Exploring Tampering

Towards an Understanding of Why Improvement Efforts Sometimes Fail

Magdalena Smeds

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Abstract

Ever-increasing competition together with increasing and changing customer demands place high demands on organisations to maintain and improve their current products and services while also developing and renewing their offerings. However, research claims that many improvement efforts carried out in organisations fail. A line of research in quality management focusing on process improvement proposes that *tampering*, i.e. attempts to solve problems without targeting the fundamental causes of the problem, may be one reason why some attempts to improve fail. This dissertation focuses on faulty identification of causes of problems, as well as responses to such problems made by individual employees in their day-to-day work.

The purpose of this dissertation is to **enhance knowledge on tampering as a means to understand why attempts to improve sometimes do not lead to the desired results**. This dissertation also answers the research questions *How is tampering manifested in various types of approaches to identifying and responding to problems?* and *How can customers cause employees to take tampering actions?* Studying how tampering is manifested in different ways depending on how a problem is interpreted and consequently the approach taken to respond to the problem can enhance knowledge about which interpretations and actions may lead to tampering. In this dissertation, approaches are viewed as alternative courses of actions available to employees when responding to problems. Four different types of approaches are studied: inaction, workaround, local improvement and system change. In addition, possible connections between customers and tampering are discussed and in this dissertation, it is proposed that the customer may have a negative impact on employees' improvement efforts. In addition to answering the two research questions, a contemporary understanding of the tampering concept is proposed.

Three studies have been conducted: a narrative literature review, a qualitative interview study and a case study with data collection through interviews, observations and a document study. This dissertation includes five appended papers. To answer the first research question, the main findings from the papers have been analysed by applying flexible pattern matching. The flexible pattern matching process was conducted by developing a theoretical framework of approaches, summarising the findings from the papers, and then comparing the findings to the theoretical framework to identify similarities and differences. To answer the second research question, examples of tampering were studied where the customer affected which problem was to be remedied or how.

The analysis in the first research question results in five manifestations of tampering in various approaches to identifying and responding to problems. Actions proposed to cause tampering are passivity/wait-and-see, symptomatic response, locally focused response, disproportionate vision and vicious spiral of firefighting. The analysis in the second research question shows multiple examples of customer-induced tampering. Customers do not tamper with an organisation's processes, but may express demands or concerns about perceived problems or how to execute a process that the organisation complies with. The saying 'the customer is always right' seems to be applied especially when the demand is placed by customers who are considered particularly important for relational or economic reasons.

This dissertation contributes to research on quality management in general and improvement efforts through employees approaches as well as the customers role in identifying and responding to problems in particular. This dissertation and the appended papers explore the concept of tampering, and suggest that there is a need for a revitalisation and a broader understanding of the concept in order to increase its applicability in contemporary contexts. This dissertation also explores the previously under-explored perspective on how customers can cause organisations to take measures that – from a process perspective – create process deterioration.

Sammanfattning

Till följd av den ständigt ökande konkurrensen samt de ökande och förändrade kundkraven är förbättring en central aspekt för organisationer för att underhålla och förbättra nuvarande produkter och tjänster samt att utveckla och förnya sina erbjudanden. Forskningen hävdar dock att många ansträngningar som görs i organisationer för att skapa förbättring misslyckas. En forskningsgren inom kvalitetsutveckling som fokuserar på processförbättring föreslår att *tampering* (sv. *överstyrning*), dvs försök att lösa problem utan att försöka påverka de underliggande rotorsakerna till problemet, kan vara en anledning till att försök att skapa förbättring misslyckas. Denna doktorsavhandling fokuserar på enskilda medarbetares bristande identifiering av rotorsaker till problem samt bristfälliga tillvägagångssätt för att agera på sådana problem i deras dagliga arbete.

Syftet med denna avhandling är **to enhance knowledge on tampering as a means to understand why attempts to improve sometimes do not lead to the desired results**. Denna avhandling besvarar också forskningsfrågorna *How is tampering manifested in various types of approaches to identifying and responding to problems?* och *How can customers cause employees to take tampering actions?* Att studera om tampering manifesteras på olika sätt beroende på hur ett problem identifieras och valt tillvägagångssätt för att agera på problemet kan öka kunskapen om vilka tolkningar och åtgärder som kan leda till tampering. Med olika tillvägagångssätt menas olika alternativa åtgärder som är tillgängliga för individer när de agerar på ett problem. Fyra olika typer av tillvägagångssätt studeras: inaktivitet, kringgående, lokal förbättring och systemförändring. Dessutom diskuteras möjliga kopplingar mellan kunden och överstyrning då denna avhandling föreslår att kunden kan ha en negativ inverkan på medarbetarnas förbättringsarbete. Förutom att besvara de två forskningsfrågorna, föreslås även en samtida förståelse av begreppet tampering i denna kapp.

Tre studier har genomförts: en narrativ litteraturoversikt, en kvalitativ intervjustudie och en fallstudie med datainsamling genom intervjuer, observationer samt dokumentstudie. Den huvudsakliga analysen genomfördes genom att utveckla ett konceptuellt ramverk bestående av olika tillvägagångssätt, sammanfatta resultaten från de bifogade artiklarna och jämföra resultaten med ramverket för att hitta likheter och skillnader. Dessutom analyserades överstyrningsexempel där kunden influerat vilket problem som ska åtgärdas eller hur.

Analysen resulterar i fem manifestationer av tampering. Tillvägagångssätt som föreslås orsaka överstyrning är: passivitet/vänta-och-se, symtomatiska åtgärder, lokalt fokuserade åtgärder, oproportionerliga visioner av åtgärder och ond spiral av brandsläckning. Analysen visar flera exempel på kundinducerad överstyrning. Kunderna överstyr inte nödvändigtvis en organisations processer, utan uttrycker åsikter eller oro kring upplevda problem eller hur man genomför en process som medarbetarna tillämpar. Ordspråket 'kunden har alltid rätt' verkar särskilt tillämplas när krav ställs av kunder vilka anses särskilt viktiga av relationella eller ekonomiska skäl.

Denna avhandling bidrar till forskning om kvalitetsutveckling i allmänhet och förbättringsarbete genom individens tillvägagångssätt samt kundens roll i att identifiera och agera på problem i synnerhet. Denna avhandling och dess bifogade artiklar utforskar begreppet tampering och antyder att det finns ett behov av att förnya och skapa en bredare förståelse av begreppet för att öka tillämpbarheten i en samtida kontext. Denna avhandling utforskar också det tidigare underutforskade perspektivet om hur kunder kan påverka medarbetare att vidta åtgärder som ur ett processperspektiv leder till processförändringar.

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List of appended papers and author's contributions

M.S., J.M. and M.E. developed the basic ideas for Papers II–IV jointly and carried out the interviews. M.S. was assigned overall responsibility of the interview study, analysis of the data and writing of the papers.

Paper I

Smeds, M. (2021), Deming's tampering revisited: definition and future research agenda. *International Journal of Quality and Service Sciences*, Vol. pre-print No. pre-print. <https://doi.org/10.1108/IJQSS-03-2021-0041>.

Paper II

Smeds, M., Martin, J., and Elg, M. (2020), To act or not to act. Exploring Deming's tampering in practice. Submitted to the European Operations Management Association (EurOMA) conference 2020 (not presented due to COVID-19). Unpublished manuscript.

M.S. was responsible for analysing the findings and writing the first draft. All authors then rewrote and revised the draft.

Paper III

Smeds, M., Martin, J., Elg, M. and Gremyr, I. (2021), Why won't you leave the process alone? Exploring emotional, motivational and cognitive mechanisms triggering tampering. *Submitted to journal* on 4th of February 2022. Undergoing third review.

M.S. was responsible for analysing the findings and writing the first draft. All authors then rewrote and revised the draft. M.S. was responsible for revising the paper during the review process however all authors contributed to the rewriting of the paper.

Paper IV

Smeds, M., Martin, J., Elg, M., and Gremyr, I. (2021), Don't just do something stand there! – Countermeasures for avoiding tampering in practice. Submitted to the European Operations Management Association (EurOMA) conference 2021, 5–7 July Berlin, Germany. Unpublished manuscript.

M.S. was responsible for analysing the findings and writing the first draft. All authors then rewrote and revised the draft.

Paper V

Smeds, M. and Poksinska, B.B. (2019), The effects of cancer care pathways on waiting times, *International Journal of Quality and Service Sciences*, Vol. 11 No. 2, pp. 204-216. <https://doi.org/10.1108/IJQSS-04-2018-0041>

B.B.P. came up with the research idea, however, both authors contributed to designing and conducting the study. M.S. was responsible for designing and conducting the document study. M.S. had the main responsibility in the writing of the paper, with specific responsibility for the introduction, the findings and parts of the analysis.

1. Introduction

A real estate owner (customer) calls a real estate manager (service provider). The customer is not angry but clearly has a 'serious tone' when calling to say that they are not satisfied with the services provided by the service provider, and that they need to see some changes quickly otherwise they may start looking for a new service provider. The service provider is taken by surprise, since this is the first time they have heard this. Worried that this important customer will terminate the agreement, the service provider asks what the customer thinks they should do. Following the customer's demands, the service provider agrees to implement daily service rounds at the customer's properties in addition to the service activities stated in the agreement. The customer hangs up satisfied with the new agreement. However, the service manager is not happy to hear about this change. The service manager, who talks on a daily basis to the employees responsible for the services at these properties, know that no particular problems have occurred and that there should be no need for daily service rounds.

(Illustrative quotation from tampering example 3, Appendix I)

Every day, we encounter obstacles and problems that need to be dealt with, both in our everyday lives and at work. Whether we are aware of it or not, problem-solving and efforts to improve are natural parts of our everyday life. The illustrative quotation above describes an everyday work situation where a dissatisfied customer encounters a manager. A customer is an individual or organisation who buys, hires or uses products or services from another organisation. The saying "The customer is always right" has haunted organisations and reminded them of the importance of providing customers with good service ever since it was coined in 1909 by Selfridge's department store founder Harry Gordon Selfridge (Jung, 2012). Having a customer focus is regarded as a central principle in quality management (QM) (Dean Jr and Bowen, 1994), and understanding customers' needs as well as increasing and maintaining customer satisfaction are often described as central to organisations as a means of being competitive (Cai, 2009; Hallencreutz and Parmler, 2021).

In this dissertation, QM is described as a management approach based on a set of principles, practices and tools that advocates systematic efforts to improve the dimensions of products and services that are important to an organisation's stakeholders (Dean Jr and Bowen; 1994; Gremyr et al., 2020). Ever-increasing competition together with increasing and changing customer demands place significant pressure on organisations to maintain and improve current products and services, as well as developing and renewing their offerings (Benner and Tushman, 2003; 2015; Ng et al., 2015). Organisations' success and survival have been shown to depend on this ability (Deming, 1993; Woodruff, 1997), since failure to fulfil customers' needs has been the downfall even of world-leading companies (Ho and Chen, 2018). Efforts to improve the quality of products and services from the customer's perspective is thus a central issue for organisations. Quality can be defined as "*meeting or exceeding customers' expectations*" (Reeves and Bednar, 1994).

With this background in mind, it seems that the manager in the illustrative quotation above should take the customer's disappointment seriously. The question is whether the response is sufficient.

1.1 Improvement through problem-solving

It has been suggested that customer satisfaction can be achieved through efforts to improve an organisation's processes (Dean Jr and Bowen, 1994). A process can be defined as 'a sequence of activities that transforms an input to an output to meet the needs of a customer or stakeholder' (Gremyr et al., 2020). In general, *to improve* can be described as 'to make better' or 'to enhance in quality or value' (Merriam-Webster Dictionary, 2021, *to improve*). Viewed through the lens of QM in particular, *improvement efforts* can be described as single or recurring activities carried out by organisations in order to enhance performance (ISO, 2015). One activity through which improvement can be achieved is problem-solving (Dean Jr and Bowen, 1994; Galeazzo et al., 2017). When talking about how to act on a problem, it is often in terms of *solving* problems. The word *solve* indicates that the problem has been remedied and that a solution has been found. However, the outcome is not always a solved problem or an improvement. Thus, instead of using the term *solve* in connection with a problem, the term *respond* is used as it does not specify the outcome of efforts made to deal with a problem. The term *problem-solving* is still used to describe the general activities of identifying and responding to problems.

QM advocates systematic improvement efforts and problem-solving through the empowerment of first-line employees (MacDuffie, 1997) who through their position at the front line are considered to possess important knowledge about the process and are thus important actors in identifying problems and their causes (Roth, 1985; Tucker et al., 2002). Prioritising the identification and elimination of problems through problem-solving is regarded by some as the most important part of efforts to improve organisations (Palady and Olyai, 2002), and is sometimes highlighted as one of the central indications of a quality culture (Waldman, 1993). Consequently, a wide selection of problem-solving processes (e.g. Marksberry et al., 2011) and approaches such as Six Sigma (e.g. Antony and Banuelas, 2002; De Mast and Lokkerbol, 2012; Muralidharan, 2015; Hoerl et al., 2021), Kaizen (e.g. Prayuda, 2020; Suárez-Barraza and Miguel-Davila, 2020) root cause analysis (e.g. Rooney and Heuvel, 2004; Andersen and Fagerhaug, 2006), PDSA (Deming, 1989) and 7-quality control tools (Ishikawa and Lu, 1985) have been developed. In line with the emphasis of QM, a considerable amount of research is carried out on how organisations and groups (e.g. Towler, 1993; Seo et al., 2016; Galeazzo et al., 2017; Franken et al., 2021) work systematically with problem-solving.

In the same way that the manager in the opening quotation above has his or her work disturbed by a situation that is considered problematic, disturbances and the need to deal with these disturbances are part of many employees' daily work. Front-line employees and middle managers who work in day-to-day operations are primarily those who suffer from operational problems and thus have good opportunities to identify and eliminate them (Tucker et al., 2002; Van Gestel et al., 2015). These employees often have valuable first-hand information about the nature of the problems and their consequences (Roth, 1985) and have sole responsibility for deciding whether and, if so, how these problems should be remedied (Van Gestel et al., 2015).

Even though individual employees are sometimes considered as the most important resource in identifying and eliminating operational problems, less attention has been paid to how individual employees respond to problems encountered in their daily work; that is, problems that are not part of an organisation's systematic improvement efforts (Smith, 1996; Tucker and Edmondson, 2002; Tucker et al., 2002; Galeazzo and Furlan, 2020). Many such problems that employees encounter can be described as 'low hanging fruit', as they are easy to identify and do not require too much time or too many resources to respond to (Su and Chou, 2008). Even though employees' problem-solving activities do not necessarily stem from the systematic quality work, these activities can still result in improvements or be highlighted as suggestions for future improvement projects. In this dissertation the notion of how individual employees identify and respond to problems in their daily work is addressed.

With this background in mind, let us go back to the illustration of the dissatisfied customer. It is clear that the real estate manager considers the satisfaction of this customer to be important and is eager to respond to the customer's problem. Since organisations spend a lot of time on problem-solving and improvement, resolving this matter should not be a problem – right?

1.2 Making improvements – easier said than done?

Over the years, there has been considerable interest in studying the success and failure of problem-solving and improvement efforts. Studying successful cases has long been the dominant way to generate knowledge about how organisations can benefit from experience when improving operations (e.g. Coronado and Antony, 2002; Zwikael and Globerson, 2006; Fryer et al., 2007; Aleu and Van Aken, 2016). Despite this, scholars seem to agree that the majority of these efforts do not lead to the desired results or worse, they fail (Sitkin, 1992; Tang and Butler, 1997; Albliwi et al., 2014; McLean et al., 2017; Antony and Gupta, 2019; Antony et al., 2019; Antony et al., 2020; Sunder and Prashar, 2020; Swarnakar et al., 2020). Claims about how many improvement efforts fail vary greatly, but researchers seem to agree that there are numerous. In addition, failure to achieve desired results does not seem to be limited to certain types of organisations or sectors – it is widespread (e.g. Longbottom and Hilton, 2011; McLean et al., 2017; Raja Sreedharan et al., 2020). The consequences of these failures are not well reported, but include missing out on desired improvements such as economic, performance and customer satisfaction gains (Mosadeghrad, 2014; Antony and Gupta, 2019) as well as wasting substantial amounts of resources such as time and human capital that could have been better spent elsewhere (Antony et al., 2019).

Although organisations naturally strive primarily to succeed, it is inevitable that they will sometimes encounter problems or fail in their attempts. Hiding and being ashamed of failure is increasingly being replaced by attempts to learn from it (Sitkin, 1992; Cannon and Edmondson, 2001; 2005). It is not obvious what constitutes a successful or unsuccessful improvement effort. There are many aspects that can be considered when assessing whether or not an outcome should be considered successful. For example, which parameters or goals 'must' be achieved, from whose perspective has something improved, gotten worse or remains unchanged (e.g. owners vs front-line employees), how long after introduction the decision on success or failure is made, etc. (Axelrod et al., 2006; Stanleigh, 2008). Unsuccessful improvement efforts have been described as efforts that fail to drive anticipated value, achieve savings goals, gain expected competitive advantage or generate lasting results, for example (Antony et al., 2019; Sunder and Prashar, 2020). What constitutes a failed effort can therefore, to a certain extent, be considered subjective and dependent on the assessor's perspective.

As an alternative to studying success, studying failure is also suggested to increase the understanding of how to act and how not to act in order to achieve sustainable and fruitful improvements (Sitkin, 1992). One way to achieve this is to learn from past experience (Shewhart, 1931). Similar to research on problem-solving practices, research on failed attempts to respond to problems and achieve improvements in QM is dominated by studies at the organisational level. Examples include studies by Bourne et al. (2003b), Lucey et al. (2005), Rompho (2011), Mosadeghrad (2014), Antony and Gupta (2019) and Swarnakar et al. (2020). Within QM, less attention has been paid to studying individual employees problem-solving (Tucker et al., 2002; Van Gestel et al., 2015; Furlan et al., 2019). Examples of such studies include those carried out by Tucker et al. (2002), Tucker (2016), Gemmel et al. (2019) and Galeazzo and Furlan (2020). In other research fields however, extensive research is available

on limitations in employees' problem-solving and decision-making capabilities (e.g. Simon, 1972; Tversky and Kahneman, 1974; Gilovich, 2008; Castillo et al., 2017).

Now that it is clear that making improvements is easier said than done, we can assume that the manager in the illustration faces something of a challenge. However, the manager does not seem particularly worried and asks the customer to suggest how to approach the problem without defining the problem and outlining its possible causes. Unfortunately for the manager, a lack of understanding the underlying problem has been suggested as one reason why improvement initiatives fail (Sunder and Prashar, 2020).

Next, the type of shortcoming when dealing with problems on which this dissertation focuses, namely tampering, will be presented.

1.3 Tampering – shortcomings in identifying and responding to a problem

There is no single explanation for why so many improvement efforts fail. As previously indicated, this is an area that interests many researchers. One pioneer in this field was Walter A. Shewhart who, in the 1920s, discovered that despite Western Electric's best efforts to live up to its slogan 'as alike as two telephones', efforts to improve their manufacturing processes only seemed to make matters worse (Does et al., 1999). It turned out that the company was attempting to improve the processes without considering the fundamental causes of the perceived problems (Shewhart, 1931). This gave rise to the discovery of the importance of basing process improvement efforts on the identification, reduction and elimination of the fundamental causes of variation (Shewhart, 1931); a view that is still central to QM (Martin et al., 2020).

Shewhart identified two shortcomings in trying to achieve process improvements. First, he saw problems in the assessment of when a process deviated from its standard performance and thus needed to be improved, i.e. difficulties in identifying problems in a process (Shewhart, 1931). He noted a tendency to over-interpret individual events that were considered to 'stand out' in a negative way, even though these events were part of the process's standard performance. Based on this, he established one of QM's basic notions, namely that the standard performance of processes contains variation that – to a certain extent – needs to be accepted. The second shortcoming was that the choice of improvement effort was made ad hoc and did not always match the problem identified (Shewhart, 1931). He therefore pointed out the need to identify the root cause of problems to determine the level of improvement needed to reduce or eliminate a problem. Deming (1993) further developed these ideas and coined the term *tampering*, i.e. "*action on the system without action on the fundamental cause of the trouble*" (Deming, 1993, p.68) to describe flawed attempts to respond to problems. A system can be described as "a network of interdependent components that work together to try to accomplish the aim of the system" (Deming, 1993, p. 50). In Chapter 2, the concepts of variation and tampering will be further elaborated on.

Going back to the illustration above, we can now interpret the situation from our newly gained knowledge about tampering. The customer describes dissatisfaction with a service, but there is no information about whether this was triggered by any specific event and the service manager states that no incidents have been reported at the property. There are no signals of non-normal process performance. It is thus likely that either there is no problem and what the customer has experienced is part of the process's standard performance, or that the problem has not yet been identified. Even so, the real estate manager acts as if a problem has been identified by changing the routines i.e. tampering.

Why did the manager end up at this conclusion? The following sections describe some challenges faced by employees when identifying problems encountered in their daily work and shortcomings in their approaches when responding to such problems.

1.4 The challenges of identifying a problem

In their daily work, employees are faced with both anticipated and unanticipated events that are interpreted and responded to, some of which are perceived as problems. Due to differences in interests and perspectives in different research fields, there is no unified definition of what constitutes a problem (Landry, 1995). According to the Oxford Dictionary a problem is a *“matter or situation regarded as unwelcome, harmful, or wrong and needing to be overcome; a difficulty”*. Due to lack of definitions of what constitutes a problem in the literature on QM, a definition is borrowed from the literature on problem-solving. In this dissertation, a problem is *“a choice situation in which a person attaches negative value to the current state of affairs, and is in doubt which course of action to take”* (De Mast and Lokkerbol, 2012, p. 606). Studies on QM traditionally concern *quality problems*, i.e. problems that *“reflect concerns over the quality ... of organizational products and processes”* (Smith, 1996, p. 536), such as deviations, errors and failure (Lillrank and Liukko, 2004). Quality problems signal that there is a gap between the current level of quality and the desired level, and that an improvement is necessary to achieve the desired quality. However, not all problems that arise in an organisation are typical quality problems. Many problems are of an everyday nature and arise when employees carry out daily activities (Lyles and Mitroff, 1980; Smith, 1989; Tucker et al., 2002). These problems, like quality problems, are often – to some extent – responded to, and if such a response is properly executed it can lead to improvements. In this dissertation, problems that an employee may encounter when carrying out daily operations, i.e. problems that are often considered ‘low hanging fruits’, as well as problems highlighted by customers are addressed. Customer-induced tampering will be further elaborated on in later sections.

The literature on problem-solving suggests several challenges that may obstruct problem identification. The nature of problems is one such challenge. What constitutes a problem is difficult to outline due to their non-physical nature, requiring someone to perceive and diagnose the relationship between an undesirable state and desirable states (Smith, 1998). Problems manifest themselves in different ways with varying degrees of complexity (Smith, 1996). Where some problems clearly present themselves (for example a car breaks down on the highway), others evolve and become clear over time and need to be thoroughly investigated (for example a local disease outbreak that turns into a pandemic).

This identification process can be further complicated if there is uncertainty about assessing the situation in the current state, for example difficulties measuring current performance or

uncertainty about what the desired state is (Smith, 1996). Such aspects mean that assessing which encountered events are considered problematic is subjective to the individual observer.

The approach taken to identify problems also impacts on the outcome of problem identification. The process through which a matter is perceived to be problematic has been called the diagnostic journey (Juran, 2003), problem identification (Smith, 1996), sensing (Kiesler and Sproull, 1982), finding (Pounds, 1965), recognition (Cowan, 1986), diagnosing (Mintzberg et al., 1976) and defining (Kilmann and Mitroff, 1979). In this dissertation, the term *problem identification* is used. Juran (2003) proposes that problem identification includes understanding the symptoms as well as uncovering and confirming a problem's causes. Using a structured approach, such as step-by-step processes or tools (for examples, see Lang et al., 1978; Marksberry et al., 2011; De Mast and Lokkerbol, 2012) is often highlighted as a success factor for effective problem identification (MacDuffie, 1997). Despite this, employees have been shown to use more unstructured approaches, as detailed in the following sections. Using structured approaches is not always considered necessary or possible due to a lack of time (Tucker et al., 2002), for example. Instead, more unstructured approaches are used, such as brainstorming (Tucker et al., 2002).

Challenges in identifying a problem are the basis for both underreactions and overreactions to problems (Smith, 1996). Underreaction occurs when an observable problem is missed and is not responded to, while an overreaction occurs when someone incorrectly points out a problem and attempts to respond to this non-problem (Shewhart, 1931; Lyles and Mitroff, 1980; Deming, 1993; Smith, 1996). The subjectiveness in identifying a problem likely forms the basis for disagreements and different assessments of what constitute a 'real' problem, and which problems need to be addressed (Smith, 1996).

Individual employee's faulty approaches when identifying problems in their day-to-day work is one of the central issues described in this dissertation.

1.5 Shortcomings when responding to problems

When a perceived problem has been identified, there is a need to decide whether and, if so, how to respond to this problem. An emerging stream of literature emphasises the role of individual employee's approaches to problem-solving (Tucker et al., 2002; Bradley Morrison, 2012; Choo et al., 2015; Furlan et al., 2019; Galeazzo and Furlan, 2019; 2020). In this literature, one explanation for the failure of problem-solving and improvement efforts is shortcomings in how employees respond to problems, since how a problem is approached is suggested to affect the effort's success or failure (Simon, 1996; Tucker et al., 2002). Adamson (1993) suggests that in some service organisations, only 5% of resources are spent on fundamental problem-solving while as much as 95% are spent on solving customers' individual service problems.

One commonly used approach that is considered to contribute to the failure of improvement efforts is fixing problems through quick fixes and workarounds (Ferneley and Sobrepelez, 2006; Campbell, 2012; Tucker, 2016). In contrast to identifying the fundamental causes in order to prevent a problem from reoccurring, as advocated in the quality literature (Deming, 1993; MacDuffie, 1997; Rooney and Heuvel, 2004; Andersen and Fagerhaug, 2006), problems are rather seen as a speedbump or an obstacle that needs to be overcome to proceed with current work (Tucker et al., 2002). In such situations, employees apply informal and ad hoc activities to generate a rapid and improvised response. Managers have been seen to apply symptomatic problem-solving when focusing on short-term fixes to control and limit the impact of a problem (Choo et al., 2015). Possible explanations for why this symptomatic approach is applied include a lack of time and motivation (Tucker et al., 2002) and the balancing act of producing and improving (Bradley Morrison, 2012).

With this backdrop in mind, there are two ways to interpret the manager's problem identification and corresponding response.

The first is that the real estate manager seems to identify the customer being dissatisfied as the problem and not considering that, the real problem may be what caused the dissatisfaction. The response of agreeing to change the routines implies that the manager perceived that making the customer happy by complying with the request would solve the problem of the customer's dissatisfaction. The second is that the problem is perceived to be that the service rounds are not being conducted frequently enough and that the schedule should be adjusted.

Either way, in accordance with the descriptions of tampering above, more information about the cause of the customer's dissatisfaction should have been collected by the manager in order to determine whether or not there was a problem. The customer's dissatisfaction may, of course, be a symptom of an organisational problem on the part of the service provider, but it may also be for an entirely different reason. Consequently, there might not be a problem with the service rounds, and the adjusted schedule may be an unnecessary response to a non-problem.

1.6 Is the customer always right or sometimes wrong?

The first section of Chapter 1 highlights customer focus as one of the central aspects of QM in general and the importance of improving product and service quality from the customer's perspective in particular. The customer is often talked about in positive terms as a driving force for improvement who can provide helpful feedback (e.g. Fundin and Cronemyr, 2003; Lundkvist and Yakhlef, 2004; Carbonell et al., 2009; Dadfar et al., 2013; Birch-Jensen et al., 2020). Some questions that come to mind are, however, is the customer always right, and is the feedback always helpful? Scholars in other research fields have suggested that some customer input can – accidentally or intentionally (Kashif and Zarkada, 2015) – lead to undesired consequences and be detrimental (Plé and Cáceres, 2010; Echeverri and Skålén, 2011; Gal et al., 2021). Interactions among actors that lead to negative outcomes have been denoted *co-destruction* (Plé and Cáceres, 2010; Echeverri and Skålén, 2011). Birch-Jensen et al. (2020) propose that digital technology has improved customer's opportunities to provide feedback and service providers' opportunities to respond to that feedback, leading to an expectation from customers that problems encountered in their individual experience should be addressed. There is thus a risk that an organisation will feel compelled to address issues that are due to sporadic, uncontrollable events (Young et al., 2004) or customers unrealistic expectations (Ojasalo, 2001). Young et al. (2004) suggest that some organisations' efforts to satisfy their customers' by addressing their every problem or complaint leave them stuck in endless firefighting and service recovery activities.

As the next chapter will detail, tampering has largely been associated with inadequate attempts to improve internal processes as a result of employees' assessments of variation in some output variables. Following the concept of co-destruction, in this dissertation it is argued that customers may have a negative impact on improvement efforts as misguided improvement efforts aimed at complying with customers' expressed needs or feedback could potentially lead to tampering.

Going back to the illustrative quotation it is obvious that there are conflicting views on how to manage the customer's complaint. The real estate manager seems to adhere to the saying that the customer is always right by agreeing to the customer's demands. The service manager, on the other hand, seems to perceive that the customer is not always right, and points out the problem of letting the customer decide how the process should be carried out without knowing how it affects the outcome of the process. In this case, the customer's interaction with the service provider was a contributing factor to that an action was taken that, from a process perspective, led to undesirable results.

Previous sections have suggested that working with improvements is important for organisations to produce products and services that satisfy the needs of customers. However, accomplishing such improvements seems to be difficult. In contrast to the currently dominant interest in systematic improvement efforts there is an emerging interest in employees' non-systematic approaches to identifying and responding to problems in daily operations. In this dissertation, it is proposed that all these previously mentioned themes (the challenges of identifying a problem, shortcomings when responding to problems and whether or not customers feedback are helpful) can be studied through the concept of tampering. Accordingly, the next section presents the purpose and research questions.

1.7 Purpose and research questions

Previous sections have highlighted that many attempts to identify and respond to problems fail. There is no consensus on the causes of these failures and many different proposals have been made. It is also pointed out that identifying problems is challenging, and that increased knowledge is needed about how employees approach problems. It has been argued that employees are one of the most important resources, if not *the* most important resource in an organisation. Studying employees' approaches to identifying and responding to problems can therefore contribute with knowledge about any shortcomings in such approaches. Tampering is a concept that has been around in QM for decades without gaining much attention and there is little research examining the role of tampering in approaching problems. In this dissertation, it is argued that studies of tampering can be used to gain more knowledge about how employees act when faced with a problem in terms of both its identification and the response. The purpose studied in this dissertation is thus:

To enhance knowledge on tampering as a means to understand why attempts to improve sometimes do not lead to the desired results.

The purpose is fulfilled by answering two research questions. Previous sections highlighted difficulties regarding identifying and responding to problems. It has been argued that to avoid failure, approaching a problem in the 'right' way and at the right level can be central. Following the idea of Shewhart (1931), the right level means that an action should be proportionate to the encountered problem and the right way means to respond to the identified causes in an adequate way by attempts to prevent, eliminate or reduce them. Little is however known about how tampering manifests when failing to approach a problem in the proposed ways. The first research question is thus:

RQ1: How is tampering manifested in various types of approaches to identifying and responding to problems?

Scholars, especially those who focus on service research, have highlighted the need to study negative consequences of relationships and interactions between customers and organisations (e.g. Ostrom et al., 2015). This highlights the role that customers may play in the deterioration of a process or system – a perspective that is not commonly applied to tampering. Regarding tampering, this could mean that customers can affect employees' decisions on when and how to respond to problems encountered. The second research question is thus:

RQ2: How can customers cause employees to take tampering actions?

In this dissertation, this issue is only studied from the employee's perspective and has delimited itself from asking the customer about his or her experience of the problems. The discussion does not aim to shift the responsibility for tampering from the employee to the customer, but rather to discuss the tensions that can arise when several actors are involved in a process.

1.8 Outline of the dissertation

This dissertation is divided into seven chapters.

Chapter 1: Introduction – In this first chapter, the research gap is presented along with the purpose and research questions.

Chapter 2: Theoretical background – This chapter defines important concepts used in this dissertation as well as the theoretical framework on which the discussion presented in Chapter 5 are based.

Chapter 3: Methods – This chapter describes the research methods used in this dissertation, as well as research quality.

Chapter 4: Overview of appended papers – In this chapter the background and main findings from the appended papers are briefly summarised.

Chapter 5: Discussion – In this chapter, the research questions are answered in order to fulfil the purpose. In addition, a contemporary understanding of the tampering concept is proposed.

Chapter 6: Conclusions – The second to last chapter summarises the most central contributions from Chapter 5 and the appended papers. To conclude, suggestions for future research are provided.

Chapter 7: The author's concluding self-reflection on the research process – In the last chapter, the author reflects on the completed dissertation work.

2. Theoretical background

This chapter presents an overview of some central concepts used to fulfil the purpose and answer the research questions in this dissertation. In the first section, the concept of variation is outlined as it underpins tampering. In the second section, the concept of tampering is elaborated on. This section aims to create a better understanding of tampering by exploring some different meanings and interpretations of tampering in previous research. The third section outlines different approaches available to employees when responding to problems. The fourth section describes the view on customer applied in this dissertation. The fifth section presents a theoretical framework.

2.1 Variation

The concept of tampering originates from failed efforts to reduce undesired process variation (Deming, 1993). Variation can be described as a difference in, for example, condition or amount between things or activities (Merriam-Webster Dictionary, 2021, *variation*). All processes have elements that contribute to variations in output and execution, such as differences in employee's knowledge, learning methods, experience and skills as well as differences in organisational setting, for example management, environment and activities (Bergman and Klefsjö, 2010). In contrast to desired variation such as employees with diversified competences in a team or product diversity, undesired variation can be variation in the execution of activities that should be uniform (Berwick, 1991) such as two judges assessing the same case differently (Kahneman et al., 2021). Such undesired variation is studied in this dissertation.

Variation in both execution of and output from a process is inevitable and must, to some extent, be accepted (Shewhart, 1931). How much variation is acceptable depends on the type of process in question and its preconditions, for example financial constraints or laws and industry guidelines. For instance, drug manufacturing processes tend to accept lower levels of variation compared to certain insurance claim processes, which generally accept higher levels of variation (Kahneman et al., 2021). Shewhart (1931) states that too much variation results in low predictability and is seldom economically defensible. He therefore urges organisations to "set up limits within which the results of routine efforts must lie" (Shewhart, 1931, p. vii). Furthermore, he states that if processes are standardised and repeated, the outcome between different repetitions can be compared, and the standard performance, or natural variation, of the process – and thus also deviations from this behaviour – can thus be discerned (Shewhart, 1931). Causes that occur naturally in the system and that contribute to the expected standard performance of the system are called *common causes*, and deviations from a system's standard performance are described as being caused by *special causes* that appear sporadically and do not occur naturally in the system (Shewhart, 1931). What is considered to be a deviation from the system's standard performance is determined by using knowledge of the process's previous performance, for example by establishing limits within which the process naturally varies, i.e. control limits. This was concretised by the development of control charts that could visualise a process's standard performance (when only common causes are present) and show when the variation was higher than desired (when special causes are present).

With this general description of variation in mind, the next section describes the difference in prevalence of variation in manufacturing and service processes.

2.1.1 Variation in manufacturing and service processes

The view of variation described above declares that variation is often undesirable and should be reduced or even eliminated. This view was formulated at a time when the focus was on standardised mass production and creating uniformity from the perspective of a manufacturing company (Shewhart, 1931; Dale, 2007). Like many of today's service processes (as described

below), the manufacture of various products was previously also a craft industry where products were customised and manufactured according to a single customer's specifications. Following technological developments in the 20th century, the mechanisation of operations enabled products to be standardised, allowing for scale production and productivity gains (Provost and Norman, 1990). Today, however, manufacturing processes are seldom either completely standardised or customised, but the processes may be placed on a standardisation – customisation scale (Lampel and Mintzberg, 1996). Still, customers are often viewed in manufacturing as a group or sub-groups with similar needs, allowing the characteristics of products to be standardised. In turn, product homogeneity allows for the standardisation of manufacturing processes. This standardisation facilitates control of processes and their output, and thus also the variation (Nolan and Provost, 1990). However, not all manufacturing processes produce uniform output; for example, high output variations are common in some processing processes (e.g. Van Gestel et al., 2015). Reasons why the variation of output in manufacturing processes is often regarded as low thus include product homogeneity, the possibility to standardise operations and a low diversity of customer needs. Typically, standardisation allows performance and output to be monitored which facilitates the study of variation (Deming, 1993).

Reducing and controlling variation of output has thus been central in manufacturing processes for a long time (Shewhart, 1931). However, the usefulness of understanding and reducing variation has also been identified in other areas such as service processes. In the service context, reducing variation may aim to reduce variation in professional judgements (e.g. Peterson et al., 1997; Kahneman et al., 2021). The view of variation as something that is mainly negative is not as black and white in services as is typically the case in manufacturing, and striking a balance between standardisation and customisation has always been a challenge for service organisations (Lampel and Mintzberg, 1996; Sundbo, 2002; Essén, 2008). The challenge is often described as a choice between the efficiency that can be achieved through standardisation and the ability to meet customers' different needs that can be achieved through customisation. One criticism of standardisation is that its inflexibility may in some cases worsen the output rather than improve it (Wood, 1994; McLaughlin, 1996). The nature of many services as individual, customised and created through craftsmanship is often cited as a reason why the variation in execution and output is typically high (Bohmer, 2005) and difficult to control (Edgett and Parkinson, 1993). Such characteristics have affected the 'acceptance' of – and the possibility to monitor and control – variation (Berwick, 1991; McLaughlin, 1996; Kahneman et al., 2021). In contrast to general manufacturing processes, both the customer and the employee are often central actors in service processes, and variations concerning their behaviours, desires and personality traits can contribute to the output of service processes varying (Yang et al., 2015). For example, there are variations in customers' service requests, their preferences and the efforts they put into service design or delivery, as well as variations in employees' attitude towards customers, their capability to serve customers and the methods used to serve customers (Frei, 2006). The prevalence and influence of customer and employee variation on process output differ among service organisations, and to be able to reduce the undesirable effects caused by such variation there is a need to identify and control the most influential aspects of such variation (Yang et al., 2015). However, controlling and managing the behaviour of employees is often difficult and sometimes even counter-productive (Chebat and Kollias, 2000; Sundbo, 2002; Gal et al., 2021).

Traditionally in QM, uniformity is usually described as a precondition to be able to study variation and apply control charts (Shewhart, 1931; Montgomery, 2012). The background to this statement is described in the next section.

2.1.2 Usefulness of uniform and predictable processes in assessing variation

The need to manage variation comes from a desire to create uniform and predictable processes (Nolan and Provost, 1990; Palmberg, 2009) that perform ‘the same’ every time. According to Shewhart (1931), a prerequisite to be able to manage the variation in a process in a reliable way is that the process is continuous, repetitive and can be standardised to some extent. This is central because variation as a phenomenon requires several process outputs that can be compared with each other. Standardised and repetitive processes imply that the analysed output corresponds to the same, or at least a similar, course of actions that is thus comparable to some extent. This is especially important if control charts are to be used in a reliable way (Montgomery, 2012). However, such process characteristics may also facilitate the assessment of variation in situations where control charts are not used.

2.1.3 Reduction of undesirable problems by managing variation

When problems are encountered in a process, there is often a desire to reduce the frequency of a certain kind of problem or even ensure that it does not reoccur (Deming, 1993). Based on an understanding of variation, the type of cause should guide the design of the improvement effort. Causes that belong to a system’s standard performance – common causes – can be left unaltered if the process output is considered satisfactory. If the output is not considered to be satisfactory, significant improvements should be made in the system causing the variation, in order to improve the average output and/or decrease the variation (Shewhart, 1931). Causes that do not belong to a system’s standard performance – special causes – are typically perceived to be harmful and should thus be prevented or eliminated (Shewhart, 1931). Failure to address the causes of problems may contribute to problems sustaining, recurring or creating new problems (Bohn, 2000). Using the wrong type of improvement effort to reduce the undesirable problems may lead to two errors (Deming, 1993):

Type I error: Responding to a cause as if it **does not** belong to the system’s standard performance, or natural behaviour, when it does.

Type II error: Responding to a cause as if it **does** belong to the system’s standard performance, or natural behaviour, when it does *not*.

Figure 1 summarises of the ‘right’ and ‘wrong’ ways to respond to the two types of causes according to (Deming, 1993).

		Type of action		
		Do nothing	Fundamental process improvement	Target specific cause
Type of variation	Common cause	OK	OK	Type I error
	Special cause	Type II error	Type II error	OK

Figure 1: Illustration of the ‘right’ and ‘wrong’ ways to respond to the two of types causes.

Adapted from Deming (1993) p. 188.

Understanding the concept of variation is central as a background to understanding the concept of tampering. The next section will outline some different aspects of tampering.

2.2. The many meanings of tampering

Online dictionaries list multiple meanings of the term *to tamper*, for instance: (1) *to interfere so as to weaken or change for the worse*, (2) *to carry on underhand or improper negotiations (as by bribery)* (Merriam Webster, 2022, *tamper*), (3) *to touch or change something without permission or without enough knowledge of how it works*, or (4) *to touch or make changes to something when you should not, especially when this is illegal* (Cambridge Dictionary, 2022, *tamper*). These highlight different aspects of what tampering entails such as that tampering is an interference, change or manipulation that is unnecessary, unauthorised or based on insufficient knowledge, and that results in something getting worse. As the following sections will explain, these aspects show a great deal of similarity to the tampering concept in QM.

2.2.1 A historic overview of the tampering concept as described by Deming

As previously mentioned, the concept of tampering in QM was established by W. Edwards Deming. Tampering has its roots in statistics, and is based on the notion of variation and specifically actions taken in processes based on a lack of understanding of variation (Deming, 1989). The term is often related to two teaching experiments: the funnel experiment and the red bead experiment (e.g. Olsen, 2007; Hanna, 2010). Deming's interest regarding tampering seems to have evolved and broadened over the years. At first, the interest seemed merely to be to reduce the economic losses that come from overadjusting or underadjusting a process, for example, adjusting machine settings when a deviation from a process's standard performance is encountered (e.g. Deming, 1982; Deming, 1989), as highlighted by Shewhart (1931) in the 1930s. More recently, the interest also seems to be on reducing the losses of improvement efforts based on flawed management principles, for example reactions to single events and management by results (MBR).

Although tampering has long been discussed, Deming (1982; 1989; 1993) does not provide any clear definition of tampering. To show some of the variation in the descriptions, a few representative examples that include the term *tampering* are given here:

- D1: "... to attribute to a special cause any unwanted variation, when in many if not most cases what they observed was variation from common causes. Improvement of the process would have been more productive. They were tampering with a stable system, making things worse." (Deming, 1993, p. 177)
- D2: "... to avoid, by tampering with the process ..., repetition of some simple mistake that could be classed as a nonrecurring special cause." (Deming, 1993, p. 23)
- D3: "... action on the system without action on the fundamental cause of the trouble." (Deming, 1993, p. 68)

These descriptions will be further elaborated on later in this dissertation when discussing a contemporary view of tampering. Additional examples can be found in Paper I.

In general terms, Deming's view of tampering is as an event that is misinterpreted as a problem and that triggers an unnecessary action that is not directed towards the cause of the problem (Deming, 1993), see Figure 2.

Figure 2: A preliminary model of tampering.

Over the years, different perspectives have been used to describe tampering: tampering in terms of overcontrol, overadjustment, MBR, and the feedback rules used in the funnel experiment. The next sections provide a historical perspective of tampering based on these four perspectives.

2.2.2 Tampering as overcontrol

The term *control* in QM originates from the practices of quality control in manufacturing processes, where control meant to check that the quality of a product conformed to specifications (Weckenmann et al., 2015). The means for control was to compare measures of finished products to more or less arbitrary tolerances (Weckenmann et al., 2015). Later, in the early stages of statistical process control, Shewhart (1931) proposed a need to shift the focus from quality control to process control, as well as a need to accept that processes produce products with some variation. Rather than a controlled product, Shewhart (1931) suggests that a process is controlled when its variation is to some extent predictable (Shewhart, 1931). Overcontrol, following Shewhart's (1931) view, can thus be regarded as unwarranted attempts to hold a process to a target in which variation is predictable. If the variation is predictable and at a satisfactory level, there is little to gain and much to lose from identifying and correcting 'accepted' deviations. Unlike overadjustment, where deviations are not actively sought but a process adjustment is made more or less sporadically, control means an active and continuous search for, and correction of, deviations.

2.2.3 Tampering as overadjustment

The term *overadjustment* originates from unnecessary adjustment of machine settings due to common cause variation in manufacturing processes (Deming, 1982; 1989; 1993). When identifying outputs that deviate from a set target, attempts are made to decrease the risk of producing defective products (Deming, 1982). This procedure was (Shewhart, 1931) – and still is (e.g. Georgantzas, 2018) – commonly used to control variation in manufacturing processes.

Although overadjustment is strongly associated with adjustments in machine settings, other types of adjustments can also result in tampering. In healthcare, such adjustments refer to aspects such as unnecessary adjustment of medical procedures and medication dosage (Fisher and Welch, 1999; Deyo, 2002). In service processes, it refers to unnecessary adjustment of service processes and behaviours of service providers (Gal et al., 2021), for example. The adjustment is typically conducted in direct connection with the identification of a problematic situation in terms of a mere sporadic side-step from established routines. Thus, this type of adjustment does not necessarily change routines as established by the organisation; it may, however, be a recurring procedure used by the employee. Overadjustment implies that even small adjustments or side-steps from established routines may result in severe consequences.

2.2.4 Tampering as management by results

A common example suggested as tampering by Deming (1989) is MBR, also called results-based management. MBR means that goals that are set should have measurable results and aim at improving an organisation's performance (Drucker, 1954). Having measurable results is not in itself problematic, but can rather be beneficial in order, for example, to evaluate whether changes that have been made lead to desired results (Bourne et al., 2003a; Franco-Santos et al., 2012). Criticism directed towards management strategies focused on results include their emphasis on output rather than the activities that lead to the output (Deming, 1989), and that the goals tend not to take variation that is naturally present in the system into account (Wilcox and Bourne, 2003; Anhøj and Hellesøe, 2017; Ericson Öberg et al., 2017).

One problem with focusing on results is that changes made in the system might be guided by a desire to implement simple and short-term changes that have a rapid effect on a result,

rather than system-improving changes that give long-term, sustainable results (Deming, 1993). As previously proposed, for example, more extensive system changes are recommended to reduce the variation in a predictable system (Shewhart, 1931).

Deming (1989) emphasises that goals are redundant in systems where performance is generally predictable within certain limits. Setting a goal within these limits risks leading to unnecessary analyses of why a result is below or above the target value, despite variations in the result being expected. Setting a goal above the limits is also of no use without making substantial system changes. Further, Deming (1989) highlights that it is pointless to set goals in systems where performance is generally unpredictable, since it is difficult to determine what a reasonable goal is. In order to set an achievable goal, knowledge of the system's current capacity is required.

2.2.5 Tampering as the feedback rules used in the funnel experiment

The funnel experiment and developments thereof (e.g. Barber, 1990; Blumstein, 1995; Jones et al., 1996; Coleman, 1999; Mostafa, 2003; Olsen, 2007; Hanna, 2010; Van Gestel et al., 2015), where the consequences of tampering are shown in a teaching experiment, is the perspective of tampering that seems to have had the greatest impact on the understanding of tampering. This perspective highlights the insufficiency of reacting to and attempting to impact process outcomes rather than changing the system that cause these outcomes (Deming, 1993). In the experiment, unintended deviations of process outcomes from a target value trigger actions that are guided by four feedback rules. Table I contains a description of the rules and provides illustrative examples of each rule.

Table I: Description of the four funnel experiment rules with corresponding illustrative examples (Deming, 1993, pp. 194–203).

Rule	Rule description	Illustrative examples
Rule 1	Always aim for the target	No interference Zero base budgeting
Rule 2	Aim for a target positioned one deviation in the opposite direction to the last output	Reaction to a rumour, or latest measurement or mistake Price wars
Rule 3	Aim for a target positioned one deviation in the opposite direction to the target	Increasing a bet to cover the losses
Rule 4	Aim for the previous output	Learning by example and not theory Adjusting the starting time of a meeting based on the last meeting's actual starting time
Note: Deviation means difference between target and output.		

For some scholars and practitioners, the illustrative examples related to the feedback rules have become synonymous with tampering (e.g. Davis III, 2000; Georgantzis and Katsamakas, 2008; Becker and Glascoff, 2014; Kwon and Woo, 2018). Of the four rules, Rule 1 includes doing nothing, Rules 2 and 3 involve to compensating for previous results, and Rule 4 tries to copy the last output. Since *rule 1* (doing nothing) symbolises ‘no tampering’, there is no need for further elaboration. The other feedback rules are, however, examples of flawed heuristics that lead to serious and systematic errors (Tversky and Kahneman, 1974).

Rules 2 and 3 demonstrate actions in terms of a reciprocal (exact compensation) or a more forceful (overcompensation) countermeasure to compensate for a failure or an unsatisfactory output (Deming, 1993). Repeating this countermeasure will once again result in an offset further away from the target. Senge (2006) calls this chain of actions *compensating feedback* and expresses that “*the more effort you expend trying to improve matters, the more effort seems to*

be required” (p. 58). An example is service employees’ reactions to encounters with difficult customers, where an angry customer is handled by treating them either more positively or more negatively than they would generally treat a customer (Gal et al., 2021).

Rule 4 demonstrates actions in terms of shifting the target for the consecutive action to the previous output. The new target is used without looking back at the original target, and as more and more actions are taken, the output moves further and further from the initial goal (Deming, 1993). This movement is denoted a ‘random walk’, where one response after another is carried out to achieve improvement without actually knowing what this improvement is (Georgantzas, 2018). An example of this ‘wandering’ is management continuously changing direction, as illustrated by the case of a Swedish administration where new reforms are implemented by each new director-general and turn the organisation in a new direction (Bringselius, 2016). The new director-general builds on the work of his or her predecessor, but changes current operations to reflect his or her vision. These changes bring not only new goals, but also new problems and issues, as well as inefficiencies (Bringselius, 2016).

These feedback rules show how a vicious spiral of repeated actions against the same problem leads to worsening results. Instead of being defeated by a bad output and surrender, additional efforts are spent in the hope that the next attempt will reach or even surpass the target. The learning is that hard work or more resources do not necessarily yield better output if the root cause of the undesirable output is not targeted (Deming, 1993).

The many different meanings of tampering in texts by Deming have led to the concept being interpreted in several different ways. The next section outlines some other scholars’ understanding of the tampering concept.

2.2.6 Other scholars’ interpretation of Deming’s tampering

There are many different interpretations and paraphrasing’s of Deming’s descriptions of tampering. Although previous sections have shown that there is more to tampering than the statistical overreaction to variation, for example flawed management principles, the statistical view still seems to be the most widespread view. The most common interpretation in the reviewed literature seems to be that tampering is a mistreatment of common causes as if they were special causes. This description is similar to the type I error described above. This description, like many other descriptions presented in Table II, uses terms such as *common causes* and *special causes*, *process stability*, *statistical control*, *control limits*, and *data point* which imply that tampering is foremost viewed as a statistical concept. Among the studied tampering descriptions, only two (Ledolter and Swersey, 1997; Kwon and Woo, 2018) do not include statistical terms. Another difference among the interpretations is whether tampering is *misinterpretations* of causes (e.g. Fisher and Welch, 1999), attempts to *explain* variation in data (e.g. Joiner and Gaudard, 1990), or *actions* such as reactions (e.g. Georgantzas and Katsamakas, 2008), changes (e.g. Cheung et al., 2012) or interventions (e.g. Shraim, 2018).

This overview, along with the previous descriptions of tampering as provided by Deming (1982; 1989; 1993), shows variation in interpretations and descriptions of tampering. In Chapter 5 (Discussion), the different views of tampering will be further elaborated on when describing how tampering is viewed in this dissertation.

Table II: Some descriptions of tampering in the literature.

Focus of description	Tampering descriptions	Reference
<i>Mistreatment of common causes as special causes</i>	<ul style="list-style-type: none"> • “The most common error in improvement efforts is to treat common cause (inherent) variation as if it were special cause (unique) variation.” • “‘Tampering’ entails reacting to common-cause variation or randomness in a process as if it were special cause variation.” • “Tampering occurs when an intervention is made to correct a deviation in a measure of system performance that reflects random variation (or noise) rather than systematic variation (a signal of a significant deviation).” • “to failure to distinguish common from special cause variation” • “... reacting to random or common-cause variation as if it is a result of some assignable or special cause.” 	<p>Balestracci, 2006, p. 115</p> <p>Georgantzas and Katsamakos, 2008, p. 89</p> <p>Shraim, 2018, p. 2</p> <p>Fisher and Welch, 1999, p. 450</p> <p>Schiff, 1994, p. 149</p>
<i>Adjusting a stable process</i>	<ul style="list-style-type: none"> • “Changing a process in which only common cause – related variation occurs” • “Tampering is defined as inappropriate actions taken on a stable process in an attempt to eliminate or reduce common cause variation.” • “... discouraging tampering with satisfactory processes in response to an essentially random AE [adverse event].” • “attempt to compensate for an undesirable result in a stable process...” • “Tampering occurs when stable systems are manipulated to their detriment.” • “If anyone adjusts a stable process to try to compensate for a result that is undesirable, or for a result that is extra good, the output that follows will be worse than if he had left the process alone...” • “making adjustments to processes when they are in a state of statistical control, that is, in response to common cause variation.” 	<p>Cheung et al., 2012, p. 2116</p> <p>Krehbiel, 1994, p. 75</p> <p>Morton et al., 2010, p. 114</p> <p>Kandanand, 2010, p. 1031</p> <p>Dimitroff, 1991, p. 264</p> <p>Gitlow et al., 1992, p. 293; Stepanovich, 2004, p. 386</p> <p>Easton, 2015, p. 100</p>
<i>Interpretation of single data points</i>	<ul style="list-style-type: none"> • “Trying to explain the reason for the exact increase or decrease in the latest point will most likely identify false causes and result in false solutions.” 	Joiner and Gaudard, 1990, p. 31
<i>Interpretation of control charts</i>	<ul style="list-style-type: none"> • “Action taken on a stable system in response to variation within the control limits, in an effort to compensate for this variation” • “The action of adjusting a process while it is still within control limits is considered tampering” 	<p>Boardman and Boardman, 1990, p. 65</p> <p>Van Gestel et al., 2015, p. 404</p>
<i>Unnecessary or incorrect process action</i>	<ul style="list-style-type: none"> • “... adjusting a process when no change is needed or adjusting incorrectly.” 	Ledolter and Swersey, 1997, p. 167
<i>No knowledge of the cause</i>	<ul style="list-style-type: none"> • “actions taken to improve errors despite no knowledge of the cause of the errors ...” 	Kwon and Woo, 2018, p. 5

2.3 Various types of approaches to identifying and responding to problems

When faced with a problem, employees need to decide on a proper response. What level of action is needed? Is there a need for a minor or fundamental improvement or should the situation be left unaddressed?

One of the main ideas in tampering is that sustainable improvements can only be achieved by dealing with a problem to the ‘right’ level and in the ‘right’ way (Shewhart, 1931). The ‘right level’ means that an action should be proportionate to the situation that needs dealing with. An action should not be exaggerated compared to the size of the problem (“making a mountain out of a molehill”), but nor should it be ‘too small’ so that a problem is insufficiently addressed and thus persists. The challenge is to find the balance between underdoing and overdoing (Keijzers et al., 2018). In addition, the problem should be handled in the ‘right way’, i.e. it should address the fundamental causes in a satisfactory way (Shewhart, 1931).

A number of frameworks have been identified that describe different approaches to identifying and responding to problems (Table III). Deming (1993), following the ideas of Shewhart (1931), describes three levels: system change, root cause improvement and doing nothing. In organisational theory, two types of innovation *radical innovation* and *incremental innovation* – have been used extensively to describe innovation at different levels (March, 1991). These terms have successfully been translated into process management terminology as *incremental improvement* and *radical improvement* to describe two levels of improvement (Benner and Tushman, 2003). Building on Benner and Tushman (2003), Ng et al. (2015) analysed previous studies of process improvements and identified an additional improvement approach, namely *process control*. A similar categorisation from the field of innovation is described by Sundbo (1997), demonstrating different approaches of innovation on a scale with radical innovations at one end, large and small incremental innovations in the middle, and general and individual acts of learning at the other end. Other interesting approaches identified in the literature are the wait-and see approach (Murphy et al., 2011; Sims and Finnoff, 2013; Jørgensen et al., 2020), workarounds (Ferneley and Sobreperéz, 2006; Campbell, 2012; Debono et al., 2013; Alter, 2014; Tucker, 2016; Tucker et al., 2020), first-order improvement (Repenning and Sterman, 2002), firefighting (Bohn, 2000; Young et al., 2004) and clinical inertia (Keijzers et al., 2018). This list of approaches is not exhaustive, but is an attempt to describe a variety of approaches to identifying and responding to problems.

The following section outline some different improvement approaches that are available to employees when responding to problems.

Table III: Different approaches available to employees to identifying and responding to problems.

Types of actions	Reference
System change	Deming, 1993
Root cause improvement	
Doing nothing	
Radical improvement	Benner and Tushman, 2003
Incremental improvement	
Radical improvement	Ng et al., 2015
Incremental improvement	
Process control	
Radical innovation	Sundbo, 1997
Large innovation	
Incremental innovation	
Acts of learning	
Wait-and-see	Murphy et al., 2011; Sims and Finnoff, 2013; Jørgensen et al., 2020
First-order problem-solving	Tucker et al., 2002
Second-order problem-solving	
Correction	ISO, 2015
Corrective actions	
First-order improvement	Repenning and Sterman, 2002
Fire fighting	Bohn, 2000; Young et al., 2004
Workarounds	Ferneley and Sobreperez, 2006; Campbell, 2012; Debono et al., 2013; Alter, 2014; Tucker, 2016; Tucker et al., 2020
Clinical inertia (active inactivity)	Keijzers et al., 2018

2.3.1 Inaction

Doing nothing can be either a passive or an active choice (Pan et al., 2019). Being passive can mean either a lack of understanding that an action is necessary or not carrying out the action required to handle the problematic situation. Keijzers et al. (2018) state that ‘to do nothing’ can in fact be an active choice, and can thus be regarded as ‘doing something’. In the QM literature, Shewhart (1931) advises against ad hoc changes to processes that show no sign of having either an unsatisfactory level of variation or signals of problems. The absence of such signals indicates that the process is working as expected and that no action is needed; thus “if it ain’t broke, don’t fix it”. In healthcare, the term *clinical inertia* is used to describe the active response of doing nothing (active inactivity) (Keijzers et al., 2018). Even though the approach is to ‘do nothing’, knowledge gained from the process may result in general and individual acts of learning to be used in future situations (Sundbo, 1997). Shewhart (1931) also states that although there may be a need to make changes in a process, for example due to unsatisfactory level of variation, aspects such as high complexity, lack of mandate or high costs may hinder the possibility to take action (Deming, 1993). Such reasons may indicate a need to actively refrain from acting, or to wait and make the improvements later.

Instead of directly deciding on an action, a wait-and-see approach can be adopted. Wait-and-see is a widely applied decision-making approach where a decision is delayed in order to wait and see whether current circumstances change, or to be able to collect additional information (Murphy et al., 2011; Sims and Finnoff, 2013; Jørgensen et al., 2020). This approach has been suggested to be useful in situations entailing a high level of uncertainty about the causes, risk, severity, impact and reversibility of action, for instance, as it is open to the possibility of identifying new or additional actions if circumstances change (Murphy et al., 2011; Sims and Finnoff, 2013; Jørgensen et al., 2020). Waiting for a clear signal can help reduce uncertainty

and thus lead to an understanding of where to direct attention. However, waiting can also aggravate the situation (Murphy et al., 2011; Strahan and Gilbert, 2021).

2.3.2 Workaround

The approach of resolving a problem by fixing the immediate issue or overcoming the obstacle without identifying and targeting the underlying causes (ISO, 2015) or preventing similar problems from reoccurring (Tucker et al., 2002) has been denoted workaround (Ferneley and Sobreperéz, 2006; Campbell, 2012; Debono et al., 2013; Alter, 2014; Tucker, 2016; Tucker et al., 2020), correction (ISO, 2015), first-order improvement (Repenning and Sterman, 2002), firefighting (Bohn, 2000; Young et al., 2004) and shifting the burden (Senge, 2006). Instead of addressing the fundamental causes of a problem, the symptoms are addressed. In the short term, targeting symptoms may seem appropriate as the current situation is improved. However, in the long term, the underlying problem may grow worse and further aggravate the situation (Senge, 2006). The actions taken are often adaptations or changes to current work procedures that are perceived to prevent an employee from achieving a desired outcome (Debono et al., 2013; Alter, 2014). In this approach, actions may be occasional or reoccurring and do not change established work processes (Alter, 2014). Firefighting is the extreme type of workaround where unanticipated and acute problems are addressed through temporary solutions or workarounds (Bohn, 2000).

2.3.3 Local improvement

As previously proposed, improvement can be described as single or recurring activities carried out by organisations to enhance performance (ISO, 2015). Improvements can be triggered either by more or less acute problems or by identifying something that has potential for improvement. The focus is often on local adjustment and modification (Bessant et al., 1994) of existing processes, products and services (Benner and Tushman, 2003; Ng et al., 2015) via small-scale improvements based on identifying the fundamental causes of a problem (Jha et al., 1996). Identification and elimination of special causes are of particular interest due to the need to prevent these causes from reoccurring (Deming, 1993). Ng et al. (2015) differentiate between actions taken to stabilise process performance to meet specifications (also called process control) and continuous improvements or incremental improvements. From a QM perspective, the first type is called corrective actions (ISO, 2015) or second-order improvement (Repenning and Sterman, 2002), and from a problem-solving perspective is denoted as second-order solutions (Tucker et al., 2002). This type of improvement is typically the focus of process management (Benner and Tushman, 2003).

2.3.4 System change

In addition to local improvement, there are also more substantial improvements that require a considerable amount of resources, careful planning and a robust intervention (Perla et al., 2013). Shewhart (1931) states that making system changes is the only way to achieve substantial change in processes where only common causes of variation occur. Due to the extensive planning and development needed for large improvements, they are typically the responsibility of management (Deming, 1993; Perla et al., 2013).

Extreme examples of system change are radical improvement (Benner and Tushman, 2003; 2015; Ng et al., 2015) and radical innovation (March, 1991); that is, extensive and fundamental changes that an organisation achieves by exploring new opportunities such as new products, processes, services, customer segments and markets. These types of actions often require substantial time and efforts, and acquisition of new knowledge and skills (March, 1991).

2.4 Interaction between employees and customers

In this dissertation, the notions that using customers' feedback is generally helpful and that tampering is an internal phenomenon isolated from customer interaction are challenged by proposing that the customer's feedback may not always be helpful, and that their involvement may be a reason why attempts to improve sometimes do not lead to the desired results. This section describes the interactions between customers and employees studied in this dissertation.

Figure 3 illustrates the customer's and employee's spheres and their interaction. In this dissertation, these spheres and the interaction concept are used to illustrate how the actors may operate in isolation as well as jointly. When a customer interacts with an employee, they can be described as doing so by direct or indirect interactions in a joint sphere. In this dissertation, it is also argued that tampering may take place in any of the three spheres. However, the discussion presented in this dissertation concentrates on the employee's sphere and the joint sphere.

Figure 3: An illustration of the employee's, customer's, and joint spheres as well as some possible interactions. Adapted from Grönroos and Voima (2012).

In this dissertation, *employee* is used as a collective term for all types of organisational members, such as first-line employees and managers. Organisations consist of employees and are dependent on them for carrying out their operations as well as interacting with their customers. It has been debated whether employees should be given empowerment in service process execution, for example, as it may be favourable in terms of customer experience and service perception but also unfavourable in terms of flexible behaviours that cause highly variable and uncontrollable processes (Chebat and Kollias, 2000). When employees act in isolation without interacting with customers, they can be described as operating in the employee's sphere.

A *customer* is someone who buys, hires or uses products or services provided by an organisation and may be either a business-to-business customer (organisational customer) or a business-to-consumer customer (individual customer) (Lambin, 2013). When customers act in isolation without contact with an employee, they can be described as operating in the customer's sphere. However, customers and employees do not always act in isolation – they may also interact. When a customer interacts with an employee they can be described to do so in a joint sphere. Although customer-induced examples of tampering are presented by Deming (1993), tampering seems to mainly be considered an internal phenomenon that takes place in the employee's sphere. An example of customer-induced tampering given by Deming (1993) is a change in a hotel's routine due to a cleaner's mistake of pouring out a guest's contact lenses that were in a glass of water. When all cleaners stopped emptying glasses of water in the hotel rooms, the hotel was criticised for poor cleaning.

Interactions are activities where two or more actors connect to engage in or influence joint interests. Two types of interactions are *direct interactions* and *indirect interactions*. *Direct interactions* are activities involving explicit contact between an organisation and a customer (Grönroos and Voima, 2012), for example an email exchange or a phone call, while *indirect*

interactions are activities where joint issues are addressed in disjoint spaces, for example a service provider asynchronously reading customer feedback online.

2.5 A proposed theoretical framework

The former sections have described some different approaches that are available to employees when responding to problems. Table IV summarises the previously described approaches and places them on a scale. The lowest level is doing nothing, i.e. *inaction* and the second lowest is a focus on symptomatic responses, i.e. *workarounds*. The second highest level is targeting fundamental causes of problems by conducting *local improvement*, and the highest level is *system change*.

Table IV: Overview of the four proposed approaches to identifying and responding to problems.

Approach	Problem focus	Action	Response aimed towards
System change	Causes belonging to a systems natural behaviour	System change Radical improvement	System
Local improvement	Fundamental (root) causes	Process control Incremental improvement	Task, routine, process
Workaround	Symptom or immediate obstacle	Correction Fire-fighting Workaround	Output, task, process
Inaction	None	None (active/passive) Wait and see	N/A

Figure 4 is an adaptation of the model described in Figure 2 and 3, and illustrates the four approaches and their problem focus (Table IV) as well as the customer’s and employee’s spheres. Figure 2 illustrates that causes are the starting point for responses leading to tampering. However, the previous section suggested that, in the workaround approach, symptoms may also trigger and be the problem focus leading to tampering. It is thus suggested in this dissertation that symptoms may be a central aspect with regard to tampering. In addition to action, inaction is also suggested as a possible approach for responding to, or rather not responding to, problems.

Figure 4: Further adaptation of Figure 2 and 3. Illustration of the four approaches and their problem focus as well as the customer’s and employee’s spheres.

3. Methods

In this chapter, the research problem, process, and methods are described and research quality and ethical aspects are discussed.

3.1 Research problem

There are multiple ways of identifying research topics, such as by identifying gaps in theory or identifying a problem in the practical world (Van de Ven, 2007). In recent times, criticism has been directed towards research, claiming that it has lost its focus on supporting the development of organisations (Hodgkinson, 2001) and focuses too much on theoretical research (Alvesson et al., 2017). To address this criticism, collaboration between practitioners and researchers in the research process could be helpful in ensuring that research reflects practice (Etzkowitz and Leydesdorff, 2000; Van de Ven, 2007). The problems that constitute the basis of this dissertation were identified through practical observations and experiences described by practitioners. Practitioners from different sectors, organisations and organisational levels expressed common challenges in terms of responding to problems and achieving desired results. The practitioners said that they are spending a lot of resources on problem-solving and firefighting, but that responses to problems did not yield the expected improvements. As these issues were considered to affect a wide population of organisations, in a variety of situations and are based on practical experience, this indicate that the problem is relevant and that the results would be of benefit to a wider audience (Van de Ven, 2007).

Through previous knowledge about QM, a possible connection was identified between these problems and the phenomenon of tampering. The topic of this dissertation is thus phenomenon-driven (Schwarz and Stensaker, 2014). A phenomenon-driven research approach concentrates on identifying and conceptualising a specific event and contributes to knowledge within a research field rather than to specific theory (Schwarz and Stensaker, 2014). The phenomenon of interest in this dissertation is tampering, or ‘shortcomings in employees’ responses to problems that lead to undesirable results’.

3.2. Research process and research design

The results presented in this dissertation aims to contribute by further studying the phenomenon of tampering, as described in the previous section, to fulfil the purpose and answer the research questions presented in Chapter 1 (see Section 1.7 Purpose and research question). To answer the purpose and research questions, this dissertation draws on three studies (Studies 1–3). The three studies resulted in five papers (Appended Papers I–V). The findings from these five papers constitute the basis of the discussion and conclusions of this dissertation. An overview of how the studies and papers are connected to the dissertation is given in Figure 5.

Figure 5: The connections between the three studies, the five papers and the dissertation.

Study 1 took place between 2016 and 2019, and focused on an improvement programme implemented in the Swedish healthcare system during this time. Parts of this study were presented in a master's thesis (Smeds, 2016) and a licentiate thesis (Smeds, 2019), and in three papers – one of which is included in this dissertation (Paper V: Smeds and Poksinska, 2019).

The common theme of the three studies is *responses to problems leading to undesirable consequences*. In Study 1, some undesirable and unforeseen consequences that had arisen due to implementing the improvement programme were identified (presented in Paper V). I found it fascinating that a programme that aimed to improve healthcare could lead to negative consequences, and it became apparent to me that not all attempts to improve processes lead to desired results. The phenomenon that was merely a finding in Study 1 became the main focus of Studies 2 and 3, which moved away from merely studying the healthcare improvement programme to increase knowledge about tampering as a concept drawing on experiences in various sectors.

Studies 2 and 3 began in August 2019. Before the start-up meeting, I conducted a preliminary literature review to get an overview of the current view of tampering and which gaps existed in the literature. The preliminary review showed that literature on tampering was scarce. This implied a need to increase knowledge about this phenomenon by grounding the problem and investigating the what, why, how and who (Van de Ven, 2007). Accordingly, four questions were formulated that guided the design of Studies 2 and 3. The questions were: What is tampering?, How does tampering manifest in practice?, Why do employees tamper? and How can tampering be managed? These questions were the inspirations for the research questions investigated in Papers I–IV. Study 2 had a theoretical focus to outline current knowledge about tampering and was conducted in parallel with Study 3 which had an empirical focus on collecting and analysing empirical examples of tampering.

Studies 2 and 3 were funded by the HELIX Competence Centre at Linköping University. HELIX is a partnership network in which researchers and practitioners from a variety of organisations meet and work together (e.g. Etzkowitz and Leydesdorff, 2000). This allowed for a continuous knowledge and experience exchange with researchers from other research fields and practitioners. The design and findings of Studies 2 and 3 have thus been discussed in seminars on several occasions. The aim of the seminars was to ensure that the participants recognised and agreed with the interpretations of the phenomenon (Birt et al., 2016).

3.3 Research methods in Studies 1–3

The findings from the five papers constitute the basis of the discussion and conclusions of this dissertation. This section presents a methodological overview of the appended papers (summarised in Table V). Chapter 4 describes each of the five papers' backgrounds, findings and contributions to the dissertation.

Four of the five appended papers have an explorative approach and one has a descriptive approach. Typically, exploratory research is conducted when a study of a research problem is at an early stage (Bell et al., 2018). The choice of conducting explorative research is a result of previous research on tampering being scarce and the research phenomenon not being clearly defined. All papers primarily have a qualitative approach, and thus the data sets mainly consist of qualitative data. A qualitative approach was selected due to its possibility to offer deep insights that expose underlying mechanisms and processes (Miles and Huberman, 1994; Yin, 2009; Patton, 2014). The exception is Paper V, in which one part of the results is a quantitative summary of the results from the document study.

Table V: Appended papers' research design.

Study no.	Study 1	Study 2	Study 3		
Paper	Paper V	Paper I	Paper II	Paper III	Paper IV
<i>Title</i>	The effects of cancer care pathways on waiting times	Deming's tampering revisited: definition and future research agenda	To act or not to act. Exploring Deming's tampering in practice	Why won't you leave the process alone? Exploring emotional, motivational and cognitive mechanisms triggering tampering	Don't just do something, stand there! – Countermeasures for avoiding tampering in practice
<i>Approach</i>	Explorative	Descriptive	Explorative	Explorative	Explorative
<i>Purpose</i>	Elucidate some unanticipated negative effects of an improvement programme	Suggest a definition of tampering, outline current knowledge about tampering and suggesting a future research agenda	Increase the understanding about tampering by exploring how it is manifested in practice within daily operations	Identify mechanisms that lead an employee to take actions that lead to tampering	Explore possible countermeasures against tampering
<i>Data collection method</i>	Case study - Interview - Observation study - Document study	Narrative literature review	Critical incident technique (Flanagan, 1954) - Interview study	Critical incident technique (Flanagan, 1954) - Interview study	Critical incident technique (Flanagan, 1954) - Interview study
<i>Data analysis method</i>	Systematic word search Theme categorisation	Content analysis Pattern matching	Coding and thematic analysis	Data-driven thematic analysis (Boyatzis, 1998)	Data-driven thematic analysis (Boyatzis, 1998)

3.3.1 Study 1: Case study design with interviews, observations and document study as data collection methods

Qualitative interviews, non-participant and participant observations, and a document study were used to collect data. The context for this study was healthcare, with a particular focus on the 21 Swedish healthcare regions. One region was selected for deeper study conducted through a case study. The sampling strategies selected were *convenience* and *deviant case* (Miles and Huberman, 1994, p. 28). This region was the most convenient choice, as it was located close to the university and relationships had already been established between the researchers and the project leaders in the region. This made it easy to attend meetings and conduct observations at the hospital, as well as interviewing respondents at the hospital at their convenience without anyone having to travel long distances. This region was also an interesting study object due to its deviant strategy in terms of implementing the improvement programme in comparison to

other regions. This decreases the generalisability of the findings from this particular case (Miles and Huberman, 1994). However, the findings in the case are in line with the findings from the document study that includes all 21 regions, implying that the findings from the case have some generalisability. The overall aims of the case study were to gain knowledge about the improvements implemented in the improvement programme and to explore some undesired and unanticipated negative effects arising from these improvements. The specific aim of Paper V was to explore some undesired and unanticipated negative effects experienced when introducing a nationally developed improvement programme on a regional level. A case study design was selected to gain deep knowledge of a phenomenon in a specific setting (Eisenhardt, 1989).

The document study

The aim of the document study was to add supplementary data, and to obtain additional insights into the research context and a historical overview of past events (Bowen, 2009) linked to the improvement programme. A document study was selected as the data collection method, as it was a way of collecting information from all Swedish health care regions. Several years of information were readily available online, and included dedicated questions about the studied effects of the implementation such as crowding out-effects. The strength of this method is that data could be gathered from a large range of respondents over a longer time period, thus providing multiple perspectives on the topic as well as a historical overview (Bowen, 2009). The data-set consisted of internal reports on related improvement projects as well as action plans and result reports from the improvement programme in progress between 2015 and 2017. The analyse methods were systematic word search and theme categorisation (Bell et al., 2018). Search terms related to the undesired effects such as crowding-out and waiting times were used to carry out a preliminary screening of the reports and get a picture of the content. Quotations from the reports were categorised into two topics: *types of effect* and *reasons for the effects*. Thereafter, all documents were thoroughly read through to find additional quotations.

The observation study

The aim of the observations was to obtain access to the ‘backstage culture’ to gain a further understanding of the participants’ views (Kawulich, 2005) on the improvement programme and its effects. The data set from the participant observations consisted of unstructured field notes. Ten observations were conducted in a variety of situations such as meetings and a workshop. The average duration of the meetings was one hour and the workshop was two full days.

The interview study

The aim of the interview study was to gain knowledge about the participants’ views on the improvement programme and its effects. The interviews were held at an early stage of the implementation, at which time a limited number of employees were involved. A stratified *purposeful* and *opportunistic* sampling method was used to select respondents (Miles and Huberman, 1994). Employees with knowledge about the improvement programme were sought and the regional project leaders were asked for guidance in who could provide valuable information on the implementation. The project leaders provided a selection of potential respondents with different positions and from different healthcare units and organisational levels. The reasons why some of the potential respondents did not participate were lack of time, perceived lack of knowledge about the programme or not responding to the email with the interview inquiry. The sampling was opportunistic, as two of the interviewed respondents were included following recommendations from other respondents. Respondents working with the improvement programme in different areas of expertise, such as radiology and urology, and professions such as nurses and physicians were selected to be able to compare respondents,

both in different groups and in the same group (Miles and Huberman, 1994; Kvale, 2007). The final sample consisted of seven nurses, three physicians, two care unit managers, two general practitioners and two project leaders.

Triangulation

In this study, multiple data collection methods were used to triangulate the findings and seek complementary information (Farquhar et al., 2020). Using triangulation has been suggested to enhance the rigour and quality of a case study (Eisenhardt, 1989; Yin, 2009). The interviews were the primary data source, providing first-hand information from one region's perspective by interviewing professionals from different professionals at multiple care units. The observations were used to obtain informal information about working routines and different employees' thoughts about issues such as, unanticipated and undesired effects. This information contributed partly to topics raised during the interviews but also to convergence (Farquhar et al., 2020), i.e. seeing whether the interviewees' perceptions were consistent with how they spoke informally. In this way, differences and similarities in perception and reasoning could be distinguished, which were later used to contrast the positive and negative perceptions that were identified. The document study was used to gain complementary information in terms of longitudinal data from multiple actors in order to follow the development across regions over multiple years. The differences in effects would probably not have been as obvious from the interviews alone, and thus the triangulation helped to paint a broader and more nuanced picture of aspects such as, the negative effects of the programme.

3.3.2 Study 2: Narrative literature review

One aim of Study 2 was to gain knowledge about the current understanding of tampering and propose a future research agenda to act as a guide for the empirical study on tampering. Another aim was to make a conceptual contribution by suggesting a contemporary view (MacInnis, 2011) of tampering. A narrative literature review was selected, as this is useful for collecting and synthesising previous research in areas where research is scarce (Webster and Watson, 2002; Tranfield et al., 2003; Snyder, 2019). The first part of the review was a Scopus search focusing on tampering and the funnel experiment. The search terms used were: "Deming* funnel", "funnel experiment", "Nelson* funnel", overadjust*, overcontrol* and tamper*. Inclusion criteria was peer-reviewed papers, written in English on topics related to tampering or variation. Papers with a statistical method focus, a description of the funnel experiment and tampering papers that did not reflect Deming's tampering were excluded. The second part of the review was a directed search conducted in the journals *International Journal of Quality and Service Sciences (IJQSS)* and *Total Quality Management and Business Excellence (TQM-BE)* covering the years 2009–2021. The same inclusion criteria as before were applied. The interval 2009–2021 covered all issues of IJQSS but not TQM-BE. Thus, to complement the second part of the review, a directed search was made in all volumes of TQM-BE. The search terms were tamper*, overcontrol*, overadjust* varia*, fail and error. The review did not aim to cover all possible papers on the topic, but to present a representative selection (Wong et al., 2013). The two steps resulted in 30 papers being included in the analysis. The analysis was conducted through qualitative thematic analysis, where the central themes of the papers were synthesised and categorised (Miles and Huberman, 1994) based on the system of profound knowledge framework.

3.3.3. Study 3: Critical incident technique with qualitative interview study as data collection method

The aim of this study was to explore how tampering is manifested in various organisations and situations. As few examples of tampering were identified in the literature, no predetermined understanding of such examples was used to guide the data collection. As previously described,

this study does not focus on any particular problem or problem type, but rather on any problem that an employee may encounter when carrying out daily operations. To gain a broad understanding of the concept of tampering and in which contexts it occurs, a decision was made to sample examples of tampering broadly and not limit it to any type of problem or context. It was thus a strategic decision to choose organisations from several sectors such as service, manufacturing and the public sector as well as respondents in different roles and positions. Organisations were selected based on *convenience* (Miles and Huberman, 1994) with regard to geographical proximity as well as taking advantage of the already researchers established contacts with organisations associated with the HELIX Competence Centre. This sampling strategy was chosen due to the project's time limitation and since it made it possible to get started quickly with the pilot interviews as well as the following interviews. The critical incident technique was selected due to its usefulness in capturing employees' perspectives on how and why a phenomenon occurs (Flanagan, 1954). Critical incidents are specific observable activities with a clear aim and clear consequences (Flanagan, 1954). To collect the tampering examples (incidents), an interview study was conducted.

Respondent selection

To capture a broad sample of employees from a wide range of organisations, sectors, positions and abilities to offer rich descriptions, a *stratified* sampling approach (Miles and Huberman, 1994) was combined with a *key informant strategy* (Patton, 2014). Organisations linked to the HELIX Competence Centre were chosen because the network includes a wide range of different organisations that have expressed an interest in participating in research studies. This was considered favourable, since it was assumed that the organisations had a preunderstanding of what being a part of a research study entails, thus facilitating the selection of respondents. Contact persons at each selected organisation were contacted and asked to suggest suitable employees to interview. Due to the ongoing COVID-19 pandemic, the contact persons in the healthcare region declined participation. Because of the strained situation in healthcare, the researchers actively opted out of the healthcare context in the interview study. A condition imposed on the contact persons when proposing respondents was to select employees with the ability to provide detailed descriptions of tampering examples. Seventeen respondents working in the sectors of municipal administration (5), real estate (4), cooling systems (2), aerospace/defence (2), education (1), technical consultancy (1) architecture (1), and the life science (1) were interviewed. They held positions in senior management (4), and middle management (6), and as first-line employees (7). Eight of the respondents were female and nine were male, and all respondents except one had more than ten years of professional experience.

The interview study

A semi-structured interview guide was developed to ensure that all aspects sought by the researchers were covered during the interviews. The questions in the guide were developed using the critical incident technique (Flanagan, 1954). The aim of the study was to collect tampering examples that met the definition 'action on the system without action on the fundamental cause of the trouble' (Deming, 1993, p. 68). Vital aspects of the tampering concept to be studied were determined such as underlying problem, action taken, outcome, consequences, actors involved, time and place, etc. Questions that captured these aspects were formulated using questions presented in Flanagan (1954) as a guide. The questions were formulated so that multiple aspects of a tampering example were captured, such as what the problem was, why the problem arose, how it was handled, who was involved and how it could have been managed instead. Five pilot interviews were conducted in order to test the interview guide, assess the use of the critical incident technique and fine-tune the interview guide before continuing with the interviews. The pilot test revealed that descriptions of the underlying

problems were insufficient, which made it difficult to fully understand why the example was considered as tampering. After the pilot test, the interview guide was slightly altered to highlight the importance of describing the underlying problem, as this aspect was considered central to properly understand the tampering situation.

The tampering examples were gathered through an interview study conducted between August 2019 and May 2020. The interviews were held by telephone or face-to-face, depending on the respondent's preference, and lasted between 31 and 60 minutes. The first part of the interview was an open question about the respondent's perception of what tampering is, in order to understand how the respondent reasoned when selecting the self-experienced examples of tampering. In the second part of the interview, the respondent described two self-experienced examples of tampering. The interviews were recorded and transcribed verbatim.

During the interviews, at least two tampering examples were collected from each of the 17 respondents. As previously described, assessing whether or not something is a problem and what is a proper response is not always obvious. In this study, the respondents were asked – based on the given definition of tampering – to decide for themselves which situations in their work they considered to be tampering. The sample of respondents consisted of employees who could be considered 'process experts' with first-hand knowledge about the processes they operate in, and who would thus have the competence to determine what could affect the process in a positive or negative way. Judgements on the 'right' way to act were based on the 'voice of the process'. According to the theory of variation (Shewhart, 1931), there is a right and a wrong way to deal with disturbances that occur in a process, i.e. to identify and deal with the underlying causes. If the problem is handled differently, tampering occurs. The response should thus be based on what is actually wrong in the process rather than the employees' own 'opinions' about which response is appropriate. This was especially important in cases where several actors were involved in various responses, where some were based on the 'voice of the process' while others focused on dealing with symptoms of problems. The two inclusion criteria for what was considered to be tampering were the respondents' credibility in their descriptions and the example's conformity with the tampering definition. Forty-eight tampering examples were collected, and after comparing the tampering examples with the definition of tampering, 39 examples remained.

One aim of the data collection was to get a wide range of tampering examples from different organisations, types of processes and organisational levels. As previously described, empirical data were collected from eleven organisations in different sectors. In the manufacturing sector, nine examples were collected from cooling systems, life-science industry, and aerospace/defence industries. In the service sector, twelve examples were collected from real estate, cooling systems, education, and technical consultancy and 15 examples were collected from municipal administration in the public sector. In three examples, no particular sector was described. The empirical material is too extensive to be described in detail in this dissertation. However, a brief description of all the tampering examples can be found in Appendix I.

The analysis process was different for each of the three papers. However, all coding was conducted in Nvivo12. The analysis in Paper II was tampering example-oriented, where the course of events was outlined for each tampering examples upon which cross-example comparison was conducted (Miles and Huberman, 1994). All 39 tampering examples were included in the analysis. The themes described and compared were interpretation of the event, event triggering tampering and effects on underlying system structure. The analysis resulted in five types: *tampering by overcompensation, derailing, disagreement, overruling and escalation*.

The analysis in Paper III focused on behavioural mechanisms such as emotional, motivational and cognitive mechanisms triggering tampering. These mechanisms are well established as a framework in other research fields (Simon, 1967; Tversky and Kahneman,

1974) and were considered suitable to explain why tampering actions were conducted by employees. A data-driven thematic analysis approach was selected, which is useful when an open approach that is not limited by previous knowledge is sought (Boyatzis, 1998). Thirty-three tampering examples included details of mechanisms, and were thus included in the analysis. Following the method suggested by Boyatzis (1998), a subsample of tampering examples was selected and a preliminary set of themes were formulated for each of the three mechanisms. The themes were then assessed for similarity, and closely related themes were merged into a common theme. The codes were then applied to the remaining tampering examples and synthesised (Boyatzis, 1998).

The analysis in Paper IV focused on the aftermath of the tampering examples in terms of how the tampering situation had been handled afterwards, how it could have been prevented and how the consequences were dealt with. All 39 tampering examples were included in the analysis. A data-driven approach (Boyatzis, 1998) was selected, and the analysis was conducted using the tampering types presented in Paper II. Following the method suggested by Boyatzis (1998), a subsample of tampering examples was selected and themes in terms of countermeasures were inductively formulated. These countermeasures were then compared to the remaining tampering examples. If additional countermeasures were identified, they were added to the list. Once all tampering examples had been analysed, the findings were synthesised for each tampering type.

3.4 Theoretical framework development for RQ1

The first research question regards how tampering is manifested in various types of approaches to identifying and responding to problems. A theoretically driven approach was chosen to develop the theoretical framework. This was partly because the author of this dissertation had previously mostly worked with empirically driven frameworks and wanted to gain experience of working with theory-driven frameworks. However, this approach was primarily chosen because the actions described by Deming (1993) (namely system change, root cause improvement and doing nothing) and Tucker et al. (2002) (namely first and second order problem-solving) and Benner and Tushman (2003) (namely radical improvement/innovation and incremental improvement/innovation) were considered good starting points for identifying approaches to be studied. The goal of this literature search was not to identify all possible actions but a fair representation of actions that may be applied when responding to problems. A list of the identified actions is presented in Table III. Early on in this work, it became clear that some of these actions had similar characteristics such as incremental improvement, root cause improvement and second order problem-solving, as well as radical improvement and system change. These actions were grouped into two approaches called *local improvement* and *system change*. Literature searches were conducted to identify additional literature on these topics as well as the approach *inaction*. Clinical inertia was identified when searching for actions on ‘doing nothing’. Workaround and wait-and-see were identified from searches on first-order problem-solving (e.g. from Tucker et al., 2020). Firefighting was not identified during this literature search, but was identified when conducting the literature search for Paper I. This action was identified in Young et al. (2004). Firefighting and workaround both showed high degrees of resemblance with first-order problem-solving, and were grouped and named *workaround*. Since these approaches and their characteristics would be used to analyse the concept of tampering, the characteristics problem and action from the model of tampering in Figure 2 were considered important to distinguish between the approaches. In addition, the definition of tampering points to the system as a central aspect of tampering in terms of highlighting where the improvement efforts are directed. Thus, the target of the response was also used as a characteristic to describe the different approaches. One adaptation that was made

to the theoretical framework was the exclusion of actions regarding innovation, as the author found it difficult to identify situations where innovation would lead to tampering actions. The final theoretical framework can be found in Table IV. A description of how this theoretical framework was used to analyse the findings in the papers is presented in the next section.

3.5 Data analysis methods used to answer RQ1 & RQ2

This dissertation set out to answer two research questions. The first is: How is tampering manifested in various types of approaches to identifying and responding to problems? This question was answered via pattern matching by comparing the main results in the papers with the theoretical framework of different approaches available to employees when responding to problems presented in Table IV. Pattern matching is a rigorous and systematic approach where theoretical formulations of patterns guide the analysis by comparing it with empirical data (Yin, 2009; Sinkovics, 2018; Bouncken et al., 2021a; Bouncken et al., 2021b). Sinkovics (2018) suggests three types of pattern matching: full pattern matching (which is the most rigorous and is useful when conducting explanatory research and examining causal relationships), flexible pattern matching (which is open to during-analysis-adaptations and is useful when conducting exploratory research) and partial pattern matching (which is inductive and is useful to get a broad overview over a topic). Based on the different aims of the pattern matching approaches as well as the research design in the study, flexible pattern matching was conducted to answer the first research question.

Flexible pattern matching consists of two parts: theoretical patterns and empirical data (Sinkovics, 2018). Theoretical patterns can be based on more or less structured literature reviews (Sinkovics, 2018; Bouncken et al., 2021b). The development of the theoretical framework used was presented in the previous section.

The empirical data used in this dissertation consisted of syntheses of the findings from the appended papers. The syntheses were formulated by reading the papers and summarising the main ideas presented in the sections' findings and discussion. Due to the nature of the data (Sinkovics, 2018; Bouncken et al., 2021b), which did not consist of full case descriptions but of findings from the papers, flexible pattern matching rather than full pattern matching was assessed as sufficient, as it allows for less strict interpretation of the data.

The pattern matching process, i.e. the analysis process, started with constructing a table (a simplified version is presented in Table VI) in which the four approaches presented in sections 2.3 and 2.5 formed the basis for the theoretical patterns against which the empirical data (presented in Chapter 4) were compared. The characteristics of the approaches were used as inclusion criteria for categorising the empirical data. The inclusion criteria (presented in Table IV) included descriptions of the problem focus, action and whether the response aimed towards e.g. a system or a routine. The flexible approach facilitated the analysis, since it allowed for a less strict interpretation of the material (Sinkovics, 2018). For example, a finding could be considered to match even if all inclusion criteria were not met, which would not have been possible if a full-pattern match had been carried out. The empirical data were then mapped into the approach that best matched the description. When the empirical data had been matched with an approach, the new findings within each group were compared and synthesised with a particular focus on the different inclusion criteria.

Table VI: Example of the results using flexible pattern matching.

Approaches to identifying and responding to problems			
Inaction	Workaround	Local improvement	System change
Paper I: “If no efforts are made to change action or it is conducted too late, undesirable results is unescapable, a phenomenon called frozen action mode.” (Kobo Greenhut et al., 2017).	Paper II: “Actions taken to manage the events inducing tampering differ widely between the tampering examples. Some actions are of a more temporary nature such as the removal of a painting (Tampering example 9), hiring a technician (Tampering example 33), and buying back-up generators (Tampering example 38).”	Paper V: Multiple local improvements were introduced such as pre-booked timeslots, prioritisation, inclusion criteria and maximum waiting times, all of which generated some undesired negative outcomes.	Paper I: Changes that impact the whole system, such as implementation of a new financial resource allocation model (Gerst, 1995).

The second research question is: How can customers cause employees to take tampering actions? The customer’s role in tampering was a finding from Study 3 that emerged when the different types of tampering were developed for Paper II. Tampering examples including customers were not actively sought in the study, but were brought up spontaneously by the respondents. As literature searches of the customer’s role in tampering did not yield any clear results, an inductive approach was adopted for the analysis. Findings from the papers and tampering examples that addressed customer involvement were compiled for further analysis. The analysis was guided by what, who, how and why questions (Van de Ven, 2007), such as in which contexts the customers caused tampering, what the chain of action that caused tampering looked like, who took the initiative and who made the tampering happen, why the employees took tampering actions, and what the effects of the tampering were. Examples of themes that emerged regarding the chain of action were through *indirect interactions* or *direct interactions*, and examples of why employees took tampering actions were *to sustain relationships*, *economic incentives* and *to score easy points with voters*.

The findings of these analyses are presented in Chapter 5 (Discussion).

3.6 Discussion on research quality and limitations

An important aspect of any research design is to strive for research results that are reliable, replicable and valid (Yin, 2009; Bell et al., 2018). As previously mentioned, this dissertation consists of findings from five papers, based on three studies.

3.6.1 Replicability

A central aspect of the research design is that a study can be repeated, i.e. it should be replicable (Bell et al., 2018). It may be necessary to replicate a study if the result is not suspected to be correct or if there is a need to do further studies that get the same result as the previous study (Silverman, 2006). Although replicability is sought in the academic world, it does not seem particularly common in areas such as social science research (Bell et al., 2018), a fact that the author of this dissertation also perceives to be applicable in the QM field. Some scholars (e.g. Silverman, 2006; Bell et al., 2018) claim that the need for a study to be replicable is affected by the epistemological approach that the researcher applies, where for example those who claim that the world does not change argue for the need for replication while and those who say that

the world is constantly changing argue against the need for replication. In qualitative or interpretative research, replicability is often described as having little desirability (Silverman, 2006). However, in this dissertation it is argued that even if it is not likely that this study may be replicated, replication of a study can – as previously described – be valuable and there is therefore a need to describe how replicability has been facilitated. The choice of data collection method and analysis methods can impact on the possibility of replicability (Miles and Huberman, 1994). To facilitate replicability, a description of the specific data collection methods and their application has been briefly presented above and is presented in more detail in each paper.

Besides the need for replicability of the data collection, there is also a need to be able to replicate the analysis (Boyatzis, 1998). If properly executed and described, the structured process of pattern matching is considered to contribute to replicability, since it requires conceptualisation of the theoretical concepts to be clearly formulated and the empirical data to be synthesised (Sinkovics, 2018). However, flexible pattern matching may be more difficult to replicate due to it being less strict than full pattern matching, for example (Sinkovics, 2018).

Qualitative research is sometimes criticised for its lack of replicability and rigour (Golafshani, 2003). To forestall such criticism, structured analytical methods could be used to interpret the empirical data, such as flexible pattern matching where the clear theoretical patterns provide a foundation that can be used for replication and comparison (Bouncken et al., 2021b). In the case of this dissertation, the theoretical framework of approaches and inclusion criteria presented in Table IV and Table VI could be used to guide replication. The actual categorisation of the content in the table is, however, more difficult to describe, which could lead to different researchers making different assessments of what belongs to the different approaches. To further facilitate the possibility of repeating the analysis presented in this dissertation, the method has been documented and described in this chapter in such a way that the various steps can be replicated. However, following methodological procedures does not guarantee that a study and its results can be replicated, as the researcher's own experiences and references can influence the outcome. This can lead to different conclusions than those that are clearly shown in the data. Such finding may be difficult to regenerate as the thought processes used to develop the conclusions can be difficult to describe. In this dissertation, the choices and application of the various methods have been described to make the process transparent and replicable to some extent.

3.6.2 Reliability

Two measures of good research quality are that the result would be the same if the study was repeated and that its outcome was not affected by chance or coincidence (Bell et al., 2018). This aspect is based on the idea that the concepts or variables studied should be consistent and reliable (Bell et al., 2018).

In this study, the very concept of tampering is in itself worth discussing from a reliability perspective. As previously described (see Chapter 2), there are several different interpretations of the concept of tampering. The lack of a clear definition means that individuals view and thus apply the concept of tampering in different ways. Although a specific definition of tampering has been used in this dissertation, the term may still be open to interpretation. This definition is based on one of Deming's definitions, which takes a broader view of tampering and has more room for interpretation than other descriptions which, for example, rely on statistical conditions (see Table II for examples). A researcher who will replicate the study or 'reinterpret' the material based on this definition may therefore come to different conclusions than those reached in this dissertation. The analysis presented in this dissertation is expressly based on Deming's definition, in order to obtain a uniform analysis and to provide those who use the same definition with something to relate their findings to. The fact that the concept itself does not

have a clear, stable definition can thus affect the study's reliability. Using the same definition as the one used in this dissertation should lead the researcher to similar conclusions. However, there is always some room for interpretation that may cause differences. In addition, the broad definition of tampering allows multiple problems to be studied. The type of problems studied may affect how tampering is manifested and how it can be understood. Researchers studying other types of problems may thus find that tampering manifests in ways other than those described in this dissertation or the appended papers.

One way of enhancing reliability is by having multiple researchers analyse the data and check inter-rater reliability (Boyatzis, 1998; Silverman, 2006). As the work on this dissertation has been carried out by a single author, this has not been done for the analysis in the dissertation. This entails a risk that the author has made subjective assessments that other authors would not have made. These interpretations are not necessarily deviant; however, by comparing these interpretations with others' interpretations, any ambiguities or alternative interpretations could have been discussed (Boyatzis, 1998). The author was aware of the reliability issues linked the analysis being conducted by a single person, and has therefore sought to stay close to the data and the definitions used in the theoretical framework and not to make too far-reaching interpretations. In the papers, however, the analysis methods and the outcomes of the analyses have been discussed by the researchers included in each study and practitioners.

3.6.3 Validity – transferability and respondent validity

There are several different sub-concepts that fall within the concept of validity; the applicability of these differs, with some sub-concepts being more applicable in qualitative research studies and others in quantitative research studies (Bell et al., 2018). Transferability is usually describes as being of particular interest in studies with a qualitative approach (Bell et al., 2018). Transferability refers to the generalisability of the findings outside the current study context, which is affected by the choice of contexts, the choice of respondents and the prevalence of the studied phenomenon (Miles and Huberman, 1994; Bell et al., 2018). It can be argued that the first study (presented in Paper V) has limited generalisability as it only studies one improvement programme in one context. However, the strength of that particular study is that the sample included all healthcare regions involved in the programme. This allowed for a compilation of data from – and a comparison between – a wide selection of actors. The possibility of generalising the results within this context and for this programme can thus be considered feasible. The transferability to other programmes and contexts is perceived as limited but not inexistent, as the concept of crowding-out effects (which is the topic of Paper V) is not unique for the studied context but has previously been discussed with regard to the 'queue billion' policy initiative, for example.

In the third study (presented in Paper II–IV), a stratified sampling approach was combined with a key informant strategy. Due to time and resource limitations, the study was designed to focus on a limited number of respondents and to aim for a broader sample of organisations, sectors and respondents with varying positions. There are multiple characteristics that can affect generalisability between employees. The respondent selection was designed to include both men and women with different positions and roles within the organisations. However, most of the respondents in the study have extensive professional experience. This could affect which tampering examples the respondents address, and thus also the generalisability of the results for respondents with less experience. Due to the rather small number of respondents, the tampering examples collected and the sectors studied may limit the opportunities for generalisability. However, generalisability has not been the primary goal of the second study. Instead, the goal was on increasing knowledge about the tampering phenomenon in a broad sense by making comparisons between different respondents and contexts to find differences and similarities. (The findings are presented in the appended papers.) The fact that few discernible differences

were identified between different groups of respondents and contexts could point towards some generalisability of the results to additional contexts and for respondents in different positions. However, with the limited sample, no such strong claims can be made. Instead, further studies are encouraged to study tampering more extensively *in* different contexts and positions, and more broadly by making comparative studies *between* different contexts and positions. The low level of generalisability that is asserted in the appended papers affects the generalisability of the results of the analysis presented in this dissertation. However, in order to increase the opportunities for others to generalise the tampering examples presented in the dissertation and the appended papers to their own contexts, a brief description of all examples has been attached in Appendix I. At various presentations and seminars where tampering examples have been presented by the author, the audience has expressed recognition in several examples and the tampering concept is general. However, the author of this dissertation has no information about how they associate the examples with their own contexts or in which contexts they operate, which makes this type of feedback difficult to interpret. Even though facial validity has been questioned as a validity method (Royal, 2016), it is still possible to speculate that a positive response via facial validity can be an indication of a concept's potential for generalisability. However, generalisability should be proven by testing and confirming the findings (Miles and Huberman, 1994).

Another relevant aspect of validity is whether the phenomenon to be studied has actually been properly described (Miles and Huberman, 1994; Bell et al., 2018). The approach for analysing the data for the first research question was pattern matching. To get the most out of this approach, the data collection should be conducted after developing the framework (Sinkovics, 2018). In this way, the data collection can be designed to specifically identify the patterns sought. For the first research question, the data was collected prior to developing the theoretical framework. This implies a risk that patterns not included in the framework will be omitted in the empirical data, or that the empirical data will not cover all the patterns included in the framework. To reduce the risk of missing patterns that would not be included in the framework, the author had this in mind when conducting the analysis and was observant for any pattern deviating from the framework.

Another risk of using an entirely theoretically developed framework is that other perspectives or types of approaches will be missed. This risk could have been reduced by carrying out additional searches. The author made several attempts to make literature searches for actions that could form additional approaches, but found it difficult to identify relevant search terms that led to such actions. Therefore, several of the actions were identified by studying those referred to in the papers identified during the literature searches. This may have contributed to some relevant approaches being missed, but the good match between the identified approaches and the empirical data implies that these were a good starting point. The risk of missing other approaches could also have been reduced by identifying new approaches from the empirical material. However, as the analysis conducted is based not on raw data but on the summaries of the findings from the appended papers, the author found that the abstraction level was too high to be able to identify any additional approaches. If the raw data had been studied, additional approaches may have been identified.

3.6.4 Ethical considerations

The ethical considerations made are based on the rules of conduct established by the Swedish Research Council (Vetenskapsrådet, 2017). These rules are relevant in every aspect of the research work, and should be included as a natural part of any research process. With regard to the studies presented in this dissertation, some considerations relating to the respondents are particularly important to address. These are confidentiality and informed consent (Vetenskapsrådet, 2017).

Upholding confidentiality means not distributing information obtained from participants in confidence and protecting the data from unauthorised access (Vetenskapsrådet, 2017). Several measures were taken to protect the privacy of the participants. One was to keep information on the participants' identity separate from the tampering examples so that no name or organisation could be identified from the transcripts. This information was stored digitally in accordance with current GDPR legislation, and was not accessible to anyone outside the research group. In addition, data was presented at an aggregated level so that no single respondents or organisations were identifiable. All participants thus remained anonymous throughout the study.

Informed consent is important in studies that collect personal data (Vetenskapsrådet, 2017). All participants were informed about the aim of the study, how the data was to be analysed and the possibility to withdraw from the study both prior to and during the interview. The participants were also allowed to decide by themselves whether or not the interview could be recorded.

4. Overview of appended papers

This chapter provides an overview of the appended papers in this dissertation, summarising the background and main findings of each paper and briefly describing the paper's contribution to the dissertation. A detailed description of the methods used in each paper can be found in the relevant paper, although some parts of the methods can be found in Chapter 3 of this dissertation.

4.1 Paper I: Deming's tampering revisited: definition and future research agenda

Published paper: Smeds, M. (2021), *The International Journal of Quality and Service Sciences*, ahead-of-print.

4.1.1 Background

Preliminary literature searches showed that research on tampering is scarce. The aim of this paper was thus to compile current knowledge about tampering to gain a better understanding of the current view of tampering and propose a future research agenda. This paper laid the ground for designing the empirical study presented in Papers II–IV. Briefly, the purpose of Paper I is to suggest a contemporary definition of tampering, outline current knowledge on tampering and suggest a future research agenda.

4.1.2 Main findings

During the review, 30 papers that discussed practical implications of tampering or related concepts such as variation were identified. The results show that the tampering concept has disseminated into different research areas and is studied in multiple sectors such as service and healthcare. Further, few empirical examples of tampering exist in the literature; most examples are anecdotes, examples that are not backed up with data and that closely follow the view of tampering as described by Deming, e.g. by providing examples illustrated by the funnel rules.

Another main finding was that the prevailing view of tampering as a statistical concept described as unnecessary adjustment of or reaction to processes characterised as stable, where only common causes of variation occur or where data lies within the control limits. Few definitions were identified that were not characterised by statistical concepts. The empirical examples of tampering follow this view of making overadjustments in manufacturing or healthcare processes, for example, due to slight shifts in an output measurement. In service, a focus on recovery strategies after a service failure rather than on identifying the fundamental causes of the problem might lead to symptomatic responses. Failure to respond in time or to change the course of action before it is too late – referred to as *frozen action mode* – may also cause undesirable results.

The findings imply that a lack of statistical reasoning and statistical thinking hampers employees' problem identification and leads them to the wrong conclusions.

Another main finding is the suggested reasons why motives and behaviours cause tampering such as failed logical reasoning (cognitive bias), convenience, external pressure and difficulty understanding how a system operates.

4.1.3 Contribution to the dissertation

This paper contributes with increased knowledge about the current understanding of tampering and proposes that the tampering context need to be revitalised and adapted to increase applicability in contemporary contexts and organisations.

4.2 Paper II: To act or not to act: Exploring Deming's tampering in practice

Working paper.

4.2.1 Background

Few empirical studies elaborate on tampering and, to the author's best knowledge, none explore the nature of tampering outside the statistical domain. This paper transcends the mainly single-case, statistically focused approaches of previous research by studying tampering in a broad variety of organisations and contexts where the use of quantitative, statistical methods may be impractical. The purpose of this paper is thus to gain knowledge about what tampering is by exploring how tampering is manifested in practice within daily operations.

4.2.2 Main findings

Thirty-nine tampering examples were collected in the interview study. These examples were then analysed and clustered into five types of tampering: *tampering by overcompensation*, *tampering by derailing*, *tampering by disagreement*, *tampering by overruling* and *tampering by escalation*. A common finding among the tampering types is a general lack of proper problem and/or cause analysis, often resulting in an overstatement of the problem and/or oversimplification of the response. The types are characterised based on their differences in how a problem is interpreted, whether there is consensus or dissensus among involved actors, the type of action taken and the consequence for the underlying system structure. The five tampering types are:

- *Overcompensation*: Sporadic unwanted deviations are misinterpreted as problems and are not further analysed to find the root cause of the problem. Actors are usually in agreement on the problem's presence. The response to such a problem is unnecessary or excessive correction of the process or output to conform or compensate. The consequence for the underlying system structure is usually an overcompensating activity.
- *Derailing*: Continuous misinterpretation of a repeated problem on multiple occasions. Actors are usually in agreement on the problem's presence. The response to such repeated problems is to make sidesteps from an established process. The consequence for the underlying system structure is an unintended evolution of a parallel process that is continuously used to handle this type of problem.
- *Disagreement*: Two or more actors disagree on what a problem is and how it should be responded to. The disagreement leads to the actors going their own way and responding based on what is best from their perspective. The consequence for the underlying system structure is an increase in activities and their variety.
- *Overruling*: Two or more asymmetrical actors disagree on what a problem is and how it should be responded to. This disagreement leads to the actor with a decision mandate overruling the process or singlehandedly making the decision. The consequence for the underlying system structure is a replacement of established process activities.
- *Escalation*: Management misinterprets sporadic unwanted deviations and acts in disagreement with the perception of a 'process-expert'. The response is to activate activities that do not impact the core process. The consequence for the underlying system structure is an increase in activities within the managerial system.

4.2.3 Contribution to the dissertation

This paper contributes to the dissertation by proposing a framework with different types of tampering. The tampering types show that tampering is manifested in different ways. The paper argues that how a problem is interpreted and the type of action taken affect the outcomes and result in different consequences for the underlying system structure.

4.3 Paper III: Why won't you leave the process alone? Exploring emotional, motivational and cognitive mechanisms triggering tampering

Paper submitted to journal. Revision submitted 2022-02-04, undergoing third review.

4.3.1 Background

There is limited research on which behavioural mechanisms affect employees' judgements, leading to tampering. Most suggestions in previous research on behavioural mechanisms are speculative or anecdotal, although one empirical study does exist. This paper addresses one of the research gaps found in Paper I and the call for more research suggested by Van Gestel et al. (2015) to increase knowledge about why tampering occurs.

4.3.2 Main findings

Twenty mechanisms were identified from the 33 tampering examples. A main contribution is the mechanisms belonging to the categories:

- emotional aspects, such as uncertainty regarding potential consequences or fear of the perceived consequences if no action is taken, disappointment, distrust and stress,
- extrinsic motivational aspects, such as incentives (economic gains and relational incentives), compliance with internal routines and sense of doing something important and
- cognitive aspects, such as selecting a 'good enough' response, overconfidence and framing of the problem.

One of the main findings concerns how negative emotions trigger tampering actions. The paper suggests that these emotions sometimes trigger either a more passive or a more forceful action. The passive action refers to actions taken that feel wrong but, even so, nothing is done to prevent it. A feeling of hopelessness enables the action, even though the chosen course of action goes against the employee's cognitive assessment. In addition, passivity is also seen when complying with internal routines without questioning them, even if they are considered insufficient. The other action, acting more forcefully, refers to actions that address a problem to a greater extent than what was considered necessary in hindsight. An excessive assessment of potential consequences sometimes creates a feeling that a problem is more serious than it actually is and therefore needs to be managed in a more powerful way outside the established routines. This forceful behaviour is also a consequence of employees' eagerness to be helpful and sense of doing something important. Believing that action and improvement are expected when a problem presents itself misleads employees to act in ways that are insufficient.

Another main finding is that tampering does not seem to be a consequence of intentional attempts to make things worse. Rather, employees seem to have a tendency to want to show that they are competent at solving problems, and that they are not afraid to take action if necessary. On the other hand, some employees also state that they feel hindered by their perceived 'low' level of discretion. None of the employees state that they are forced to act in certain ways; however, there is a perception that others expect things to be done in certain ways. This creates a feeling of external pressure.

4.3.3 Contribution to the dissertation

The contribution of this paper to the dissertation is two-fold. First, it proposes that employees do not always make rational decisions or act according to their cognitive assessments, but are driven by emotional, motivational and cognitive mechanisms. Second, it proposes that these mechanisms may trigger a passive action or a forceful action when responding to the perceived problems.

4.4 Paper IV: Don't just do something, stand there! – Countermeasures for avoiding tampering in practice

Working paper.

4.4.1 Background

This paper addresses one of the research gaps identified in Paper I, namely suggesting how tampering can be managed and avoided. The few studies in previous research that discuss tampering mainly focus on identifying and removing individual cases of tampering in one organisation. The purpose of this paper was to explore possible countermeasures against tampering. A framework of countermeasures was developed based on the five tampering types presented in Paper II. In this dissertation the countermeasures are presented on a general level.

4.4.2 Main findings

One of the main findings is the need to change the view of what a problem is and how problems should be handled. The findings indicate the need to address problems and investigate them immediately when they arise. This is primarily done in order to determine what the symptoms are and what the underlying problems are, or to determine whether a problem is a non-problem that does not need to be addressed. Some organisations in the study state that they need to stop engaging in firefighting because it is considered time-consuming and sometimes even counterproductive. There is a need to establish processes and to trust these processes, and to question and improve these processes when systematic shortcomings are discovered. In addition, there is a need to find a balance between accepting that mistakes occur in the process – and thus leaving the process untouched – and identifying and improving the systematic shortcomings that lead to a deterioration of the process. In cases where new or parallel activities or processes have been unintentionally developed, there is a need to let go of these and return to the established process. Faulty practices should thus be abandoned in favour of those that are agreed on.

Some of the examples of tampering are perceived to have been avoidable if those who are 'process experts' had participated in the decisions, since they are often the ones who are affected by the problems and have the best knowledge of daily operations. Another countermeasure is to get the management to come together and listen to employees within the organisation, to dare to question their own and others' opinions and to question the need to act on all problems that arise.

4.4.3 Contribution to the dissertation

This paper contributes a set of countermeasures to tampering. Each countermeasure suggests how to target a different type of tampering. In addition, this paper argues for a need for a change in mind-set to acknowledge that not all undesirable issues are problems, and that reflecting on problems and their causes before acting may prevent the initiation of ill-considered 'improvement' efforts.

4.5 Paper V: The effects of cancer care pathways on waiting times

Published paper: Smeds, M. and Poksinska, B.B. (2019), *International Journal of Quality and Service Sciences*, Vol. 11 No. 2, pp. 204-216.

4.5.1 Background

A care pathway is a widespread, internationally used tool aimed at standardising a certain interval of a care process. In 2015, Sweden initiated the implementation of Standardised Cancer Care Pathways (CCPs), aimed at improving the timeliness and equality of care. Even though the programme was discussed, planned and developed by expert groups at national level, the programme resulted in several undesirable and unintended consequences. This paper elucidates some of the undesirable side-effects such as longer waiting times for other patient groups as a consequences of this programme. The central theme of the paper is 'crowding out', meaning that patients with a greater medical need have to wait longer for their care in favour of patients with a lesser need. Briefly, the aim of this paper is to describe the 'crowding out' effects resulting from the CCP implementation.

4.5.2 Main findings

One of this paper's main findings is the difficulty of predicting the consequences when making changes in large, complex systems such as healthcare. Even though there were indications of potential undesired side-effects reported from other countries that had previously implemented CCPs, these side-effects were not addressed when designing the programme and were not communicated to the health care regions operationalising the programme. This paper shows that similar negative side-effects to those recognised elsewhere were reported by concerned medical staff in the healthcare regions.

Another main finding was that several of the measures developed proved to be sufficient for dealing with the local problem, i.e. long waiting times for cancer patients. However, a lack of analysis regarding how the introduced measures would affect other parts of the system led to new and unexpected problems being created elsewhere. The paper presents some reported new problems (referred to in the paper as reasons for 'crowding out' effects) that arose due to the implementation, such as an increased number of patients in need of cancer diagnostics, a lack of capacity (especially in functions that handle numerous different patient groups such as radiology and pathology) and the underutilisation of resources due to medical appointments being unused.

Another main finding was the consequences of the implementation, i.e. the 'crowding out' effects. The prevalence of these effects illustrates that not all changes lead to improvements. Measures designed to improve quality in one part of the system may lead to decreased quality in other parts of the system. In this case, shorter waiting times and improved access to care for cancer patients was perceived to lead to longer waiting times for other patient groups. Furthermore, this paper shows the importance of adopting a holistic view when implementing measures that may affect multiple actors or parts of the system.

4.5.3 Contribution to the dissertation

This paper contributes to the dissertation in two ways. The first way is with an example of tampering that shows how implementing of a measure introduced to improve one part of the system may cause undesired effects in other parts of the system. The paper highlights the importance of taking a holistic view when carrying out measures that may affect multiple actors or parts of the system. The second contribution is the elucidation of the undesired effects that are allowed to arise and that grow worse when problems are recognised but are not taken seriously.

5. Discussion

In this chapter, the findings from the papers are discussed and related to the purpose and research questions presented in Chapter 1. In the first section, a contemporary view of the tampering concept is discussed. In the second section, the research question: How is tampering manifested in various types of approaches to identifying and responding to problems? is addressed. In the third section, the research question: How can customers cause employees to take tampering actions? is addressed.

5.1 Towards a contemporary view of tampering

Chapter 2 described tampering from a historical perspective and outlined how some scholars have interpreted the tampering concept. In this section, these aspects are further elaborated on to elucidate how tampering is viewed in this dissertation. This is an attempt to broaden the view of tampering and adapt it to a contemporary context in order to increase its applicability in several contexts, such as service, as well as toning down the concept's statistical emphasis.

5.1.1 Is tampering about identifying or responding to a problem – or both?

The different descriptions of tampering outlined in Chapter 2 showed a discrepancy in interpretation regarding whether tampering is a *misinterpretation* of the type of variation causing a deviation from a process's standard performance (that is regarded as a problem), or an *action* taken due to a misinterpretation. In other words, does tampering occur when *identifying* or when *responding* to a problem? In agreement with what seems to be the most common view of tampering, it is argued in this dissertation that the answer to this question is that the emphasis is on the latter, i.e. a misguided action, although the misinterpretation is also relevant. One argument for this is that a misinterpretation in itself is problematic; however, it has little or no effect on a process until the misinterpretation has been acted upon. The action taken is thus what causes undesired results in a process. However, the misinterpretation is the basis for this action. It is worth mentioning that not all failed improvement efforts are the result of tampering. The misinterpretation part distinguishes tampering from other types of failed improvement efforts, for example those that are based on a desire to improve the standard performance of a process or a system that is considered unsatisfactory (Shewhart, 1931; Deming, 1993). In contrast to such efforts, tampering occurs when failing to identify and appropriately respond to the fundamental (root) cause of a deviation from a process's standard performance. Thus, it can be argued that tampering regards both identifying and responding to a perceived deviation (problem), with the emphasis on the response.

5.1.2 Relating Deming's descriptions of tampering to those of other scholars

In this section, tampering is discussed in relation to the representative examples of tampering descriptions given by Deming (1993) and presented in Chapter 2. These representative examples are repeated here:

- D1: "...to attribute to a special cause any unwanted variation, when in many if not most cases what they observed was variation from common causes. Improvement of the process would have been more productive. They were tampering with a stable system, making things worse." (Deming, 1993, p. 177),
- D2: "... to avoid, by tampering with the process ..., repetition of some simple mistake that could be classed as a nonrecurring special cause." (Deming, 1993, p. 23) and
- D3: "... action on the system without action on the fundamental cause of the trouble." (Deming, 1993, p. 68).

In Chapter 2, it was highlighted that making a type I error, i.e. responding to a cause as if it does not belong to the standard performance of the system, when it does, seems to be the most common description of the tampering concept. This description conforms to descriptions provided by Deming such as D1 above. However, there are other descriptions of the tampering concept that imply that there may be more to tampering than reacting to common causes of variation as if they were special causes of variation. For example, description D2 highlights that making changes to a process due to a nonrecurring special cause, i.e. making a type II error may also be tampering. Viewing both type I and type II errors as tampering is an extension of the traditional interpretation of the concept. This interpretation may not be that far-fetched considering that there are other descriptions such as D3 that open up the concept by not stating what type of cause is involved or what type of action to take. Only one description in Table II may be interpreted as adhering to this more open description of tampering. Kwon and Woo (2018) highlight actions taken to improve errors, but they do not specify whether these errors belong to the process's standard performance (because mistakes will happen) or are, as in description D2 non-reoccurring special causes. Thus, there is no clear description of what tampering is.

The background given in Chapter 2 implies that the understanding of tampering has remained largely unchanged and is mainly viewed as a statistical process control concept occurring in manufacturing. Although several examples of tampering are given in Deming's texts that do not necessarily regard type I errors and do not emphasise the use of statistical tools, these aspects still seem to dominate today's view of tampering. However, criticism has been raised about the tampering concept's strong dependence on control charts, since the use of control charts is sometimes impractical (Van Gestel et al., 2015; Hanna et al., 2020). Based on the background described in Chapter 2, there seems to be a gap between the view of variation in contemporary contexts and the view of variation in relation to the concept of tampering. An example is that the description of variation given in literature on service processes implies that the view of variation may not be as static in this context as it probably was in the manufacturing context where the concept was first developed. The prevailing view of tampering is primarily applicable in processes where there is a clear target value for a process's standard performance, where this standard performance is reasonably stable and the process has a more or less uniform execution. However, this is not the case for all processes. This means that the predominant view of tampering may not be sufficient to address the tampering phenomenon in contemporary contexts. In this dissertation, it is thus suggested that a broader and less statistically focused description of tampering, such as D3, may be applicable in a wide range of contexts.

In this dissertation, the definition of tampering presented in Paper I – which is based on D3 – is used. This definition reads: *“a response to a perceived problem in the form of an action that is not directed at the fundamental cause of the problem, which leads to a deterioration of the process or the process output”* (Smeds, 2021, p. ahead-of-print).

5.1.3 Assessing variation and avoiding tampering in processes without using control charts

The previous section highlighted that a process's standard performance cannot easily be assessed in all processes. The nature of some processes, as described above, has been suggested to hamper the use of control charts to monitor and study variation (Van Gestel et al., 2015; Hanna et al., 2020). Hanna et al. (2020) go so far as to claim that statistical tools are not appropriate in all contexts and situations. Some researchers have therefore highlighted the role of the employee's knowledge and expertise in cases where control charts are not used (Van Gestel et al., 2015; Hanna et al., 2020). Besides Hanna et al.'s (2020) discussion about operators' use of statistical process control versus expert intuition in order to avoid tampering in contemporary manufacturing organisations, little attention has been given to revitalising and adapting the tampering concept in line with contemporary contexts. Previous research has

elucidated how to assess variation and avoid tampering by using control charts, but the following paragraphs suggest how this can be achieved without the use of control charts.

Some of the problems encountered in everyday life are undesired deviations from a process's standard performance. A basic question, regardless of whether or not control charts are used, is whether an undesired deviation is 'normal' (belongs to the process's standard performance) or 'abnormal' (does not belong to the process's standard performance). In a control chart, what is normal or abnormal is determined by control limits based on measurements of the actual process's behaviour (Shewhart, 1931). Similarly, a process's standard performance needs to be understood when a process lacks a clear target value and when information about the actual process's behaviour is not as easily accessible. A concept that deals with this issue, and that also shows some similarity with the concept of variation, is *noise*. *Noise* is described as unwanted random variation, and arises in a process where the outputs of the same activity, such as decisions in courts or in insurance cases, are different even though they are expected to be the same (Kahneman et al., 2021). According to the same researchers, noise occurs both in situations when the same employee makes different decisions based on similar data on different occasions and when different employees make different decisions based on the same data (Kahneman et al., 2021). Kahneman et al. (2021) suggest that when a process lacks a clear target value, the spread between different process outputs can be compared with each other. For example, comparisons of diagnostic outcomes or treatment recommendations can be made between physicians who study the same patients or comparisons of grade assessments can be made between teachers who correct the same assignment. The deviation can be used to study what causes these deviations, determine what is a 'normal' or abnormal, agree on 'limits' for what constitutes a process's 'standard output', and find ways to control the process so that the desired output is obtained (Kahneman et al., 2021). In this dissertations it is argued that this way of thinking could be a way to determine what a process's standard performance is, and could be used as a baseline for assessments of which undesired deviations may need to be responded to.

It is not always obvious whether a response to a problem has led to a reduction in the frequency of the problem, whether the problem has been eliminated or whether the problem will recur. Another useful idea that could be translated from the use of control charts is to study patterns (Shewhart, 1931), which may for example be recurring problems. If a problem recurs, the previously used response can be evaluated, and this evaluation can then form the basis for whether the current problem should be handled in the same way again or whether some other type of action is necessary. Thus, errors can be detected and responses that do not lead to desired results can be corrected (Argyris, 1977). An empirical example of learning by studying past behaviour patterns was given in tampering example 11 (in Appendix I). A manager stopped calling the employees to crisis meetings to deal with difficult pupil cases when they realised that these meetings were often used for cases that were not acute, the quick handling of some cases and not of others created inequalities (and variation) and these meetings created extra work for the manager and employees. This way of acting adheres to one of the most central ideas of statistical process control, namely the importance of studying and learning from past experience (Shewhart, 1931).

5.1.4 Black swans and underestimation of problems – the opposite of traditional tampering?

One way to approach and further develop a concept is to reflect on what the opposite of this concept could be. Overlooking signals relates to what Shewhart (1931, p. 178) would define as a type II error, where special cause variation is confused with common cause variation. The opposite of tampering, or actually overadjustment, has been denoted underadjustment (Deming, 1989). Hypothetically, it can be speculated that a consequence of this failure to identify a problem is that if it is unacknowledged it cannot be addressed; or, in other words, nothing is

done even though something is required. Common sense suggests that the consequences of overlooking a problem is not necessarily catastrophic if it is sporadic and of a lower level of severity, and thus does not reappear. However, it is likely that the problem will reoccur or persist and grow worse with time. Paper I, however, addresses an extreme scenario where continuous oversight of signals later culminates in an unforeseeable problem of extreme measures, a phenomenon known as a *black swan* (Aven, 2014). An example of such an event that few foresaw but that had severe consequences in many organisations is the COVID-19 pandemic (Antipova, 2021).

Black swan is a concept that, in contrast to the tendency to overestimate what constitutes a ‘problem’, addresses the risk that problems that emerge are underestimated. Aven (2014) proposes that special causes of extreme measures can be compared to the concept of black swans. As previously described, special causes are causes that are not part of a process’s standard performance (Shewhart, 1931), and since they often occur sporadically there is a risk that they will be perceived as surprising. A black swan is an event outside one’s expectations, causing extreme consequences that can only be explained in retrospect (Taleb, 2005). The nature of a black swan event implies that such events cannot be missed by the observer post factum. However, the difficulty lies in predicting and perceiving the events pre factum. Failure to predict these events may be because of a lack of scientific knowledge about their existence, a lack of knowledge about their existence from the observer’s perspective and the perceived unlikelihood of the event (Aven, 2014). The perception of what constitutes a black swan is thus subjective, and is influenced by the observer’s knowledge and pre-understanding (Taleb, 2005). Even though the particular event may be difficult to predict, it is necessary to be observant of signals implying that something is amiss (Taleb, 2005). Tampering and black swans share the challenge of finding the balance where signals are neither trivialised nor exaggerated. Otherwise, in the case of black swans, there is a risk that early signals will be missed, or false signals will be acted upon.

5.2 Manifestation of tampering in various approaches

Deming (1989; 1993), following the ideas of Shewhart (1931), suggests that there are right and wrong ways to address problems stemming from common and special causes of variation. As previously presented, Deming (1993, p. 188) suggests that common causes should be reduced by changing the system that cause the variation, while special causes should be removed or prevented from reoccurring (see Figure 1). The findings from Paper II and III suggest that this way of reasoning about how to approach problems is not reflected upon or applied in everyday situations. Studying whether tampering manifests in different ways depending on the interpretation of a problem and the consequently selected approach can enhance knowledge about which interpretations and responses may lead to tampering. In the following sections, the four types of approaches presented in section 2.3 – inaction, workaround, local improvement and system change will be discussed in relation to tampering.

5.2.1 Inaction – when doing nothing leads to firefighting

The findings in Papers I, II and V show that even though a problem is known, it is not always addressed. The findings in Papers II and V showed that some problems were not taken seriously even in cases where the problem was known to have aggravated a process or caused new problems. Although it was known that the problems would need to be dealt with in due time, they were not considered critical and could thus wait. This approach can, to some extent, be compared to a wait-and-see approach (Sims and Finnoff, 2013; Jørgensen et al., 2020). However, the difference is that when tampering, the wait-and-see approach was not a strategy for seeing how any uncertainties would turn out or gaining time to gather more information (Sims and Finnoff, 2013). Rather, the wait-and-see approach involved waiting until there was

an actual necessity to address the problem. The consequence was that the problem got worse and spread, which meant that it eventually became acute and thus had to be addressed promptly through firefighting. This laid-back approach to responding to known problems can be described as a ‘head-in-the-sand approach’. Paper III suggests that tampering can be caused by a passivity that arises as a result of a feeling of hopelessness, for example, because there is no point in opposing someone else’s will or acting in any other way, or uncertainty about the consequences of deviating from established working methods. This allows decisions to be made that are perceived as wrong, or inadequate routines and activities being allowed to continue. The wait-and-see approach has been suggested to be justified when the consequences or risks of waiting are considered lower than the consequences of acting (Sims and Finnoff, 2013). The findings in Paper V, however, suggest that assessing such risks is difficult and that the situation can change over time and make a problem that seemed insignificant become much worse. The cost of waiting may, however, be much higher than if an action had been taken when the signal was first detected (Murphy et al., 2011). This has been called the frozen action mode (Kobo Greenhut et al., 2017), which is addressed in Paper I, where failure to respond in time or change the course of actions before it is too late may allow problems to escalate. Tampering is thus manifested in inaction when failing to address known problems in time, resulting in problems worsening and consequently requiring prompt attention through firefighting.

5.2.2 Workaround – ‘quick fixes’ and alternative actions

The findings in Papers I, II and V show that when current processes, routines or templates are considered to be insufficient to complete a task or achieve a goal, employees find ways of dealing with such dilemmas by adjusting, subtracting, adding or finding alternative tasks without identifying the causes of the underlying problem. Such workarounds counteract the purpose of having established processes or routines that aim to standardise work, since they add further complexity and practice variation, thus increasing the in-process variation. The findings in Papers I and II support previous research stating that one problem with not removing the causes of problems and focusing on symptoms is that the problem will reoccur and thus need to be ‘worked around’ again (Tucker et al., 2002; Senge, 2006; Debono et al., 2013; Tucker et al., 2020). One of the risks of using workarounds is that those that have been shown to work well will be applied regularly and create individual routines for how recurring problems can be handled. These problems then become an accepted and expected part of everyday work rather than an exception. Paper II shows that such ‘quick fixes’ have a tendency to spread among colleagues. The number of employees using measures that deviate from established processes increases and too does the variation. One example of such an established workaround presented in Paper II is to spend the entire remaining budget before the new budget year begins. This is a common behaviour that is used across sectors and even nations. The underlying problem is a budgeting process that ‘punish’ those who do not spend all of their money by reducing their budget next year or the remaining money being taken away (Gerst, 1995). Even though this workaround is well-known in some organisations and sectors, there seems to be little interest in resolving this matter.

The findings in Paper II suggest that employees sometimes feel pressured to bypass current processes to achieve the goals or carry out the work that is expected by management or customers. Instead of management identifying the causes of problems before approaching employees, they merely communicate a need to perform better or set a higher goal in the hope of motivating improved performance. Demanding improvement without providing employees with the means to do so is not a new phenomenon (Deming, 1993). Paper III shows that this may be due to the management feeling pressured, for example, by senior managers or external authorities to improve the output of the process. The management thus expects employees to continue working according to the established routines with no improvements, but to perform

better than usual. The findings do not show clearly why no change in the routines is made, but it is possible to speculate that a lack of time or resources limits the opportunities to develop the working method, as suggested by Tucker et al. (2002), for example. The findings in Papers II, III and IV show that employees will find alternative ways of dealing with such dilemmas because they perceive that it is expected of them and to be seen to do a good job. However, Deming (1993), building on Shewhart (1931), points out that if one wishes to improve unsatisfactory outcomes in a stable process, something must be done to change the system that generates these outcomes since a process usually performs at the level that its design allows. By not changing the system, the system causes that generate the unsatisfactory outcomes remain. However, the causes are concealed by employees carrying out workarounds that seem to have 'improved' performance. It will appear as if no change was needed in order to achieve the improvement, when in reality the workarounds have resulted in multiple alterations not being communicated to management. The 'true' process thus generates the same figures as before, although the 'workaround' process shows an improvement – at least on the surface.

Situations that can be compared to firefighting (Bohn, 2000; Young et al., 2004) differed depending on whether they concerned self-perceived problems or problems that were pointed out by others. Problems pointed out by others largely involved a departure from and a renunciation of one's own established processes to meet the needs of the other actor. Instead of finding out the reason why a customer or employee was dissatisfied and doing something to deal with the situation, the response focused on remedying the dissatisfaction (as a symptom).

However, not all symptomatic actions are bad if they are followed by rectification of the causes. In some cases, it may be appropriate to first address the symptoms and then find the fundamental cause of the problem. One such example is presented in Paper II where the first action taken in response to a power failure in a hospital was to get the power back by switching on a backup generator (symptomatic response) and then find the fundamental cause of the power failure. In some cases, the risks and consequences of not firefighting thus need to be weighed against the alternative of directly addressing the cause (Young et al., 2004). However, the extinguishing of the 'fire' should be followed by a root cause analysis in order to prevent the problem from reoccurring. However, in the same example, this root cause analysis led to the wrong conclusion that the cause was a lack of functioning backup generators rather than that the cause was a problem occurring from the primary generator.

5.2.3 Local improvements creating unexpected side-effects in other parts of the system

The findings in Papers II and V suggest that improvements introduced in one part of the system do not necessarily lead to improvements in other parts of the system. The problem or potential for improvement identified in one part of the system does not necessarily have to be considered or prove to be a problem in other parts since, for example, the focus or objectives may differ. Furthermore, the findings show that identified problems and proposed responses that are not discussed with other actors who are indirectly or directly affected by the improvement may cause trouble or have negative consequences in these areas. Paper V clearly shows that even small local improvements such as introducing standardised inclusion criteria for when to treat a disease can cause severe consequences for the system in terms of decreased availability and longer waiting times for the treatment of other diseases. The error does not lie in the actual identification of the problem or its response in relation to the context in which the response is designed, but in the mismatch that this response creates in other contexts. As presented in Paper II, such improvements can include updates to work procedures and templates, changes in responsibilities, or the introduction of new processes introduced by management or support functions such as human resources. The findings in Paper II propose that a consequence of this may be that the employee who has been negatively affected by the change feels compelled to use workarounds to achieve the goals or results that are expected of their own business. (For

further discussion see the previous section.). Paper III shows that these improvements are not made with the intention of harming others or gaining benefits. According to the results in Paper III, this may be due to frustration at a problem in one's own organisation that creates a strong drive and commitment to tackle the problem. There seems to be a perception that one's own starting point and perspective on the problem will be sufficient to respond to the problem independently. This eagerness to respond to a problem results in a 'just do it' mentality where the response is not discussed with other actors. Tampering may thus be manifested in local improvements when a response to a problem is resolved locally without taking its potential consequences in other contexts into consideration. This near-sighted approach to responding to known problems can be illustrated by a 'not looking beyond one's own back yard' mentality.

5.2.4 System change – swelling problems and disproportionate actions

When a problem and its causes are identified, one challenge lies in identifying the right level to address the problem (Keijzers et al., 2018). The findings in Paper II show that actions taken can be disproportionately large compared to the problem to be solved. Furthermore, the findings in Paper II show that a problem that can be solved quickly and 'easily' with small measures may instead generate a large action that not only addresses the perceived problem but also swells beyond the scope of the problem. A small problem leading to a major improvement project aimed at changing the current way of working may be appropriate if there is a clear need for or gain from such a change. Such deliberate and sought-after improvements, for instance radical improvement or innovation (March, 1991; Benner and Tushman, 2003), are beyond the scope of this dissertation and will not be discussed further. With regard to tampering, on the other hand, such a large project is not considered necessary and causes an imbalance between the problem and the efforts made to resolve it. The consequence is a lengthy and costly process where the initial reason for the project is no longer in focus and the end-result is, in the worst case, worse than before. This high-reaching approach to responding to known problems can be illustrated by a 'let's fix some more things when we're at it' mentality. Paper III proposes that one mechanism behind such actions is a desire to be a part of something important and contribute to improving operations. By developing and implementing a major improvement, a willingness to drive the organisation forward and a focus on identifying problems and taking them seriously are shown. There is a willingness to be involved, contribute and make one's mark on the organisation. Paper III also shows that some projects that tend to swell are not abandoned as a result of sunken-cost fallacy. There seems to be a reluctance to abandon projects in which a lot of time and money has been invested, and these projects are therefore allowed to continue even if the result risks being unsatisfactory. One way tampering is manifested in system change is thus when small problems lead to large, and unnecessary, projects to change a system; projects that in other cases would have required planning and prioritisation in order to be initiated now arise as spontaneous 'in the heat of the moment' projects.

The findings in Paper II show that system change may not be a consequence of a deliberate attempt to improve a system, but may instead be an undesired and unforeseen consequence of repeated workarounds made to respond to symptoms. Failure to resolve the fundamental causes of problems and instead respond to symptoms causes problems to repeat themselves, i.e. reoccurring effects (Young et al., 2004). The findings in Paper II show that repeated actions may develop into a new process used to manage such symptoms. There are multiple reasons why a problem reoccurs. It may, for example, arise as part of the process's natural behaviour or a repeated special cause (Deming, 1993), but also as a cascade effect from previous actions (Mold and Stein, 1986; Bohn, 2000; Deyo, 2002). The cascade effect (Mold and Stein, 1986; Deyo, 2002) means that an event triggers a chain effect with increasing momentum that is difficult to stop and has major, undesirable consequences. For example, prioritising a delayed delivery (response to symptom) results in additional deliveries being delayed, which must thus

be prioritised with the long-term consequence that the queuing system fails completely (Appendix I, tampering example 37). Reusing an insufficient action changes the system from having a stable process with a few errors to an unpredictable process in need of constant firefighting to deal with the reoccurring problems. Firefighting becomes the new norm, problems become expected, and the organisation is caught in a vicious spiral of firefighting that steals focus from other more important tasks (Bohn, 2000; Young et al., 2004) and makes it more difficult to solve the fundamental problem. This repetitive approach to responding to known problems can be illustrated as a ‘catch-22’ situation. Paper III suggests that the mechanism behind this may be a desire to do one’s best and to avoid the shame of not doing one’s best to improve the current situation. There is an understanding that the disorder that prevails is created by one’s own behaviour and that the subsequent problems must be dealt with. The problem is that there is a lack of understanding that it is precisely this behaviour that leads to the situation deteriorating. Another way that tampering is manifested in system change is thus that what starts as an innocent response to a symptom ends with a new deteriorated process and a constant flow of new problems.

5.2.5 Summary

The previous sections have shown that tampering is manifested in multiple ways, depending on the characteristics of how a problem is interpreted and which approach is carried out. A summary of the manifestations is presented in Table VII.

Table VII: Manifestations of tampering in various approaches to identifying and responding to problems.

Approach	Inaction	Workaround	Local improvement	System change	
<i>Metaphor</i>	Head in the sand	A short cut is the longest way round	Not looking beyond one’s own back yard	Let’s fix some more things while we’re at it	Catch-22
<i>Interpretation of problem</i>	Ignoring known problem Problem is missed	Symptom identified as problem	Problem or improvement potential exists	Problem exists	Symptoms that need to be addressed
<i>Action causing tampering</i>	Passivity Wait-and-see	Symptomatic response of adjusting, subtracting, adding or finding alternative tasks	Locally focused response	Disproportionate vision	Vicious spiral of firefighting
<i>Consequences</i>	Problems persist Problem culminates – worst case black swan	Problems persist Problem reoccurring	Problem locally resolved New problems arise elsewhere	Problem ‘forgotten’	Problem reoccurring Problems are expected

5.3 Customers causing employees to take tampering actions

A traditional view of tampering appears to be that it takes place in internal manufacturing processes far from the customer and where customer interaction is thus absent. For example, an operator probably makes the decision to change settings in a manufacturing process without input from or concern about a customer. Rather, the operator concentrates on defect prevention

and making products that conform to specifications (Hanna et al., 2020). If tampering is mainly considered to occur in such processes, it is not surprising that the customer's role in tampering is not perceived as particularly central. Although this may be the most commonly applied view of tampering, Deming (1993, p. 199) implicitly makes a connection between efforts to satisfy customers and tampering when he states that "reaction to a complaint from a customer" is an example of tampering. Service organisations working with service recovery that focuses on addressing individual customer's problems rather than underlying organisational problems has been highlighted as especially problematic (Young et al., 2004). This type of use of customer feedback become especially relevant when studying tampering outside its traditional manufacturing setting in, for example, service processes where customers interact more with the service providers' employees. For example, customers may not have the knowledge to accurately assess the quality of a service or product, and their feedback may thus be inaccurate and basing improvements on such feedback may led organisations down a bad path (Mir Djawadi et al., 2018). Another way customer experienced problems can be misleading is that they can be based on incorrect information, expectations, or premises, for example a customer may pretend to be dissatisfied or exaggerate their dissatisfaction to get more out of a situation. In addition, it is paradoxically stated, in the same sentence that describes reactions to customer complaints as tampering, that: "Of course, keep the customer happy at almost any cost" (Deming, 1993, p. 199). If this urge is taken seriously, it could mean that even tampering actions would be okay if they make the customer happy. If it is advocated that tampering should be avoided, which is the argument presented in this dissertation, such a statement sounds ill-advised. However, in the light of the rule of thumb that says that it costs five times more to get a new customer in exchange for keeping an old one (Dutka, 1994), the issue becomes more complex. Put simply, there may be a need to weigh up the loss of the process against the gains for a customer. This dilemma is multifaceted, but even so, in this dissertation it is advocated against tampering in such a situation.

In the following sections, some empirical examples of interactions between a customer and employees leading to tampering will be discussed.

5.3.1 Customers causing tampering actions through indirect interactions in the minds of the employees

When a customer is an end-product buyer, the customer is usually not physically present during the production process. However, the customer may be present in the minds of the employees where employees bear customers in mind when conducting their work, for example customers' expectations or requirements. In such situations, the customer involvement is generally considered to be low as merely the presence of a customer is required (Bitner et al., 1997).

One example (tampering example 2 in Appendix I) of such interactions is employees recalling the customers' requirements, making them feel responsible for and eager to fulfil them. In this example, the manufacturing organisation invests a lot of resources in identifying reasons why certain measurements on their products sometimes do not fall within the set tolerances; despite multiple facts indicating that their product is satisfactory. Examples of such indicators were quality tests showing that quality requirements set by the customer were met, a lack of customer complaints and low customer returns. The respondent presenting this example described that they were tampering repeatedly by carrying out investigations to avert a perceived problem or deficiency that was believed to lead to dissatisfaction or complaints from the customer. The employees were concerned that the customer would be dissatisfied if the product did not live up to the promised requirements and so unnecessary resources were spent on unnecessary changes that were made *proactively* based on something that may or may not happen in the future and thus had not yet occurred. It can be speculated that it is not likely that this applies to any customer, but that it is more likely that this feeling is particularly strong if

the customer is considered to be particularly important, for example for economic or relational reasons, which was the case in this tampering example.

To sum up, tampering can take place in processes where the customer is involved to a low degree. The customer does not need to be physically present, but can be materialised through employees bearing customers in mind when conducting their work. The mere thought of the customer's potential dissatisfaction can influence premature and unnecessary actions.

5.3.2 Customers causing tampering through indirect, digital and asynchronous interactions

There are also examples of tampering through indirect interactions where a customer brings a problem or action to the table, i.e. is the provider of input that causes an employee to take tampering actions. In the examples presented below, the customer and the employee never formally meet. The interaction between the actors is sporadic and asynchronous. As the customer is not active in the process besides when providing the input, the level of customer involvement in the process can be perceived as moderate (Bitner et al., 1997).

Two tampering examples concern public organisations complying with perceived deficient citizen proposals. The citizen proposals are actively collected (Fundin and Elg, 2006) through a digital platform that enables interactions between public organisations and citizens (customers). The citizens provide the municipality with input in terms of suggestions for improvements or changes in the municipality's operations. A respondent in study III states that the customers cannot be blamed, since they only provide input to the process; rather, the employee is responsible as a result of not researching the proposal sufficiently before implementing it. The respondent suggests that these proposals do not always focus on the root cause of the problems that the citizen wants to remedy; rather, they are based on the citizen's subjective view of 'their' problem. This can lead to the municipality having to change its routines, make investments or increase its overheads to administer the proposals, even though they do not have the desired effect. Young et al. (2004) state that when customers complain about perceived problems, these are often symptoms of problems occurring in an organisation. The customer cannot distinguish between symptoms and their causes as they do not have knowledge and insight into how the organisation operates (Young et al., 2004). In this dissertation, it is speculated that customers may cause employees to take tampering actions when focusing on the customers' direct complaints or concerns without identifying whether these are symptoms of organisational problems, for example. In addition, the respondent suggests that there is a risk that proposals will be implemented because they have been made visible and are chosen because they are 'low-hanging fruit' that can help politicians 'win points' among voters, despite the fact that there are more important problems to address. Choosing to comply with such proposals may take away attention and resources from more important problems that are yet to be identified or resolved.

To sum up, tampering can take place in processes where the customer is involved to a moderate degree. The customer and the employee have indirect asynchronous interactions through digital platforms, where the customer's mere input can cause employees to take actions directed towards symptoms rather than organisational problems.

5.3.3 Customers causing tampering through direct interactions

As previously described, direct interactions are activities where an explicit contact takes place between an employee and a customer. In the empirical examples presented in Paper II (Appendix I) where direct interactions occur, the examples display high customer involvement as customers and employees interact to discuss a problem and its response together (Bitner et al., 1997) resulting in tampering.

In some empirical examples presented in Paper II, the feedback provided by customers is not part of the organisation's active collection of customer feedback, and thus the employee is initially passive (Fundin and Elg, 2006). Instead, the customers are the active actor that

encounters the employee with their concerns, either in physical meetings or over the phone. Two situations are identified in the empirical material; one where the customer wants the employee to adapt a process to match the customer's process, and one where the customer is dissatisfied and demands improvement (e.g. the illustrative quotation in Chapter 1).

In the first situation (tampering example 1, Appendix I), an organisation's largest customer presents advantages in the two actors aligning their processes in order to simplify the customer's work of compiling information for an order. After implementing the change, the employee realises that in easing the work for one customer they have made the process more difficult for other customers. In the current example, it turned out that the new process created extra work both for other customers when trying to obtain new information and for employees when supporting other customers. The employees realised that just because the process improves for one customer, it does not necessarily improve for everyone.

According to one respondent involved in the second situation, a customer was dissatisfied with a service or product and blamed the employee for not getting what they expected. In line with Järvi et al. (2018), one reason for the concern seems to be that the customer makes the unintentional mistake of not understanding that there is a mismatch between its view and the employee's view of what the service or product entails. According to the respondent, there is a misunderstanding on one or both sides. However, the customer enters the discussion with an agenda convinced that their perspective, is the 'right' perspective and instead of asking the employee about their doubts, they place demands. In another example, the customer even threatens to terminate the agreement.

It has been suggested that in some service organisations, such statements provoke service recovery where employees attempt to resolve the dissatisfaction by adhering to the customers concerns (Young et al., 2004). The findings in Paper II show that one problem with addressing the customer perceived problem rather than causes is that these problems can be misleading. One example of this is that this problem may not be related to the process being suggested to change. For example, a customer being worried about how work is carried out stemming from a problem in another project that spills over into a concern that the same problem will arise in the project in question. The action is based on an expected problem that does not yet exist and by acting on the expectation, the problem becomes 'real'. Like the example in the previous section, it can be speculated that some organisations are willing to sacrifice some of their resources in favour of customers who are considered to be particularly important, for example for economic or relational reasons. The respondent describing tampering example 3 states: "... it's because you are nervous about the tenant and have to show diligence... So the recurring thing is that you have to take action, it does not matter what it is. They are too kind to the tenant, I think." (tampering example 3, Appendix I) By threatening to terminate the agreement, the customer puts pressure on the employee. Whether or not the customer actively uses it, they have a power advantage (Järvi et al., 2018) since the employee representing the organisation in these cases needs the customer more than the customer needs them. Or at least, that is the impression that the customer is conveying.

The findings from the empirical examples indicate multiple reasons why customers cause employees to take tampering actions. One reason is the process knowledge of the employee, receiving the complaint. An employee with little knowledge of the process could find it difficult to argue that the customer's concerns are misguided and may have a greater tendency to trust these concerns and thus take tampering actions compared to an employee with greater knowledge. For example, in tampering example 3 (Appendix I), a real estate manager who handles customer relationships may focus more on safeguarding the relationship and making the customer happy again, while the service manager wants to discuss practical details of the problems with the process execution.

Another reason is the discomfort of being confronted with negative feedback or treated in a confrontational way (Gal et al., 2021). The findings in Paper III suggest that fear of conflict was an emotional mechanism that caused employees to take tampering actions. Unlike, for example, indirect digital interaction, which is typically not addressed to any particular employee and may thus be perceived as more objectively directed at the entire organisation, direct interaction may be perceived as personal and more difficult to escape.

To sum up, tampering can take place in processes where the customer is involved to a high degree. In direct interactions between a customer and an employee, the customer may propose mutual benefits that negatively affect other customers, or may use their position of power that forces the employee to comply with their demands or risk losing the customer.

6. Conclusions

This chapter presents the conclusions, theoretical implications and managerial implications of this dissertation and proposes some paths for future research.

6.1 Tampering – why attempts to improve sometimes do not lead to the desired results

Every day, we face the challenge of determining whether or not encountered events are indicative of a problem being present. Is the call from a dissatisfied customer a sign of a problem with how we carry out a process? Was the power failure due to a machine malfunctioning or a blown fuse? Such matters lead to a requirement to assess whether a response is needed and, if so, which one. Previous research points to challenges associated with identifying and responding to problems, and implies that many improvement efforts fail. This dissertation has studied the concept of tampering to understand why attempts to improve sometimes do not lead to the desired results.

Tampering as a concept has been part of Deming's view of improvement since the 1980s. Strongly influenced by the view of improvement that Shewhart developed in the 1920s, the term has come to symbolise the problem of not taking variation into account when deciding to adjust a process that produces undesirable output. Even today, the concept has a strong connection to its statistical basis, where there is a focus on interpreting and analysing data with the help of control charts. The concept of tampering thus has the same meaning today as when it was developed by Deming in the 1980s. In line with previous research that has criticised the concept's mismatch with how organisations currently operate, it is argued in this dissertation that there is a need to change the view and meaning of the concept in order to become more practically relevant and meet the challenges that organisations face today. Considering everything that has happened in the world – and not least in the business world – since the development of the tampering concept, there is a need to reconsider how applicable this concept is in a contemporary context.

In line with Paper I, this dissertation has argued for a need for a broader and more open definition of tampering and has applied such a definition in the analysis. Tampering is “*a response to a perceived problem in the form of an action that is not directed at the fundamental cause of the problem, which leads to a deterioration of the process or the process output*” (Smeds, 2021). The aim of this contemporary definition and view of tampering is for it to be applicable in a wide range of organisations and contexts, especially those where applying a statistical focus is challenging. By studying tampering supported by this definition, more knowledge can be gained about why attempts to improve sometimes do not lead to the desired results.

6.1.2 How is tampering manifested in various types of approaches to identifying and responding to problems?

Previous research has found that a large number of improvement efforts fail. One of the reasons for this, as described in the literature, is faulty approaches when responding to problems. This dissertation adheres to the view presented by Shewhart (1931), whereby approaching a problem at the ‘right level’, i.e. an action should be proportionate to the problem that needs responding to, and in the right way, i.e. directing efforts towards either specific causes or the system, may be central to achieving sustainable improvement. There are several different approaches for employees to choose from when deciding how to respond to a problem. This dissertation studies how tampering is manifested in four approaches: inaction, workaround, local improvement and system change.

- *Inaction* refers to the approach of doing nothing or applying a wait-and see approach.
- *Workaround* refers to the approach of fixing the immediate problem, often a symptom, without identifying and targeting the underlying causes of the problem.
- *Local improvement* refers to the approach of targeting the underlying causes of the problem through local adjustment and modification of existing processes, products, and services.
- *System change* refers to the approach of targeting the system through more extensive system alterations primarily changing existing processes, products and services.

Whether tampering is manifested in different ways depending on the interpretation of a problem and the consequently selected approach has been studied in this dissertation to enhance knowledge about what interpretations and responses can lead to tampering. The results of the analysis presented in this dissertation show that tampering is manifested in different ways in the different approaches. A summary of the manifestations is presented in Table VII. To summarise, this dissertation suggest that tampering is manifested in:

- *inaction* when failing to address known problems in time, resulting in problems worsening and consequently requiring prompt attention through firefighting,
- *workarounds* when alternative ways of carrying out tasks or processes are used to bypass processes or routines that are perceived as insufficient without targeting the underlying causes of the problem,
- *local improvement* when a response to a problem is locally resolved without taking its potential consequences in other contexts into consideration, and
- *system change* when small problems become the start of large, and unnecessary, projects to change a system. Projects that would otherwise have required planning and prioritisation in order to be initiated now arise as spontaneous ‘in the heat of the moment’ projects. Tampering is also manifested in system change when what starts as an innocent response to a symptom ends with a new, deteriorated process and a constant flow of new problems.

Although the ideas behind tampering were developed by Walter Shewhart as early as the 1920s and one of the forefathers of QM – Edwards Deming – spent much of his active time proclaiming which behaviours and thought patterns can lead to undesirable results, tampering actions still seem to be part of organisations’ daily operations. In this dissertation, it is argued that the concept of tampering has received too little attention and that reflecting on how problems are approached may be a key to understanding why attempts to improve sometimes do not lead to the desired results.

6.1.2 How can customers’ cause employees to take tampering actions?

Traditionally, tampering is considered to be internal phenomenon where employees make unnecessary adjustments in a process. Customers’ influence on organisations to take tampering actions has been proposed theoretically. However, to the author of this dissertation’s best knowledge, it has not been empirically studied before. In this dissertation, customer-induced tampering implies that undesirable outcomes of an employee’s actions may not only be caused internally but also be induced by customers. The discussion presented in this dissertation show multiple examples of customer-induced tampering. The customers do not tamper with an organisation’s processes, but may express opinions or concerns about perceived problems or how to execute a process that the employee complies with. The customers can cause employees to take tampering actions through employees mentally recalling customers’ requirements, digital asynchronous interactions, phone calls or physical meetings. The saying ‘the customer is always right’ seems to be adhered to particularly often when customers are considered particularly important for relational or economic reasons.

6.2 Theoretical implications

This dissertation contributes to research on QM in general and improvement efforts through employees' approaches to identifying and responding to problems in particular. This dissertation has two main theoretical implications.

This dissertation and its appended papers explore the concept of tampering and suggest that there is a need for a revitalisation as well as a broader understanding of the concept in order to increase its applicability in contemporary organisations. Previous research on tampering has traditionally focused on tampering as a statistical concept describing an employee's unnecessary adjustment of process activities in response to undesired variation (e.g. Van Gestel et al., 2015; Georgantzas, 2018). This thesis adheres to criticism that has been directed against the difficulty of applying the concept, for example in settings where the use of control charts is challenging or impractical (Van Gestel et al., 2015; Hanna et al., 2020). This dissertation suggests that increased applicability and approachability can be achieved by shifting the focus from the previously narrow focus on statistical process control and identifying variation using control charts to a more general level that focuses on process improvement and everyday problem-solving. This dissertation contributes with a new and contemporary understanding of tampering by highlighting the contemporary definition of tampering presented in Paper I and suggesting how variation can be assessed and tampering avoided in processes without using control charts. In this dissertation it is also suggested how tampering is manifested in different approaches employees may apply in response to perceived problems. These approaches contribute to knowledge about process improvement by increasing the understanding of some of the alternatives that employees are faced with when deciding how to act when faced with a problem. In addition, in this dissertation it is suggested that undesirable outcomes of an employee's actions may be induced not only internally but also by customers. This view has, to the author's best knowledge, only been suggested theoretically and thus received limited empirical attention.

Traditionally, research on improvement efforts focus on how organisations work systematically with planned and intended improvement efforts. However, there is growing interest in how employees approach problems in everyday situations and the impact on improvement or lack of improvement (Tucker et al., 2002; Furlan et al., 2019; Galeazzo and Furlan, 2019; Gemmel et al., 2019; Tucker et al., 2020). This dissertation further adds to this research by contributing knowledge about some of the alternative approaches that employees are faced with when deciding how to act on a problem. In this dissertation, it is argued that how employees identify and respond to problems, as well as the mechanisms behind these responses, can contribute knowledge about why efforts to improve sometimes do not lead to the desired results. Furthermore, in this dissertation it is also suggested that in addition to learning from systematic improvement failures (e.g. Sitkin, 1992; Tang and Butler, 1997; McLean et al., 2017; Antony and Gupta, 2019), a lot can be learnt by studying how employees' approach problems on an individual level in their everyday work.

Traditionally, tampering has been considered a phenomenon that takes place in internal processes without any customer interaction. This dissertation challenges this view by exploring the previously under-studied perspective of how customers can influence employees to take measures, that from a process perspective, leads to undesirable results. Customers' influence on organisations to take tampering actions has been proposed theoretically by for example Deming (1993), and this dissertation thus contributes with additional examples of how direct and indirect interactions between employees and customers may result in tampering.

6.3 Managerial implications

Previous research indicates that many organisations struggle to sustain improvement efforts and achieve desired results. The discussion presented in this dissertation suggests that tampering may be a cause of these unsatisfactory results. QM gurus such as Deming and Juran state that employees should not be blamed for problems in organisations that are caused by the system. However, it is rarely the system that actually makes assessments and carries out actions. Employees are, to some extent, influenced and limited by their systems; however, they also have the discretion to deviate from the system's established routines and processes. This dissertation therefore argues for studying how employees rather than organisations act when they encounter problems in their daily lives, not to find scapegoats or someone to blame, but to better understand the actual interpretations and actions that contribute to these failures. One of the main implications of this dissertation is the usefulness of understanding tampering to help reflect on the risks of initiating ill-considered improvement efforts. The most important implications from this dissertation and its appended papers are:

- *Managers and first-line employees alike, everyone carries out tampering actions.* This implies a need to reflect on how employees in different positions and roles act in different situations. The findings presented in this dissertation, however, suggest that similar behaviours and interpretations are sometimes made independently of the employee's position, which suggests that it may not be the position that is decisive for how one acts, but one's personal experiences and characteristics. There is therefore a shared need to increase awareness of what triggers employees to perform tampering actions.
- *Overinterpretation of undesired events and misinterpretation of symptoms as problems i.e., difficulties in understanding what constitutes a problem may lead to unnecessary responses.* The findings outlined in this dissertation show that interpreting an event and understanding whether it actually is a problem and, if so, distinguishing between what is a symptom and what is the underlying problem, is sometimes challenging. This indicates a need to stop and reflect on the situation that arises to ensure that no hasty conclusions have been drawn and that the 'real' problem has been identified. In this dissertation, it is also suggested that there is a need to change the mindset from considering that all unwanted events are problems to understanding that even undesired results can be a natural and inevitable part of the system. In addition, there is a need to reflect on the 'problem identification' applied when identifying problems to discover possible shortcomings and possible misleading triggers.
- *Find the balance between underdoing and overdoing.* The findings presented in this dissertation imply that choosing an insufficient approach to address a problem may lead to undesirable results. Although this dissertation fundamentally advocates Shewhart's and Deming's view that 'non-problems' should not be addressed and that problems should be fundamentally resolved, there is also an understanding that this is not always easy or possible to achieve. In the same way that not all problems should be approached by doing nothing or addressing their fundamental root cause, not all problems can be 'worked around' or ignored. In this dissertation, it is argued that there is a need to reflect on how problems are approached based on what is the right way (to act or not to act) and what is the right level. Further, it is argued – in line with previous research – that an increased awareness of which approach is chosen, and accordingly its potential consequences for the output, is necessary to prevent surprises in the form of problems that recur or undesirable results. In addition, there is a need to consider how much of an organisation's resources it is worth investing to keep customers satisfied. The saying 'the customer is always right' was coined to highlight the importance of seeing things from the customer's perspective not necessarily sacrificing the

organisation's own processes to make the customer happy. According to some respondents in this study, misunderstandings between customers and organisations are a common cause of dissatisfaction. Therefore, an open and honest dialogue about expectations and operational processes can be a first step towards reducing the risk of customer-induced tampering.

6.4 Future research

Based on the findings presented in this dissertation and ideas generated during the dissertation work, this section proposes some possible future research paths.

6.4.1 *Identifying organisational mechanisms triggering tampering*

Paper III explores the behavioural (emotional, motivational and cognitive) mechanisms that trigger tampering. Previous research and the findings in paper III suggest that tampering actions may also be triggered by mechanisms stemming from organisational factors. In Paper III, mechanisms such as compliance with internal routines and compliance with perceived external expectations imply that employees do not act in isolation, but are affected by an organisation's routines and other actors. Deming (1993) also states that 95% of problems in organisations stem from system factors and not from employees. An investigation of which system factors influence employees and their behaviours, and how, may thus contribute additional knowledge about how the organisation's processes and structure may cause tampering.

6.4.2 *How is tampering manifested in situations such as those considered as black swans?*

It has been suggested that black swans can be regarded as special causes of extreme measures. At the time of writing this dissertation, it has been about two years since the outbreak of the global COVID-19 pandemic. The author speculates that few organisations had included 'global pandemic' in their risk analyses and were thus unprepared for its effects. Despite a lack of understanding of the extent of the effects, it was crucial for organisations to assess at an early stage which measures were needed to respond to arising problems. It can be speculated that few probably knew at this stage what the 'right way' to act was. One challenge was to decide on which measures are necessary and reasonable without knowing whether they will need to be sustained for weeks, months or even years, and how they will affect the organisation's performance (Liao, 2021). Research on the effects of the pandemic suggest that "[c]hanges to services adopted in response to an emergency situation, although well-intentioned, may not necessarily turn out to be changes for the better" (Tack et al., 2021, p. A27). This implies that tampering may occur even in such extreme situations. Empirical investigations into how tampering manifests itself in black swan events could thus be interesting.

6.4.3 *Learning from past failures*

There is an increasing interest in studying failed attempts to solve problems (Sitkin, 1992; Tang and Butler, 1997; Albliwi et al., 2014; Antony and Gupta, 2019; Chiu et al., 2020; Sunder and Prashar, 2020). However, a question that arises is How do organisations learn from their mistakes? Do they have processes, follow-ups or evaluations in place to take advantage of the knowledge that a failed problem-solving attempt can generate? Studying organisational learning and its implications for tampering may be helpful to avoid tampering in the future.

6.4.4 *Observing the problems-solving behaviour of employees*

This dissertation is based on a limited set of tampering examples and cases. The presented findings have limited generalisability, but could provide a basis for further studies on tampering from both a broader and a deeper perspective. Tucker et al. (2002) conducted observational studies to investigate the problem-solving behaviour of front-line employees (nurses). This approach provided a deep understanding of how employees act in the heat of the moment and why. A similar study could be conducted in relation to tampering to gain more knowledge about potential tampering-enabling behaviours and triggers.

7. The author's concluding self-reflection on the research process

Reflection is often described as an important activity, in both private life and professional life, in order to formulate and become aware of one's experiences and their impact on the self and the process (Mortari, 2015). Although it is considered important, we rarely take the time to reflect. This dissertation advocates reflection in daily work to reduce tampering and it would therefore be hypocritical not to end this dissertation with a reflection. The last section of this dissertation will therefore be a self-reflection.

When this research project started, I had only heard about the concept of tampering in passing, but had never reflected on its meaning or consequences for employees' daily work. I had little pre-understanding of its theoretical and practical meaning, and therefore entered the project with an open and to some extent clear mind. This has been both an advantage and a disadvantage. The advantage has been that I did not feel 'locked in' by any preconceptions and have thus not been afraid to twist and turn the concept and explore it from different perspectives. I feel that it has helped me to be receptive and open to different people's thoughts and opinions, which has contributed to a broader understanding of the complexity and multifaceted nature of the concept. It has also contributed to an understanding of the need to adapt concepts in line with different contexts and difficulties in finding common denominators that can be widely applied.

I have also experienced disadvantages of not having any preconceptions about the concept of tampering. One difficulty has been trying to familiarise myself with the original and more theoretical conceptualisations, while at the same time adapting the concept to a contemporary context. Not being completely clear about what tampering means to me conceptually, and at the same time trying to interpret it in a contemporary context and in – for me – 'new' contexts, may therefore have affected the outcome of the data collection. The data collection was performed very early in the project when my understanding was less developed. With the knowledge I now have at the end of this project, I would have done certain things differently if I could redo them today. For example, I would have spent more time formulating my understanding of the concept more clearly in accordance with what emerged in Paper I. In this way, my perception of the concept would have been a little clearer when I embarked on the data collection. Prior to the data collection, I would have instructed the respondents more clearly about what information they should give in their tampering examples. For example, the problems and their consequences should have been even more clearly formulated. I think a large part of the research process became more difficult due to lack of richness of detail in some examples, which turned out to be required to get a good picture of the extension of the problem and its implications. In hindsight, I believe that my limited understanding of the concept has probably contributed to follow-up questions being missed during the interviews resulting in, only scratching the surfaces of some of the tampering examples. The somewhat limited descriptions made it difficult to make comparisons between some tampering examples, and sometimes required me to 'read between the lines'. This may have affected the outcome of the analysis. However, to verify that the interpretations were sufficient, the analyses conducted in the papers have been discussed with other researchers. Ideally, this should have been done in the dissertation as well. Since this is a single author's work, however, this has not been done to any greater extent than in my discussions with my supervisors.

The challenges I encountered during this research process have definitely made me grow as a researcher. From the beginning of the tampering project, I was given a lot of responsibility for the research process. In this way, I had the opportunity to be involved in leading and designing a project from start to finish. It has been educative to design and carry out the project, with all its considerations and choices in terms of topics to explore and methods to use, and challenging to coordinate the project and keep it going. This gave me experience and

understanding of how much is required to carry out even small projects. The plan I presented in my planning report turned out to be too extensive and time-consuming to complete within the timeframe. I underestimated how challenging the mental process of wrapping my head around the concept was, and the amount of time needed to carry out analysis work on each research question. Although not all the steps in my original plan were completed, it gave me the chance to explore how tampering could be studied in other ways, for example by collecting additional examples via surveys and validating the results using vignettes. I consider these remaining steps to be possible future projects to extend the work presented in this dissertation.

Regarding the choice of interviews as a data collection method, I believe in retrospect that, despite the challenges described above, the interviews were a good way to explore the concept as it made it possible to obtain informative descriptions of the tampering examples. In most cases, the respondents did a good job of describing what they meant by tampering and were able to describe their context and their processes. In this way, I got a good picture of how they view tampering in their context and in the individual examples. I have now conducted two interview studies and, being a social person, I like this format as a means to talk to people about their experiences. However, I think it would be useful to try some other methods in the future, such as the use of diaries and systematic observational studies.

Although this has been the biggest challenge I have faced so far in my life, it has not deterred me. Quite the contrary. Having come out on the other side has made me curious to see what other challenges I can take on. To quote Miss Li:

*Yes, I am, I am stronger than I think
And I will conquer every wall 'cause I am not afraid to fall
(Miss Li, Stronger)*

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Appendix I: Brief descriptions of the tampering examples

No	Name	Context	Description of tampering example
1	The customer	Service	A service provider adapts a process to respond to the needs of an important customer. Despite knowledge about the adapted process being misaligned towards other customers and new problems arising due to this change, nothing is done to change the process.
2	The machine settings	Manufacturing	Operators in a manufacturing process adjust machine settings in response to undesired variation in thickness in a material without knowing what caused the deviation from the target thickness.
3	The daily service rounds	Service	A service provider changes their routine for service rounds in line with the wishes of a concerned customer without consulting the responsible service manager and without knowledge of any problems occurring or what caused the customer's concerns.
4	The front desk	Other	A firm adjusts its finished office renovation and rebuilds a newly built front desk to address complaints expressed from one 'important' customer without questioning the additional investment and work it adds.
5	The office spaces	Other	A firm adjusts its finished office renovation to an open plan office space and rebuilds two offices to address complaints from two employees without questioning the additional investment and work.
6	The senior grants	Public sector	A public administration complies with a proposal for an increased grant to an association without consulting the budget holder and without considering what is a reasonable with regard to the grant's purpose and amounts given to other associations.
7	The complainer	Other	A firm adjusts its office renovation due to resistance from one employee without questioning the additional investment and work.
8	The property provision process	Service	A service provider changes one of its core processes but returns to the old process due to employees' resistance.
9	The painting	Public sector	Removal of a painting from a public space due to complaints from one politician without consulting the administration's art specialist.
10	The December orders	Public sector	Budget holders working on a budgeting model that is perceived as insufficient by spending the remaining money before the budget year ends.
11	The pupil cases	Public sector	An administration manager continuously sidesteps an established case administration process when confronted with perceived urgent cases which, when examined further, turn out not to be urgent.
12	The reprioritisations	Manufacturing	Production managers continuously sidestep an established production planning process by reprioritising work orders daily when confronted with delays.
13	The Excel lists	Manufacturing	Operators and production managers continuously sidestep an established production planning process by reprioritising work orders daily when confronted with delays.

14	The conflicting goals	Service	Conflicting goals in a service organisation brings the dilemma of which aspects to consider when designing new projects, as fulfilling one goal may obstruct fulfilling another.
15	The copy and paste system	Service	A service organisation designs a new project management system that slows down the project management process and make the process work worse than when the old system was in use.
16	The sensitive subject	Public sector	Politicians interfere with a public administration's development of work processes against honour-related violence and give directives that go against the strategies developed by expert actors and other administrations.
17	The performance appraisals	Public sector	An HR department changes the templates to be used by managers in performance appraisal meetings and removes aspects considered important by the managers. Managers use workarounds by implementing individual updates to the template to suit their needs.
18	The administrator	Service	To resolve the issue of not having enough time to complete projects, a service organisation moves tasks to an administrator – a response that turns out to slow down the process further.
19	The procurement	Service	When drawing up an agreement on a consulting service, the employees from the manufacturing company – who lacked knowledge about the subject in need of consulting – included some services in the contract that were misaligned towards the problem to be solved, by suggesting them without first conducting an analysis of which services were needed.
20	The triple inspection	Service	Three actors were given the responsibility to report problems at a premises to ensure that no problem was missed.
21	The property agreement	Service	A customer complains about how a service is delivered by a property provider, without studying the agreement. The customer threatens to terminate the agreement. When the property manager confronts the customer, it turns out that the customer does not know what is stated in the agreement and that no error has been made.
22	The three-actor disagreement	Manufacturing	When three actors start a collaboration project to develop a new product, the parties seem to agree on the goal and scope of the project. As the project continues, disagreements arise which, instead of being resolved together, lead to the actors going their own way and running the project in their desired direction.
23	The authorisations	Service	Additional authorisations are implemented in an invoice process in response to more and more incorrect invoices being sent to customers. Still more incorrect invoices are sent to customers.
24	The inspectors	Manufacturing	To rectify sporadic mistakes made in a packaging process, additional inspections are added to the process – a response which only seems to increase the number of mistakes.
25	The negative revenue	Manufacturing	A management team in a manufacturing company discusses this year's negative revenue, instead of analysing the causes. Employees are fired or relocated to save money.
26	The budget cuts	Public sector	A public administration requires its departments to make budget cuts due to increased costs. How much each department has to save is not based on its service's value, but is proportional to its costs. The departments feel pressured to make suboptimal individual budget cuts.

27	The sports arena	Public sector	A politician with limited knowledge about the need for sports arenas in a region changes the location of a planned arena to a city without any real need, and thus delays the construction of a sports arena in a city where there is a demand for a arena.
28	The scheduling	Public sector	A manager changes the scheduling process for board meetings without knowledge about how to plan the meetings to ensure that board members can attend. The changes lead to low attendance.
29	The compulsory meeting	Public sector	To deal with low meeting attendance, a manager introduces compulsory attendance, which according to the employees forces them to attend meetings that do not concern their work.
30	The retirement homes	Public sector	A group of politicians with limited knowledge about the operational processes at homes for the elderly wanted to increase the opportunities for residents to engage in activities at these homes. They sent a directive to increase the number of scheduled activities and to offer specific activities, even though the residents had little or no interest in such activities.
31	The directives	Public sector	Politicians with limited knowledge about an administration's operations give directives on how to conduct the administration's work, which are misaligned with their current work processes.
32	The penny	Service	A service organisation implements a new ordering process and digital ordering system. The new system forces the employee to fill in a preliminary order cost, a step that could be skipped before and still send an order. In the new process, some employees work around this forcing step by entering 'a penny' which contradicts the purpose of the new process.
33	The German consultant	Manufacturing	A problem in a manufacturing process causes a production stoppage. The operators start to rectify the root cause of the problem, and a manager calls an external technician to help. The problem is resolved before the external technician arrives.
34	The yellow note	Service	In a review of a process, a note was found that was filled in weekly with information that no one used. Despite pressure to stop filling in the note because it took up a lot of employees' working time, the employees continued to fill it out.
35	The individual budgets	Public sector	A public administration requires its departments to make budget cuts, instead of assessing which activities are of value to achieve its purpose as an organisation. The departments feel pressured to make suboptimal individual budget cuts.
36	The SOPs	Manufacturing	Individual sporadic errors in a packaging process are reacted to by updating or revising written work routines without finding the source of the problems.
37	The decision chain	Manufacturing	A quality problem occurs and is responded to in a production process. In parallel, the problem is discussed in a management meeting which, after finding a response, finds out that the problem is being resolved or production is already up and running.
38	The power failure	Public sector	A power failure occurred at a hospital and the underlying problem was resolved by the service department. The hospital board wanted to buy additional backup generators to avoid future power failures without consulting the service department.
39	The citizen proposals	Public sector	A public administration was dissatisfied with its waiting times for responding to citizens' proposals. A new goal of responding within five days was set which was very hard to attain, and employees used workarounds to be able to reach the target.

Appendix II: Appended papers

Papers

The papers associated with this thesis have been removed for copyright reasons. For more details about these see:

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