunzmann | up753837@myport.ac.uk | +49 (0)172-7320981

The contact details of the supervisor: Dr James McCalman | [james.mccalman@port.ac.uk](mailto:james.mccalman@port.ac.uk) | 02392 844035

If your concerns or complaints are not resolved by the researcher or by the supervisor, you can contact the Dean:

Dean: Professor Gioia Pescetto

Telephone: +44 (0) 023 9284 8484

Email: [gioia.pescetto@port.ac.uk](mailto:gioia.pescetto@port.ac.uk)

Richmond Building Portland Street Portsmouth

PO1 3DE

If the complaint remains unresolved, please contact: The University Complaints Officer  
+44 (0) 23 9284 3642 [complaintsadvice@port.ac.uk](mailto:complaintsadvice@port.ac.uk)

**Who is organising and funding the research?**

The research is fully self-funded and nobody will receive any financial contribution by conducting this research.

**Who has reviewed the study?**

Research in the University of Portsmouth is looked at by independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by University of Portsmouth Research Ethics Committee.

**Thank you very much for taking time to read this information as well as for considering to take part in the study. If you participate your consent will be sought; please see the accompanying consent form.**

**You will be given a copy of this information sheet and your signed consent form, to keep.**

## Appendix T – Ethical Approval Final Letter



12 December 2016

Holger Kunzmann  
DBA Student  
Portsmouth Business School

Portsmouth Business School  
University of Portsmouth  
Richmond Building  
Portland Street  
Portsmouth  
United Kingdom  
PO1 3DE

T: +44 (0)23 9284 8484  
W: www.port.ac.uk/pbs

Dear Holger

|                                    |   |
|------------------------------------|---|
| <b>Study Title:</b>                | <b>A human factors view on the safety of organisational change – a shift of mindset of managers from failure and success towards resilience engineering</b> |
| <b>Ethics Committee reference:</b> | <b>E418</b>   |

Thank you for submitting your documents for ethical review. The Ethics Committee was content to grant a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, revised in the light of any conditions set, subject to the general conditions set out in the attached document, and with the following stipulation: The favourable opinion of the EC does not grant permission or approval to undertake the research. Management permission or approval must be obtained from any host organisation, including University of Portsmouth, prior to the start of the study.

### **Summary of any ethical considerations:**

-

### **Documents reviewed**

The documents reviewed by Dr Peter Scott [LCM] + PBS Ethics Committee

| <i>Document</i>                                     | <i>Version</i> | <i>Date</i> |
|---|----------------|-------------|
| Ethical Review form                                 | 1              | 09 Nov 16   |
| Participant invitation sheet and information letter | 1              | 09 Nov 16   |
| Consent form  | 1              | 09 Nov 16   |
| Ethical Review form                                 | 2              | 29 Nov 16   |
| Participant invitation sheet and information letter | 2              | 29 Nov 16   |
| Consent form  | 2              | 29 Nov 16   |
| Interview questions                                 | 2              | 29 Nov 16   |
| Commentary on changes                               | 1              | 29 Nov 16   |
|   |                |             |
|   |                |             |
|   |                |             |

### **Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements set out by the University of Portsmouth.

### **After ethical review**

#### Reporting and other requirements

The attached document acts as a reminder that research should be conducted with integrity and gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Notification of serious breaches of the protocol
- Progress reports
- Notifying the end of the study

#### Feedback

You are invited to give your view of the service that you have received from the Faculty Ethics Committee. If you wish to make your views known please contact the administrator, Christopher Martin.

**Please quote this number on all correspondence: E418**

Yours sincerely and wishing you every success in your research



**Chair**

Email:

Enclosures: *“After ethical review – guidance for researchers”*

Copy to:

Prof James  
McCalman