TEXT MINING THE QUALITY PARADIGM(S)

Daniel Carnerud

Supervisors:
Professor Ingela Bäckström, Mid Sweden University
Professor Kristen Snyder, Mid Sweden University

Department of Quality Technology and Management
Mid Sweden University, SE-831 25 Östersund, Sweden
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Daniel Carnerud

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Department of Quality Technology and Management
Mid Sweden University, SE-831 25 Östersund
Sweden

Telephone: +46 (0)771-975 000

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Daniel Carnerud

Department of Quality Technology and Management
Mid Sweden University, SE-851 70 Sundsvall, Sweden
Returning from seeking “knowledge” to being on the way,
“Way” becomes a verb – waying.
Movement is a way,
Moving is along a path,
Weakening the stronghold of “conclusion”,
Let it be another way,
To “circumclude” –
Being Around, Being Present, Being Here,
“Quality” comes from ways of thinking –
The spider web and snowballs,
Quality discourse comes from what has been absent –
The way.
A way is a path.
What a joy to being on the way !
What a journey to be
Along a water path !

(Xu, 2000, p. 447 - 448)
ABSTRACT

The purpose of this thesis orbits around an examination of the formation of a quality paradigm. In this inquiry, the exploration and application of text mining have been used to provide new insights into quality as a paradigm.

The findings reveal the existence of unifying topics, around which research on quality has clustered, constituting the foundational pillars of an academic quality paradigm. These foundational pillars are operational paradigms that embody both epistemological perspectives and operational concerns regarding quality. The three operative paradigms upon which the quality paradigm rests are the operative paradigm of back-end quality (orbiting around: QM, TQM and service quality), the operative paradigm of middle-way quality (orbiting around: ISO, BEMs and Quality Awards) and the operative paradigm of front-end quality (orbiting around: Reliability, Costs and Processes). The three operative paradigms differ in their levels of abstraction, accountability and system-learning emphasis. However, the mutual purpose and aim of the three operative paradigms, and hence the paradigm as a whole, is to continuously control, assure and develop systems affecting quality initiatives in service of the customer(s).

The findings also indicate that the operative paradigms of back-end and front-end quality seem to be specializing and drifting apart, which might lead to a division of the quality paradigm into two separate paradigms.

The studies in this thesis also confirm the existence of changes in the focus and popularity of specific topics. However, the key epistemological findings are the central and perpetual research topics that are identified – supporting the supposition that research on quality truly constitutes a delimited and recognized research paradigm.

Furthermore, the studies show that research on quality expanded during the end of the 1980s and beginning of the 1990s, after which a contraction took place, followed by stability at the start of the 21st century. Consequently, it is found that research on quality entered a stable and mature phase in the 21st century, settling down as a distinctive and established research paradigm.

Finally, it is found that the exploration and application of text mining is a potent approach when probing the epistemological foundations of an academic discipline.

Keywords: Quality Paradigm, Quality Movement, Quality Revolution, Quality Management, QM, Total Quality Management, TQM, Business Excellence, Text Mining, Data Mining
SAMMANFATTNING

Syftet med denna avhandling var att undersöka kvalitetsparadigms uppbyggnad och utveckling. För ändamålet har text mining utforskas och tillämpats. Resultaten påvisar en grund av förenande ämnen kring vilka kvalitetsforskningen har cirkulerat och som tillsammans utgör grundpålar för det akademiska kvalitetsparadigmet. Dessa grundpelare är operationella paradigm som innefattar både epistemologiska liksom praktiska perspektiv gällande forskningen om kvalitet.


Resultaten indikerar även att det operativa paradigm av styrningskvalitet respektive brukarkvalitet blir allt mer specialiserade och därmed glider isär. Vilket riskerar att slita itu kvalitetsparadigmet i två separata paradigm.

Studierna bekräftar även förekomsten av förändringar i popularitet liksom fokus för vissa ämnen. Den centrala epistemologiska iakttagelsen är dock de bestående och återkommande forskningsteman som identifierats som stärker tesen att kvalitetsforskningen verklig utgör ett avgränsat och erkänt forskningsparadigm.


Slutligen visar resultaten att utforskning och tillämpning av text mining är en kraftfull metod för att undersöka de epistemologiska grunderna i en akademisk disciplin.

Nyckelord: Kvalitetsparadigm, Kvalitetsrörelsen, Kvalitetsteknik, Offensiv Kvalitetsutveckling, Text Mining, Data Mining
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List of papers

The thesis is mainly based on the following papers, herein referred to by their letters:

Paper A Exploration of text mining methodology through investigation of QMOD-ICQSS proceedings
Carnerud, D. (2014)
Presented and published in the proceedings of the 16th QMOD-ICQSS International Conference, 3-5th September 2014, in Prague, Czech Republic.

Paper B Exploring research on quality and reliability management through text mining methodology
Carnerud, D. (2017)

Paper C 25 years of quality management research – Outlines and Trends.

Paper D Kaizen and continuous improvement–trends and patterns over 30 years.
The TQM Journal, Vol. 30 Issue: 4, pp. 371-390

Paper E Four Decades of Research on Quality: Summarizing, Trendspotting and Looking Ahead
Presented and published in the proceedings of the 21st QMOD-ICQSS International Conference, 22-24 August 2018, Cardiff University, Wales, UK
Submitted for publication

Paper F The quality movements three operational paradigms - A text mining venture
Submitted for publication
1. INTRODUCTION

In this chapter, the background, purpose and research questions are presented along with the structure of the thesis.

1.1. Background

In the final issue of the Journal of Quality Management (JQM) in 2001, editor and co-founder Robert L. Cardy elaborated on the reasons for the ending of the journal. According to Cardy (2001), because the landscape of quality had changed so much since the journal was founded in 1995, it was necessary to either retitle or relaunch the journal or to end it. At the time, the quality movement had provocative, strong and compelling implications for management (ibid). Hence, JQM was launched as an outlet for work on the effective management of people in quality-oriented environments (ibid). However, the quality movement had a “faddish” character (ibid). Since then, the movement has been integrated into various functions and programmes, making it less viable as a distinct stand-alone function (ibid). Consequently, Cardy (2001) views quality as a philosophy and as a programme that is still alive and well but mainly in the domain of operations management (OP). From Cardy’s (2001) viewpoint, such quality work mainly focused on techniques, not on people’s issues. Herein lay the problem for JQM according to Cardy (2001): it was devoted to issues regarding the management of people, but fewer and fewer management scholars were examining quality-related issues. Additionally, the customer-centric approach, which lies at the heart of the field of quality, had largely taken over the whole quality movement, which foreshadowed JQM’s intent to focus on people (ibid). Cardy (2001) was not the first to air his concerns about the future direction of quality. Looking in the rear-view mirror, Garvin (1984) early on emphasized that quality is a complex and multifaceted concept that causes great confusion and endless debate, hindering organizations from making real progress on the quality front. Senge (1992) was also prompt in his criticism of the course that the quality movement had taken, commenting that researchers as well as practitioners had to re-discover learning as a central parameter if the quality movement was not to fade into the footnotes of history. Boaden (1996) recognized the statistical history of TQM as a distinguishing factor; nevertheless, the fundamental principles of TQM were shared with other approaches to management, indicating that TQM was simply another management fad. Entering the new millennium, Dale et al. (2001) found that TQM was still in the early stage of theory development and tended to be viewed as part of operations management rather than as an academic subject in its own right. However, this situation was changing, and TQM was becoming established as an independent discipline (ibid). Later, Singh and Smith (2006) found QM to still be a relevant research field; however, the major
faultlines need to be addressed if it is to prove itself as a viable management paradigm. Miller et al. (2018) establish that the quality movement is still steadily progressing and evolving, requiring organizations to adapt and change. However, given the scale of this movement and its research activity, a considerable amount of confusion may have resulted (ibid). Thus, Miller et al. (2018) see a need to counteract excessive variety and confusion by presenting models that seek to organize the various viewpoints of the quality movement into a coherent framework. Fredriksson and Isaksson (2018) support such a notion, underlining that to conduct scientific and university teaching activities, there is a need to define the similarities and differences among quality philosophies. Additionally, for sensemaking purposes, it would be suitable to have a model that helps to describe quality philosophies (ibid). According to Dahlgaard-Park et al. (2018), evidence suggests that TQM may be regarded as a shift in existing management theories or even paradigms. However, Dahlgaard-Park et al. (2018) also acknowledge that management academics and practitioners are still debating whether TQM is a management theory, a fad or just a set of management techniques for ensuring consistency and satisfactory performance by organizations, products or services. Consequently, establishing a clearer theoretical base for TQM will contribute to an improved understanding of the field’s existing position (ibid). A central question in these studies is whether quality – due to the philosophy and approaches surrounding it – truly does change activities on the shopfloor, or if it is only a question of new terminology, used to give a facelift to an established knowledge base. The question of terminology is closely related to the debate as to whether quality and associated quality approaches are simply fashions or fads1 (Foley, 2001; Rogberg, 2006; Van Der Wiele et al., 2000). These issues are important and valuable for practitioners of quality as well as for the community at large because research usually precedes both teaching and practical implementation (Becher and Trowler, 2001; Czarniawska 2007; 2011; 2011 Falkh emitter, 2014; Härnsten and Wingård, 2007; Winther Jørgensen and Phillips, 2002). At best, research, science and practice will be involved in a dynamic and nurturing relationship (ibid). Hence, a better understanding of developments in the relevant research fields could provide insight and understanding into how quality activities have been perceived and have evolved both inside and outside of the academic community - offering not only a glimpse into history but also hopefully an indication of the future.

Given the interest in the quality-related epistemological issues accounted for above, it is not surprising that researchers have taken an interest in research on quality as a source for studying the development of the field (Ahire et al., 1995; Aquilani et al., 2017; Bajaj et al., 2018; Boaden, 1996; Brown, 2013; Coleman, 2013; Dale et al., 2007; Dean and Bowen, 1994; Fredriksson and Isaksson, 2018; Giroux and Landry, 1998; 1 The topic of management fashions and fads is elaborated in the theoretical section.
Gupta et al., 2014; Miller et al., 2018; Nettle, 1995; Perla and Parry, 2011; Rahman and Sohal, 2002; Sanderson, 1995; Sousa and Voss, 2002; Thiagarajan and Zairi, 1997; Zain et al., 2001). However, with the exception of a handful of studies, the dominant research method has consisted of various forms of literature reviews (Dereli et al., 2011; Lo and Chai, 2012). For this reason, and as the field’s digital archives are now approximately 30 years old and counting, studies taking a quantitative approach have been called for by Lo and Chai (2012). According to Lo and Chai (2012), the main purpose of such studies is to provide a complementary picture of the field, thereby increasing our understanding of research as well as practice. The work that has led up to this thesis has been inspired by the notion of applying new perspectives to existing models and frameworks of the epistemological formation of quality, and the exploration of text-mining methodology has been proposed as a suitable approach. The aim of text mining is to look for valuable patterns, correlations and trends in large datasets with the help of statistical and mathematical techniques, a process that is too complex and resource-intensive for manual processing. Additionally, there do not appear to be many text-mining studies targeting quality. Additionally, text mining seems to offer a way to bridge the divide between qualitative and quantitative studies in that it uses statistical procedures to find patterns and trends in unstructured data (i.e., text). Finally, text mining is rapidly developing as a method to generate high-quality data, and it is therefore of great interest to examine its potency for the purpose described here.

1.2 Purpose and research questions

The purpose of the thesis is twofold: 1) to examine the epistemological formation of quality as a paradigm and 2) to explore the application of text mining.

RQ1 - In what ways can text mining be used to provide new insights into quality as a paradigm, and what is required to apply such a methodology?

RQ2 - How can the epistemological formation of quality as a paradigm be described and understood?

1.3. Structure of the thesis

The thesis consists of eight chapters and six appended papers. The thesis can be structured into four main parts, see Figure 1.

Part 1: Consists of an introduction to and description of the research purpose, followed by theoretical and methodological sections. The theoretical frame of
reference presents quality from a historical and epistemological perspective as well as existing ways of describing the field. The methodological section presents how the research design is connected to the overall purpose of the thesis as well as how the studies have been conducted.

Part 2: Consists of results in the form of summaries of the appended papers, analysis, and conclusions that reconnect the research purpose and research questions.

Part 3: Consists of discussions regarding results, research design and the epistemological formation of quality as a paradigm. Presents concluding outlines regarding future research agendas.

Part 4: List of references and appendix containing papers A, B, C, D, E and F in full text.

![Figure 1 Structure of the thesis](image_url)
2. THEORETICAL FRAME OF REFERENCE

The aim of this chapter is to present theoretical frameworks as well as general concepts and definitions that are relevant to the research and are applied in the upcoming analysis and conclusions of the thesis, as presented in Figure 2.

Figure 2 Overview of the theoretical chapter

2.1. Chapter outlines

The chapter begins with a short mainstream introduction to research on quality and presents the general outlines of the discipline. As a way of making sense of the historical contexts in which research on quality has grown, this chapter follows historical perspectives on the evolution of the field. This discussion is followed by examples of existing definitions and theoretical models of the discipline. Then, the chapter amplifies the critical viewpoints by raising fundamental epistemological issues. Next, the perspectives of fashions and fads within management research are presented and related to research on quality. The succeeding chapter addresses research publications as study objects and as means of understanding academic formations and constructions. Consequently, it becomes natural to revise previous
studies of QM research, where a qualitative bias is observed. Finally, text-mining methodology is suggested as a way of adding new perspectives on research on quality and, hence, on the field as a whole.

2.2. Terminology

Setting the stage, it is appropriate to illuminate an issue of terminology. The main object of study in this thesis is research on quality. It is probable that some readers will instinctively question why the research object is not simply labelled QM- or TQM-research? This is a legitimate question indeed. However, the issue of naming and labelling the discipline and paradigm as well as its associated concepts is complicated. It is even questionable whether there exists a standalone quality discipline or paradigm. Hence, with the goal of keeping an open mind regarding the possible existence of a quality discipline or paradigm as well as how it should best be described and labelled, the term “quality” is used when referring to concepts, work and the community in general, and “research on quality” is used when specifically treating the research itself. However, aiming for transparency and as a way of portraying the complexity of this issue, to the fullest extent possible, original labels have been used when referring to other authors, publications and contributions in the field. Thus, terminologies such as QM, TQM and BE may be treated synonymously depending on the labels chosen by the cited author(s).

2.3. Introducing Quality

The issue of quality in products and services has interested researchers and practitioners for decades, some would even argue millennia (Perla and Parry, 2011; Sanderson, 1995; Schoengrund, 1996). However, it is in the 20th century, with the teachings of the so-called quality gurus Shewhart (1939), Feigenbaum (1951), Deming (1986) and Ishikawa (1985), that quality became a high-priority management area in its own right (Brown, 2013; Dale, et al., 2001). Whereas some researchers, such as Anderson et al. (1994), Butman (1997) and Zairi (2013), have turned their attention towards the named quality gurus, others have focused on the statistical roots of QM (Coleman, 2013; Fisher and Nair, 2009; Kanji, 1994). National perspectives are adopted by Nettle (1995), Rahman and Sohal (2002) and Zain et al. (2001), whereas the dynamic relationship between the western world and Asia, most notably the USA and Japan, has been a central perspective on QM and its historical development for Dahlgaard-Park (1999; 2011) and Dahlgaard-Park, et al. (2013). Out of the shared interest of researchers, gurus and practitioners around the globe to better understand quality improvement work, a phenomenon grew that has been referred to as a quality revolution or the quality movement (Kanji, 1990). The quality movement strongly resembles what many would categorize as an academic
discipline or paradigm, including all that comes with it – scholars, scientific journals, conferences, etc. However, within the quality movement, as in so many other management disciplines, some fundamental questions appeared early on – most of which remain relevant today. Most notably, it remains unclear how to properly name and define the potential academic discipline that the quality movement is founded upon, i.e., what are its synonyms and what are its specific, separate, concepts (Boaden, 1996; Dale et al., 2007; Dean and Bowen, 1994; Giroux and Landry, 1998; Klefsjö et al., 2008; Singh and Smith, 2006; Sousa and Voss, 2002; Zbaracki, 1998)? Many different terms have been suggested and used during the last decade, such as Quality Control (QC), Total Quality Control (TQC), Company Wide Quality Control (CWQC), Zero Quality Control (ZQC), Quality improvement (QI), Quality Management (QM), Total Quality (TQ), Total Quality Management (TQM) and Business Excellence (BE) (ibid). Consequently, confusion, misunderstanding and implementation problems have followed the quality movement, as has an intensive debate over what is actually the core or pillars of the discipline and what are just trends, fashions and fads (ibid).

2.4. Historical perspectives on quality

Some trace the quality movement as far back as ancient China, Egypt, Greece and Rome (Juran, 1995; Perla and Parry, 2011; Sanderson, 1995; Schoengrund, 1996). However, a more common way of describing the different evolutionary steps of QM

Figure 3 Quality Management Evolution in four phases, inspired by Bergman and Klefsjö (2010), Dahlgaard et al. (2007), Dale et al. (2007) and Garvin (1988)
is by presenting it in four phases which started at the beginning of the 20th century (Bergman and Klefsjö, 2010; Dahlgaard, et al., 2007; Dale et al., 2007; Garvin, 1988). The four phases are inspection, quality control, quality assurance and TQM (ibid), as illustrated in Figure 3.

This way of presenting history has been challenged as being overly simplistic in its sequentiality, too western-oriented and excessively focused on technology (Dahlgaard-Park, 1999, 2011; Kroslid, 1999). Dahlgaard-Park (1999, 2011) favours a more dynamic, wavelike, learning interaction between the west, especially the USA, and Japan, where both sides acquired knowledge from each other, developed that knowledge, and then re-inspired each other (ibid).

Kroslid (1999) also presents a more dynamic and complex view of history in which he identifies two schools of thought in QM: the deterministic approach and the focus on continuous improvement (ibid), Figures 4 and 5. In his view, QM went from a focus on the product to embracing a process-centred approach and finally to a cultural focus (ibid). Accordingly, the level of development, referring to the effectiveness and capability of the improvement efforts, gradually increased from an initial low level to a very high level (ibid).
The deterministic school should be seen as grounded in the product- and inspection-oriented approach in which quality is achieved by rigid control in all levels of production (ibid). Founding fathers of the deterministic school include Taylor and Crosby (ibid). In contrast, the school of continuous improvement – with Deming, Juran and Ishikawa as forefathers – regards quality as inherently incomplete; thus, the purpose, and hence, the soul of QM lies in achieving continual improvement of everything ceaselessly (ibid). From this perspective, quality immediately starts deteriorating when an organization looks at it as a standard that all need to settle upon and conform to instead of looking for improvements, however small, every day (ibid). As Deming, Juran and Crosby are often referred to as the quality gurus and founding fathers of QM, it might be surprising to find them separated in the way Kroslid (1999) presents them. However, Crosby (1999) actually never saw himself working in the same field as Deming and Juran, which is why it might be fully legitimate to divide them in such a fashion:

“I considered their ideas irrelevant to my work. I think they returned the thought. We were not important to each other” (Crosby, 1999, p. 207).

However, Crosby did value his contemporaries for their insights on statistics (Deming) as well as quality control and quality engineering (Juran) (ibid). Crosby (1999)’s perspective was that he himself was working with QM. In a historical survey of paradigm shifts in QM, Weckenmann et al. (2015) find that four major shifts can be identified during the last 100 years, alongside a large number of smaller developmental steps, illustrated in Figure 6.
The first paradigm, following the early era of mass production from 1900-1940, concerned product quality and quality inspection (ibid), Figure 7. In response to the need to combine increasing requirements regarding delivery time, production costs and expected quality, a shift to process quality took place, which demarcates the second paradigm (ibid), Figure 8.

Within this paradigm came QC, quality assurance and Statistical Process Control (SPC) (ibid). In the 1980s, it became increasingly obvious that the product-related process philosophy that prevailed had to be widened to include a broader palette of dimensions (ibid). This widening resulted in a third paradigm, which expanded the mainly linear process base of quality towards a system-oriented view that included not only the linear dimensions of a value-creation process but also, as a second dimension, its connections and interdependencies with all other processes and activities in the organizations (ibid). This system-quality perspective paved the way for QM and the ISO 9000 series (ibid). According to Weckenmann et al. (2015), the fourth – and currently last – TQM paradigm is fully visible from approximately 2005 onwards. This TQM paradigm is characterized by the fact that the concepts of QM are also used in areas that have no direct competition but that seek
their own improvements, such as education, health care and public administration (ibid).

Furthermore, the influence of employees – as opposed to machines or other technical components – is assigned ever-greater importance (ibid). According to Weckenmann et al. (2015), these shifts are currently visible through the TQM and BEMs, which consider the organization to be both an economic and a social actor by taking not only financial results but also employee- or society-related results into account, illustrated in Figure 9. Additionally, Weckenmann et al. (2015) identify two major engineering challenges that must be resolved to assure success in any quality activity. On the one hand, there is a need to ensure employee competence as a base for high-quality products and continuous innovation (ibid). On the other hand, there is a need to control innovation and development processes, ensuring that products enable healthy growth and a focused, sustainable improvement of the enterprise (ibid).

Finally, Weckenmann et al. (2015) extrapolated possible future directions for quality management, which can be summarized overall as responsibility; that is, the organization will be assessed for its ways of acting, including not only its sustainability but also its honesty, reliability and treatment of employees. In their analysis of the current situation, Weckenmann et al. (2015) find that there are three aspects of special importance that describe major fields where further developments in quality management are needed. The first challenge lies in fully considering and determining quality as it is perceived by the customer (ibid). The second aspect is to develop more human-focused activities so that human beings are involved with their full range of specific needs and requirements (ibid). The third aspect concerns increased usage of data mining and knowledge discovery technologies, so-called intelligent quality management (ibid).

Maguad (2006), for his part, views the modern quality movement as the continuation of an age-old human endeavour that dates back to the beginning of civilization. Human beings have always encountered problems pertaining to quality, although the approaches employed to manage those problems have differed from era to era (ibid). However, the 20th century moved quality to centre stage due to the emergence of massive forces that demanded a quality revolution (ibid). Hence, Maguad (2006) foresees that it will probably take decades, if not a whole century, for the quality management discipline to mature. Thus, it is possible that the 21st century may well become known to historians as the century of quality (ibid). Although the approaches differ in technique, emphasis and application, the
objective of the teachings of quality gurus during the so-called quality century remains the same: continuous improvement of every output, whether it is a product or a service, by removing unwanted variation and by improving the underlying work processes (ibid). Looking ahead, it is almost certain that market developments will create ever-higher expectations and higher demands on goods and service providers (ibid). To succeed in such a dynamic environment, business must continue to focus on innovation, flexibility and speed (ibid). Thus, the challenge for quality professionals will be that of becoming change masters rather than just being quality managers (ibid). Furthermore, as quality evolves from the industrial age to the information age, it is likely that there will be an increased application of quality principles to information and knowledge management (ibid). Additionally, quality in the 21st century will probably become a culture-changing strategy that will be used to fight social ills and promote the equal distribution of wealth and equal access to sources of progress, such as higher education and advanced health care (ibid). In summary, Maguad (2006) views quality as a means of protecting humanity – in the new millennium – from disruptive changes to the environment and of improving the social and economic lives of many.

2.5. Defining and theorizing quality

In the 20th century, quality attracted increased interest from the manufacturing industry as well as other parts of society (Brown, 2013; Coleman, 2013; Dahlgaard-Park, 1999; Dahlgaard-Park, et al., 2013; Nettle, 1995). This mounting interest is often referred to as the “quality movement” or the “quality revolution” (ibid). However, the movement or revolution is seldom defined or specified, leaving the concepts broad and vague. Nonetheless, frameworks and definitions have been presented, aiming to explain the theoretical foundations of quality initiatives. Usually, these theoretical contributions go hand in hand with specific terminology, such as QM and TQM, without specifying the difference between the associated terminologies. This is troublesome, as one risks comparing and discussing apples and oranges.

Reeves and Bednar (1994) argue that definitional difficulties account for many of the inconsistent and often-contradictory empirical results found in the quality literature. In an attempt to clarify and explicate definitions of quality, four roots of definitions of this concept are identified: quality as excellence, quality as value, quality as conformance to specifications and quality as meeting and/or exceeding customers’ expectations (ibid). Each perspective has strengths and weaknesses in relation to measurement and generalizability, managerial usefulness, and consumer relevance (ibid). Consequently, before adopting a guiding definition, it is necessary for both practitioners and researchers to examine these strengths and weaknesses as well as the inherent trade-offs of accepting one definition over another in relation to the mission at hand (ibid).

Deming (1986) has also commented on the issue by stating that:
“The difficulty in defining quality is to translate future needs of the user into measurable characteristics, so that a product can be designed and turned out to give satisfaction at a price that the user will pay” (Deming, 1986, pp.168-169)

Furthermore, Deming despised much of what is related to the quality movement as well as terminology such as TQ and TQM, which in his eyes had become superficial labels for tools and techniques (Senge, 1992; 2006). In Deming’s opinion, the effects of such labels were counterproductive because they stopped people from thinking (ibid); this was unfortunate, as Deming’s main mission was the opposite: to transform management with the help of his profound knowledge (ibid).

Subsequently, Gopal K. Kanji, founder and editor of two international academic journals concerning QM (Journal of Applied Statistics and Total Quality Management and Business Excellence) defined the research area as follows:

“TQM is the way of life of an organization committed to customer satisfaction through continuous improvement. This way of life varies from organization to organization and from one country to another but has certain essential principles which can be implemented to secure greater market share, increase profits and reduce cost” (Kanji, 1990 in Dahlgaard, et al., 2007)

Kanji (1994) later presented the TQM pyramid as a way to conceptualize and explain the main ideas of the field. The pyramid consists of general governing principles and the core practices that translate them into action, visualized in Figure 10. The general governing principles are as follows: delight the customer, management by fact,
people-based management and continuous improvement (ibid). The core practices are customer satisfaction, internal customers are real, all work is a process, measurement, teamwork, people make quality, continuous improvement cycles and prevention (ibid).

Another way of describing QM is put forward by Hellsten and Klefsjö (2000), who portray QM as consisting of tools, methodologies/techniques and values, visualized in Figure 11. The values (continuous improvement, base decision on facts, focus on customers, focus on processes, top management commitment and let everybody be committed) are identified as fundamental elements of QM by Bergman and Klefsjö (2010). The values, often presented as a cornerstone model, are visualized in Figure 12 (Bergman and Klefsjö, 2010).
Furthermore, Oakland (2014) presents a framework for QM consisting of a core of hard management necessities: planning, performance, processes and people. The core is held together by soft outcomes: culture, commitment and communication (ibid). Accordingly, performance is achieved using a business excellence approach and by planning the involvement of people in improving the processes visualized in the model shown in Figure 13 (Oakland, 2014, p. 27).

![Figure 12 Interpretation of The Cornerstone Model (Bergman and Klefsjö 2010)](image1)

![Figure 13 The 4 Ps and 3 Cs of TQM (Oakland 2014)](image2)
Garvin (1984) presents five approaches to quality: transcendent, product-based, user-based, manufacturing-based and value-based. The transcendent approach makes quality synonymous with "innate excellence" (ibid). However, quality cannot be defined precisely; one learns to recognize it by experience (ibid). The product-based approach offers an opposing view of quality as something precise and measurable (ibid). Differences in quality reflect differences in the quantity of some ingredient or attribute possessed by a product or service (ibid). The user-based approach centres on the subjective and personal views and preferences of the customer, i.e. "the customer is king" (ibid). The manufacturing-based approach instead focuses on the supply side of quality, primarily engineering and manufacturing practice (ibid). High quality is seen as “conformance to requirements”, with any deviation implying a reduction in quality. Finally, the value-based approach views quality as a combination of performance and acceptable price or cost (ibid).

Sandholm (1999), in turn, observes that a quality culture of total quality is characterized by customer focus, process orientation, participation and empowerment, and continuous improvement. The culture differs from company to company depending on the level of maturity in the organization (ibid). Five stages of a quality culture are identified: dormant, awakening, groping, action and maturity (ibid). An organization wishing to move in a positive direction needs a strategic plan based on four elements: commitment of top management, cultural change, improvements and systematic approach (ibid). The strategic plan, then, needs to combine a variety of concepts, views and methods that resonate with the cultural maturity of a company (ibid).

Oliver (2014) proposes an interesting way of closing the gaps between scholars by acknowledging that historically, quality was believed to derive from technological excellence in manufacturing. Oliver (2014) then argues that quality is a consumer-generated comparative judgement, yet he finds that these historical and technological definitions of quality may serve a positive purpose as comparative referents because individuals have no implicit sense of quality unless a standard of comparison is provided. This point can be summarized as arguing that technological quality has a valid role to play when transforming consumer preferences into quality dimensions of a service and product (ibid). However, these quality dimensions are always subordinated to the consumer experience, and as soon as a consumer is capable of envisioning the characteristics of a technologically better product, consumer preferences will always outweigh technological quality (ibid).

2.6. Epistemology, paradigms and quality

According to Perla and Parry (2011), epistemology is the branch of philosophy generally concerned with the nature of knowledge through questions such as “How do we know?” and “What is meaningful knowledge?”. The understanding of what
it means to have knowledge in a certain field and the contexts and circumstances that have shaped this knowledge are fundamental questions that researchers and philosophers have explored for centuries (ibid). Furthermore, Perla and Parry (2011) illustrate and simplify Plato’s definition of knowledge by stating that it exists at the intersection of truth and belief; knowledge cannot be claimed if something is true but not believed or believed but not true. For quality improvement issues, this understanding is of great importance because the point of quality management is to successfully implement positive changes on the ground (ibid). “Understanding how best to maximize the overlap between actual and best practice is where quality improvement needs to employ educational and social sciences’ methodologies and techniques.” (Perla and Parry, 2011, p. 27) What better way to employ this than by testing it on one’s self, trying to better understand where the quality-research community’s beliefs in scientific evidence lie and consequently better understand where those beliefs intersect with knowledge.

Barouch and Ponsignon (2016) find that managers’ familiarity with epistemological foundations is a condition for the success of QM programmes. Hence, they propose a generic framework for QM that is grounded in three philosophical paradigms: pragmatic, systemic and constructivist (ibid). The suggested QM framework consists of six concepts: customer and stakeholder focus, management commitment and leadership, employee involvement, process management, continuous improvement and partnerships with customers, suppliers and society (ibid).

Interconnected with epistemology are paradigms, which, according to Patton (2015), are worldviews and ways of thinking about and making sense of the complexities of the real world. Paradigms are normative, informing practitioners about which activities are legitimate without the necessity of long existential or epistemological consideration (ibid). Consequently, paradigms dictate what is important, legitimate and reasonable (ibid). This power makes paradigms double-edged swords; on the one hand, they make decisions about what to do relatively easy (ibid). On the other hand, motives and inducements for key decisions become obscured in the unquestioned assumptions of the paradigm (ibid). This is important to keep in mind as the paradigm-derived biases contain value-laden prejudices concerning what constitutes credible and valuable contributions to knowledge (ibid). Such prejudices and paradigmatic blinders limit methodological choices, flexibility and creativity (ibid). Consequently, training and academic socialization tend to make researchers biased in favour of and against certain approaches (ibid). Similarly, Arnbor and Bjerke (2009) view paradigms as part of a “conceptual language” developed by theorists of science when discussing the relationship between ultimate presumptions and the practical use of various methodological views. Paradigms are seen as consisting of a conception of reality (vision of the world), a conception of science, a scientific ideal and ethical/aesthetical aspects (ibid). Methodological views have the
double function of encompassing some ultimate presumptions while providing prerequisites for the design of practical instruments (ibid). The practical operationalization is tied together by the concept of the operative paradigm, which acts as a bridge between methodological views and the study area. Hence, Arbnor and Bjerke (2009) underscore the necessity to consequently relate operational issues to ultimate presumptions, i.e., to some paradigm. A summary of the relationships between the concepts is illustrated in Figure 14.

![Figure 14 Key concepts Arbnor and Bjerke (2009)](image)

Arbnor and Bjerke (2009) highlight that paradigms are usually quite stable and not exposed to major forces of change. To constantly question the constitution of reality or our scientific opinion would render practical research difficult, if not impossible (ibid). Operative paradigms, however, may change fairly often depending on the shifting character of the study area and the type of operative paradigm in question (ibid). Tsutsui (2001) looks into why the Japanese paradigm has, to some, become a beacon of enlightened labour management and responsible technological development, while others excoriate it as an intensified Fordist purgatory. Tsutsui (2001) sees the culturalist interpretation, which ascribes the distinctive nature of Japanese methods to a unique legacy of social organization, as a limited analytical framework for analysing the Japanese experience of industrial production. Additionally, the view that instead stresses Japanese proficiency at imitating management techniques once revered, but then largely forgotten, in the United States is seen as stereotyped and just as unconvincing as the culturalists’ dogma (ibid). According to Tsutsui (2001), the discourse on Japanese management has been dominated by business experts, journalists, and social scientists, who have largely refrained from seeking historical affirmations for their views. Consequently, constructing a new narrative of the evolution of Japanese methods can bring meaningful relief from fractured and polarized readings that dominate the current discourse on Japanese industrial management (ibid). It is hoped that such a narrative will release the interpretative deadlock between traditional versus modern, native versus imported, liberating
versus oppressive and “post-Fordist” versus “ultra-Fordist” (ibid). Hence, by examining Japanese management in its full historical complexity and specifically by reconceiving of it as the product of a century-long dynamic of foreign inspiration and indigenous adjustment, Tsutsui (2001) seeks to provide a new coherence to contemporary understanding of the Japanese model and its origin (ibid). The reception and adaption of American managerial ideas in Japan is the prism through which the development of the Japanese management paradigm is scrutinized, i.e., Tsutsui (2001) examines how American managerial models were “sold”, publicized, packaged and disseminated to the corporate elite, industrial labour, and the general public. From this viewpoint, Tsutsui (2001) sees Taylorism as extending far beyond workshop methodologies to constituting a broadly defined ideology of management, an ideology that transcended the factory to structure debates over economic policy, social stabilization, industrial relations, and bureaucratic authority. The Japanese refinement of Scientific Management, eventually systemized and disseminated as the total quality control concept of the 1960s, allowed firms to exploit the technical benefits of Taylorism while avoiding the determined opposition of workers and labour unions (ibid). Thus, while remaining consistent with Taylorite imperatives, the Japanese practice of modern management ultimately traced a distinct trajectory of development (ibid). By seeing the evolution of Japanese industrial management as an ongoing interchange between foreign models and domestic constraints, i.e., a long-term process of imitation and innovation, Tsutsui (2001) seeks to challenge simplistic popular notions of the origins of the Japanese paradigm. Neither culturalist essentialism nor a genius for mimicry can adequately account for the apparent contradictions of contemporary Japanese management (ibid). Consequently, the Japanese management paradigm should be seen as both an evolutionary advance upon classic mass production and as a potentially revolutionary departure from the orthodoxy of the American assembly line (ibid). Schonberger (2007) comes to a similar conclusion, stating that the core of Japanese management seems built to last and that a large set of Western innovations blend well with those from Japan. At the core of Japanese management are quality, flexibility and quick response as well as concepts and techniques of employee involvement (ibid). However, many aspects of company management still beg for innovative solutions: better ways of tapping the hearts and minds of customers, advances in the management of innovation and insights into how to sustain and build on best practices (ibid). Schonberger (2007) expects breakthroughs in these areas and that advancements will continue to consist of a mutually enriching combination of the Japanese core and Western innovation (ibid).

Xu (2000) seeks to illuminate the relationship between discourse and knowledge and chooses quality as a case study with which to do so. The aim is to demonstrate that language, through modes of the discursive formation of quality, produces an effect
that may be taken as knowledge (ibid). Accordingly, Xu (2000) sets the condition that there is no ahistorical moment for researchers; the momentary character of knowledge production is applicable to everyone who attempts to make claims. Hence, knowledge should be seen as a momentary enterprise, “a way-station along a way”, which evokes movement (ibid). Xu (2000) views texts as key sources for this purpose and argues that lack of time and patience has made scholarly readings of early texts on quality rare, which is why historical detail is now put in the limelight. In this effort, Xu (2000) highlights the difference between what a person has said and interpretations of the same. These interpretations leave room for manoeuvring that makes the shaping of concepts possible (ibid). Consequently, if every interpretation constitutes a degree of betrayal to a source, striving for “authentic representation” of the original is illusory (ibid). Referring to Munro (1995), the elusiveness of quality appears to be one of its inherent resources (ibid). This in turn creates a dilemma: the harder one tries to define quality, the further away one seems to be from its essence (ibid). However, Xu (2000) finds it intriguing that quality cannot be captured by an all-embracing definition. Hence, Xu (2000) suspends the efforts to define quality and instead focuses on delineating quality’s discursive connections. Xu (2000) finds two discursive objects: standards and quality generated by discourse among engineering, marketing and specialization. Standards emerge as discursive objects as engineers are able to convert technical features of a product into numbers and the presence of numbers replaces that of the product (ibid). In the same way, the presence of standards enables the absence of products (ibid). Just as the presence of numbers manifests a certain materiality, standards can also be treated as objects (ibid). However, working with standards requires more than establishing technical specifications, giving standards a code and disseminating them (ibid). Standards are a powerful form of intervention that can take on many forms, e.g., quality awards, BEFs and ISOs (ibid). Regarding quality, the boundaries of engineering and marketing constitute a non-inscribed space where the fixed (engineering) and the moving (marketing in the form of changing customer demands) modes of quality converge (ibid). In Xu’s own words: “Beyond the thresholds of mainstream discourses of engineering, marketing and specialization emerges a discursive object, ‘quality’, which stands no longer for an engineering concept; nor can it be dictated entirely by the market.” (Xu, 2000, p. 442) Over time, it has become inadequate to consult engineers or to rely on managers to solve problems concerning quality – cooperation and integration are needed (ibid). Additionally, given this need, a lack of agreed-upon definitions does not prevent the presence of a discourse on quality (ibid). Furthermore, a common understanding is not a necessary condition for speaking and writing about quality (ibid). Quality has become a discursive object that has taken on a life of its own (ibid). In conclusion, Xu (2000) finds that the empirical lies also in the historical and that
texts are artefacts of perspectives from the past that constitute conditions for the present. It is discourse that produces the effect of knowledge on quality (ibid).

In closing, Ramirez and Tipliç (2014) view higher education around the globe as in a state of flux, seeking the holy grail of excellence and invoking world standards and “best practices” as road maps in this quest for excellence. Härnsten and Wingård (2007) point to three questions: Can the academy navigate the turmoil and confusion of the 21st century wave of mass education? Who is deciding what is considered relevant knowledge? How is this relevant knowledge generated?

2.7. Fads, fashions and quality

According to Sandholm (1999), several trendy quality strategies have been observed since the 1980s. However, applying what is trendy at the moment will not generate good results (ibid). Sanholm (1999) names zero defects (ZD), quality circles, quality function deployment (QFD), statistical process control (SPC), ISO 9000, TQM, benchmarking, and balance scorecards as fashions that will fade away, if they have not already. The fault does not lie with these initiatives as such but in the way that they are implemented (ibid). Instead of deploying them to tackle a specific problem or customer need, they are, in the West, used as a general approach to improvements that lead to marginal results (ibid). Lillrank (1995) takes a different perspective, noting that despite the increasing interconnectedness of the world, organizational innovations – as opposed to capital and technology – take years, even decades, to cross the globe. The delay can be understood by reviewing the variables incorporated in a transfer process of complex systems, which include the level of abstraction (high and low), if the system is demand- or supply- driven and the type of managerial content transferred (management principles, organizational vehicles and management techniques) (ibid). The transfer process of management innovations from Japan to the West during the 1980s is illustrated in Figure 15. Figure 15 shows that simple methods and techniques with low organizational-context-dependence are straightforward to copy and implement. Furthermore, Figure 15 illustrates that core ideas or functions of an organizational innovation need to be abstracted and then recreated in an application that serves local conditions. Lillrank (1995) stresses that a significant amount of application work is necessary at the receiving end, especially concerning organizational forms. Lillrank (1995) uses the quality control circle (QCC) as an example of a Japanese organizational innovation that was transferred to the US and Europe in the 1980s through a low-abstraction demand-driven channel that did not properly transfer organizational and strategic significance. Consequently, the QCC soon fell out of fashion and was replaced by other management concepts such as time-based competition (TBC) (ibid). However, as time passed, the fundamental ideas behind the QCC started to make their way through high-abstraction channels, and unique Western organizational applications
started to emerge, such as continuous improvement (CI) and lean production (ibid). Hence, Lillrank (1995) concludes that the most promising organizational transfers occur by implementing an intelligent learning process, where examples from abroad are used as stimulations for an organization’s own thinking.

![Figure 15 The transfer process of management concepts Lillrank (1995)](image)

According to Rogberg (2006), research dealing with the spread of popular management models has mostly paid attention to how executives are attracted to the general message advocated, and such research has indeed observed fashion life cycles amongst management models. Rogberg (2006) also states that within this research community, there exists a widespread assumption that fashion is peripheral and unimportant, something Rogberg (2006) strongly questions: his results show that a steady stream of new, fashionable, management models are accepted as starting points for organizational change in reality, not only in principle. Abrahamson and Eisenman (2008) elaborate on the topic of fads and fashions in employee-management techniques. The central message is that the language of repeated waves cumulates in management fashion trends as opposed to independent, transitory, and non-cumulative fads (ibid). Abrahamson and Eisenman (2008) note that scholars have tended to use the terms fads and fashion indiscriminately when the two in fact derive from two very different theories, as they describe very different social processes (ibid). Both orientations focus on popularity waves of one or several management techniques; however, fads are collective behaviours thought to arise from an episodic conjunction of forces triggering their diffusion, whereas fashions result from supply and demand in a knowledge market (ibid). Studies that explicitly or implicitly rely on the theory of fads have dominated the scholarly literature (ibid). Hence, scholars have generally studied one single management technique at a time independently of other management techniques in the prevailing popularity wave (ibid). Consequently, management techniques classified as fads have largely been considered insignificant, non-rational waves with little or no lasting impact (ibid). Theories of fashion, on the other hand, view the language of management techniques as
cumulating over time, just like other fashions (ibid). From this standpoint, management techniques are, thus, likely to have multi-fashion, important and cumulative impacts on the prescriptive language of management techniques and on the behavioural enactments of these prescriptions (ibid). Herein lies the advantage of the theory of fashions over the theory fads, as the first provides a cumulative and directional dimension (ibid). From this perspective, fashions both grow out of and extend previous fashions rather than constituting individual and unpredictable fancies (ibid).

Czarniawska (2011) problematizes a perhaps common notion that fashion in research is necessarily a bad thing. Czarniawska (2011) underlines that fashion is not only a cultural phenomenon but also a production system and that it is necessary to find a balanced approach between the two so as not to develop tunnel vision. Fashion, understood as the prevalent way of doing something, has a close connection to what Kuhn and others call a paradigm (ibid). What seems to be the case is that instead of studying fashion or paradigms in order to better understand them, researchers get stuck in moralizing the phenomenon. Therefore, it is easy to miss the potentially progressive momentum of fashion, making it a paradox in itself – promoting both innovation and “dime-a-dozen mass-production” (ibid). As Czarniawska (2011) so colourfully puts it: “On the one hand, its variety is limited by the iron cage of existing institutions, which fashion reproduces; on the other hand, fashion is engaged in a constant subversion of the existing institutional order, gnawing at its bars.” (ibid. p.601)

Czarniawska and Panozzo (2008) argue that managerial fashions have been “rationalized” by framing them into a supply-and-demand model, where authors try to show that there must be something rational about fashion, otherwise, managers would not follow fashions. In the same vein, it could be argued that there exists a demand among managers and a supply from consultants; consequently, fashions come and go (ibid). It is hard to determine who is “wagging the dog”, but rationally, fashion cycles keep coming and going (ibid). Czarniawska and Panozzo (2008) also claim that densely populated settings such as big cities, social networks and organizational fields facilitate and encourage imitation. Furthermore, Czarniawska and Panozzo (2008) offer a modern interpretation of Gabriel Tarde, who, they argue, contrasted fashion with custom. The inventions and innovations that are imitated are allegedly superior, first because of their qualities, and then depending on who coined and circulated them (ibid). Determining the underlying reason for a fashion is not always easy because the two easily intertwine, with the fashion’s spokespersons sometimes obscuring its real quality (ibid). The third type of superiority of fashion is that which has many allies in other areas, making it well anchored and not threatening to existing institutionalized structures (ibid). Finally, Czarniawska and Panozzo (2008) take up the notion of translation not being a
neutral transformation from one language to another, adaptation is always made –
fashion is created when it is followed. Translation simultaneously produces and
reproduces variations in fashion, as repetition creates and re-creates difference
(ibid).
Trout (2004) acknowledges rises and falls in what he calls intellectual fashion;
however, he tries to clarify how such trends influence the evolution of the quality of
theory. One main point is that classical sciences, such as theoretical physics, do not
aim to be normative or to offer humans useful guidance about important matters,
whereas epistemology does (ibid). He further states that if epistemology is to live up
to its normative promise, it must embrace what he calls Ameliorative Psychology
and start down the road to epistemological excellence: the efficient allocation of
cognitive resources to robustly reliable reasoning strategies, all applied to significant
problems (ibid). A way of pursuing this road is to focus on hard theories, i.e., those
that are easier to subject to reliable testing, as opposed to soft theories (ibid).
Starbuck (2009) conceptualizes four detrimental beliefs that he finds harmful for
science and that are the reasons for faddishness: that research lends itself to mass
production, that mechanistic descriptions adequately portray behavioural and social
processes, that generalizations ought to be broad and that statistical methods
provide useful insights even if researchers misuse them. He further states that
knowledge production has only been weakly cumulative, with new theories and
methods supplanting earlier ones rather than built upon later ones (Starbuck, 2009).
Starbuck (2009) compares Kuhn’s paradigms to what he sees as fads in social science,
but he sees two differences:
1. Whereas Kuhn’s different and replacing paradigms aim at explaining more
or less the same phenomena, successive fads, by contrast, in the social and
behavioural sciences have picked up different topics and have sought to
explain rather different phenomena.
2. Kuhn’s description of paradigm evolution, according to Starbuck (2009),
was driven by a paradigm’s inability to explain specific phenomena,
whereas the ideas behind social and behavioural fads have generally been
so ambiguous and general that it is impossible to find phenomena that
they actually contradict or predictions that they cannot make. Social and
behavioural researchers seem to have abandoned topics mainly out of
disappointment that their research has not been producing new,
interesting insights, rather than out of concern for anomalies. This
disappointment with results helps to explain why new research topics
have no clear connection to preceding ones; that is, an abrupt shift in the
topic of discussion has appeal (Starbuck, 2009).
Furthermore, fads occur in part because researchers value novelty and they have
limited tolerance for imitation (Starbuck, 2009). However, shifting from theory to
theory is a sign of more than disappointment and dissatisfaction (ibid). However, if
earlier theories actually offered valuable explanations, researchers would probably have incorporated them instead of constructing completely new ones (ibid). The mass production of science creates chaff, chaff that guides by example and inspires more chaff; and this large form of social interaction serves as a model of how research is produced (Starbuck, 2009). Mechanistic theories encourage faddishness by emphasizing the importance of details and behavioural regularity at the microscopic level (ibid). In pursuit of specificity, mechanistic descriptions often call for details about which researchers have no evidence (ibid). Because they spell out processes in detail, mechanistic theories resist descriptions that are somewhat ambiguous and somewhat general (ibid). Although these properties make theories more testable, they also highlight theories’ minor flaws and portray theories’ correctness as binary (ibid). The development of general theories has escalated with the intensification of mass public education (ibid). Teachers try to make lessons meaningful to as many students possible, thus the attractiveness of broad generalizing theories. This trend is also driven by the fact that formal education emphasizes abstraction and in-principle discussions in classrooms rather than practical experiences “from the ground”, and such teaching gives students practice in applying abstract generalizations to concrete instances. Finally, Starbuck (2009) favours Weick’s proposal to put forward “theories of the middle range”, ones that are not so wide in scope that they make numerous assumptions and rely on many inaccurate observations. However, Starbuck (2009) concludes that the debate on the usefulness of broad generalizations continues because it is difficult to find a harmonious balance among generality, parsimony and accuracy, which is unclear and unstable over time.

As a reply to or continuation of the ideas of Starbuck (2009), Abrahamsson (2009) argues that studies of fads and fashions in science, implicitly or explicitly, build on the assumption that fashion in design rests on selecting problems on the basis of non-scientific criteria. The follow-up question then becomes what distinguishes “non-scientific” selections of theories and methods from “scientific selection”. Abrahamsson (2009) concludes that only by clearly defining the term “science” can scholars differentiate what constitutes a scientific fad from what constitutes science itself. Abrahamsson (2009) also classifies researchers of fads and fashion in science into two categories: the tentative ones, who ask if fads and fashions truly exist, and the ones who boldly provoke the whole academic scene, arguing that fads and fashions dominate one or all branches of social science. The latter category of scientists runs the risk of having to deal with the fury of their colleagues (ibid). Abrahamsson (2009) states that such fury is uncalled for and sees the study of fashions and trends as a way to identify and understand the causes of possible fads and fashions as well as to launch new ideas and areas of inquiry. At the end of the day, the study of fashions and trends may help a community to loosen the grip of
past theories and methods to make room for potentially new and interesting ones (Abrahamsson, 2009).

Cole and Scott (2000) view the quality movement as one of many management movements. However, the quality movement stands out in its longevity, having dominated management’s attention for almost two decades (ibid). Cole and Scott (2000) argue that students of organizations have tended to dismiss quality management and quality improvement as yet another superficial and ephemeral fad. Instead of at least assessing, not to mention guiding, the field’s development, organizational scholars have remained aloof and sceptical (ibid). Cole and Scott (2000) maintain that both researchers and practitioners can learn much by viewing quality management as a recent important instance of change and bringing the quality movement into closer dialogue with the more general formulations and enduring concerns of organizational theory. Furthermore, between academic observers and the management community, they observe a dichotomy of interpretations of the meaning and lessons of the quality movement (ibid). Whereas academics tend to ignore or discount the significance of quality improvement efforts, managers are more inclined to believe that significant changes occurred and that palpable gains were achieved (ibid). Cole and Scott explain this by the view that scholars look for evidence of the use of specific quality methodologies in a prescriptive fashion (e.g., the use of a specific problem-solving tool). When such evidence is lacking, they point to the gap between quality rhetoric and reality and shift their attention to analysing the causes of that discrepancy (ibid). Managers, for their part, want to believe that what they do makes a difference and are, hence, more willing to settle for anecdotal evidence of effectiveness (ibid).

Van der Wiele et al. (2000) have turned their attention specifically towards TQM, exploring whether it is a fad, fashion or fit. They note that criticism of TQM started in the early 1990s, and they claim that TQM does not produce sufficient results to justify the expenditure committed to its introduction and development. Additionally, TQM was seen as an excuse to streamline organizations (ibid). Furthermore, TQM was accused of producing too much inward thinking (ibid). On the other hand, looking at the historical track record in both Europe and Japan for a period between 20-40 years, it might be argued that TQM has moved in the direction from fashion to fit (ibid). However, TQM can be seen as a generic term for a management philosophy that is built on a small number of key concepts (ibid). Hence, it might be important to note that the many tools, techniques, approaches, and organizational arrangements that have been developed to facilitate the use of TQM could be considered fads in their own right as organizations have attempted to use them as stand-alone solutions to problems (ibid). In the West, TQM started attracting attention during the 1980s, and since then, two major advances have helped to spread the message and encourage involvement: the ISO 9000 series and
quality awards / BEMs (ibid). However, in many cases, little progress beyond the ISO 9000 series of quality management maturity has been made, and the only element of TQM philosophy that has been accepted is quality assurance of processes (ibid). If, then, TQM is to develop from a fad to fashion and fit, it needs to be clearly defined, measurable and to have no direct link to short-term major losses (ibid).

2.8. Studying research publications as a way of understanding a discipline

2.8.1. The sociology of science and scientometrics
The sociology of science examines a variety of connected matters, such as the social structure of science and the processes involved in the production of scientific knowledge (Zuckerman, 1988). In so doing, it resembles the sociologies of art, law, religion, politics, and economics, since each examines institutional organization, structure, processes, contexts and products (ibid). Zuckerman (1988) states that various new research procedures have been developed for the comprehensive study of specialities, and such procedures complement the traditional case study method. These new techniques can provide cognitive maps not only of specialities but also of disciplines and interdisciplinary areas (ibid). One of these disciplines later became known as scientometrics, which Leydesdorff (2001) defines as the study of the quantitative aspects of scientific communication, R&D practices, and science and technology (S&T) policies. According to Leydesdorff and Milojević (2015), the sociology of science during the 1980s was increasingly drawn to micro-analyses focusing on the behaviour of scientists in laboratories (Leydesdorff and Milojević, 2015). From this viewpoint, quantitative analysis of scientific literature at the macro-level was not considered a useful tool to explain scientific practices (ibid). Hence, scientometrics was propelled towards the library and information sciences (ibid). This development during the period 1985-2000 led the field of science and technology to branch into a qualitative sociology of scientific knowledge on the one hand and a quantitative study of scientometrics and science indicators on the other. (ibid). Consequently, unlike the behavioural sciences and mainstream philosophy of science, scientometrics focuses on texts (documents) as empirical units of analysis, illustrated in Figure 16 (ibid). Leydesdorff and Milojević (2015) highlight that texts cannot be reduced to their authors, nor can theories be reduced to the documents in which they are published. However, a measure in one dimension can be used as a proxy or indicator for the other (ibid).
Hood and Wilson (2001) stress that there has been considerable confusion in terminology among bibliometrics, scientometrics and informetrics. On the one hand, this is not surprising, as much of scientometrics is indistinguishable from bibliometrics and vice versa (ibid). On the other hand, some researchers envision that a slackness towards definitions, such as the use of bibliometrics as a synonym for all metrics studies, might lead to a crisis in the field (ibid). However, there seems to exist a general agreement that the introduction of informetrics as a generic term for both bibliometrics and scientometrics was necessary to distinguish the fields’ main concerns (i.e., scientific communication) from the science of science and library science (ibid). Hood and Wilson (2001) view the discoveries of certain regularities (power laws) as enablers for the development of the three fields. The first of these was Lotka’s law, which described a relationship between authors and papers (ibid). This was followed by Bradford’s law, dealing with the problem of the scatter of papers on a scientific subject through scientific journals (ibid). Zipf’s law addresses word frequency or occurrence (ibid). In summary, Hood and Wilson (2001) find it noteworthy that there exist three related terms used to describe part of each of these disciplines. Each term has a particular historical origin that is generally well documented (ibid). Additionally, each of these terms has a range of definitions, introduced by several authors in the field, all with considerable overlap in meaning without necessarily being synonyms (ibid). Furthermore, it seems that informetrics and scientometrics are gaining in popularity, with bibliometrics staying fairly stable (ibid). However, as researchers in the field are turning more and more towards measurement of the Internet, web and cyberspace, new terms such as netometrics,
Webometrics and cybermetrics are likely to increase in usage, which in turn will influence the development of bibliometrics, scientometrics, and informetrics. This perception is in line with Björneborn and Ingwersen (2004), who also note that the library and information sciences (LIS) and the related fields of sociology of science and science and technology studies have developed a range of theories and methodologies concerning quantitative aspects of how different types of information are generated, organized, disseminated and used by different users in different contexts. This development of terminologies is flourishing because the Web constitutes an obvious research field for bibliometrics, scientometrics and informetrics (ibid). The specific conceptual diversity and development often make it difficult to understand what is actually analysed in the contributions, which is why Björneborn and Ingwersen (2004) present a framework illuminating the relationship among the fields, illustrated in Figure 17.

![Figure 17 The relationships among the LIS fields of inform-/bibli-o-/sciento-/cyber-/webo-/metrics (Björneborn and Ingwersen, 2004).](image)

The main reason for denoting webometrics is the close linkage to bibliometrics and informetrics and to put forward an LIS perspective on Web studies (ibid). Cybermetrics, in turn, is proposed as a generic term for “the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the whole Internet drawing on bibliometric and informetric approaches” (Björneborn, 2004).

De Bellis (2014) finds that the multitude of definitions point to the fact that biblio-, sciento- and informetrics are about the application of mathematics and statistical tools to an increasingly elusive set of objects: books, science, information. De Bellis (2014), however, finds that despite the broad range of definitions, it is not necessary to be alarmed concerning potential sources of uncertainty, as the true object of most
current research in the field boils down to the quantitative analysis of published scholarly literature, notably journal articles and the network of their bibliographic connections. According to De Bellis (2014), peer-reviewed journals have been the most efficient channels of reliable, certified knowledge from the mid-17th century onward, at least in the natural and biomedical sciences. In addition, starting from the first half of the 20th century, journal articles have undergone a process of standardization relative to structure, format, and style that makes them ideal candidates for the automatic extraction of metadata, which is often a good starting point for quantitative analysis (ibid). Bibliometrics are not rooted in a particular knowledge domain. By handling information patterns that belong to the knowledge transfer process generally, bibliometrics holds the key needed to unlock the hidden structure of science and to “indicate” the occurrence of epistemic values in potentially any scholarly field: most productive, most cited, most collaborative, most “whatever” authors, groups, institutions, and countries (ibid). Defining the scientist as a paper-delivering professional whose reputation is also dependent on the network of mutual citation interlinkages in published literature was the best (or worst) service done by social studies to the burgeoning field of scientometrics (ibid). Fully embracing the ambiguities inherent in the history of science metrics, then, might just be a humble first step towards next-generation research evaluation reflecting the consensus of a wide range of scholars and interested parties, not just bibliometricians. (De Bellis, 2014)

As a cross-disciplinary rule of thumb, published articles in respected journals represent “production units” of scientific knowledge, and bibliometric distributions reflect the patterns in such outputs across authors or “producers” (Talukdar, 2011). The process of generating and accumulating scientific knowledge raises interesting research questions, such as whether there is empirical regularity in scientific productivity patterns as captured in bibliometric distributions across authors (ibid). Such questions seek insights that are not only of general interest but also of importance to researchers in various academic disciplines seeking to understand patterns of scientific productivity and their implications (ibid). Bibliometric studies may be broadly categorized as either relational or evaluative, either offering insights into the relationship between units of analysis or aiding in the evaluation of units of analysis (Stuart, 2018). In scientometrics, scientific manuscripts have a specific status, as their content is validated by peer review (in context of justification), upon which the texts are admitted to the archive of published and thus authenticated knowledge on which future work can be built (Leydesdorff and Milojević, 2015). Furthermore, research paper abstracts have significant functions in the process of conveying information about each study, making them important in the scientometrics field due to their informative nature. (Rashidi and Meihami, 2018). Common to all data sources, archival records of scientific communications contain
information from which one is able to reconstruct patterns and identify the latent characteristics of both authors and document sets (Leydesdorff, 2001). However, Leydesdorff (2001) underscores that scientometric representations are formal and subsymbolic: they remain in need of interpretation. This closeness to uncertainty contained in the distribution relates scientometrics to the (neo-evolutionary) study of complex and adaptive systems (ibid). Thus, the complexity of the scientists’ worlds is reflected in the scientometric reconstructions (ibid). The recognition of these objectified reconstructions recursively assumes and potentially refines the cognition within the discourses at both levels (ibid). Finally, Leydesdorff and Milojević (2015) note that modern scientometric research lies at the crossroads of social science, information science, and advanced computing with its effort to capture patterns in “big data”. Scientometric analysis focuses on revealing the internal structures of intellectual domains, mapping the components of disciplines, fields, or specialties on the basis of evidence from the literature (ibid). Models developed from such work can both provide meaning to possible future states and specify uncertainty (ibid).

2.8.2. Text Mining
A majority of business data are stored in unstructured form (i.e., text), with some researchers citing numbers as high as 85-90% (Larose, 2005). With this background, a research paradigm labelled knowledge discovery in databases emerged, later evolving into data mining and similarly into knowledge discovery in textual databases. This in turn evolved into text data mining, and the field finally settled on simply text mining (ibid). According to Miner (2012), text mining is one example of the larger academic practice that he labels text analytics, which brings together and cuts across the disciplines of statistics, machine learning, management science, artificial intelligence, computer science and other disciplines, illustrated in Figure 18 and Figure 19.

Over the last few decades, data mining has been used frequently within business intelligence (BI), and text mining is now expanding as a method of extracting knowledge (Carneiro Moro et al., 2014; Chakrabarti, 2003; Kent, 2014). Text mining and data mining share the same purpose: to look for valuable patterns, correlations and trends in large datasets with the help of statistical and mathematical techniques; a process that is too complex and resource-intensive for manual processing (Aggarwal and Zhai, 2012; Liu, 2011). Not surprisingly, text mining is increasingly used in quality and business development, and new areas of application are being continuously developed and tested in theory as well as in practice (Choudhary et al., 2009; Finch, 1999; Heim and Field, 2007; Kent, 2014; Khamis et al., 2013; Kôksal et al., 2011; Lo, 2008; Özdağoğlu et al., 2018).
Figure 18 Overview of text analytics (Miner, 2012)

Figure 19 Overview of text mining (Miner, 2012)
2.9. Contributing to existing epistemological viewpoints through text mining

Research intended to identify general patterns and characteristics within the research field of quality has been undertaken previously. The main modus operandi has been qualitative, with various forms of literature reviews (Ahire et al., 1995; Aquilani et al., 2017; Bajaj et al., 2018; Barouch and Ponsignon, 2016; Boaden, 1996; Brown, 2013; Coleman, 2013; Dahlgaard et al., 2007; Dahlgaard-Park et al., 2018; Dale et al., 2007; Dean and Bowen, 1994; Fredriksson and Isaksson, 2018; Garvin, 1984; Giroux and Landry, 1998; Gupta et al., 2014; Hellsten and Klefsjö, 2000; Kanji, 1994; Klefsjö et al., 2008; Kroslid, 1999; Maguad, 2006; Miller et al., 2018; Nettie, 1995; Oakland, 2014; Perla and Parry, 2011; Rahman and Sohal, 2002; Sanderson, 1995; Schoengrund, 1996; Silva and Ebrahimpour, 2002; Singh and Smith, 2006; Sousa and Voss, 2002; Thiagarajan and Zairi, 1997; Xu, 2000; Zain et al., 2001; Zairi, 1994). However, some studies have used a quantitative approach. Heady et al. (1997) and Lo and Chai (2012) rest on a purely qualitative methodology. Dahlgaard-Park et al. (2013), Dereli et al. (2011), Jensen et al. (2018), Martínez-Lorente et al. (1998) and Papadimitriou (2018) can be viewed as conducting mixed-methods research by blending the two methodological approaches. These prior studies and successive theses qualify as mixed-method studies. However, none of the previous studies have examined the epistemological formation of quality as a paradigm through exploration and application of text mining. In chronological order, summaries of the previously identified studies are presented below. Key aspects of the research design and main findings are accounted for. This summary, like the studies in many cases, contributes both to pioneering methodological design and to relevant findings on the investigated topic.

Heady et al. (1997) argue that to fully understand QM, as well as its subtopic TQM, it is imperative to know the background of the authors writing on these topics. Consequently, a statistical test based on 2,512 abstracts of quality management articles was used to compare publication patterns by time, authorship, and quality management subtopic (ibid). Heady et al. (1997) stress that published texts have always been an important part of communication among groups, and content analysis uses this information (ibid). Additionally, formal textual information is sometimes more applicable than that obtained through questionnaires and interviews because it records in a way that is uninfluenced by the researcher (ibid). Finally, textual information sources often cover extended periods, which facilitates longitudinal studies (ibid). Regarding the use of computerized content analysis, Heady et al. (1997) underline that manual content analysis places high demands on human concentration and objectivity, factors shown to be a significant source of error. Furthermore, the exact assumptions and word associations used are exposed when computer analysis is involved (ibid). Finally, computerized content analysis is
fully repeatable (ibid). Regarding the choice of abstracts, Heady et al. (1997) argue that focusing on the main issues of the article is easier when information in the body of the article is excluded. For example, Heady et al. (1997) argue that it is difficult to find a business article that does not include the word quality and management in the text, even when the article is not about quality or its management. The findings show that the non-academic literature is approximately five times larger than the academic literature; however, publication patterns are strikingly similar (ibid). Furthermore, the non-academics seem to have been the first to make a substantial contribution to the literature, which started in approximately 1984, with academic journals following approximately five years later (ibid). Additionally, both groups show signs of turning away from writing about TQM, although there is no such indication for the QM literature in general (ibid). Finally, Heady et al. (1997) would like to tone down the conclusion that the non-academic community controlled the early development of QM. Even if the results might be interpreted this way, Heady et al. (1997) underline that all leading figures such as Shewhart, Deming, Juran, Ishikawa and Taguchi taught at university during some period of their careers. Thus, it might be claimed that they were all teachers when they were spreading the word about quality (ibid).

Martínez-Lorente et al. (1998) consider the evolution of the elements, practices and mechanisms that define TQM. In so doing, the ABI-INFORM database is searched for business and research articles published between 1986 and 1997, including the terms TQM, quality management (QM) and total quality (TQ) (ibid). It is shown that the term TQM started to become popular in the mid-1980s but that the elements that shaped it were actually developed during the 1950s to 1970s (ibid). Furthermore, the use of TQM was already widespread at the beginning of the 1990s, reaching a peak in 1993 (ibid). Martínez-Lorente et al. (1998) also find that the number of papers using the term TQM has been in decline since 1993 but that TQM still maintains a prominent position in the academic management literature. Martínez-Lorente et al. (1998) argue that the decrease in the number of published papers is due to TQM now being broadly known and accepted and, thus, it is no longer attracting as much attention from scholars as it once did. Instead, some of the most recent incorporations into TQM, such as benchmarking and self-assessment, seem to have become the subject of further treatment in the management literature (ibid). Martínez-Lorente et al. (1998) also find that most theoretical developments in the advancement of TQM have been made in the USA, whereas Japan has held the lead in terms of applications. Additionally, there seem to be variances amongst different countries in the application of TQM (ibid). This observation indicates that the culture of the company influences the approach to the application of TQM and, hence, that different countries with different cultures apply TQM in different ways (ibid).
However, Martínez-Lorente et al. (1998) maintain that these differences are diminishing as economies and societies are becoming increasingly inter-related. Dereli et al. (2011) perform a content analysis investigating the statistical distribution of the papers published in Total Quality Management & Business Excellence (TQMBE) from 1995 through 2008. A review of the 1132 papers illustrates an increase of publications up to 1998, peaking in 1998 (n=96) (ibid). A decrease then followed in 1999, with a minor upward trend between 1999 and 2001 (ibid). Dereli et al. (2011) also conduct an analysis of conceptual and linguistic similarity between keywords in published papers. The ten most frequent keywords are grouped and identified as TQM, customer and employee satisfaction, service, performance, organization, ISO 9000, Six-Sigma, business development, leadership, processes, business excellence, management and quality (ibid). Dereli et al. (2011) find that an outstanding result in the keyword analysis is the frequency of ‘service’-related keywords, which is interpreted as an increasing interest in TQM by service organizations. Furthermore, they distinguish an interest in ISO and quality certifications in the literature but ask for further studies that identify their distribution over the years (Dereli et al., 2011). Finally, Dereli et al. (2011) establish that it is already known that the quality and scientific knowledge of TQM have enhanced during recent decades. However, insights into the speed of progress are still questionable (ibid). Therefore, Dereli et al. (2011) identify a need to further examine and measure the interest in TQM.

In an attempt to investigate the issue of changes in QM research throughout the years and to evaluate its current prospects, Lo and Chai (2012) apply quantitative methods to bibliometric data. A quantitative approach is advocated because the only, or to the best of their knowledge predominant, method of analysing QM research and its transformations through the years seems to be a qualitative one (Lo and Chai, 2012). Without discarding valuable insights gained from previous studies, Lo and Chai (2012) nonetheless see value in complementary quantitative approaches that might help to discover and describe novel patterns and perspectives previously omitted. Reflecting on the results of their study, Lo and Chai (2012) conclude that quantitative analysis coupled with qualitative evaluations of core results does indeed generate noteworthy perspectives relevant to the concepts and assumptions investigated. Hence, they suggest additional studies based on quantitative methodology, emphasizing comparative studies of academic journals within the field as a way of broadening the view and understanding of QM (Lo and Chai, 2012). Lo and Chai (2012) establish that QM research has evolved around customer satisfaction, implementation of TQM, monitoring quality cost, measuring service quality and studying TQM outcomes. Core research themes from which succeeding themes have sprung are found to be service quality, customer satisfaction and TQM framework identification (Lo and Chai, 2012). Furthermore, conceptual developments are noticed; from an initial focus on statistical control, a gradual shift
has taken place towards strategic aspects such as improving general and key business processes (Lo and Chai, 2012). Subsequently, recent developments in TQM consist of a shift towards providing quality service and measuring its success (Lo and Chai, 2012).

Dahlgaard-Park et al. (2013) determined that the total number of articles in the field of TQM decreased after reaching its peak in 1995. However, the number of papers focusing on techniques and tools within the QM framework in terms of Lean, Just-in-Time/Toyota Productions System, Benchmarking and Six-Sigma has been increasing (Dahlgaard-Park et al., 2013). Additionally, papers focusing on core values/key principles regarding the need to build a quality culture in terms of leadership, people-based management, continuous improvement, management based on facts, and focus on the customer have slightly increased during the last decade. Dahlgaard-Park et al. (2013) conclude that their findings establish that QM is now at a more mature stage, where focus has shifted from tools, techniques and core values that are needed to build a quality and BE culture. Furthermore, Dahlgaard-Park et al. (2013) find that organizational culture is becoming increasingly important for organizations in the pursuit of quality and excellence.

Papadimitriou (2018) reviews and explores the primary characteristics of the best papers of the Toulon-Verona Conference (TVC) on Excellence in Services between 2008 and 2016. The results show that of the 51 identified papers, 45 were multiple-authored papers (ibid). Of these papers, only five were multi-nationally authored (ibid). Out of the 51 papers, 25 of the lead authors were female and 25 were male; in one of the papers, the gender was not determined. The most frequently researched topics concerned the private sector, education (primarily higher education), health care and the public sector (ibid). Excellence of service in the tourism and banking sector was the least-studied topic, which, according to Papadimitriou (2018), indicates that these two areas provide a future focus for research and that the TVC call for papers had not targeted academic departments of marketing and finance. Finally, Papadimitriou (2018) found that publication of research papers in TVC promoted the citation and visibility of research, especially if the papers were selected as best papers.

Jensen et al. (2018), for their part, summarize the research published in the Journal of Quality Technology (JQT) between 1969 and 2016. They conclude that the papers in JQT have consistently focused on real-world problems and on providing solutions for practitioners, which is in line with the original editorial aim and scope of the journal (ibid). Naturally, the problems have changed, but the goal of providing practical solutions has not (ibid). The body of literature covers over 1,200 research papers and is divided into five decades (ibid). The first decade (1969-1978) is dominated by articles on basic tools of quality control: statistical process control and monitoring, sampling, statistical tolerancing, and reliability engineering (ibid).
During the second decade (1979-1988), many organizations struggled to determine the best ways to integrate the statistical design of experiments into their new product design and development activities, which is reflected in the publications (ibid). Taguchi methods have been widely explored as an appropriate way to do this (ibid). The third decade (1989-1998) demarked a transition from a prior emphasis on quality inspection and acceptance sampling (ibid). Instead of viewing quality as “meeting specifications”, it was recognized that quality could be designed into processes and measured in different ways (ibid). Additionally, as computing power increased, it was possible to simultaneously monitor the quality of multiple variables (ibid). Hence, multivariate quality control started increasing in popularity and has continued to do so to this day (ibid). The fourth decade (1999-2008) was the decade of statistical process control/statistical process monitoring (SPC/SPM) (ibid). Additionally, the fourth decade manifested an increase in the importance of discussion articles, where leading researchers added broader perspectives concerning the basic problems that the literature was addressing, the issues associated with these problems, and how the field should progress (ibid). During the fifth decade (2009-2016), the trend of notable development in statistical process control and monitoring continued to grow, especially in the area of profile monitoring (ibid). In a historical overview of the totality of these articles, Jensen et al. (2018) find that article length has been steadily increasing since the 1990s, from a median length of under 10 pages to a median length of approximately 15 pages (ibid). Short articles of fewer than five pages were plentiful in the early years of the journal but are non-existent in recent years (ibid). Correspondingly, the number of references given per article has also increased (ibid). Taken together, Jensen et al. (2018) find that the increased length and number of references reflect the increasing complexity of the literature and demonstrate that more recent research often builds on earlier ideas published previously. Looking at the topics covered, Jensen et al. (2018) find a decrease in articles covering topics such as acceptance sampling, basic statistical analyses, distributions, linear models, product screening and inspection, quality management, statistical intervals, and tolerancing. These topics reflect much of the practice of the time with a heavy emphasis on classical statistical methods and ensuring quality through sampling methods. In contrast, topics with increasing coverage over time include CUSUM/EWMA charts, multivariate quality control, optimal design, other univariate control charts, and profile monitoring (ibid). These changes reflect the advances in methodology, data availability, and computing power that are now available to handle larger amounts of data and more complex problems (ibid). A final group of topics include those that remain relatively consistent over time (ibid). Such topics include classical DOE, measurement systems analysis, reliability, and Shewhart control charts (ibid). These are tools that do not go out of style and will continue to remain relevant in the future (ibid). Looking toward
the future, Jensen et al. (2018) conclude that the aim of research in JQT must be to make all processes, products, and services work better and more efficiently. It is not sufficient to focus solely on how to meet specifications because methodologies must be developed that support constant improvement (ibid). As conformance to standards has become a core customer expectation, it no longer delights the customer when it is present; rather, it upsets the customer when absent (ibid). Consequently, the need to delight the customer expands the scope of quality such that it has an impact on virtually all human activity and interactions (ibid). Hence, Jensen et al. (2018) summarize that the quality technology profession makes its greatest contribution to society when efforts are concentrated on making all processes, products, and services work better and more efficiently. In this venture, quality tools, methods, and philosophy integrated with solid innovation efforts are fundamental to success (ibid).

2.10. Analytical framework

As a way of describing how the theoretical perspectives presented above serve the purpose of the thesis, an analytical framework is presented in Figure 20. The purpose of the thesis is twofold: 1) to examine the epistemological formation of quality as a paradigm and 2) to explore the application of text mining. Hence, the analytical framework is a synthesis of the epistemological categorizations of Arnbor and Bjerke (2009) and disciplinary perspectives in science studies by Leydesdorff and Milojević (2015), both summarized above in Figures 14 and 16. Accordingly, on the X-axis, theories of quality form the basis for scientific paradigms. Conversely, these paradigms are manifested on the Y-axis through research publications produced by research on certain study areas. Through exploring the application of text mining methodology, this thesis will test whether any operative paradigms of research on quality will emerge, linking together the overarching paradigms (theories) and study areas.
Figure 20 Analytical framework developed to fit the purpose of the study
3. RESEARCH DESIGN AND PROCESS

This chapter describes the methods applied during the research, the choices made in relation to the overall purpose, and the research questions, illustrated in Figure 20. Furthermore, it describes the validity, reliability and generalization of the research approach. The chapter ends with a description of the research process from a personal perspective.

3.1. Research approach – mixed methods

The degree of alignment between an overarching inquiry framework or purpose and a specific study focus constitutes a test of the relevance of the general framework that guides the specific inquiry; it also tests the likelihood that the specific study will contribute to knowledge within a more general and established inquiry tradition (Patton, 2015, p.252). Furthermore, it is not a question of whether, but rather of how much and how aware, a researcher is of theoretical and philosophical baggage that influences the study design and, hence, outcomes (Creswell, 2013; Patton, 2015). For this reason, the following passage aims to illuminate theoretical perspectives, paradigms and viewpoints that have been present in the research context. Notions that resonate on a deeper level with the values, intention and purpose of the researcher are elaborated in more detail than other viewpoints because they have hands-on impact on the research design and, consequently, outcomes.

Creswell (2013) presents six interpretive frameworks to which a researcher can adhere: postpositivism, pragmatism, feminist theories, critical theory, queer theory, and disability theory. These are theoretical paradigms and perspectives that guide
one’s work during the research process (ibid). Attached to these interpretative frameworks are five research strategies, called approaches: narrative, phenomenology, grounded theory, ethnography and case study (ibid). Patton (2015) presents 16 different qualitative inquiry frameworks that researchers apply and belong to: ethnography, autoethnography, reality-testing/ foundationalist epistemologies, grounded theory, realism, phenomenology, heuristic inquiry, social constructionism and constructivism, narrative inquiry, ethnography, semiotics, hermeneutics, systems theory, complexity theory and pragmatism, and generic qualitative inquiry. Both Creswell (2013) and Patton (2015) clarify that these interpretative frameworks and approaches are their respective selections, classifications and interpretations and that there are many other ways of grouping and categorizing research. Patton (2015) argues that each researcher’s responsibility is to decide on the relative value of any given inquiry framework based on one’s own interest, theoretical preferences, intellectual tradition and inquiry context (ibid, p.164). Each approach has its strengths and weaknesses (ibid). However, there exists one essential difference between the two scholars’ classifications. Whereas Creswell (2013) views case studies as a methodological approach, Patton (2015) views case studies as a question of research design, since virtually every social scientific study is an analysis of a social phenomenon specific to a time and place and, hence, could be seen as a case study in one way or the other (ibid). Instead, the relevant question for a researcher to raise is what constitutes a case within one’s own research domain and study purpose (ibid). The next step is to adjust one’s line of argumentation accordingly (ibid). To do so, the key issue is to outline a boundary regarding a specific phenomenon of interest (ibid). The boundary will be both arbitrary and fundamental because it is these boundaries that determine the case and, hence, the focus of inquiry (ibid). That the boundaries are arbitrary is no problem as long as the researcher does not think or claim otherwise (ibid). Yin (2009) presents yet another definition of what constitutes a case study, namely, “An empirical inquiry about a contemporary phenomenon (e.g., a “case”), set within its real-world context—especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2009, p.18). A key component of case study research is the examination of the context and other complex conditions related to the case(s) being studied (Yin, 2012). This focus on context and other complex conditions through an in-depth study of the case(s) makes it possible to cover a wide range of topics within the scope of any given case study (ibid). Research questions with a descriptive onset, such as “What is happening or has happened?” are especially suitable for descriptive case studies. When selecting a case study design, four types are available to the researcher, according to Yin (2012): a single- or multiple case study, which is holistic or contains embedded sub cases in an overall holistic case.

In contrast to Creswell (2013) and Patton (2015), Arbnor and Bjerke (2009) state that there exist only three methodological views that a creator of knowledge (e.g.,
researcher) can adhere to – analytical, systems or actors. Each methodological view is to be seen as a bridge between the theory of science (ultimate presumptions and the paradigm) that is followed by the researcher and the methodology pursued (operative paradigm and study area) (ibid). Each methodological view bears specific conceptions of reality and science, scientific ideals and ethical/aesthetical perspectives that lead researchers to methodological procedures and methodics corresponding to the values of each methodological view (ibid). Comparing the three methodological views is problematic because they depart from very different outsets. However, some distinguishing dichotomies can be depicted (ibid). One such demarcation line is the three methodological views of knowledge, where the analytical view has the ambition to explain reality as it is through the combination of different isolated facts into an impartial picture of reality (ibid). On the other end of the spectrum, the actors’ view aims to understand the socially constructed reality that everything is a part of, where the output represented in metaphors, structural images, narratives and the like is seen as a part of reality rather than only representing reality as a detached picture (ibid). The systems view can aim for both explanation and understanding; however, the first is more common (ibid). The search for explanatory knowledge is done through a systemic view of reality – meaning that its parts cannot be seen in isolation from each other but rather as a complex web of more or less structured totalities, called systems (ibid). A second distinction among the three methodological views regards their assumptions about reality. The analytical view sees the world as filled with independent facts, objective as well as subjective, that together add up to a whole (ibid). The systems view shares the assumptions about the world consisting of facts, however, this view refutes that they are independent (ibid). In contrast, the systems view holds that the whole differs from the sum of its parts, implying that it is not only the parts that are of interest but also their relations (ibid). Consequently, knowledge developed through the systems view depends on systems, and individual behaviour is explained through the systems principle – i.e., parts are explained through the characteristics of the whole system (ibid). The actors’ view turns the tables and instead aspires to understand the whole through the characteristics of its parts (ibid). In this light, knowledge developed through the systems view is dependent on the type or types of systems it has grown out of (ibid). Hence, it can be referred to as systems-dependent knowledge and does not become general and absolute, as is the case for knowledge developed through the analytical view (ibid). Furthermore, the systems view looks for forces, not causes and effects, which is the predominant focus of the analytical view (ibid).

Looking at a more detailed lever, postpositivism, according to Creswell (2013), is often reductionistic, logical, empirical, cause-and-effect oriented, and deterministic based on a priori theories. In the field, inquiry is often designed as logically related steps, is open for multiple perspectives rather than a single reality, and implements rigorous methods for data collection and analysis (ibid). Additionally, to strengthen
the precision of studies, multiple levels of data analysis are often used along with computer programmes to assist in analysis (ibid). In opposition to the deterministic features of postpositivism, pragmatism focuses on research outcomes and the practical consequences of inquiry (ibid). Consequently, pragmatism holds no obligations to any one system of philosophy and reality; researchers are free to choose the methods, techniques, and procedures that best meet their needs and purposes (ibid). Subsequently, multiple sources of data collection will often be used, the practical implications of research will be stressed, and research that best addresses the research problem will be imperative (ibid). Summarizing the different perspectives and stances presented above, research and studies can be framed from three different viewpoints:

- Using the vocabulary of Creswell (2013), research could best be described as postmodern or pragmatic case studies.
- From Patton’s (2015) perspective, the research moves within inquiry framework(s) systems theory, complexity theory and pragmatism with a case study design.
- Following the three methodological views presented by Arnbor and Bjerke (2009), the research is best described as directed from a systems perspective.
- Because all three studies are uniquely tied to their specific objects of study, they could fall within Yin’s (2012) frame of exploratory and descriptive case studies.

Furthermore, five of the six papers use text-mining methodology, applying multivariate data analysis methods with unsupervised learning models (Hair et al., 2014; Larose, 2014; Miner, 2012; Weiss et al., 2012). The aim of using such a method is to examine the interdependence between cases to reveal the structures of relationships (ibid). Hence, the studies rest on a quantitative and inductive foundation and should be regarded as exploratory and descriptive (ibid). Given that all studies use research publications, it is fair to see them as archival analyses of archival records (Yin, 2009; 2012). In effect, the study is as quantitative in its design of the data mining process as it is qualitative in evaluating the outcomes. Accordingly, as there exists a close connection between quantitative and qualitative dimensions in the study, it is possible to view the research strategy as a mixed method using embedded design (Creswell and Plano Clark, 2011).

3.2. Research method – text mining

The purpose of the thesis is twofold: 1) to examine the epistemological formation of quality as a paradigm and 2) to explore the application of text mining. Consequently, text mining has been explored and applied as a principal research method in the conducted studies. An overview of text mining is presented above in chapter 2.7.2 and serves as an introduction to the field. In chapter 3.3, the data analysis process,
which has evolved throughout the exploration and application of text mining in the studies and overarching work, is accounted for. The studies and trailing papers have all been crafted to shed light on RQ1 (in what ways can text mining be used to provide new insights into quality as a paradigm, and what is required to apply such a methodology?) and RQ2 (How can the epistemological formation of quality as a paradigm be described and understood?). The contribution of each study to the purpose and research questions of the thesis is elaborated below: Conference proceedings (chapter 3.3.2.1.), Research paper abstracts (chapter 3.3.2.2.) and Full research papers (chapter 3.3.2.3.). In chapter 4, a summary of each research paper generated from the studies is presented.

3.3. Data analysis process

3.3.1. CRISP-DM

Patton (2015) asserts that different research methods can produce quite different findings. The challenge is, hence, to determine which design and methods are most appropriate, productive, and useful for the inquiry at hand (ibid). Then, as there are many design and data collection options, each with various strengths and weaknesses, the researcher has both an opportunity and responsibility to design studies in alignment with the questions guiding the inquiry and within the context of the given academic field (ibid).

According to Creswell (2013), the processes of data collection, data analysis, and report writing are not distinct steps; instead, they are interrelated and often proceed simultaneously in a research project. Creswell (2013) represents the procedures as a spiral image – the data analysis spiral illustrated in Figure 22. One main point is that the researcher engages in the process of moving in analytic circles rather than using a fixed linear approach (ibid). The procedures consist of Data Collection, Data Managing, Reading and Memoing, Describing, Classifying and Interpreting and Representing and Visualizing (ibid). Data collection refers to the gathering of data (ibid). Data Managing concerns organizing the data (ibid). Reading and Memoing serves to generate an overview and feeling for the data from a holistic standpoint (ibid). Describing, Classifying and Interpreting deals with coding, or categorizing,
the data into coherent segments and then interpreting and situating them within the larger context of the study, i.e., sense making (ibid). Representing and Visualizing aims to fine-tune the research findings so that they are accessible and pedagogically straightforward (ibid).

Within the field of text- and data mining, a Cross Industry Standard Process for Data Mining (CRISP-DM) has been developed that consists of six phases: Business Understanding, Data Understanding, Data Preparation, Modelling, Evaluation and Deployment, visualized in Figure 23 (Wirth and Hipp, 2000). Business understanding includes defining the study’s objectives, formulating the problem, and formulating the strategy to tackle the problem (Chapman et al., 2000). Preparing data includes cleaning the data of distorting information and values as well as narrowing down the elements and variables to be included and processed (Kurgan and Musilek, 2006). The modelling phase concerns the choice and calibration of methods to analyse the data (Reinartz, 2002). Evaluation of the modelling means that the results are secured and compared with the objectives of the study (Mariscal et al., 2010). Deployment relates to the objectives of the study and ensures that the results are applied accordingly (ibid).

Creswell (2013) underscores that data analysis needs to be customized and continuously revised to incorporate learnings that evolve during a research journey. This viewpoint is supported by Patton (2015), who states that research design should not be mechanical, linear or written in cement. Instead, design is a process and a way of thinking that is consistently refined, and the more times one tests and improves one’s design, the better it gets (ibid).

With the above as backdrop, a custom-built research design has evolved, influenced by Creswell’s (2013) data analysis spiral and the CRISP-DM process. The result is a business reflexive text-mining process, visualized in Figure 24. The evolved research design contains steps and procedures from the two outlooks above and combines their meaning. However, the phase data collection is explicitly spelled out in the new process, and one phase is completely novel - business reflexivity. Business reflexivity means continuously positioning the research project(s), the researcher(s), the research purpose(s) and question(s) within their larger context. In this thesis,
business reflexivity can be said to be most represented by chapters 2.4-2.8 in the theoretical section; chapters 3.2, 3.3, 3.4.7 and 3.5 in the methodological section; chapters 4.1 and 4.2 in the results; 5.1-5.2 in conclusions; 6.1-6.2 in the discussion; and 7.1-7.2 in future research. In conclusion, the thesis has been crafted in accordance with a business reflexive text-mining process.

When selecting a case study design, four types are available to the researcher, according to Yin (2012): a single- or multiple case study, which is holistic or contains embedded sub cases in an overall holistic case. As the historical and theoretical context for the three conducted studies is identical, and as they focus on QM research, it is possible to see the three studies as an embedded single-case study. However, because each study is unique in its specific context (the first dealing with complete conference proceedings from 9 conferences, the second with journal abstracts from one scientific journal over a time span of 30 years and the third dealing with journal abstracts from three different journals over the timespan of 25 years), it is more suitable to classify the study as an embedded, multiple-case study. A commonality of multiple case studies is that they test the conditions under which the same findings might be replicated; alternatively, they include deliberately contrasting cases (ibid). From this perspective, the three case studies should be seen as trying to replicate the conditions under which previous results have been produced. Furthermore, Yin (2012) states that convenience and accessibility are not strong enough reasons for choosing a case; instead, clear and substantive rational
needs must be highlighted. However, it is also important that the screening and selection process does not become too extensive, as it might impact the actual study while also consuming valuable time and resources (ibid).

### 3.3.2 Data collection and data understanding

As the phases of collecting and understanding data are iterative and the passages below account for the data collection and data understanding of five studies, it was decided to jointly present the two phases to improve readability.

Selecting cases is a key issue in research because the results depend on the cases studied (Creswell, 2013; Patton, 2015). The guiding star should therefore be to strategically select cases so that they are in alignment with the purpose, questions and collected data of the inquiry, a process labelled purposeful sampling (ibid). Consequently, data collection requires not only defining the types of data that are to be collected and the process of pursuing this collection (Creswell, 2013) but also steps such as gaining permission, evolving a robust sampling strategy, developing techniques for logging and storing information and reflecting upon ethical issues that may surface (ibid). However, the main idea of purposeful sampling is to select cases that purposefully convey an understanding of the research problem as well as the central phenomenon in the study (ibid). Thus, it is essential to decide who or what should be sampled, what form the sampling will take and the sample size (ibid). Patton (2015) envisions the process of strategic sampling and design alignment as containing four steps, illustrated in Figure 25.

![Figure 25 Steps for Design Alignment (Patton, 2015, p.265)](https://example.com/figure25)

Regarding the types of purposeful sampling strategies, Patton (2015) names eight main strategies, which are then further divided into 40 detailed purposeful sampling strategies. Creswell (2013) refers to the 16 topologies of Miles and Huberman (1994). An overview of the respective overall strategies is presented in Table 1.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Maximum variation</td>
<td>Single significant case</td>
</tr>
<tr>
<td>Homogenous</td>
<td>Comparison-focused sampling</td>
</tr>
<tr>
<td>Critical case</td>
<td>Group characteristics sampling</td>
</tr>
</tbody>
</table>

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47
Table 1 Overview of purposeful sampling strategies by Miles and Huberman (1994) and Patton (2015)

<table>
<thead>
<tr>
<th>Theory Based</th>
<th>Theory-focused and concept sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirming and disconfirming cases</td>
<td>Instrumental-use multiple-case sampling</td>
</tr>
<tr>
<td>Snowball or chain</td>
<td>Sequential and emergence-driven sampling strategies during fieldwork</td>
</tr>
<tr>
<td>Extreme or deviant case</td>
<td>Analytically focused sampling</td>
</tr>
<tr>
<td>Typical case</td>
<td>Mixed, stratified and nested sampling strategies</td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
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<tr>
<td>Politically important</td>
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<tr>
<td>Random purposeful</td>
<td></td>
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<tr>
<td>Stratified purposeful</td>
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<tr>
<td>Criterion</td>
<td></td>
</tr>
<tr>
<td>Opportunistic</td>
<td></td>
</tr>
<tr>
<td>Combination or mixed</td>
<td></td>
</tr>
<tr>
<td>Convenience</td>
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</table>

Given the views and taxonomies regarding purposeful sampling strategies from Patton (2015) and Creswell (2013), letting the purpose be a guiding force, theory-based as well as theory-focused and concept sampling seems to best fit the context and intentions of the research strategy and design. These strategies are elaborated in greater detail below.

Following the typology of Miles and Huberman (1994) in Creswell (2013), theory-based sampling aims to find examples of theoretical constructs and thereby elaborate on and examine them. Patton (2015) follows this line of reasoning, emphasizing that concepts and constructs are mental models that represent some part of human experience – experiences that are worthy of inquiry because they are phenomena of interest and importance. Subcategories in the domain of theoretical and concept sampling strategies are, according to Patton (2015), the following: deductive theoretical sampling/operation construct sampling; inductive grounded and emergent theory sampling; realist sampling; causal pathway case sampling; sensitizing concept exemplars; principles-focused sampling and complex dynamic systems sampling. Deductive theoretical construct sampling involves finding case manifestations of a theoretical construct of interest so as to examine and elaborate the construct, its variations and implications (ibid), with the goal of sampling on the basis of the potential manifestation or representation of theoretical constructs (ibid). On a more detailed level, deductive theoretical sampling aims to deepen or verify theory in new contexts, new time periods, or new situations (ibid). Closely related to deductive theoretical sampling is
sensitizing concept exemplars sampling (ibid). The difference is that the latter focuses on contextually specific uses and meanings rather than on contribution to theory more generally (ibid).

Summarizing the issue, deductive theoretical sampling is seen as the principal sampling strategy because data and cases should be collected primarily because they present research on quality – which can be expected to be based on one or more theoretical constructions. However, because the purpose of the study is both descriptive and exploratory, data and cases should also be open to new interpretations and viewpoints, and thus, inductive grounded and emergent theory sampling could be seen as secondary strategies for data and case selection.

On the issue of sample size, both Patton (2015) and Creswell (2013) stress that it depends on the context of the inquiry – the purpose, what will be valuable, what will have credibility, how the findings will be used and what resources are available. Sample sizes have continuously grown during the research period, and the data sets are elaborated in more detail below in section 3.3.2.1. Conference proceedings, 3.3.2.2. Research paper abstracts and 3.3.2.3. Full research papers.

3.3.2.1. Data source A - Conference proceedings

Quality Management and Organizational Development - an International Conference on Quality and Service Sciences (QMOD-ICQSS) had, by 2014, been organized for 16 consecutive years in locations all around the world with participants from around the globe. Over time, it has developed into one of the largest scientific conferences in the world within the research fields of quality, service quality and related management issues. Thus, the QMOD-ICQSS constitutes a relevant object of study if one wishes to examine the epistemological formation of quality as a paradigm. As the purpose of the thesis was also to explore the application of text mining, it was thought that conference proceedings from the QMOD-ICQSS conference would constitute an appropriate source of data. As the conference founders and organizers supported the idea of exploring QMOD-ICQSS proceedings through text mining, it was possible to collect proceedings from previous conferences. Thus, an effort was made to collect all proceedings from previous conferences. However, it turned out that proceedings from certain years were not available. Finally, proceedings from 2003, 2006, 2007, 2008, 2009, 2010, 2011, 2012 and 2013 were obtained, producing a dataset consisting of 1019 conference proceedings. When preparing the data for modelling, it turned out that the data (conference proceedings) were not saved and stored in a standardized matter. Hence, substantial effort was needed to transform the data into workable material. Subsequently, the data were modelled through the use of probabilistic topic modelling (briefly explained in chapter 3.3.4.2 and thoroughly elaborated in appended papers A, B, C and E). Some insights on the epistemological formation of
quality as a paradigm as well as the potency and limitations of text mining were obtained; these are summarized in chapter 4.1 and presented fully in appended paper A. However, with regard to the guiding purpose and research questions of the thesis, it was assessed that the absence of proceedings from seven organized conferences, as well as the technically unsatisfactory disposition of the data, made the study object and data source unsuitable for further studies. Consequently, the search for new sources of data began.

3.3.2.2. Data source B - Research paper abstracts

To provide an overview of what forms of academic contributions could be studied, a visualization of the system that is engaged in research and implementation of research on quality is illustrated in Figure 26. From an epistemological point of view, it is probably possible to use any of the identified zones as a study object. However, from a text-mining perspective, the data must be in unstructured matter (i.e., text). Furthermore, within academic disciplines, academic contributions are valued differently, and in most cases, the academic paper is seen as the most prestigious form of publication (Becher and Trowler, 2001). Following the arguments of Heady

![Figure 26 The System of research on quality](image-url)
et al. (1997), Lo and Chai (2012), Dahlgaard-Park et al. (2013), Dereli et al. (2011), Jensen et al. (2018), and Martínez-Lorente et al. (1998), it is probable that research on quality is no exception to this rule. Consequently, by studying what has been published in journals covering research on quality, one should gain insight into which issues and research questions have been preoccupying the field over the years. Nevertheless, by omitting books and other forms of academic publications, several areas of academic contributions and focus will certainly be left out. Acknowledging this limitation, it was nonetheless assessed that scientific journals covering quality were an interesting study object for text-mining activities. Hence, a search was started for relevant scientific journals covering research on quality. The following points guided the search for scientific journals from which new data could be collected:

- Quality should be in the title because it signals a close association to the topic.
- The purpose of the journal is to present a broad spectrum of QM research.
- Journals with a long publication history were prioritized.
- The journals had to be peer reviewed, abstracted, indexed and ranked by major institutions in the academic community.
- The database structure had to allow large-scale data collection.
- The journals should, if possible, be distributed by different publishing houses.

Through the lens of the search criteria, three academic journals were identified as interesting potential study objects:

- International Journal of Quality & Reliability Management (IJQRM)
- The TQM Journal (TQMJ)
- Total Quality Management & Business Excellence (TQMBE)

As the digital archive of IJQRM dated back the longest (1984), it was selected as the most suitable study object in a first attempt to examine the epistemological formation of quality as a paradigm through the exploration and application of text mining on research papers. Thus, an attempt to collect data was initiated. It was soon clear that the available data were year of publication, author(s), title, abstract, keywords and type of publication (e.g., research paper, book review, editorial, etc.). Heady et al. (1997) assert that abstracts are preferred to full articles because focusing on the main issues of the articles is easier when information in the body of article is excluded. The purpose of abstracts is to summarize the main points of a research paper, and they are generally accessible online free of charge; hence, database creation consisting of research paper abstracts offers a cost-efficient approach for
researchers interested in a specific type of studies (Delen and Crossland, 2008). Consequently, it is not surprising that collecting and studying journal abstracts is common in text mining (Feldman and Sanger, 2007). Usage of keywords is also an alternative approach; however, keywords are seen as a less reliable data source because researchers are relatively free to choose keywords; consequently, there is a risk of adding keywords that help index the research paper rather than classify it accurately (Miner, 2012). Subsequently, research paper abstract and year of publication were selected as variables for the study. In the modelling phase, it was thought that probabilistic topic modelling, which had been deployed in the previous study, was an efficient means to extract the most common topics in the data. However, it was necessary to better classify and structure the data to increase the level of significance in the results. Cluster modelling was selected as a suitable method to achieve that purpose because the main goal of cluster analysis is to group data based on their inherent characteristics (Kaufman and Rousseeuw, 2009). As the initial test showed positive results, cluster analysis was performed in the study (cluster analysis is described briefly in section 3.3.4.1 and more thoroughly in papers B, C and E). Exploration and application of the combination of cluster analysis and probabilistic topic modelling was successful. Consequently, the study led to a research paper (summarized in chapter 4.2 and presented fully in appended paper B). Because the study results gave insights into the epistemological formation of quality as a paradigm as well as the exploration and application of text mining, it was thought that the initiated research design and process was worth pursuing. Hence, data collection and modelling were performed with data from the two other identified scientific journals (TQMJ and TQMBE). Additionally, because of the goal of increasing the visibility of longitudinal patterns in the data, time series analysis was deployed (briefly described in section 3.3.4.3 and more comprehensively in papers C and E). The study outcomes were positive and were compiled into a research paper (summarized in chapter 4.3 and presented fully in appended paper C). Because the beaten path was still judged to generate valuable epistemological perspectives on the formation of quality as a paradigm as well as practical awareness of the application of text mining, an update of the data source was initiated. First, the data set for IJQRM, TQMJ and TQMBE was updated so that it included entries up until 2017. Second, a search for additional journals to be included in the data set was begun. In this pursuit, it was thought that it would be valuable to expand the data set with journals that take a broader perspective on operations management (OM). With this in mind, the following points guided the new search for scientific journals from which data could be collected:

- QM, TQM or OM had to be in the title.
- The purpose of the journal should be to publish theoretical and practical research on QM or OM research.
- Journals with a long publication history were prioritized.
The journals had to be peer-reviewed.
Source Normalized Impact per Paper (SNIP), Impact per Publication (IPP) and SCImago Journal Rank (SJR) had to be available and acceptable for each journal.
The database structure had to allow large-scale data collection.
The journals should, if possible, be distributed by different publishing houses.

From this search, one scientific journal focusing on quality was identified and, thus, data were collected:

- Quality and Reliability Engineering International (QREI)
  - Span of digital archive: 1985 – 2017

Additionally, two OM journals were identified, and, thus, data were collected and incorporated into the dataset:

- International Journal of Operations & Production Management (IJOPM)
  - Span of digital archive: 1980 – 2017
- Journal of Operations Management (JOM)
  - Span of digital archive: 1980 – 2017

Given that the data set had been expanded with scientific journals whose scope extended beyond research on quality, it was natural to suppose that the data needed to be filtered in some manner. Coincidentally, TQMJ issued an invitation to submit research papers to a forthcoming special issue on Kaizen: An Ancient Operational Innovation Strategy for Organizations of the XXI Century. It was thought that a delimited study, such as one on Kaizen, would help apply new epistemological perspectives to the formation of quality as a paradigm and also raise practical awareness of the application of text mining. This special issue, as a delimited study, had the potential to be used as a benchmark for the results obtained from the previous studies, which took on an all-embracing outlook on quality. Against this backdrop, a study on Kaizen took shape. However, after the data set had been screened for entries on Kaizen, it became clear that there were not many records available. The results were somewhat surprising but still judged to be worthy of further investigation; however, a modified research design was required and is further described below in section 3.3.2.3. Nevertheless, from the viewpoint of data screening, the explored process had proven efficient. Hence, a new study took form with the aim of generating results that were more easily comparable with the previous work. Through this process, the dataset was screened for entries containing the word *quality*. This pathway proved successful and developed into a full study (summarized in chapter 4.5 and presented fully in appended paper E). To synthesize all the studies, conclude the overall findings and reconnect to the research purpose, a final study was performed. However, as the point was to summarize previous findings, no further text mining activities were conducted; hence, a complementing study design was used and is presented below in section 3.3.2.3.
3.3.2.3. Data source C - Complementing methodological designs
As indicated above, only 27 entries on Kaizen were identified during data screening, which is too small a number for text mining procedures to be relevant. However, the topic and initial results were judged to be relevant from the viewpoint of examining the epistemological formation of quality as a paradigm. Additionally, to explore the application of text mining, it was considered relevant to explore its shortcomings and the potential advantages of alternative methodological procedures. Hence, it was decided to explore the entries qualitatively by collecting and reviewing the complete research papers of the 27 identified entries. Additionally, metadata were collected and compiled, such as title, author(s), manuscript origin (country/countries) and type of paper (i.e., research paper or case study). The outcome provided relevant insights into Kaizen and Continuous Improvement (CI), the epistemological formation of quality as a paradigm and the benefits of combining methodological pathways (summarized in chapter 4.4 and presented fully in appended paper D).

3.3.2.3. Limitations
As presented above, the data source of the studies and, hence, the thesis consists primarily of conference proceedings and abstracts of research papers from scientific journals. As a result, it is possible that trends, patterns and characteristics of research on quality that could be identified via other scientific publications, such as books; book reviews; general reviews; secondary articles; editorials; guest editorials; awards for excellence (notifications); introductions or summaries from conferences; notes from the publisher, are excluded.

3.3.3. Data preparation
Preparing data includes cleansing the data of distorting information and values as well as narrowing down the elements and variables to be included and processed (Kurgan and Musilek, 2006). The five studies differ in the ways in which the data have been processed; hence, a summary is provided below. For detailed accounts of the data preparation in each study, the reader is referred to each publication. In study A, a noteworthy proportion of time was dedicated to transferring the data to a standardized and digitally processable format; this was necessary because the proceedings were structured and presented in different ways as well as in different digital formats from conference to conference (year to year). Following this step, two main approaches were deployed to identify relevant and information-rich data. First, the data were cleaned of words that occurred less than a specified number of times. Second, the term frequency-inverse document frequency (tf-idf) was used when creating the word vector. However, as accounted for above, in study D, the decision was made to depart from the initial research design and instead collect and review
full papers that required no data preparation. None of the collected metadata in study D needed profiling because they were collected manually. A subsequent step for studies B, C and E was to isolate the research paper abstracts from other journal content, such as book reviews, editorials and errata. As the strategy in studies B and C was to collect and organize a database with a minimum amount of screening, no other profiling or labelling of data was conducted. In study E, however, the data needed further screening because the data set consisted of two OM journals. Therefore, the complete data set was screened for entries containing quality.

3.3.4. Modelling

3.3.4.1. Cluster analysis
Cluster analysis is a collection of multivariate techniques whose main goal is to group data based on their inherent characteristics (Kaufman and Rousseeuw, 2009). Cluster analysis should primarily be seen as an exploratory and descriptive technique because the results are highly dependent on the specific variables used in the dataset, and clusters will always be formed regardless of the existence of any actual structure in the data (Hair et al., 2014). Because the purpose of the research is both exploratory and descriptive, cluster analysis is chosen as the principal method of modelling.

A critical issue when applying cluster modelling is choosing an appropriate stopping rule; that is, determining the number of clusters that best represents the data structure (Child, 2006). There is no standard objective selection process for choosing stopping rules; in addition, the specific theoretical and practical research situation needs to be taken into consideration as important conceptual issues, e.g., manageability and communicability, may be embedded in the data (Hair et al., 2014). In cluster analysis, there exists no single method for validating, evaluating and labelling clusters (Aggarwal and Zhai, 2012; Weiss et al., 2012). This troubling fact is even more of a concern with regard to the evaluation of unstructured data (text), as this is still a relatively novel area of research, and classical processes for validating structured data (numbers) are not applicable (Larose, 2005; Miner, 2012). However, one automated procedure increasingly being applied for this purpose is probabilistic topic modelling (Blei, 2012; Mimno, 2012; Meeks and Weingart, 2012).

3.3.4.2. Probabilistic topic modelling
Zipf’s law states that given some corpus of natural language utterances, the frequency of any word is inversely proportional to its rank in the frequency table (Upton and Cook, 2014). Similarly, probabilistic topic modelling encompasses several associated methods that group words into topics on the basis of their most likely association (Aggarwal and Zhai, 2012; Charu et al., 2012; Newman et al., 2009; Welling et al., 2008; Xie and Xing, 2013). Although it is a relatively new method,
probabilistic topic modelling is generally considered to be a fast and effective way to identify and portray the most frequently occurring and probable themes and subjects in unstructured data sets (Blei and Lafferty, 2009; Steyvers and Griffiths, 2007).

3.3.4.3. Time series analysis
Time series analysis was determined to provide valuable insight into the overall dataset because it offers a way to study data from a longitudinal perspective (Chakrabarti, 2002; Djurfeldt and Barmark, 2010; Liu, 2008). Hence, trend analysis was applied using support vector machine and moving average on each journal’s full publications track record as well as on the entire, joint, dataset.

3.3.4.4. Sidestepping text mining and CRISP-DM
As mentioned above, additional metadata were collected during the process of qualitatively analysing papers on Kaizen; these data include title, author(s), manuscript origin (country/countries) and type of paper (i.e., research paper or case study). These data were compiled and presented in appropriate diagrams and tables. Additionally, the 27 identified articles were reviewed by the research team, which consisted of three researchers. The 27 papers were evenly distributed among the researchers and then examined. When reviewing the papers, the goal was to determine whether the study was theoretical or practical (focusing on implementation). Furthermore, with the aim of clarifying the theoretical foundations of Kaizen and how it was described, each paper’s theoretical base for Kaizen was scrutinized. Similarly, practical papers focusing on implementation were examined with respect to the tools, techniques and/or methods implemented and described. Finally, with the objective of exploring the relationship between Kaizen and Continuous Improvement (CI), the association between the two concepts in each paper was assessed.

3.3.5. Interpretation
According to Creswell (2013) and Patton (2015), there is no single recipe or procedure for analysing data. Patton (2015) states that there are guidelines that provide direction; nevertheless, no significance test exists to establish whether findings are truly relevant or not – no magic bullet to settle reliability and validity. If there is any rule of thumb, Patton (2015) declares, it might be to “Do your very best with your full intellect to fairly represent the data and communicate what the data reveal given the purpose of the study” (Patton, 2015, p.522). Furthermore, Patton (2015) reminds us that one should not wait until data are collected to choose an analytical approach. The reason for this caution is that data should be sampled according to what one wants to address in the analysis - “connecting design and
analysis: purposeful sampling and purpose-driven analysis” (Patton, 2015). Given this outset, theory-focused and concept sampling should be followed by analysis strategy(ies), which analyse what the cases illuminate about the sensitizing concept or principles being studied, inductively generate and document the emergent grounded theory or deductively examine whether and how the patterns identified illuminate the theory that frames the inquiry (Patton, 2015, p.528). The approaches Patton (2015) presents for conducting analyses are distinct but not mutually inclusive. Hence, when analysing, it is common to include several approaches (ibid). The approaches according to Patton (2015, p. 551) are Content analysis, Case study, Cross-case pattern analysis, Cross-case thematic analysis, Inductive analysis, Deductive analysis, Indigenous concept analysis (emic analysis), Analyst-generated concepts (etic analysis), Indigenous typologies and Analyst-constructed typologies.

Looking closer at the guidelines for analytical strategies proposed by Creswell (2013), they all include coding data, combining the codes into broader categories and displaying and making comparisons. As an example of a general analysis strategy, Creswell (2013) puts forward Wolcott’s (1994b) sequential steps:

1. Highlight certain information in descriptions
2. Identify pattern regularities
3. Contextualize with the framework from literature
4. Display findings in tables, charts, diagrams, and figures; compare cases; compare with a standard case

Yin (2012) states that there is no automated algorithm when analysing narrative data. Case studies driven by the discovery motive might start off the analysis by stating what the researcher thinks he or she has discovered (Yin, 2012). Another technique is pattern-matching, where the researcher stipulates some pattern of expected findings at the outset of the case study (ibid). Pattern matching then involves comparing the empirically based pattern with the predicted pattern (ibid). Additionally, a sibling of quantitative time-series analysis is also applicable: that is, assembling key events into a chronology (ibid). The outcome is descriptive patterns that hint at possible causal relationships (ibid). Furthermore, regardless of whether computer software is used, the researcher conducting narrative case studies needs to create their own unique algorithms to logically and consistently code their specific case study (ibid). This might be said to be especially true in regard to the analysis and evaluation of topic models; no machine learning models have yet outperformed human judgement even if steady progress is being made in the field (AlSumait et al., 2009; Dacres. et al., 2013; Chang et al., 2009; Chemudugunta, et al., 2008; 2008; Wallach et al., 2009; Xie and Xing, 2013). Czarniawska (2014) summarizes the issue by stating that many researchers have concluded that no software can interpret the collected field material and say “what it means” or “what it could mean”, which creates the possibility of several competing or complementing interpretations or perspectives. This viewpoint is applicable to the inquiry design in all conducted studies, and
interpretations and evaluations are open to multiple realities. However, according to Patton (2015), the sampling strategy and analysis strategy should go hand in hand. Given that purposeful sampling strategies, deductive theoretical sampling, inductive grounded and emergent theory sampling are followed, it is logical that both deductive and inductive analysis strategies are pursued to tackle the stated research questions. Connected to the process of analysing data is the process of interpreting data (Creswell, 2013; Patton, 2015). Interpreting data is about abstracting data and results into broader context(s) and giving them meaning(s) (ibid). As with the process of analysing, interpretation has no off-the-shelf design; it comes in various forms and shapes, often based on hunches, insights and intuition (Creswell, 2013). However, Patton (2015) reminds us that in addition to creativity, good judgement is needed on the part of the researcher to achieve balance and credibility in the interpretations made.

Regarding both analysing and interpreting in practice, there are some pathways that should be taken into consideration. The first obvious option is that analysis and interpretations are made solely by the author. This route is effective and grants that the analysis and interpretations are made by a person well informed about both the theoretical and practical issues of the inquiry. The obvious downside is that personal bias and subjectivity could spoil valid results. One way to strengthen the analysis and interpretations made is to collect external feedback from either colleagues in the department or a knowledgeable person at another university or similar. With this feedback, the analysis and interpretations are then reviewed by the author for corrections and improvement. Another pathway would be to invite other researchers to perform first-hand analysis and interpretations of the data. These could be individuals working independently, with the outcomes compared and combined afterwards. Or, a seminar or workshop could be organized, where analysis and interpretations are made through a mutual and co-creational process. The latter procedures of including others in analysis and interpretation have the advantage that several minds work actively with the material, which could strengthen the analysis and interpretations.

3.3.6 Evaluation
3.3.6.1. Validity and reliability
Validity, simply put, concerns what a study should measure, and reliability concerns how it is measured (Hair et al., 2014). Hence, validity addresses whether a measure or set of measures correctly represents the concept of the study and the degree to which the study is free from any systematic or non-random errors (ibid). Reliability zooms in on the consistency of a variable or sets of variables, and to be found reliable, a variable needs to be consistent in its values (ibid). Other terms with similar implications are trustworthiness, verification, credibility, authenticity,
transferability and objectivity (Creswell, 2013). As the available terminologies are numerous, Creswell (2013) urges researchers to choose types and terms with which they are comfortable. Regardless of terminology, Creswell (2013) recommends pursuing multiple validation strategies to enhance the accuracy of studies. Of the eight validation strategies, peer review, member checking and external audits are proposed as highly reliable procedures (ibid). Peer-review serves the purpose of providing the researcher with relevant input on the study during the research process (ibid). Member checking invites participants and study objects to comment and judge the accuracy and credibility of findings (ibid). External audits, much like a fiscal audit, call on external and impartial examination of the research process with the aim of assessing accuracy (ibid).

In conclusion, on the issue of validity, the key is evaluation and analysis of the obtained results. Regarding reliability, it is foremost the stages of data preparation and modelling that include crucial steps that might impact the consistency of the data. In a larger context, research and studies can be evaluated by different standards. One way to go about this process, according to Creswell (2013), is to do the following:

1. Assess whether the research question drives data collection and analysis rather than the reverse.
2. Examine to what extent data collection analysis techniques are competently applied in a technical sense.
3. Assess whether the researcher’s assumptions are made explicit, such as the researcher’s own subjectivity.
4. Assess whether the study has overall merit – is it robust, does it respected theoretical explanations, and does it discuss disconfirmed theoretical explanations?
5. Assess the study’s value, both in informing and improving practice (the “So What?” question)

Other standards for validity and reliability, such as guidelines for publication, are those set in the community of inquiry (ibid). The implication is that diverse approaches to research have developed their own traditions of rigor, communication and ways of working towards consensus (ibid).

A further perspective on evaluating research entails reviewing the following four perspectives (Creswell, 2013):

- **Substantive contribution.** Does it contribute to our understanding of social life? Demonstrate a deeply grounded social scientific perspective? Seem “true”?
- **Aesthetic merit.** Does this piece succeed aesthetically? Does the use of creative analytical practices open up the text and invite interpretive
responses? Is the text artistically shaped, satisfying, complex and not boring?

- **Reflexivity.** How has the author’s subjectivity been both a producer and a product of this text? Is there self-awareness and self-exposure? Does the author hold himself or herself accountable to the standards of knowing and telling of the people he or she has studied?

- **Impact.** Does it affect me emotionally or intellectually? Generate new questions or move me to write? Try new research practices or move me to action?

Regardless of terminology, *peer review, member checking and external audits* have been utilized in the research process. *Peer-review* has been conducted for all scientific papers and conference proceedings. In studies D and E, *member checking* has been employed because the paper was written by more than one author. Furthermore, acceptance of a conference proceeding to a recognized conference as well as publication in a respected scientific journal indicate that an accepted scientific standard within the field of quality has been reached by all studies. Concerning the overall doctoral thesis, as a part of *member checking*, the complete department has been invited to four seminars in which the status and development of the research have been reported and discussed. Additionally, because the research journey included successful publication of a Licentiate thesis, *member checking* was performed because the first draft of the thesis was scrutinized by a department college. Then, an *external audit* was employed through the use of an external auditor who examined the work. Finally, an open hearing was organized where the external auditor presented his view on the work, and the general public was invited to comment and discuss. The same process has been applied for the doctoral dissertation, but the *external audit* was completed by an expert panel consisting of 4 external reviewers.

On the issue of validity and reliability, Yin (2012) states that a hallmark of sound case studies is transparency with data and results, offering readers the opportunity to make independent interpretations of presented data and outcomes. With the goal of providing high transparency, the data-mining process, including the choice of software and key decisions during the research process, has been described in detail in each paper, and the results have been made available in appendixes. However, due to requests by editors and reviewers to limit the number of words in the manuscript, much of the initial submitted material has been edited out of the final version of the paper. Finally, Yin (2012) states that replication logic is a valid approach to case studies, as it can challenge and validate the presented results.
3.3.7. **Business reflexivity**

Case studies are commonly criticized for offering little or no generalizability value (Yin, 2012). In response, Yin (2012) cites the need to distinguish between two types of generalization: statistical and analytic. Statistical generalization, from samples to totality, is often incorrectly seen as the only way to generalize the findings of social science research (ibid). Instead, analytic generalizations use a study’s theoretical framing to establish a logic that might be applicable to other situations (ibid). This distinction is necessary because statistical analyses and other quantitative methods generally aim to generalize to populations (on the basis of statistical claims), whereas case studies and other qualitative methods tend to generalize to other situations (on the basis of analytic claims) (ibid). A parallel is drawn to experimental science, where generalizations from a single or small set of experiments often follow after researchers have made innovative ventures into unchartered territories with serendipitous findings as the outcome (ibid). Whether making generalizations in case study design or experimental science, both approaches follow the same roadmap (ibid). First, a conceptual claim is made where the researcher presents how a study’s findings have formed relationships among particular sets of concepts, theoretical constructs or sequences of events (ibid). Second, the theoretical propositions are applied to similar concepts, constructs or situations outside the case study (ibid). The point of making this kind of analytical generalization is not to present “proof” or a conclusion. Instead, such a generalization should be seen as presenting a “working hypothesis” that can serve as inspiration and as a starting point for new studies and findings (ibid).

3.3.8. **Packaging of message**

The doctoral thesis is an effort to summarize the key elements from each study and the research journey as well as to combine the learning outcomes into a whole that is larger than the individual parts. Hence, the appended papers are summarized in section 4.1. In section 4.2, additional results that have been made through the research are accounted for. In sections 5 and 6, conclusions are drawn and discussed. Finally, in section 7, possible future directions for the research are proposed.

3.3.9. **Communicating & Accounting**

The research has, at this point, led to the following:

- Three published articles in two scientific journals
- Two accepted and presented conference proceedings
- One accepted article in a third scientific journal
- One submitted article to a fourth scientific journal
- One licentiate thesis
- One doctoral thesis
Communication of scientific papers and conference proceedings has foremost been done through the individual platforms of each scientific journal and conference. This usually implies that the papers are printed and distributed to journal subscribers and conference participants and that digital versions are available through websites or databases. Additionally, presentations and discussions of the two conference proceedings were conducted during each conference. The department-wide seminars have aimed to spread the results within the research group. The two public hearings for Licentiate and Doctoral theses have been conducted with the aim of disseminating the research results to a broader group of researchers as well as to the general public.

3.4. My contribution to the studies and papers

The studies described above have been conducted in collaboration with other researchers as well as singlehandedly. Consequently, three of the six generated research papers are single-authored papers (papers A, B and C). The remaining three studies and papers (papers C, E and F) have been conducted in collaboration, and the contributions from the researcher are briefly described below.

In study 4, the researcher was independently responsible for data collection, data understanding, data preparation and modelling. As the initially planned application of text mining was judged inappropriate, a qualitative analysis of the identified study object was carried out in collaboration with two other researchers. Hence, analysis, interpretation, evaluation of results and business reflexivity were conducted in collaboration with other researchers. The study was then compiled into a research paper (paper E) by the researcher. The researcher’s contribution to the study and paper is assessed as 70%. In study 5, the researcher conducted data collection, data understanding, data preparation, modelling and analysis. Interpretation, evaluation of results and business reflexivity were conducted in collaboration with a department colleague. The researcher then compiled the study into a conference proceeding and research paper. The researcher also presented the conference proceeding at the 2018 QMOD-ICQSS conference. The researcher’s contribution to the study, conference proceeding and paper is judged to be 85%. In study 6, the researcher conducted data collection, data understanding, data preparation, modelling and analysis. Interpretation, evaluation of results and business reflexivity were conducted in collaboration with two department colleagues. The researcher compiled the study into a research paper (paper F). The researcher’s contribution to the study and paper is judged to be 85%.
3.5. Ethics

3.5.1 Published content with no real-life participants
Both qualitative and quantitative research need to address ethical issues such as providing reciprocity to participants for their willingness to provide data, handling sensitive information, and disclosing the purpose of the research (Creswell and Plano Clark, 2011). In particular, studies where real-life participants are involved and where there is a need to be sensitive to vulnerable populations, imbalanced power relations or placing participants at risk need to think carefully about ethical issues (Creswell, 2013). Patton (2015) insists that the protection of human subjects is fundamental when conducting qualitative research. As the studies upon which the thesis is based primarily use research paper abstracts as well as conference proceedings and full research papers, there is no data collection from real-life participants. Although the data are undoubtedly created by real life scientists, only one study uses metadata on the manuscript origin, which discloses information regarding the writers. Regardless, as the originators of the manuscripts have chosen to publish the papers and corresponding abstracts, it is likely that they are aware of and agree to the possibility of their work being used and scrutinized for scientific purposes. Hence, the ethical considerations have primarily been oriented towards the availability of data sources and the implications for the research.

3.5.2 Journal paper abstracts, open access or not?
Academic research outputs have traditionally been subject to subscription-access and a paywall, but over the past three decades, the situation has started to change (Laakso and Polonioli, 2018). The complexity of the debate around open access also stems from the presence of clashing stakeholder interests, where the vision of the path forward is not uniform and key actors have their own considerations and arguments for how the future of scholarly publishing should be shaped (ibid). A general assumption is that academics want to have their work read, and universities are paying them to write it and to provide the bulk of the expertise required for journals to function effectively (ibid). In addition, while universities have traditionally paid again for access to that work, potential readers who are outside the universities are denied access to it. It should come as no surprise that many see this as an unsustainable and unfair process (ibid). At the same time, while many academics have seen open access publishing as a viable solution to the unfairness and unsustainability of the current situation (Bacevic and Muellerleile 2017), others have warned that the case for open access has also opened the door to lower standards in research and publication practices (Beall 2012). According to Covey (2009), the seeds of the dispute are found in what McSherry (2009) calls the epistemic regime, which consists of two social worlds. In one world, knowledge can be owned, whereas in the other, it cannot (ibid). The academy generates knowledge that cannot
be owned but that is considered cognitive property, such as facts and ideas (ibid). The academy monopolizes competence in a gift economy, and researchers have a moral obligation to generate facts and ideas and to give them to their peers and the public as gifts – the ethic being sharing (ibid). The value of the gift to its creator is the recognition it brings, but to give the gift, researchers must express their facts and ideas in fixed form; they must turn them into artefacts (ibid). Creating an artefact moves the work into the realm of law and knowledge that can be owned (ibid). Artefacts are considered intellectual property by existing copyright law polices and, hence, they are intellectual commodities in a market economy (ibid). The ethic now being that economic rights and the value of the artefact lie in its potential for economic gain (ibid). To promoters of open access, the need for change in the existing regime is twofold (ibid). First, journal prices are considered to be spiralling out of control, provoking an economic crisis (ibid). Second, the attempt to commodify knowledge that cannot be owned, thereby enclosing the commons, hinders innovation and obstructs the public good, which might lead to a social crisis (ibid). Open access challenges the existing situation in two ways (ibid). First, as it compels authors to legally preserve certain rights to their work, it challenges the tradition of full copyright transfer to the publisher (ibid). Second, it challenges the model underlying U.S. copyright law that assumes economic gain is the incentive that drives faculty to conduct research and to publish journal articles (ibid). Covey (2009) asserted that the gift and market economies have always clashed, but the conflict was relatively discreet until digital technologies entered the scene. Because technology enables vast dissemination at minimal cost and journal publishers are leveraging technology to raise prices, license access and limit fair use, the moral choice from the perspective of many authors is open access to the gift of journal literature (ibid). Against this backdrop, it is worthwhile to reflect upon the ethical perspectives of data collection, modelling and dissemination in the thesis. The main data source in the studies, which thus constitutes the foundation for the thesis, is a set of research paper abstracts from six academic journals from three different publishers. Data collection was possible because the research paper abstracts were openly accessible and free of charge. An attempt to collect research paper abstracts from one (U.S. based) scientific journal that qualified according to the stated search criteria was abandoned because the abstracts were not openly available free of charge and legal actions on the part of the publisher could not be ruled out. This condition runs parallel to the notion discussed above: locking knowledge and information behind pay walls effectively keeps uninitiated people from accessing and working with it. In the context of this thesis, this situation has one main consequence in the realm of validity: unique perspectives on research on quality may have been omitted. However, a more critical issue of validity and data selection might be hidden in the included journals. Even if the abstracts are publicly available,
free of charge, they nonetheless originate from journals and research papers that are not open access. This circumstance opens the thesis to the criticism that it is cementing and promoting an obsolete publishing world-order and the knowledge that is propelled through it, instead of giving voice to the growing open-access movement and the research on quality that is published through open access. This critique can be amplified if one considers that the studies on which the thesis is built are published in journals that are not open access. This critique is acknowledged, and future research on this issue is suggested. However, it is also necessary to emphasize that the technical revolution upon whose waves open access is surfing is a relatively new phenomenon. As the purpose of the thesis was to examine the epistemological formation of quality as a paradigm, it was necessary to include research journals and publishing houses that represent the old, still prevailing, world order to present a trustworthy depiction of historical developments in the field.

3.6 The research journey – a personal expose

The research has been driven by an interdependent curiosity and interest in epistemological issues on the one hand and machine learning on the other. Both angles of the research appeared pretty much simultaneously while I was participating in the 2013 QMOD-ICQSS conference in Portoroz, Slovenia. For some time, I had pondered the quality movement, its theoretical foundations and its relationship with the outside world. With a Bachelor’s degree in political science, I was grateful for the practical, hands-on approach my Masters degree in quality management and leadership had given me. I believe that quality initiatives have incorporated much of Kurt Lewin’s thinking about action research, where implementation, reflection and action go hand in hand (Bradbury et al., 2008). Or, as stated in French and Bell (1999), action should follow research and research should follow action, an apparent connection to the well-established approach of plan, do, study and act (PDSA). However, as time went by, issues of a theoretical and epistemological nature were growing and posing greater and greater concern. For example, what was the unifying theoretical foundation of the researchers at the QMOD-ICQSS? They seemed to lack a common ground to stand on. In addition, how was it that so much research was carried out on implementation and operational issues and so little attention was paid to the theoretical and epistemological matters of the field? I noticed similar currents in the consulting sector, which showed great interest in new management concepts but did so mostly from a shallow perspective, with a focus on how those concepts could be packaged and sold. Consequently, I slowly developed a partly sceptical and dystopic view regarding management research and implementation, including quality initiatives. The fundamentals and conditions for long-range initiatives, firmly anchored in theory
and research, seemed to be missing. Cautious to avoid turning my impressions into established truths, I began thinking of ways to approach these questions scientifically. The thought of taking “all data” from a specific data source containing research on quality and processing it with modern software emerged. It appeared to be an interesting venture, as the aim was to examine both theoretical and practical perspectives that could potentially be of use to the field. In a seminar at the abovementioned QMOD-ICQSS conference in Slovenia, it dawned on me - why not use the QMOD-ICQSS proceedings as a data source? After initial research and reasoning with colleagues and mentors, QMOD-ICQSS was decided on as the data source of choice.

Soon, the first setback appeared: no archive or database existed for the QMOD-ICQSS conferences. This came as something of a surprise, but with indispensable help from Jens Dahlgaard, Su Mi Dahlgaard-Park and Ingela Bäckström, the conference proceedings from 9 out of 16 conferences were gathered. The second blow came shortly after, when it was revealed that all conferences had different formats and layouts for the conference proceedings, which led to some cumbersome problems for processing and modelling. However, with valuable support from Måns Magnusson and Mikael Bengtsson from Linköpings University’s department of computer and information science, the efforts resulted in study 1 and paper A, where probabilistic topic modelling was tested. However, due to the troubles of collecting and preparing the conference proceedings as well as their limited timeframe, it was clearly necessary to scout for other data sources, as described in chapter 3.3.2. Quite rapidly, scientific research paper abstracts were identified as an appropriate path worth exploring. The shift in this direction proved to be a positive step, as it was possible to collect data more easily and focus could be put on working hands-on with modelling and evaluation of the observations, instead of preparation.

In parallel, participation in a PhD course on the theory and application of BI arranged by ETOUR at Mid Sweden University (MiUn) sparked new ideas on how to model and analyse the data, foremost cluster modelling, which was applied in Papers B, C and E. Bit by bit, the frameworks of a quality paradigm puzzle emerged. Given that my initial mindset leaned towards a view of management research and application as being quite superfluous in nature, generating a never-ending stream of trends, fads and fashions, I was surprised to find that there seemed to be some kind of overarching base that tied the research together, at least over a time period of 30 years. Consequently, my focus gradually changed from trends, fashions and fads within the quality paradigm towards its foundation beams, with the evolving results and conclusions creating both comfort and alarm. On the one hand, a spark of optimism was lit in that there actually seemed to exist a fundament of research on quality that remained immune to short-lived influences. Such a foundation is a condition for any long-range activity, be it research or practice. On the other hand,
the findings also led to new questions and frustrations. If, then, there actually are validated pillars of a scientific quality paradigm that have been tested and revised for at least 30 years, why does there seem to be such a propensity towards the new and transitory? The questions are not new and are beyond the scope of the thesis, but they constitute a springboard for future research and implementational activities.
4. SUMMARY OF APPENDED PAPERS

This section presents a summary of the six studies as well as additional results from the research process. Complete versions of the six papers can be found in the Appendix.

4.1. Summary of paper A

"Exploration of text mining methodology through investigation of QMOD-ICQSS proceedings"

Carnerud, D. (2014)
Presented and published in the proceedings of the 16th QMOD-ICQSS International Conference, 3-5th Sep, 2014, in Prague, Czech Republic.

Background

Within the quality movement, there exists a spirited debate concerning the historical developments and future direction of the research field, where many demand a more concrete theoretical grounding if the discipline is not to lose relevance as an academic field of study (Dahlgaard-Park, 1999; Dahlgaard-Park, 2011; Singh and Smith, 2006; Van Der Wiele et al., 2000). Traditional research methods used to explore the quality movement have – to a large extent and rather successfully – consisted of surveys, literature reviews and case studies (Dahlgaard-Park et al., 2013; Kroslid, 1999; Mauléon, 2003; Montabon et al., 2007; Sila and Ebrahimpour, 2002). However, as we now find ourselves in an era where the help of digital tools enables us to collect, process and analyse large amounts of data in a previously unprecedented way, it could be relevant to use these novel methods and data sources to shed new light on the quality movement (Angell and Corbett, 2009; Gattiker and Parente, 2007). In this way, new epistemological knowledge could be generated; whether it confirms earlier conclusions or not is beside the point – the mere exploration itself is a theory-building activity that will hopefully imbue the research paradigm with new energy (Godfrey-Smith, 2003). Moreover, because there is a lively debate concerning the fundamentals of TQM, what it actually consists of, its context-dependence or independence, and even what it should be called (Harnesk and Abrahamsson, 2009; Green; 2012, Hellsten and Klefsjö, 2000, Nair, 2006; Sila, 2007; Soltani et al., 2008, Zhang et al., 2012), it becomes imperative to remain open-minded when conducting exploratory inquiries (Godfrey-Smith, 2003), which offer a good environment for successful data and text mining (Miner, 2012; Weiss et al., 2012).

Traditionally, research on data mining within the fields of computer science, statistics, mathematics and artificial intelligence has focused on how large masses of numbers and figures can be used to gather valuable insights into the past, present and future (Larose, 2005). However, a relatively new field of research is now...
emerging out of data mining: text mining (Weiss et al., 2012). Text miners use much of the knowledge and tools derived from traditional data mining but focus on linguistic data sets instead of numerical ones (Miner, 2012). This leap towards statistical processing of verbal data is driven by the urge to develop ways of generating knowledge from human records and data, which are ultimately often non-numerical (Aggarwal and Zhai, 2012).

**Purpose**
The purpose of the study was to explore whether and how text-mining methodology could be applied to investigate and analyse large numbers of academic papers.

**Methodology**
Text mining can be conducted through different methods; however, among the most promising today are so-called probabilistic topic models using the Latent Dirichlet Allocation (LDA) model as a distributed algorithm, which offers a method to cluster words into topics on the basis of their most likely association (Blei, 2012; Charu et al., 2012; Newman et al., 2009; Xie and Xing, 2013). Topic modelling with the use of LDA was chosen as the principal method of processing the data.

**Main findings**
Text mining with the help of topic modelling has proven to be one way of processing the QMOD-ICQSS conference proceedings. Text mining, combined with topic modelling, is seen as a unique methodology compatible with the values, tools and methods within the TQM community, offering interesting new ways of approaching large datasets by adding a new perspective to that of traditional methods such as content analysis, case studies, surveys or literature reviews. Text mining in general and topic modelling specifically were demonstrated to offer great opportunities to explore large amounts of information and discover underlying structures, patterns and trends. However, it is concluded that attaining real-life datasets that are suited for text mining is easier said than done. Hence, the crucial point is to successfully obtain and experiment with relevant datasets from organizations if the methods are intended to develop into a relevant tool for people working with quality development and improvement.

Closely connected to the issue of attaining data is the question of the format in which that data is distributed. Simply put, the conference proceedings of QMOD-ICQSS have become more graphically and visually attractive during recent years, which makes them harder to transform into a workable data format. Because a graphically more appealing presentation of the conference proceedings is probably seen as something positive for the conference participants, this should be continued;
however, the proceedings could also be saved in a format that simplifies digital processing and, ideally, saved in a database that is easily accessible to researchers. Another issue that should be highlighted is interpretability: as a topic model grows larger, it becomes more difficult for the human mind to overview and assess it. The results do not provide any help in resolving the difficulties of analysing topic models, but the study does give support to Chang et al. (2009) in that human judgement is capable of identifying relevant topics and topic models, especially because the recognition of the tf-idf formula as the source of error in the initial topic models was completely due to human assessment. However, as larger topic models consisting of many topics are generated, they rapidly become too large and difficult to for the human mind to capture in an objective way, and this issue of the evaluation of topic models is of crucial importance and needs to be handled if topic modelling is to develop as a practical and meaningful methodology. Finally, the results showed variation in the QMOD-ICQSS proceedings, indicating that there could be trends across the conferences. However, determining how much was dependent on the specific theme or location of the conference was beyond the scope of the study.
4.2. Summary of paper B

Exploring research on quality and reliability management through text mining methodology

Carnerud, D. (2017)
International Journal of Quality & Reliability Management, Vol. 34 Issue: 7, pp. 975-1014,

Background
Concern about fashions, trends and fads in management research and practice is not a new phenomenon in the academic community (Abrahamson, 2009; Czarniawska, 2007; 2011; 2014; Czarniawska and Panozzo, 2008; Parush, 2008; Star-buck, 2009; Trout, 2004). Researchers interested in QM and TQM are no exception to this general rule: the question has fuelled debate for many years, with even Deming (1986) taking a stand by urging scientists and practitioners to promote valid quality improvement measures instead of just flaunting slogans (Dahlgaard-Park, 1999; 2011, Dahlgaard-Park et al., 2013; Perla and Parry, 2011; Sila and Ebrahimpour, 2002; Sousa and Voss, 2002; Van Der Wiele et al., 2000). As the ongoing digitalization of society offers access to an ever-increasing amount of data as well as ever-more powerful hard- and software, new methods of identifying, mapping and structuring trends in digital material continuously arise (Delen and Crossland, 2008, Dereli et al., 2011).

Against this backdrop, the International Journal of Quality & Reliability Management (IJQRM) offers an interesting object of study because it is one of the few research publications dealing with QM and other aspects of business and manufacturing improvements that has a digital publication archive dating as far back as 1984. This unbroken sequence of publications – with more than 240 issues available – makes IJQRM an ideal context for research into how a publication and its research articles have evolved historically (Aggarwal and Zhai, 2012; Kent, 2014; Larose, 2005; Liu, 2011; Miner, 2012; Weiss et al., 2012). A retrospective view of trends, fashions and fads is not useful for historical purposes alone; it can also help the editors and publishers of today to gain a better understanding of the dynamics of the product and make strategic decisions accordingly (Carneiro Moro et al., 2014; Finch, 1999; Heim and Field, 2007; Köksal et al., 2011). Tapping into the historical progression of a research journal can also be helpful to researchers in the midst of the publishing process by identifying the optimal journal for publication by providing information about what kind of research has historically been a cornerstone or stronghold of a certain publication (Becher and Trowler, 2001; Delen and Crossland, 2008; Dereli et al., 2011; Starbuck, 2009). Finally, analyses of research journals could serve as a way to identify upcoming trends, which might help in
decision making about future research as well as with the alignment or direction of research programmes (ibid). Hence, this study aimed, with the help of computational tools and techniques, to explore the digital library of IJQRM over the last 30 years, looking for possible trends, fashions and fads.

Methodology
The study explores the effectiveness of using text-mining methodologies to collect, organize and summarize the digital library of IJQRM from 1984 to 2014. To structure and condense the data, k-Means clustering and probabilistic topic modelling with Latent Dirichlet Allocation (LDA) was applied. The dataset consisted of research paper abstracts.

Main findings
The study supports the notion that there are trends in research, but as the results do not offer any guidance as to the reasons behind these trends, complementary studies are called for. Topics identified as being in decline are QFD and areas within the fields of reliability, failure and maintenance management. A topic on the rise is found to be Six Sigma, with a particular orientation towards Lean, innovation, implementation and improvement.

The study suggests that quality and reliability management are the dominant fashions or trends in the analysed academic field. However, the study also offers an alternative explanation that discusses whether TQM, ISO and service quality might actually be the current paradigms and fashions in the field, as they have remained more distinct, making them less watered-down than quality and reliability management.

The results of the study verify the mission statement of IJQRM as a journal “dealing with all aspects of business and manufacturing improvements,” with specific coverage of quality and reliability management as well as the following:

- TQM
- Service quality
- ISO
- Process management
- QFD
- Six-sigma

Finally, the study justifies further examination of cluster and topic modelling for both epistemological pursuits as well as for business intelligence purposes.
4.3. Summary of paper C

25 years of quality management research – Outlines and Trends.


Background
Research on QM literature with the aim of identifying changes over time has been undertaken previously (Ahire et al., 1995; Dahlgaard-Park et al., 2013; Gupta et al., 2014; Rahman and Sohal, 2002; Sila and Ebrahimpour, 2002; Zain et al., 2001). Lo and Chai (2012) establish that QM research has evolved around customer satisfaction, implementation of TQM, monitoring quality cost, measuring service quality and studying TQM outcomes. Core research themes from which succeeding themes have sprung are found to be service quality, customer satisfaction and TQM framework identification (ibid). Furthermore, conceptual developments are noted: from an initial focus on statistical control, a gradual shift has taken place towards strategic aspects such as improving general and key business processes (ibid). Subsequently, recent developments in TQM consist of a shift towards providing quality service and measuring its success (ibid).

With the exception of Lo and Chai (2012), the studies are mainly literature reviews conducted through a qualitative approach, with Dereli et al., (2011) and Martínez-Lorente et al. (1998) falling in-between. In addition, as noted by Dahlgaard-Park et al. (2013), both Lo and Chai (2012) and Dereli et al. (2011) are based on the same study object, Total Quality Management & Business Excellence (TQMBE), and both studies together cover a period of merely 15 years (1995-2008 and 1996-2010). With the aim of extending the scope of both the years studied and the academic journals included, Dahlgaard-Park et al. (2013) incorporate literature from 25 years (1987-2011) from the ABI/INFORM complete periodical database, which contains more than 6800 academic journals. Nevertheless, Dahlgaard-Park et al. (2013) fall back on qualitative methodology and literature reviews. Consequently, there is still a lack of quantitative studies on the QM literature over a longer time period and including more journals than TQMBE. With the aim of bridging this gap, the study included 25 years of data from TQMBE as well as the International Journal of Quality & Reliability Management (IJQRM) and the TQM Journal (TQMJ).
Methodology
To categorize and condense the data, k-Means clustering and probabilistic topic modelling with Latent Dirichlet Allocation (LDA) were applied. The dataset consisted of abstracts from research papers from the International Journal of Quality & Reliability Management (IJQRM), the TQM Journal (TQMJ) and Total Quality Management & Business Excellence (TQMBE).

Findings
The purpose of the study was to explore and describe how research on QM has evolved historically. Thus, topics of QM research and their development over time have been documented. Central topics within QM research are found to be the following:

- Control, costs, reliability & failure
- Service quality
- TQM – implementation & performance
- ISO – certification, standards & systems
- Innovation, practices & learning
- Customers – research & product design

Of the central topics, in addition to innovation, practices and learning have previously been identified as core themes of QM research. Hence, innovation, practices and learning can be seen as a novel identified central theme within QM research that prior studies have overlooked.

Furthermore, it was shown that QM research has undergone shifts in research focus, most notably from a dominance of TQM and control of quality, costs and processes towards a focus on service quality, customer satisfaction and Six-Sigma, Lean and innovation.
4.4. Summary of paper D

Kaizen and continuous improvement–trends and patterns over 30 years


Background
Thirty years have passed since Imai (1986) proposed Kaizen as the nucleus of Japan’s competitive success. The message has been repeated ever since, adding to the Kaizen success story that has become an accepted key concept of modern management in the 21st century (Imai, 2012; Miller et al., 2014). Kaizen has also been presented as a fundamental factor in Japanese management and is often considered an underlying element of Lean production and TQM (Brunet and New, 2003). The concept of Kaizen is often used as a synonym for continuous improvement (CI), but essential disagreements exist in academia and practice concerning the definition and (in)compatibility of the two terms (ibid).

Without disputing the positive effect of Kaizen and CI in Japan and throughout the world, Brunet and New (2003) and Suárez-Barraza et al. (2011) note important issues concerning terminology, implementation and epistemology. Both Brunet and New (2003) and Suárez-Barraza et al. (2011) stress that clarifying the nature and scope of Kaizen is imperative for improving its success rate in real world applications. In the same vein, both Bhuiyan and Baghel (2005) and Singh and Singh (2015) establish that a more critical analysis and a more rigorous theoretical basis for conducting research in the field are required. With the aim of adding new perspectives on the evolution of Kaizen, this study adopts a longitudinal and comparative perspective, researching how Kaizen and CI have been used by scholars in six academic management journals over more than 30 years.

Method
The study applies a mixed methods approach to search for tendencies and outlines concerning Kaizen and CI in four scientific journals focusing on QM and two focusing on OM. The dataset contains entries from 1980 until 2017, which makes it possible to depict how Kaizen has evolved over more than 30 years.

Findings
The findings show that Kaizen and CI attracted special interest in the mid-1990s, after which interest appears to have decreased. However, the findings imply that a regenerated interest in these areas spiked after 2010. In addition, the results indicate that Kaizen is accepted by one part of the management community but completely ignored by the rest. Finally, the data illuminate a need to strengthen
and clarify Kaizen's theoretical basis and its relationship to CI. If an aspiration exists to increase the success rate of Kaizen implementation, the results from the study highlight the need to address and clarify epistemological, terminological and theoretical issues.
4.5. Summary of paper E

Four Decades of Research on Quality: Summarizing, Trendspotting and Looking Ahead

Presented and published in the proceedings of the 21st QMOD-ICQSS International Conference, 22-24 August, 2018, Cardiff University, Wales, UK
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Background
Regardless of time period or context, quality has had multiple and often muddled definitions and has come to describe a wide variety of phenomena (Reeves and Bednar, 1994). Furthermore, Reeves and Bednar (1994) find that the complexity and multiple perspectives historically associated with quality have made theoretical and research advances difficult. However, the remedy is not to formulate one definition or model that attempts to account for all possible variables (ibid). Rather, the goal should be to develop models and definitions that are comparable, cumulative and that account for components that have been previously neglected (ibid).

Evidently, there exists a century-long vibrant discourse regarding the fundamental dimensions of research on quality. However, is this only a question of academics who study quality being locked inside their ivory tower debating issues of no importance to the practical shop floor and the managerial reality of everyday business life? Not if you follow the thoughtlines of Barouch and Ponsignon (2016), who find that managers’ familiarity with epistemological foundations is a condition for the success of QM programmes. From this perspective, it becomes apparent that theoretical and practical advances go hand in hand. Consequently, a deepened understanding of how central research topics have developed and evolved over time not only helps academic discourse to progress but also informs practice. Hence, the purpose of this paper is to identify and depict the key areas around which research on quality has focused during the past 37 years. Additionally, this paper aims to explore longitudinal patterns and trends within the identified key areas during the past four decades. Therefore, this study aims to present new perspectives on the foundational elements and evolutionary patterns of research on quality as well as on the future direction of this research field.

Method
Findings
This study identifies seven central topics around which research on quality has centred during this time period:

- Service Quality & Customer Satisfaction
- Process design & Control
- ISO Certification & Standards
- TQM - Implementation, Performance & Culture
- QM - Practices & Performance
- Reliability, Costs, Failure & Problems
- Excellence - BEMs, Quality Awards & Excellence in Higher Education.

With the exception of QM - Practices & Performance, which has not been as clearly identified previously, the results show that the total number of entries has risen constantly since 1980; however, there was a period of decline between 2000 and 2012, indicating that after almost four decades, research on quality is still vibrant and relevant.
4.6. Summary of paper F

The quality movements three operational paradigms
- A text mining venture

Purpose
This study analyzes four text-mining studies of quality management (QM) to illustrate and problematize how research on quality has informed the quality paradigm since the 1980s. By understanding history, we can better manage current developments.

Design / Methodology / Approach
Findings are based on a meta-analysis of four text-mining studies that explore and describe 11,579 research entries on quality between 1980 and 2017.

Findings
The findings show that research on quality during the last 30 years can be described as a research paradigm consisting of the three operational paradigms:

- Operative paradigm of back-end quality, orbiting around Quality Management (QM), Total Quality Management (TQM) and service quality
- Operative paradigm of middle-way quality, circling around ISO, Business Excellence Frameworks (BEMs) and quality awards
- Operative paradigm of front-end quality, revolving around reliability, costs and processes

The operative paradigms are interconnected and complementary but also show the existence of a divide between a general management view on quality and a hands-on engineering take on quality. The findings indicate that research on quality is a long-lived standalone paradigm, which supports the notion of quality being a genuine academic entity, not a fashion or fad.

Originality
Text-mining studies targeting research on quality are scarce, and there seem to be no prior models that depict the quality paradigm based on such studies. The perspectives presented here will advance the existing paradigmatic discourse. The new viewpoints aim to facilitate and deepen the discussion on current and future directions of the paradigm.
5. ANALYSIS

In this chapter, the findings from all studies are discussed in relation to the theoretical and methodological parts of the thesis with the aim of addressing the purpose of the thesis and shedding light on the research questions.

5.1 Relinking to the analytical framework

In chapter 2.10, an analytical framework is presented that describes the theoretical and methodological wiring of the thesis. With this backdrop, the findings emanating from the conducted studies are analysed through the outlooks presented in the theoretical frame of reference; chapters 2.3 (Historical perspectives on quality), 2.4 (Defining and theorizing quality), 2.5 (Epistemology, paradigms and quality), 2.6 (Fads, fashions and quality), 2.8 (Studying research publications as a way of understanding a discipline), 2.9 (Contributing to existing epistemological viewpoints through text mining) as well as chapters originating from the research design and process; 3.1 (Research approach – mixed methods), 3.2 (Research method – text mining), 3.3 (Data analysis process) and 3.5 (Ethics) - illustrated in Figure 27.
To analyse the epistemological formation of quality as a paradigm, the analysis is divided into four parts: one longitudinal (chapter 5.1.1.), one content-based (chapter 5.1.2.), and a third chapter synthesizing the two perspectives (chapter 5.1.3.). The division is made on the basis of the studies’ dual contributions – shedding light on the epistemological formation of quality from both a longitudinal and content perspective. Analysis of the application of text mining is treated last, in chapter 5.1.4.

5.1.1. The study results from a longitudinal perspective

From theoretical chapter 2.3, it is evident that several scholars have identified a chronological development in the historical evolution of the quality field, with an initial focus on inspection and control, which then shifted towards assurance, continuous development and culture (Bergman and Klefsjö, 2010; Dahlgaard et al., 2007; Dale et al., 2007; Garvin, 1988; Lo and Chai, 2012; Maguad, 2006; Weckenmann et al., 2015). Dahlgaard-Park (1999, 2011) and Kroslid (1999) also suggest a sequential development of the field; however, they opt for a more dynamic and complex historical depiction. Based on 30 years of evidence, the findings from the present doctoral thesis support both viewpoints. Studies B and C portray a more linear development, where focus has shifted from areas such as quality control and cost of quality, QFD, reliability-, failure- and maintenance-management, processes and TQM towards service quality, customer satisfaction, Six-Sigma, Lean and innovation. Study E, on the other hand, which includes more journals in the data source, contrasts with such a notion and instead argues that the development has quite steadily orbited around seven core research themes (see chapter 4.5, p. 77). In study E, there is evidence for perennial shifts, but the main point is that different study areas seem to publish in different journals.

Consequently, looking at historical developments from the perspective of Olivers (2014), studies B, C and E strengthen the idea of quality as technological excellence in manufacturing truly being the dominating view throughout the past. However, quality viewed as a consumer-generated comparative judgement could also be extracted from the identified topic customer satisfaction.

Looking at the longitudinal development of scientific knowledge in TQM, Dereli et al. (2011) establish that it is not a question of whether knowledge has progressed during the last decades, rather, the question is the pace at which progress has been made. Indeed, all studies in the dissertation imply that research on quality is vibrant; however, the issue of speed and progress is complex because it is value laden. If one looks at the total number of publications as an indicator of speed and progress, it seems that the field as a whole has slowed down since the start of the new millennium (see 4.3 and 4.5 for summary, or appended papers C and D). On the other hand, the equilibrium regarding the output of research papers shown in studies B, C and E could also indicate that development has moved into a more
balanced and harmonious rate of speed and progress, as suggested by Dahlgaard-Park et al. (2013). This observation would be consistent with Van der Wiele et al. (2000), who, looking at the historical track record in both Europe and Japan, notice that TQM can be seen as having moved in the direction of fashion to fit (ibid). Furthermore, this observation would support Feigenbaum (1999), who pinpoints the late 1980s as the specific time period when fact-based decision making became widely accepted as an absolute and universal managerial necessity. This acceptance occurred as sales of his 1983 edition of Total Quality Control suddenly skyrocketed, and it is this edition in which the concept of total quality management (TQM) was introduced (ibid).

Shifting focus from speed to progress, studies B, C and E confirm the findings of Heady et al. (1997), who conclude that both managers and academics are showing signs of turning away from writing about TQM, although there is no such indication for the QM literature in general (ibid). Similarly, the study results affirm those of Martínez-Lorente et al. (1998), who find that the use of TQM terminology was widespread at the beginning of the 1990s, with a subsequent decline since 1993, but that TQM vocabulary still maintains a prominent position in the academic management literature. Additionally, studies B, C and E acknowledge the claim from Martínez-Lorente et al. (1998), who observed that self-assessment had become one of the new materializations of TQM. However, benchmarking, which was also recognized by Martínez-Lorente et al. (1998) as a new step within the field, was not identified by the studies in this thesis as a central part of such new advancements. With the exception of benchmarking, studies B and C also confirm the claim of Dahlgaard-Park et al. (2013) that papers focusing on techniques and tools in terms of Lean, Just-in-Time/Toyota Productions System, and Six-Sigma have been increasing. Dahlgaard-Park et al. (2013) also find that papers focusing on core values/key principles regarding the need to build a quality culture in terms of leadership, people-based management, CI, management based on facts, and focus on the customer have slightly increased during the last decade. With the exception of focus on the customer, which is most notably visible as customer satisfaction in studies B, C and E, and CI in study D, the studies in the thesis cannot validate these observations. Furthermore, the studies in this thesis cannot validate the conclusion of Dahlgaard-Park et al. (2013) that focus has shifted from tools and techniques to core values that are needed to build a quality and BE culture. Some indications from studies C and E, however, show that organizational culture is central in research on quality. However, the findings in this thesis cannot confirm the claim of Dahlgaard-Park et al. (2013) that organizational culture is becoming increasingly important for organizations in the pursuit of quality and excellence.

The findings from studies B and C also follow the conclusions from Jensen et al. (2018), who find that during the third decade of JQT (1989-1998), there was a
transition from a prior emphasis on quality inspection and acceptance sampling towards designing quality into processes and measuring it in different ways (ibid). Furthermore, Jensen et al. (2018) find that the fourth decade (1999-2008) and the fifth decade (2009-2016) was the era of statistical process control/statistical process monitoring (SPC/SPM), shown in studies B, C and E as a steady interest in processes. As examples of tools that do not go out of style and will continue to remain relevant in the future, Jensen et al. (2018) name DOE, measurement systems analysis, reliability, and Shewhart control charts (ibid). Among these results, reliability is most visible in the study results. Ultimately, it is important to note that JQT, the study object of Jensen et al. (2018), is, like QREI, more technically oriented and treats the practical nature of niched problems. Moreover, the historical depiction of Jensen et al. (2018) is more fine-grained than those in the conducted studies. In all, this makes comparisons challenging and not fully compatible.

Study D, on Kaizen, can offer a historical point of view highlighting the notion of Dahlgaard-Park (1999, 2011), who underscores the interaction between the west, especially the USA, and Japan, where both sides acquired knowledge from each other, developed it and then re-inspired the other (ibid). More importantly, study D stresses that the research community is only one part of the quality system (depicted in Figure 26) and that there are major quality activities taking place outside this arena. Kaizen was introduced to the West in the 1980s, and the volume of management books on the topic seems vast. However, research, at least from a quality perspective, has been scarce.

Zooming in on current developments, studies C and E indicate that areas such as education and health care have shown an interest in quality. It is worth highlighting that study E reveals a special interest in excellence among the higher educational sector; this finding would support the claim from Ramirez and Tiplic (2014), who view higher education around the globe as in a state of flux, seeking the holy grail of excellence. The reasons for this trend are not clear, but it is possible that excellence for some reason resonates more than quality with the visions and values of academia. A similar bias towards Kaizen in the public sector can be identified in study D, but just as with excellence, the reasons for this possible preference cannot be derived from the conducted studies. It may be possible to interpret the results as supporting Weckenmann et al. (2015), who find that the present quality paradigm, from 2005 onwards, is characterized by QM concepts also being used in areas such as education, health care and public administration. On the other hand, it is worth reflecting upon whether such a paradigmatic shift could be expected to generate clearer evidence in the data if it truly represents a new paradigm. Given that the results in studies B, C and D only offer vague indications in support of this hypothesis, the idea of a complete paradigmatic shift seems to be disproven, though it is acknowledged that such a shift could be in the making. In line with these lines of thought, none of the studies in this thesis shows any support for the supposition
that the influence of employees – as opposed to machines or other technical components – is assigned ever-greater importance. This finding is proposed as a further sign of the latest paradigmatic shift argued for by Weckenmann et al. (2015). Glimpsing into the future, taking all conducted studies into account, the results cannot be said to clearly support the predictions of Weckenmann et al. (2015), who sees responsibility as the next guiding star for QM. However, in study D, cluster 5.4.2.0.1, which represents a significant part of the data (9%), hints that there might be some truth in the prediction, as studies touching upon global cultural differences, as well as social, human and environmental issues are recognized. In closing, it is perhaps not surprising that the studies cannot clearly verify predictions for the future because they are mainly focused on historical developments in the field ranging over 30 years. Nonetheless, if we are to adopt Maguad’s (2006) view of quality as a means of protecting humanity from disruptive changes to the environment and of improving the social and economic lives of many, the void is troublesome.

5.1.2. The study results from a content perspective
Studies A, B, C and E identified central areas around which research on quality has orbited. Compared with the theoretical models and perspectives presented in chapter 2.5, it is evident that the study results are of a less abstract nature than much of the theoretical groundwork accounted for and, hence, not compatible with that prior work. As an example, in studies B, C and E, both processes and performance are identified as central research themes, albeit often specifically connected to QM and TQM activities. These themes constitute two of Oakland’s (2014) core of four hard management necessities. However, Oakland’s (2014) two remaining hard management necessities – planning and people – are of a highly abstract nature and could thus be derived from all identified research themes or to none, as most quality activities, be they practical or scientific, probably involve planning and people in some way. Similarly, out of culture, commitment and communication, the soft outcomes that tie together Oakland’s (2014) framework, only culture could be directly observed in studies C and E.

Correspondingly, in a comparison with the five fundamental values of QM put forward by Bergman and Klefsjö (2010), focus on processes and focus on customers can explicitly be identified as central research themes in the studies. In regard to Bergman and Klefsjös’ (2010) values of top management commitment and let everybody be committed, neither is directly observed in studies A, B, C, and E. However, as with Oakland’s (2014) management necessity people, it is possible that those values play an important role in successful quality initiatives and are parts of an organization’s culture – which is identified in studies C and E as a research topic. In the same vein, Bergman and Klefsjös’ (2010) value base decision on facts could probably be used as
an overarching heading for all identified research themes because, after all, it is likely that most researchers and managers would argue that they base most of their decision on facts. Finally, Bergman and Klefsjö (2010) see *continuous improvement (CI)* as a fundamental value. Studies A, B, C and E do not pinpoint this value, but study D on Kaizen touches upon CI, and it is evident that the topic has been fairly well researched. Nevertheless, CI has not shown up as a stand-alone topic in studies A, B, C and E. In addition to the values propelled by Bergman and Klefsjö (2010), Hellsten and Klefsjö (2000) propose that QM is a trinity and also consists of *tools and methodologies/techniques* that vary over time. As the tools and methodologies/techniques are more concrete, they are also explicitly addressed in studies A, B, C and E. Examples of tools are control charts, process maps, ISO 9000 and MBNQA criteria. Visible methodologies/techniques include QFD, Process Management, Quality Circles and Self-Assessment.

In regard to Kanji’s (1994), only the TQM-pyramid and the stated general governing principle *delight the customer* can be observed in studies A, B, C and E. However, as previously stated, CI can be identified as an existing research theme by study D, but not as an overarching central topic. In regard to the two remaining governing principles *management by fact* and *people-based management*, neither can be observed directly by any of the studies in the thesis. However, as in previous cases with Oakland’s (2014) management necessity *people*, the soft outcomes *commitment* and *communication* as well as Bergman and Klefsjö’s (2010) value *top management commitment, let everybody be committed and base decision on facts*, the high level of abstraction of these principles makes them difficult to falsify. Comparably, with the exception of teamwork, the core practices in Kanji’s (1994) TQM-pyramid that can be accounted for are the more concrete ones: *customer satisfaction, all work is a process, measurement, continuous improvement cycles and prevention*. In contrast, the core practices *internal customers are real and people make quality* are more elusive and, perhaps for this reason, not identified in any of the thesis’s studies.

Similarly, out of the characteristics of a quality culture stated by Sandholm (1999), *customer focus* and *process orientation* have been strengthened by studies A, B, C and E. Additionally, as stated previously, CI was recognized as a well-researched area, albeit not a central one. However, in regard to *participation* and *empowerment*, the themes are not identified, possibly due to their more elusive nature.

In the same vein, looking at the origins of quality definitions put forward by Reeves and Bednar (1994), only the more concrete ones *quality as conformance to specifications* and *quality as meeting and/or exceeding customers’ expectations* can be derived in studies B, C and E, whereas *quality as value* is not clearly visible. Although, it could be argued that *value*, in some ways, is connected with *costs*, which does appear in studies B, C and E. Regarding *quality as excellence, excellence* does appear in studies A, B, C and E,
but it is questionable if they are compatible, as excellence in studies A, B, C and E appears most prominently in the realms of BEMs and excellence in higher education. Similarly, among Garvin’s (1984) five approaches to quality, the product-based, user-based, and manufacturing-based approaches can be directly observed in studies A, B, C and E because they can be linked with research areas such as process design, reliability, ISO- certifications and customer satisfaction. As mentioned previously, the value-based perspective could perhaps be derived from costs, which is also visible in studies B, C and E. However, costs should then also be coupled with customer satisfaction in order to be in line with Garvin’s (1984) taxonomy. Regardless, the transcendent perspective, which, according to Garvin (1984), is the most obscure and subtle, cannot be identified in studies A-E.

Barouch and Fonsignon (2016) propose a generic framework for QM that is grounded in three philosophical paradigms: pragmatic, systemic and constructivist (ibid). Additionally, in this case, customer (but not stakeholder) focus and process management can be said to be verified by studies A, B, C and E. Whereas management commitment and leadership, employee involvement and partnerships with customers, suppliers and society are not observable in studies A-E. As mentioned above, CI is recognized as an important research area in study D but is not a central research area in studies A, B, C and E.

With the exception of business development and leadership, the results from the conducted studies show a large overlap with those of Dereli et al. (2011), who identified the ten most frequent keywords in TQMBE between 1995 and 2008: TQM, Customer and employee satisfaction, service, performance, organization, ISO 9000, Six-Sigma, business development, leadership, processes, business excellence, management and quality. Additionally, the observation from Dereli et al. (2011) of an increasing interest in TQM by service organizations is confirmed by studies B, C and E. Furthermore, Dereli et al. (2011) distinguish an interest in ISO and quality certifications in the literature but ask for further studies that identify their distribution over the years, and that distribution is shown in studies C and E. Thereby, studies A, B, C and E can also be said to confirm the claim from Van der Wiele et al. (2000) that the ISO 9000 series and quality awards / BEMs are two significant trajectories that have helped to spread the message and encourage involvement in TQM (ibid).

Furthermore, the results from studies B, C and E show strong correspondence with the central research topics identified by Lo and Chai (2012): customer satisfaction, implementation of TQM, monitoring quality cost, measuring service quality and studying TQM outcomes. However, studies B, C and E cannot verify the findings of Lo and Chai (2012), who identify service quality, customer satisfaction and TQM framework identification as core research themes from which succeeding themes have sprung.
Considering studies A-E from Xu’s (2000) viewpoint of delineating quality’s discursive connections, apparent touchpoints emerge. Xu (2000) identifies two discursive objects: standards and quality generated by discourse between engineering, marketing and specialization. Standards can take on many forms, such as quality awards, BEFs and ISOs, and in the boundaries between the fixed (engineering) and the moving (marketing in the form of changing customer demands), non-inscribed modes of quality take form (ibid). Studies A, B, and C can be viewed as in line with such a delineation, whereas one part is concerned with more intangible quality concerns (QM, TQM, Service Quality & Customer Satisfaction). The other part addresses concrete quality issues with the provided product or service (Process design & Control; Reliability, Costs, Failure). In parallel to these two discursive objects, the studies single out standards in the form of ISO; BEMs and quality awards as a manifestation of quality work. Such a dynamic interpretation of the study results resonates with Tsutsui’s (2001) account of the evolution of Japanese industrial management as an ongoing interchange between foreign models and domestic constraints, a long-term process of imitation and innovation. In this line of reasoning, the study results could possibly be seen as an evolutionary discursive process between three complementary parts of a quality paradigm. This would also be consistent with the view of Maguad (2006), who argues that over time, approaches to quality differ in technique, emphasis and application; however, the objective of the teachings remains the same.

5.1.3. Synthesizing chronology and content

Trout (2004) notes that classical sciences, such as theoretical physicists, do not aim to be normative or to offer humans useful guidance about important matters, whereas epistemology does. A way of pursuing this road is to focus on hard theories, those that are easier to subject to reliable testing, as opposed to soft theories (ibid). In contrast, Starbuck (2009) views mechanistic theories as encouraging faddishness by emphasizing the importance of details and behavioural regularity at the microscopic level (ibid). In pursuit of specificity, mechanistic descriptions often call for details about which researchers have no evidence (ibid). Because they spell out processes in detail, mechanistic theories resist descriptions that are somewhat ambiguous and somewhat general (ibid). Although these properties make theories more testable, they also highlight theories’ minor flaws and portray theories’ correctness as binary (ibid). Thus, Starbuck (2009) favours Weick’s proposal to put forward ”theories of the middle range”, ones that are not so wide in scope that they make large numbers of assumptions and rely on many inaccurate observations. Nonetheless, Starbuck (2009) concludes that the debate on the usefulness of broad generalizations continues, as it is difficult to find a harmonious balance among generality, parsimony and accuracy, which, furthermore, is unclear and unstable.
over time. Against this background, the results from studies A-E have evolved into a theoretical construct that portrays the central paradigmatic dimensions of research on quality. Thus, grounded in both empirical and theoretical foundations, a model describing the paradigm of research on quality is presented in Figure 28 (the arrows represent the cumulative growth of research).

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![Diagram of quality paradigm 1980-2010]

The model aims at being in the middle range, balancing between generality and precision in a manner that is straightforward to validate. Consequently, the research paradigm of quality between 1980-2010 can accordingly, in the wording of Arbnor and Bjerke (2009), be described as the specializing and diverging, yet interconnected, development of three complementary operative quality paradigms: the operative paradigm of back-end quality, the operative paradigm of middle-way quality and the operative paradigm of front-end quality. The three operative paradigms differ in their levels of abstraction, accountability and system-learning emphasis. However, the mutual purpose and aim of the three operative paradigms, and hence the paradigm as a whole, is to continuously control, assure and develop systems affecting quality.
initiatives in service of the customer(s). Research orbiting around QM, TQM and Service Quality is viewed as aiming for generalist management knowledge focusing on overarching organizational concerns with a base in theory, culture and values. Such insights are imperative for long-lasting and organization-wide success. However, as such quality initiatives are primarily concerned with managerial perspectives, they operate on a high abstraction level “behind the scenes”, hence, the label back-end quality. At the other end of the spectrum, reliability, costs and processes are closer to the actual product and service, as well as actual customer experience(s). Thus, the label front-end quality. Bridging the two operative paradigms, ISO, BEMs and quality awards are seen as middle ways that pragmatically try to bring the two diverging ends together.

There are apparent parallels between the presented model and the discursive objects, standards and quality generated by discourse among engineering, marketing and specialization, presented by Xu (2000). Through ISOs, quality awards and BEFs, the

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Figure 29 The quality paradigm of the 1980s
operative paradigm of middle-way quality can be seen as the embodiment of standards. Furthermore, the operative paradigms of back-end and front-end quality can be seen as illuminating the continuous discourse among engineering, marketing and specialization. The operative paradigm of middle-way quality also supports the observations of Van der Wiele et al. (2000), who find that the ISO 9000 series, quality awards and BEMs have been central to the spread of quality. Regarding ISO 9000, Dereli et al. (2011) come to similar conclusions. The operative paradigms also resemble earlier results from Lo and Chai (2012), who identified six key areas in research on quality: Monitoring quality costs, Measuring service quality, Implementation of TQM, Studying TQM outcomes, Measuring service quality and Customer satisfaction. However, it must be stressed that there exist differences in how to view the chronological evolution of the key areas and operative paradigms. As mentioned in chapter 5, there are numerous accounts of a development from emphasis on the operative paradigm of front-end quality in the 1980s,
which was then replaced by an emphasis on the operative paradigm of back-end quality in the 2010s, illustrated in Figures 29 and 30. However, this historical description can be challenged by the argument that the operative paradigms have developed quite steadily and homogenously, albeit in different academic journals, as illustrated in Figure 28. This is seen as a consequence of specialization and increased knowledge in each operative paradigm, which led academic journals to focus on either of the two polarising operational paradigms. Consequently, if scientometric studies are conducted in academic journals primarily covering one operative paradigm, the other operative paradigm will obviously be perceived as diminishing.

5.1.4. Text mining and the study results

The thesis is built upon the premise of exploring how text mining can be applied to generate new insights into quality as a paradigm. In this venture, it was necessary to establish the conditions under which it is appropriate and possible to apply text mining. From this perspective, the results from studies A-E coincide with the observations of Heady et al. (1997), who find that textual information sources often cover extended periods of time, which facilitates longitudinal studies. With the exception of study A, the data source starts in the 1980s, which made longitudinal studies of 30-40 years possible.

Analysing how the data sources have developed during these four decades, studies B-E reveal an increased standardization in the format and style of research papers in scientific journals covering research on quality. The databases starting in the 1980s include the title of the paper, author and abstract; however, they do not include a structured abstract. As time progressed, each journal’s databases began to include structured abstracts, keywords and type of paper, making public information less versatile. In comparison, the data source of study A (i.e., conference proceedings) was not standardized to the same degree. From the perspective of text mining, it became evident from studies A-E that increased standardization facilitated information retrieval and comparison among papers as well as journals. Consequently, the observations in studies A-E assert De Bellis’s (2014) statement that journal articles have undergone a process of standardization relative to structure, format, and style starting in the mid-20th century. Accordingly, studies A-E also confirm De Bellis’s (2014) view that increased standardization of scientific journals has made them suitable candidates for data collection and statistical modelling. However, it is also possible that the positive side of increased standardization of abstracts has as a downside in that unique and distinguishing patterns become less visible – and are consequently overlooked by methodologies such as text mining. This is why a flexible research design, such as that used in study D, is appropriate, as it prevents methodological considerations from fully dictating the research agenda.
Furthermore, study A was based on complete manuscripts (i.e., conference proceedings), whereas studies B-E used abstracts from research papers. Using *abstracts* instead of *complete manuscripts* facilitated both data collection and modelling. Moreover, comparing study A with studies B, C and E, it seems as though it is easier to identify the main issues of the manuscript when information in the body of the manuscript is excluded, which coincides with the assertion of Heady *et al.* (1997). Additionally, it is worth pointing out that collecting and modelling complete research papers, beyond posing technical challenges, also raised legal considerations, as discussed in chapter 3.5.2.

Finally, studies B, C and E have evolved sequentially. The data source has continually expanded, and modelling, evaluation and presentation of results have successively been refined. Study C is largely based on the same research design as study B but with a larger data set, whereas study E is based on both a larger data set and a slightly different research design (i.e., application of a filtering scheme). In sum, the findings show large overlaps, with the clearest dividing line in study E, which questions the historical depictions of studies B and C. Given that studies B, C and E show both similarities and dissimilarities, these results are seen as proof of the possibility, strength and necessity of repeating and validating studies based on text-mining methodology. This finding is in line with Heady *et al.* (1997), who propose that studies based on computerized content analysis (i.e., text mining) are repeatable and thus open for validation.
6. CONCLUSIONS

This chapter presents the conclusions drawn from the theoretical, methodological and empirical findings presented in Chapters 2, 3, 4 and 5. The conclusions are first presented by relating them to the two research questions and then to the overall purpose of the thesis.

6.1. Reconnecting to the research questions

6.1.1. Research question 1

In what ways can text mining be used to provide new insights into quality as a paradigm, and what is required to apply such a methodology?

To apply text mining for the given purpose, the first key was to identify a data source that allowed for large-scale data collection. Such a data source was found in the online databases of scientific research journals. Consequently, the research approach allowed the collection and modelling of the complete archival records of six scientific journals, rendering a final data set of 10,560 entries – a data set too large for manual processing. To the best of the author’s knowledge, the data sets of each of the conducted studies are unique in their kind and have not been collected before. Furthermore, the author is not aware of any studies combining cluster modelling and probabilistic topic modelling. Therefore, the results presented in the studies can be said to provide new insights on the basis of their unique data and way of modelling. Furthermore, as the data set consists of an unbroken publishing series, it offers a unique longitudinal perspective on developments in the field. Additionally, successful application of text mining requires identifying software that allows the modelling technique of interest. One aspect of this choice depends on the researcher’s or research team’s knowledge of computer programming. The other lies in understanding the possibilities and downsides of the large, ever-growing, variety of software providers and products. Finally, it is important to emphasize the importance of well-considered data selection when conducting longitudinal text-mining studies based on a limited number of data sources. In the thesis, this issue is highlighted in study E, where technically oriented engineering studies, which can be said to represent a classic form of quality work, seem to use their own publishing platforms, whereas studies with a more managerial approach publish in theirs. Such a bias has important implications for both the application of text mining and the formation of quality as a paradigm.
6.1.2. Research question 2

*How can the epistemological formation of quality as a paradigm be described and understood?*

Taking a closer look at research journals covering research on quality, it is clear that there was a mounting interest in quality during the 1980s. That development points towards research on quality expanding during the end of the 1980s and beginning of the 1990s, after which a contraction took place, followed by stability at the start of the 21st century. Consequently, it is possible to state that research on quality entered a stable and mature phase in the 21st century, settling down as a distinctive and established research paradigm.

Zooming in on the content of research on quality, the studies confirm the existence of changes in focus and changing popularity of specific topics. On the other hand, central and perpetual research topics are also identified – supporting the supposition that research on quality truly constitutes a delimited and recognized research paradigm. Consequently, as Maguad (2006) predicts that it will probably take decades, if not a whole century, for the quality discipline to mature, it is seen as reasonable that the quality paradigm centres around core research themes that are continuously developed, tested, refined and improved.

6.2. Reconnecting to the research purpose

*The purpose of the thesis is twofold: 1) to examine the epistemological formation of quality as a paradigm and 2) to explore the application of text mining.*

In sum, the thesis has, through explorational scientometric studies applying text-mining methodology, shown that research on quality constitutes a research paradigm consisting of three operative paradigms: the operative paradigm of back-end quality, the operative paradigm of middle-way quality and the operative paradigm of front-end quality, illustrated in Figure 28. The paradigm with its operational paradigms fits well into the ecosystem of the development and reproduction of quality knowledge and initiatives, illustrated in Figure 32. Furthermore, entering the new millennium, the paradigm is seen as having reached a stable maturity level. However, the operative paradigms of back-end and front-end quality seem to be specializing and drifting apart, which might lead to a division of the paradigm into two separate paradigms.
Figure 32 The quality paradigm of the 1980-2010s within the ecosystem of implementing and developing research on quality
7. DISCUSSION

In this section, the findings and conclusions from the thesis and studies are elaborated, discussed and reflected upon, i.e., this section presents business reflexivity (chapter 3.3.4) in practice.

7.1. 30 years of research on quality – where have we been?

Out of the shared interest of researchers, gurus and practitioners around the globe in better understanding quality improvement work, a phenomenon grew that has been referred to as a quality revolution or the quality movement. The quality movement strongly resembles what many would categorize as an academic paradigm, with all that comes with it – scholars, scientific journals, conferences, etc. However, within the quality movement, as in so many other management paradigms, some fundamental questions emerged early on, most of which remain relevant today. Most notably, how should we properly name and define the potential academic paradigm around which the quality movement revolves? Consequently, confusion, misunderstanding and implementation problems have followed, as has an intensive debate over what actually constitutes the core or building blocks of the paradigm and what are just trends, fashions and fads.

Patton (2015) sees paradigms as worldviews and as ways of thinking about and making sense of the complexities of the real world. Arbnor and Bjerke (2009) view paradigms as part of a “conceptual language” developed by theorists of science when discussing the relationship between ultimate presumptions and the practical use of various methodological views. The main point is that paradigms serve to inform practitioners about which activities are legitimate without the necessity of long existential or epistemological consideration. To constantly question the constitution of reality or our scientific opinion would render practical research difficult, if not impossible. Operative paradigms, however, may change fairly often depending on the shifting character of the study area and the type of operative paradigm in question (ibid). In regard to the research paradigm scrutinized in this thesis – quality – existing theoretical models often include dimensions that are too general or vague to be testable. Perhaps this is due not only to researchers, in the wording of Trout (2004), presenting soft theories that cannot be verified but also to the elusiveness of the concept of quality. Coincidently, this elusiveness of definitions and challenge of testing is seen by Munro (1995) as an aspect of quality’s resources. Nonetheless, it is seen as positive that the studies in this thesis have led to a middle-range theory that can be tested. From the perspective of Perla and Parry (2011), where knowledge lies at the intersection of truth and belief, the presented theoretical model and operative paradigms can thus be said to lean towards representing truth, whereas other dimensions not identified by the studies lean towards representing belief. However, it is important to note that such non-identified dimensions, e.g.,
leadership and co-worker commitment, could still be part of the quality paradigm. However, such studies are presented in other academic journals that are more focused on these kinds of issues, and consequently those studies were not included in the current data set and research design.

The many different terms used and the different ways in which content and practices are labelled and defined have resulted in difficulties capturing, labelling, delimiting and comparing research on quality. Such hardships have made theoretical and research advances difficult, as inquiry and research into quality and quality-related issues must build upon a thorough understanding of differing definitions of the construct (Reeves and Bednar, 1994). Universalistic propositions describing the relationship between quality and various variables cannot be made when the meaning of the dependent variable continuously changes (ibid). At the same time, there is a need to compare research on quality in order to discuss and develop ideas, research and practices. The remedy is not to formulate one definition or model that attempts to account for all possible variables (ibid); rather, the goal should be to develop models and definitions that are comparable and cumulative and that account for components that have been previously neglected (ibid).

These perspectives are important to keep in mind when reflecting and discussing epistemological and paradigmatic issues concerning quality, as they point towards knowledge creation and “ownership” as important forces that influence the twists and turns of the epistemological and paradigmatic discourse. The development of general theories has escalated with the intensification of mass public education (Starbuck, 2009). Teachers try to make lessons meaningful to as many students as possible, thus the attractiveness of broad generalizing theories. This trend is also driven by the fact that formal education emphasizes abstraction and in-principle discussions in classrooms rather than practical experiences “on the ground” (ibid).

From the viewpoint of this thesis, it therefore becomes legitimate to question the empirical underpinnings of existing theoretical models. Their abstract nature makes them generic, but on the other hand, they may lose their footing in real practice and research. The presented model of the quality paradigm may be dull in its distinct labelling of the operative paradigms. However, it is hopefully a more tangible and transparent depiction of the quality paradigm that tries to describe the field while being open to validation.

Xu (2000) takes a slightly different perspective when referring to Munro (1995), stating that quality’s evasiveness of definitions appears to be one of its resources. This in turn creates a dilemma: the harder one tries to define quality, the further away one seems to be from its essence (ibid). However, Xu (2000) does not find this problematic; instead, he finds it intriguing that quality is able to resist being captured by an all-embracing definition. Hence, Xu (2000) suspends the effort to define quality and instead points towards the need for system-wide dialogue in
regard to quality issues. It has become inadequate to consult engineers or to rely on managers to solve problems concerning quality – cooperation and integration are needed (ibid). Additionally, a lack of agreed-upon definitions does not prevent the existence of a discourse on quality (ibid), and a common understanding is not a necessary condition for speaking about and writing on quality (ibid). Quality has become a discursive object that has taken on a life of its own (ibid). From the perspective of the presented findings, this view reduces the possible problems resulting from the quality paradigm being built upon three separate operative paradigms. Instead, it can be viewed as a desirable process of specialization that sets the scene for pulsating cross-functional dialogues.

Such conclusions can be said to go hand-in-hand with Jensen et al. (2018), who, glancing at the future, conclude that research in JQT must aim to make all processes, products, and services work better and more efficiently. It is not sufficient to focus solely on how to meet specifications because methodologies must be developed that support constant improvement (ibid). Conformance to standards has become a core customer expectation, and it no longer delights the customer when it is present; rather, it upsets the customer when absent (ibid). Consequently, the need to delight the customer expands the scope of quality such that it has an impact on virtually all human activity and interactions (ibid). Hence, Jensen et al. (2018) summarize that the quality technology profession makes its greatest contribution to society when efforts are concentrated on making all processes, products, and services work better and more efficiently. In this venture, quality tools, methods, and philosophy integrated with solid innovation efforts are fundamental to success (ibid). Accordingly, this view goes hand-in-hand with the conclusions of this thesis, which favour a dynamic learning dialogue between the operative paradigms. In light of contrasting but mutually rewarding standpoints, Dahlgaard-Park et al. (2013) indicate that QM is now in a more mature stage, in which the focus has shifted from TQM to tools and techniques and to the core values that are needed to build a culture of quality and BE. With the exception of TQM and excellence, the topics identified in studies A, B, C and E do not correspond to the techniques/tools and core values/key principles studied by Dahlgaard-Park et al. (2013). While it might be tempting to judge the findings as incompatible and incomparable, it is worthwhile to clarify the reasons for the divergence. The inconsistency between the studies is due to differences in data collection and modelling. Consequently, these differences can be viewed as examples of how variations in study design as well as in deductive and inductive approaches generate diverse results that are valid, relevant and mutually enriching.

Similarly, the results of studies C and E confirm that the three core research themes identified by Lo and Chai (2012), service quality, customer satisfaction and TQM framework identification, are indeed central topics of the quality paradigm. However,
none of the studies validate the thesis of Lo and Chai (2012), which states that those are the core themes from which succeeding research themes on quality have sprung, as the dataset used in the studies did not allow that particular analysis. In the same vein, the results in the thesis oppose the findings of Bajaj et al. (2018), who conclude that there are few journals specializing in TQM, as only four of 62 journals included in their study had published more than five articles on the subject. From the standpoint of this thesis, the results of Bajaj et al. (2018) are an effect of study design, where a narrow definition of the study object has led to the identification of few data entries. Ultimately, as Cole and Scott (2000) suggest, what knowledge is believed to be and how it can be obtained vary over time and space. From this viewpoint, the operative paradigms and trends described in this thesis are valuable to the ongoing debate regarding quality and will hopefully be helpful in the continued development of the quality paradigm.

Reflecting on the results of the study, it becomes apparent that mapping out what Becher and Trowler (2001) refer to as the “knowledge context” of research on quality gives valuable insights into epistemological and paradigmatic questions related to quality. By studying the behaviours, methods, symbols, and language of research on quality, one can obtain an increased understanding of what influences have been fluctuating in the field (Becher and Trowler, 2001). When reviewing a discipline’s foundation, Becher and Trowler (2001) note four unifying factors: artefacts, institutions, language and theory. Specifically, the medium of language and the disciplines of discourse can be seen as a conveyer of the contextual distinctions within and between academic disciplines. In the case of quality, it is obvious that artefacts in the form of “the quality gurus”, such as Shewhart, Deming, Juran and Crosby, exist, as do university institutions teaching and researching quality. However, the case for a common language and theory is debated. Is there truly a common and unique language and theory that separates quality research from other academic paradigms, making it a paradigm of its own? The findings in this thesis point towards the existence of both a unifying language and theoretical and practical constructs that together form a quality paradigm based on three operative paradigms.

Czarniawska and Panozzo (2008) argue that fashion can be contrasted with custom and that it can be hard to decide which reason is forcing a fashion, as the spokespersons for a fashion sometimes obscures its real quality (ibid). From the viewpoint of a quality paradigm, this is an interesting perspective, as some “gatekeepers” and founding fathers, through their “guru status,” might have muddled the actual quality paradigm by their personal views and perspectives. Furthermore, Czarniawska and Panozzo (2008) claim that densely populated academic settings promote imitation. Becher and Trowlers (2001) claim that more densely populated research landscapes propel more spin-offs. From this
perspective, it is perhaps logical that a rift in the quality paradigm has developed between the operative paradigms of back-end and front-end quality. Each operative paradigm attracts their adherers who do their best to specialize and succeed within their own orientation and more or less consciously distance themselves from the other operative paradigms.

This depiction would support the summary and prognosis of Juran (1995), who noticed that professionalism among quality specialists has grown, as seen in the current existence of quality and reliability engineers. Juran (1995) foresees the same development at the business level, which might lead to the establishment of corresponding titles such as Professional Qualitist, Certified Public Qualitist or a similar generic term to describe someone active in the field of quality. Both could be seen as early acknowledgements of specialization in the form of the three operative paradigms.

Another important reason for undertaking epistemological inquiries is the close connection between knowledge production (research) and knowledge reproduction (teaching). This might be said to be especially true for research on quality, as it has been heavily occupied with practical issues of implementation and improvement. That there exists a malicious hierarchy between research and teaching is nothing new, but its influence on the changing landscape of higher education is relevant for a deeper understanding of research on quality.

Higher education underwent a change during the late 20th century, targeting more and more students globally, nationally and regionally with fewer and fewer resources. As a result, the pedagogical milieu has changed, and information reproduction from students is prioritized at the expense of critical thinking. One aspect of this problem is that control mechanisms and power influences constrain the possibility of creating a thriving culture of co-creation between researchers, teachers and students. However, the epistemological key point is the following: what happens to a knowledge field when education is focused on reproduction and research is highly volatile due to short-term funding of projects with lack of theoretical development? If theoretical research gets reduced attention in favour of trendy, short-term research topics, the students will learn only to reproduce knowledge and information that will become outdated very soon, instead of learning for life and acquiring skills that they will derive long-term benefit from. Consequently, there is a risk of academia and the quality field eroding its own fundament, i.e., actual knowledge production, since both researchers and students will lack an incentive to engage and invest in a knowledge field that will soon change anyway.

Summarizing the issue, one could ask if the process of knowledge production is particularly important for research on quality. The answer could well be that it is, as research on quality has, from the start, been practice-oriented, which has led to
theoretical and epistemological research being less highly prioritized and thus building its house on a shaky foundation. If, then, the impoverishment of higher education is added to the mix, it is clear that the field is in serious danger of “cutting off the branch it is sitting on” because the graduating students and researchers who set out to apply quality-research findings in the private and public sectors will not recognize their own subject just a couple of years after graduation. Not recognizing your own field of expertise is of course frustrating, but it also creates aversion and a public sentiment that quality issues are just fads and trends, not long-term knowledge that will last a lifetime. Thus, a negative cycle is created, generating more questions about legitimacy and existence even as more academics pursue education and research within the field.

Finally, it is important to reflect upon whether a paradigm, like a movement or revolution, can ever be perfectly pinned down. Both movements and revolution feature an intrinsic momentum, and it is often impossible to identify a definitive start or end. Consequently, it is natural that the quality paradigm will be subject to constant debate, with proponents claiming its death or continued well-being.

7.2. Text mining and scientometrics as a way to map research on quality

Xu (2000) finds that the empirical lies also in the historical and that texts are artefacts of perspectives from the past that constitute conditions for the present. Furthermore, it is discourse that produces the effect of knowledge on quality (ibid). The findings in this thesis are in line with these thought lines. Heady et al. (1997) stress that published texts have always been an important part of communication between groups, and content analysis uses this information (ibid). Additionally, formal textual information is sometimes more applicable than that obtained through questionnaires and interviews because it records knowledge in a way that is uninfluenced by the researcher (ibid). In most cases, the academic paper is seen as the most prestigious form of publication (Becher and Trowler, 2001). Consequently, studying what has been published in academic journals covering quality should provide insight into which issues and topics have been preoccupying the field over the years. Nevertheless, by omitting books, one area of academic contributions and focus is indisputably left out. Additionally, it is important to stress that paper A uses conference proceedings and papers B, C and E use journal abstracts as a data source. Thus, topics and categories that could be identified via other research publications are excluded, such as books; literature reviews; general reviews; viewpoints; secondary articles; editorials; guest editorials; awards for excellence (notifications); introductions or summaries from conferences; notes from the publisher; and articles without an abstract. In sum, as the studies and thesis do
not encompass the complete publication landscape, it is possible that fundamental and transitory topics are left out or undervalued.

Another possible critique of the study design and application of text mining is that 30-40 years is within the span of a working person’s career, and it could thus have been possible to collect data by interviewing persons in the field. Basing the studies on research papers and conference proceedings, however, has the advantage of including many different authors, both those who have remained within the field as well as those who have left, thereby giving a more multifaceted depiction of the field’s historical development. In the same line of thought, special issues in scientific journals could be accused of distorting the picture, as it is the editorial board that decides which topics are of special interest. However, the majority of volumes are not special editions and should therefore not impact the overarching results. With research conferences, the story is somewhat different because each conference has a special theme, usually with some connection to the geographical location of the conference and the host university, which should have an impact on the contributions. In addition, conferences usually have a policy of requiring at least one participant to present the paper. This may influence who chooses to send a contribution and who does not. Furthermore, as every scientific conference worth mentioning is cooperating with at least one scientific journal, it is worth reflecting upon the consequences this might have on research being conducted and presented at conferences. Is it that this kind of collaboration facilitates new and emerging topics being picked up by scientific journals? Or, is it that the partnership, intentionally or not, steers the research and subsequent conference proceedings in the direction of what is published in the associating journal(s)?

In any case, it may be that the strong focus on publication in English that prevails in the quality paradigm and in academia at large distorts the picture emerging from the data. Researchers with a high ability to express their findings in English or who have access to editing will probably be at an advantage in publishing. Because there already exists an Anglo-Japanese bias to research on quality due to the field’s historical development, the field could be skewed even more, ultimately rendering it irrelevant to non-Anglophone countries. Inclusion of non-English publications in further studies could be a way of testing the extent of this possible bias. Moreover, Czarniawska and Panozzo (2008) as well as Lillrank (1995) take up the notion of translation not being a neutral transformation from one language to another; adaptation is always made. Translation simultaneously produces and reproduces variation, as repetition creates and re-creates difference (ibid). As the last century has shown that there exists a global interest in quality issues and a vivid transaction of knowledge between languages and countries, especially between Western countries and Japan, this statement could help us to better understand as well as to
problematize the imitation and dispersion of quality initiatives among countries, regions, industries and organizations.

Finally, an apparent issue for the experienced text miner is that purposeful and interesting results are generated foremost through the processing of large datasets. The datasets of the presented studies are substantial. Nonetheless, it could be argued that studies containing an increased number of scientific journals could be more likely to identify paradigmatic insights of interest. Hence, more studies that include larger datasets could be called for. On the other hand, bibliometric power laws such as Lotka’s law, which estimates the exponentially diminishing returns of searching for references in science journals, could be used as counter arguments (Talukdar, 2011), as Lotka’s law states that it is enough to identify the “core publications” for a field and that researchers gain little from their efforts at searching for relevant entries outside that set (ibid). Consequently, it could be of more interest to increase the diversity of data (e.g., non-English journals or journals with low IF) instead of adding more of the same.

7.2.1 Data (un)reliability in text mining and scientometrics

As the research progressed, it became evident that academic journal databases function quite differently. A telling example was the incapability of some search engines and search functions in databases to identify a research paper on the basis of a complete abstract. However, the searched paper could be identified on the basis of the exact keywords. On some occasions, the opposite was true. Additionally, abstracts or keywords are sometimes missing, and on a few occasions, both are missing. In some cases, this situation is probably due to the author(s) not providing abstracts or keywords and the editorial boards and reviewers not having demanded such. In other cases, it may have to do with the database itself. Such errors could occur when importing the data to the database or when creating or updating the database structure, such as when database updates have paused. The latter could be the case with discontinued journals where the incentives or resources for keeping the database up to date might be scarce. In conclusion, it seems important that researchers working with academic journal content that is digital and/or online keep a watchful eye on data reliability. Additionally, for a more general research public, this observation could underscore the importance of using several different ways of searching for literature, data and research findings to strengthen the reliability and validity of the conducted study.
8. FUTURE RESEARCH

8.1. Additional data collection
With the aim of increasing the relevance of time series analysis using published papers as baseline data, it could be fruitful to expand the data collection so that it includes the ranking and impact factor of each journal. In this way, it would be possible to link or evaluate trends regarding the number of issues published annually with the journal’s importance according to the academic community. Furthermore, it could be possible to base future studies on manuscripts or abstracts from scientific journals that are open access. This also opens up the possibility to work with complete research papers, but mostly it could provide additional insights into the similarity or dissimilarity of research topics between subscription-based and open access papers. Moreover, if one is interested in highlighting trends and fads of the quality paradigm, especially during its expanding phase in the 1990s, it could be of interest to include discontinued journals. Additionally, in an effort to look for non-identified dimensions that are, according to a number of existing theoretical models, believed to constitute a part of the paradigm, it could be worthwhile to include scientific journals in closely related fields, e.g., leadership and human resources (HR), and apply a filtering scheme that identifies quality-related studies. Finally, it would be of the highest interest to include non-English scientific journals so that similarities and differences in the epistemological formation of quality could be studied from different angles.

8.2. Practical implications
In light of the suggested divide between the operational paradigms, it could be valuable to further examine the possible practical implications. Heady et al. (1997) would like to tone down the conclusion that the non-academic community controlled the early development of QM. Martínez-Lorente et al. (1998) argue that the decrease in the number of published papers is due to TQM now being broadly known and accepted and, thus, no longer attracting as much attention from scholars as it once did. Martínez-Lorente et al. (1998) also find that most theoretical developments in the advancement of TQM have been made in the USA, whereas Japan has held the lead in terms of applications. Additionally, variances seem to exist in the application of TQM amongst different countries (ibid), indicating that the culture of the company influences the approach to the application of TQM and, hence, that different countries with different cultures apply TQM in different ways (ibid). However, Martinez-Lorente et al. (1998) maintain that these differences are diminishing as economies and societies are becoming increasingly interrelated. Against this backdrop, it would be interesting to examine and extrapolate whether it is necessarily a bad thing that the quality paradigm is split into several paradigms.
or if is it a natural process that should be welcomed? In such a venture, it could be suitable to include scientific journals focusing more explicitly on reliability or quality technology, e.g., JQT, as well as non-English journals.

8.3. Effects of general theories

Falkheman (2014) and Czarniawska (2007; 2011; 2011) emphasize the need to understand that there exists a discrepancy between research and education because education, with its focus on the fundamental theories of a discipline, tends to be normative. These fundamental theories and models have a tendency to simplify reality so that they fit into a certain formula or visual description (ibid). What then happens is that people educated in a field view the world and act in a manner that is grounded in these simplified versions of research and reality, with increasing frustration when what they have learnt in university does not work as easily in reality (ibid). Ultimately, they resign and blame the field for being old and irrelevant, looking for other remedies to help them pursue everyday organizational life. Studies that highlight and reflect upon these conditions within the quality paradigm could help hinder that destructive pathway and instead point towards a constructive middle-way where abstract theories and practical hands-on work meet.

8.4. Delimited inquiries

According to Ramirez and Tiplic (2014), higher education around the globe is now in a state of flux, seeking the holy grail of excellence and invoking world standards and “best practices” as road maps in this quest for excellence. As the studies confirm a bias from higher educational institutions towards excellence, it could be interesting to conduct studies on the quality paradigm from this perspective, pondering the reasons and implications for the paradigm and operative paradigms. Similarly, there seems to exist a special interest in Kaizen in the public sector as well as in Spanish- and Portuguese-speaking countries. It could be interesting to further investigate such indications. Additionally, further studies should scrutinize the idea of Weckenmann et al. (2015) that responsibility is becoming increasingly important to the emerging quality paradigm.
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