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**Exploring Poor Outcomes from Quality Assurance  
Programs – An Analysis based around the concept of  
Mechanisms and The Theory of Constraints (TOC)  
Thinking Process (TP)**

**Author**

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Thesis submitted in fulfilment of the requirements for the award of

**Doctor of Philosophy**

Of

School of Business and Law, Edith Cowan University, Perth, Western Australia

2018



# Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

- i. incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;
- ii. contain any material previously published or written by another person except where due reference is made in the text of this thesis; or
- iii. contain any defamatory material;

.....  
Layla Al Hameed

.....  
28<sup>th</sup> March 2018  
Date



# Abstract

Quality programs have been used by organisations since their advent in the 1930s and continue to be implemented to achieve various goals. For example, according to the International Organization for Standardization (2015) and the CASRO Institute for Research Quality (2016), organisations aim to reduce costs, gain a competitive advantage, improve the quality of their processes and products, and enhance profitability through attaining such accreditations. ISO accreditations have also been used to ensure compliance with market requirements (Williams, 2004). However, a major challenge in implementing these programs, referred to in this thesis as ‘Quality Assurance Programs’ (QAPs), is the gap that continues to exist between the desired and the actual outcomes (Prajogo, 2011; Williams, 2004). The actual outcomes are often poor and disappointing, with many firms reporting dissatisfaction with the outcomes of such expensive QAPs (Heravitorbati, Coffey, & Trigunarsyah, 2011; Ormerod, 2006).

Successful ISO accreditations are typically evident when the ISO standards are met, and profitability and organisational performance enhanced; however, failed accreditations are difficult to quantify because organisations may attain the accreditation but fail to achieve fundamental desired outcomes, such as increased productivity. These disappointing outcomes come at a high cost for both the organisation and the employees. This thesis sets out to explain this observed anomaly for three different case examples. The focus is on investigating “how” and “why” QAPs succeed or fail, and to provide an explanation for such outcomes. In other words, this thesis seeks to contribute to answering the research question “what works for whom in what circumstances?” (Pawson & Tilley, 1997). This requires defining the possible mechanisms in context that explain the observed outcomes.

The investigation conducted in this thesis proposes particular mechanisms that explain the observed outcomes. For this purpose, a structured-case method was used. Structured-case refers to a formal process model involving three structural components: a conceptual framework, a predefined research cycle, and a literature-based scrutiny of the research finding (Carroll & Swatman, 2000). This method has the advantage of constructing a theory from the data collected in the field.

Three case studies were selected to explain anomalies in outcomes related to ISO accreditations and QAP. The core of the investigation is the proposal that implementing ISO accreditations can enable the organisation to lead the market in one or more of Treacy and Wiersema's (1993) strategic choices: Customer Intimacy (CI), Operational Excellence (OE), and Product Differentiation (PD). For implementing this purpose, a relatively new feature within the Theory of Constraints (TOC) - the Strategy and Tactic (S&T) tree - was used. The thesis demonstrates how combining the S&T tree with Treacy and Wiersema's (1993) strategic choices has important outcomes for QAP.

The aim of this thesis is to explain the anomalous outcomes of the ISO accreditation. For this purpose, the research required a research philosophy that enables an explanation and proposal of generative mechanisms. Therefore, Critical Realism (CR) was adopted as the philosophy of the thesis and this provided the foundation for proposing mechanisms. It is argued that mechanisms proposed from the Theory of Constraints (TOC) have the capacity to explain the poor performance demonstrated in the three case organisations. The particular mechanisms proposed are Goal Alignment, Defining the Constraints, and Defining the Tactics. It is suggested that when these mechanisms exist and are activated, the desired outcomes are more likely to be achieved. On the other hand, it is proposed that the absence of these mechanisms can explain the anomalies and the disappointment in the outcomes of the three cases.

Case study A is an ISO certified professional service provider. Their goal was to upgrade from local Australian standards to ISO accreditation in order to meet market requirements. Attaining this accreditation effectively addressed customer intimacy (CI in the strategic choices model); in addition, it helped the organisation to streamline their processes. The examination of this case showed that the outcomes were generally poor and that employees had varied understandings of the goal of the ISO accreditation. To explain such an anomaly, the TOC Thinking Process (TP) tools were used. Through this process, the causal mechanisms behind poor outcomes were proposed as being not targeting the system constraint, and a lack of goal alignment between the ISO accreditation goal and the organisational goal. In addition, it was suggested that for this organisation to continue its quality program successfully, their



next ISO accreditation should aim to achieve another Treacy and Wiersema (1993) strategic choice, namely OE, and apply the S&T tree in its tactical implementation.

Such significant findings needed to be checked and tested in a second case, which was the rationale for selecting organisation B. At the time of data collection, this organisation had recently attained an ISO accreditation, after two previous unsuccessful attempts. The accreditation helped to improve their internal operations (OE) which consequently reduced their operational and rework costs. However, several undesirable outcomes associated with the accreditation became evident such as the staff not realising the importance of following the ISO accreditation's procedures and standards. The mechanisms suggested to explain this anomaly were again a lack of goal alignment and not targeting their constraint. The analysis also showed that the organisational goal was not defined in terms of the organisation's throughput (the TOC defined necessary real goal). It was suggested that to continue their QAP successfully, this organisation needs to link the subsequent accreditation's goal to achieving CI. This will encourage goal alignment and result in leading the market in this strategic choice.

The third case study, organisation C, did not go through a QAP program and the role of their auditing, as a simplified form of a quality program was more holistic, and the S&T tree assisted in defining the pervasive role of quality, in the sense of "fitness for purpose", throughout the organisation. This case is a professional not-for-profit research centre. After three years of operating, the management sought to restructure and reinforce their research focus. This decision was made because the observed research outcomes were not meeting their stated goals. In this case, it was felt that their goal was articulated well but their implementation was poor. In order to focus on their implementation issues, it was decided to develop models of S&T trees specifically for the critique of the stakeholders. This provided an opportunity for management to reflect on the goal of the organisation and their performance. The process of developing and validating the S&T trees models actually became an important QAP in its own right and led the centre to defining and addressing the conflicts within the system. The suggested explanation of the anomaly of poor outcomes in this case is that the tactics to achieve their strategies were not well defined; in other words, poor implementation leading to disappointing outcomes.

Besides defining TOC based mechanisms, a major contribution of this thesis is the development of a new approach for the S&T tree which expands its usage to include operationalising Treacy and Wiersema's (1993) strategic choices. This new model is a platform that provides an opportunity for stakeholders to define and possibly address the assumptions underpinning the organisation's decisions and actions. The stakeholder feedback generated is also important because it communicates the strategic choice in light of the actual needs of the organisation. Most importantly, the S&T tree can be used for more than just planning the execution of a goal; it actually can be used to plan the organisation's sequential growth and lead the market in one or more of Treacy and Wiersema's (1993) strategic choices.

This thesis proposes a linkage between TOC and the concept of mechanisms and demonstrates how TOC can help explain the mechanisms behind poor QAP outcomes. By so doing, it also demonstrates the advantages of linking Critical Realism and TOC, and how the S&T tree models provide a promising platform for operationalising the achievement of Treacy and Wiersema's (1993) strategic choices. Finally, from a practical perspective, it suggests that any QAP, including ISO accreditation, should only be considered if they target the constraint of the system.

## Publications from this Thesis

### Conferences

- ❖ Al-Hameed, L., Dobson, P. J., & Jackson, P. (2014). *A Framework for Clarifying the Goal and Implementation of ISO*. Paper presented at the The 25th Australasian Conference on Information Systems., Auckland, NZ.
- ❖ Al-Hameed, L. (2016). *Faking heroism: A mechanism of 'Mafia Offer'*. Paper presented at The Rise and Future of Heroism Science, Murdoch University, Perth, Australia. Peer reviewed conference retrieved from [https://heroismscience.files.wordpress.com/2016/07/the-rise-and-future-of-heroism-science\\_conference-program\\_20-06-16.pdf](https://heroismscience.files.wordpress.com/2016/07/the-rise-and-future-of-heroism-science_conference-program_20-06-16.pdf)
- ❖ Al-Hameed, L., Dobson, P. J., & Jackson, P. (2016). *The Strategy and Tactic (S&T) tree for achieving the Treacy and Wiersema (1993) strategic choices* Paper presented at the ECU Business Doctoral and Emerging Scholars Colloquium Edith Cowan University, Perth, Australia. Peer reviewed conference retrieved from <http://www.ecu.edu.au/schools/business-and-law/research-activity/research-news/events/2016/11/ecu-business-doctorial-and-emerging-doctoral-scholars-colloquium>

### Book chapters

- ❖ Al-Hameed, L. 2018. "Faking Heroism as a Mechanism of 'Mafia Offer': A Critical Realism perspective on the Abuse of Heroism" In *Handbook of Heroism and Wellbeing in the 21st Century: Applied and Emerging Perspectives*, edited by Olivia Efthimiou, Scott T. Allison, Zeno E. Franco. Routledge, New York, USA.



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## Dedication

*To my first teacher, my late father Mustafa M. Bilal &  
my wounded country Iraq, I dedicate this thesis*





# Chapter 1 The Background

## 1.1 Anomalous Outcomes of Quality Assurance Programs

Quality Assurance Programs (QAPs) are used by organisations to assure the quality of specific functions, products, services or departments. The International Standardisation Organisation (ISO) accreditation is one of the most common quality assurance programs. Two case studies A and B follow the implementation of these QAP programs.

ISO accreditation is widely used in organisations through the embedding of its standards in organisational processes; it allows these standards to be institutionalised in the organisation's processes (Yeung et al, 2011) and facilitates change at the operational level in line with published standards (Prajogo, 2011). Through ISO accreditation, organisations variously aim to reduce costs, gain a competitive edge, and improve the quality of their processes and products (International Organization for Standardization, 2015), as well as improve profitability (The CASRO Institute for Research Quality, 2016). ISO accreditation is also used to ensure compliance with specific standards so that the systems and products of an organisation are more acceptable to the market (Prajogo, 2007; Williams, 2004).

ISO standards and accreditations series are extensive – there are over 21,000 standards (International Organization for Standardization, 2016) including but not limited to: ISO 9000 Quality management, ISO 14000 Environmental management, ISO 45001 Occupational Health and Safety, ISO 27001 Information security, ISO 26000 Social responsibility, ISO 50001 Energy management, and many other standards and certified standards which cover different aspects of industry and business.

The outcomes of QAPs, including ISO accreditation, are difficult to evaluate as success or failure. Failure may refer to not achieving the accreditation or it may mean achieving the accreditation but staff not following its guidelines after accreditation. It may also mean that the expectations of the ISO accreditation in terms of

organizational outcomes, such as increasing profitability and/or productivity, have not been met.

Achieving the desired outcomes of ISO accreditation is not guaranteed. In fact, the outcomes of such quality programs are often disappointing and many firms have reported dissatisfaction with the organisational outcomes of such expensive QAPs (Hareton, Leung, Chan, & Lee, 1999; Heravitorbati et al., 2011; Naveh & Marcus, 2004; Ormerod, 2006; Prajogo, 2007, 2011; Senge et al., 2007). For example, Florida Power and Light, the winner of the Japanese Deming prize for Quality Management in 1989, had to downsize the staff in their quality management department from 85 to three employees because the quality improvement process represented unjustified bureaucracy to the other employees. The award required long hours of extensive work, and the employees were upset by the amount of paperwork and documentation, meetings, and strictness required by the quality program. In addition, Florida had to deal with financial difficulties due to the quality program costs and previous unwise decisions (Dooley & Flor, 1998). In the case of the Malcolm Baldrige National Quality Award winner, Wallace Company, they failed to avoid bankruptcy a short time after winning the award (Choi & Behling, 1997). Such results can be seen as a failure of QAPs because of the negative consequences associated with their implementation, therefore, raising concerns about the QAPs' value despite apparent success.

A study by Costa and Lorente (2007) suggested that implementing ISO accreditation does not necessarily contribute or lead to better management of an organisation. For example, Yeung et al. (2011), Caro and García (2009), Terziovski, Samson, and Dow (1997), Wahid and Corner (2011) and Prajogo (2011) argued that ISO accreditation has a weak and sometimes negative effect on business performance or business competitive performance because ISO accreditations exhaust employees with work and documentation, and this would negatively impact the motives and productivity of the employees. In addition, ISO accreditation might result in low growth in annual sales and low annual profit margins (Naveh & Marcus, 2005). The negative impact on business performance might extend to the operations' effectiveness, efficiency, and environmental responsibility (Prajogo, 2011), in that, achieving accreditation such as ISO 9000 is either to achieve external motives such as satisfying external pressures from the market, customers and governments,

enhancing the organisational image in the market, or complying with competitors. The ISO accreditation, in this case, is less likely to achieve a competitive advantage because this requires building the organisation's resources, meaning that ISO accreditation needs to be adopted to achieve internal motives such as improving operational processes, reducing error cost and reworking, and/ or establishing their quality system. In a similar vein, Feng et al. (2008) conducted a survey study which included 613 accredited Australian and New Zealand companies and reported a weak effect of ISO implementation on subsequent business performance compared to operational performance. The latter included measurements of lower defect rates, reduction in the cost of achieving quality, higher productivity, poor on-time delivery and low customer satisfaction and an increase in the cost of goods sold as well as abnormal return on assets (ROA) (Naveh & Marcus, 2005). According to these authors, the outcomes of ISO accreditation tend to have a greater impact on operating performance than financial performance; for example, achieving more revenues or organisational performance in general. In other words, the accreditation is able to streamline the operations, but it does not mean that it will improve performance, because it might not target the constraint of the system. Only removing and controlling the constraint will improve organisational performance. Similarly, the selected case studies in this thesis confirm similar anomalies in their ISO accreditation outcomes. For example, organisations A and B both undertook ISO accreditations to meet market requirements, but after achieving the accreditation, both organisations had to deal with undesirable consequences such as employees' negative attitudes towards the new system, and a high workload created by the new system, almost on a daily basis.

The contribution of ISO accreditation to improvements in different aspects of organisational performance (Manders, 2015) has been acknowledged. However, even after implementation, organisations encounter problems embedding accreditation into their culture and daily practice, and frequently find themselves still confronting old problems. For example, a member of organisation B stated he sometimes questioned what came next and wondered how the ISO accreditation's extensive processes and documentation had benefitted the organisation. He felt that some employees did not fully comprehend the purpose of the accreditation and commented that the organisation still had a way to go to fully embed the program into their

system. As in other organisations, despite the management and team in organisation B carefully following each stage of the process “by the book”, they fell short of achieving their desired outcomes.

Many organisations devote their best resources to achieving their accreditation goals (Barnard, 2010; Evans & Lindsay, 2008), yet the outcomes are often unsatisfactory. Poor outcomes from QAPs are a concern because organisations invest significant amounts of money, time, effort and management attention to them and expect their investment to provide substantial returns (Barnard, 2010, p. 406; Barnes, 2008, p. 272). It is the contention of this thesis that in response to such disappointing outcomes, organisations tend to look at individual factors involved in the process such as people, management, finance or the market to identify possible causes, rather than addressing the underlying root causes.

Extensive literature, including studies by (Prajogo, 2011, Feng et al., 2008, Disterer, 2012, Williams, 2004, Molina-Azorín, Tarí, Pereira-Moliner, López-Gamero, & Pertusa-Ortega, 2015, Naveh & Marcus, 2005, Hareton et al., 1999, Barnes, 2008, Costa & Lorente, 2003, and Evans & Lindsay, 2008) has discussed reasons and potential causes for the lack of success of QAPs. Motives of implementing QAP seem to play an important role in perceived success; however, it is not clear from the literature why different motives have markedly different outcomes. Two basic groups of motives are usually adopted by organisations for implementing ISO accreditation. According to Williams (2004), the first are coercive external motives, including:

1. Customer demand: where accreditation is required by clients such as logistics organisations;
2. Pressure from competitors: organisations who seek ISO accreditation to attain homogeneity in their environment and amongst their competitors;
3. Non-EU government requirements: this includes organisations who are not involved in or part of EU treaties; and
4. Required by EU regulations: organisations who are involved and part of EU treaties.

The second group comprises non-coercive, internal motives, including:

1. Achieving quality improvement benefits;
2. Part of a larger strategy: This refers to obtaining accreditation as one stage in a bigger plan for development; and
3. Marketing strategy: Organisations who aim to achieve accreditation in order to publicise their business and attract clients who prefer to deal with accredited organisations.

Similar to Williams (2004), Prajogo (2011) classified motives of adopting ISO 9000 accreditation into internal and external motives. Internal motives include reducing errors, establishing communication links with customers and establishing a documentation and tracking system to control internal operations. External motives, on the other hand, such as government policy, customers' demand and expected marketing benefits, enforce organisations to undertake ISO 9000 accreditation. Implementing the ISO 9000, in this case, comes as a response to the pressures of such external factors because the certification represents strong evidence of the organisation's capability to produce "high-quality" products (Prajogo, 2011). Quality programs could be implemented for a combination of motives, such as political reasons or as part of government policy (Jeppesen, 2005; Prajogo, 2011; Sayer, 1992), and it is difficult to fully appreciate such motives and their impacts without careful contextual examination.

Williams (2004) investigated whether the benefits of ISO 9001:2000 certification were greater for firms motivated by internal motives rather than outside coercion. His findings suggested organisations that follow non-coercive motives have better outcomes, based on operational and business performance, than those where ISO is enforced. Other studies provided similar conclusions (Disterer, 2012; Santos & Escanciano, 2002; Zatzick, Moliterno, & Fang, 2012), while Prajogo (2011) discussed symbolic advantage as a strong motive for many particularly certification focused QAPs like ISO accreditations and quality awards. In fact, the symbolic advantage of ISO accreditation is the highest motive for organisations in Sweden (Johnson, 2004).

According to Evans and Lindsay (2008), the absence of strong supporting motives, shortage of time to devote to the quality program, and/or lack of a formal strategic plan for establishing the changes are all possible causes of poor QAP

outcomes. Johnson (2004) stated that failure to implement ISO accreditation might result from unclear goals, unrealistic expectations, inadequate management support, limited training and an unclear strategy for implementation. Evans and Lindsay also argued that these obstacles are the most common reasons for the failure of quality programs to improve organisational performance. They suggested the pace of implementation could cause failure or disappointment. In the same vein, Barnes (2008) indicated the time taken to become familiar with terms and procedures of quality systems can affect success, and suggested a deeper understanding of the goals and procedures was required prior to implementation. Moreover, the conflict between a divergence of quality, organisational culture and individuals can affect the outcomes of the program (Barnes, 2008).

A useful approach for examining programs implemented in a social context is that of Pawson and Tilley (1997). Pawson and Tilley adopted a so-called Realist Evaluation approach, whereby programs are seen as complex “social” interventions (Pawson, 2006). ISO accreditation depends on cooperation and adoption of its standards by groups and individuals in the organisation. Therefore, the implementation of quality programs can be considered as heavily social in nature. However, because they focus on changing practices and procedures, I suggest that ISO accreditations can be viewed as flat programs that are lacking emphasis on structural change or proposing mechanisms to facilitate change. ISO programs also tend to overlook the importance of understanding and acceptance of all stakeholders. In fact, the structure and culture of these programs imply that once organisations realise their inadequacies, they are able to address them.

Traditional analyses of quality programs’ outcomes tend to address the “what” factors that impact the program’s success rather than the equally important “how”, “why” and “where” factors. In order to address this gap, the current research proposes a focus on the underlying mechanisms, in order to provide an explanation of the observed anomalies and hence the “how” and “why”.

The concept of mechanisms will be applied to explain observed anomalies in poor ISO performance. Critical Realism (CR) adopts the concept of mechanisms as a tool for understanding social problems in a deeper, structural sense and allows for meaningful explanation and possible solutions (Bhaskar, 1989). Mechanisms are

sensitive to variations in context since they may or may not be activated in a particular context due to contingent conditions or possible countervailing mechanism(s). Astbury and Leeuw (2010) described the important role played by mechanisms in social programs and policy and concluded such a focus can explain “how and why programs work (or fail to work) in different contexts and for different program stakeholders. This is where the explicit use of mechanisms can play an important role in assisting theory-oriented evaluators to articulate more precisely the causal linkages between programs and their desired effects” (p. 364).

## **1.2 The Thesis Proposal**

As discussed in the literature and the case studies selected in this thesis, the anomalies in QAP outcomes, including ISO accreditation, require explanation. To explain such disappointing outcomes, I am proposing that such anomalies can be explained by defining possible mechanism(s) with the capacity to generate such phenomenon. It then seeks to find empirical confirmation that this is, in fact, the case.

It is difficult to identify possible mechanisms from the QAP literature due to a lack of emphasis on ‘mechanisms’ in existing studies. In the literature, (Disterer, 2012; Prajogo, 2011) identified an important mechanism commonly linked with successful outcomes – having an alignment between the organisation’s needs and motives for improvement. Disterer (2012) and Prajogo (2011) argued that internal motives for ISO accreditations generally provide better outcomes, suggesting that ISO accreditations may be successful when they address the organisational constraint. Such an argument seems an obvious proposition, yet it is clear that this linkage is not always addressed in the decision of organisations to proceed with ISO accreditation. An example would be implementing an ISO accreditation for a symbolic advantage when the organisation has to overcome major internal production issues. In this case, ISO accreditation would not generally be expected to lead to the most ideal outcomes (unless through luck or a fortuitous context).

Despite the fact that the mechanisms of successful quality implementation have rarely been discussed in the literature, there are several mechanisms for failure that have been identified in research (Disterer, 2012; Heravitorbati et al., 2011; Prajogo, 2011): the lack of alignment between motives for implementing QAP and

organisational goal (Disterer, 2012), using the wrong strategy and/or wrong tactics, seeking comprehensive improvement (high expectations) (Barnard & Immelman, 2010; Senge et al., 2007), and poor implementation leads to poor outcomes (Prajogo, 2011). In order to strengthen the theoretical base for explanation and integrating further mechanisms, I propose using the Theory of Constraints (TOC) to explain the mechanisms affecting the outcomes of such programs.

In line with TOC, the thesis builds on the argument that poor linkage between motives and constraints is a powerful mechanism for explaining poor outcomes of QAP. I examine the linkage between the motives or the goals of QAP and its outcomes by presenting examples A and B where organisation A actually was seeking to attain symbolic advantage from ISO certification in order to meet the requirements of their markets, and organisation B was seeking process improvement and a strategic advantage over their competitors. Using the adopted thinking of TOC, I suggest that in order to achieve the best outcomes from the process, accreditation should target the system's constraint. Furthermore, the success of accreditation depends on the organisation defining their goal in terms of their throughput, which defines the constraint. If the organisation has the "wrong" goal, then the accreditation process is unlikely to achieve the benefit desired. For case A, the goal of the ISO accreditation was to meet the market requirements to be able to apply for government projects. However, the TOC analysis showed that this goal was not in line with the organisational goal of continuity because the accreditation did not get them more customers; rather, they maintain the same number of customers but bigger projects. The fact that these two goals were not linked means it was never identified how achieving one goal would lead to the other. For this organisation, attaining the ISO accreditation was motivated by attracting more projects and clients, yet this did not agree with its official statement of the organisational goal. The real goal of organisation A should be, according to TOC, 'to increase the goal units' since they are an NFP organisation. Such a fundamental misrepresentation of the organisation's real goal resulted in a lack of clarity around the goal for implementing QAP, and in fact, the goal of implementing ISO accreditation focused on attaining symbolic advantage which was most likely unaligned with the organisation's real goal and therefore limited its capacity to achieve the organisation's real goal. In terms of TOC,



the argument is simple yet powerful: define a clear goal focused on the constraint to throughput and align it to the goal of ISO accreditation.

Treacy and Wiersema's (1993) strategic model was used in this research to provide a context for linking the organisational goal to the proposed mechanism. I am suggesting the use of Treacy and Wiersema's (1993) strategic model enables organisations to lead the market through excelling in one or more of dimensions of value: Customer Intimacy (CI), Operational Excellence (OE), and Product Differentiation (PD), and maintaining the threshold on other value disciplines (Treacy & Wiersema, 1997). This model has been used, along with TOC, as a means to redefine the organisational goal, and then to show how QAP should be applied to attain that organisational goal. The three case studies selected in this thesis highlight each of Treacy and Wiersema's strategic choices and link them to the objectives for QAP: CI in organisation A; OE in organisation B, and PD in organisation C. I am arguing that alignment of the goal of QAP with these strategic choices was vital for successful implementation. The selection of the "right" strategic choice is similarly important.

Treacy and Wiersema's (1993) model was used alongside the new TOC tool, the Strategy and Tactic (S&T) tree, to describe in practice how to ensure alignment between improvement goals and the selected organisational goal. To achieve this alignment, the relevant strategic choice (e.g. CI) was placed at the top of the tree with the proposed proper strategy, such as *attracting more clients* or *meeting market requirements*. In all cases, the QAP accreditation used a tactic for achieving the corresponding strategies. The S&T tree was developed in this thesis to operationalise the strategic choices put forward by Treacy and Wiersema (1993). This new usage of the S&T tree aims to support the implementation of QAP to meet the organisations' strategic choice. In this context, QAP was categorised as a tactic or one of them for achieving a particular strategy in a particular level and ultimately the organisational goals.

The application of the S&T tree model can assist with planning the execution of the changes required for QAP. This is in line with Eichen (2006), who suggests that management's ability to choose and excel in one strategic choice and communicating this choice to their employees so that they understand and apply it effectively is the

factor that makes the difference between success and failure in achieving these strategic choices. It is the contention of this thesis that the S&T tree can provide this means of communication and also provide a plan for integrating quality improvement programs.

Linking the TOC and the concept of mechanisms is intrinsic to the TOC approach of addressing the root causes of any observed problems at a deeper level where unobservable cause(s) interact. The basic principle of TOC argues in favour of focusing on a single constraint that is preventing throughput. Therefore, in order to achieve the desired outcomes, my proposal is that the motive for ISO accreditation should be to address the constraint in order to achieve maximum business benefit. This study aimed at confirming this proposal and delineating other important mechanisms. TOC is used as the theory to thus identify the mechanisms which constrain QAP performance.

Critical realism (CR) was adopted as an appropriate underlabourer for this thesis because it supports the concept of mechanisms as a central concept. Bhaskar (1978) proposed the existence of empirical, actual and real domains of reality (Mingers, 2004) and argued that investigation through these domains reveals that “what happens in the world is not the same as that which is observed” (Danermark, Ekstrom, Jakobsen, & Karlsson, 2002, p. 20). In CR, mechanisms are viewed as phenomena in an “objective existence”, which distinguishes CR from other forms of reality by focusing on what the observed event says about the underlying causal relationships or social mechanisms that are enduring and what lie beyond the common experience (the empirical domain) (Mingers, 2004). Defining mechanisms in CR depends on theory to derive possible explanations, and in this study TOC is the theory used due to the interest of my supervisors and the availability of a local expert who offered invaluable support. The decision to use TOC was largely fortuitous initially, but as the study developed, the power of its arguments became more evident: for example, the need for goal focus, and recognition of the constraint as the core concept of TOC. In addition, the TP tools proved helpful in describing the important mechanisms to explain the observed anomaly of poor QAP.

The Theory of Constraints was developed by Goldratt (Goldratt & Cox, 1986) and other TOC practitioners and consultants (Barnard, 2009; Goldratt, Goldratt, &

Abramov, 2002; Mabin & Davies, 2010; Ricketts, 2008; Scheinkopf, 1999) over a period of more than 30 years. The principle of “FOCUS” is central to this theory in guiding managers towards the weakest link in the system rather than focusing on everything within the organisation (Goldratt, 2010). Constraints can range from being physical, nonphysical such as policy related, market and demand, or it could even take the form of a dummy constraint (Pass & Ronen, 2003). TOC introduced its innovative approach that targets the constraint leading to improvements to overall performance of the system; this differs from the traditional approach of aiming to improve the overall performance through improvements to every part of the system. According to TOC, the real goal of the organisation is “to make money now and in the future” by increasing throughput, that is, the rate at which the system generates “goal units” of the organisation (Cox III, Boyd, Sullivan, Reid, & Cartier, 2012) and (Goldratt & Cox, 1986). This directs organisations towards the real purpose of their existence, which is notably different in service and Not-For-Profit (NFP) organisations. For example, instead of “increasing throughput”, TOC adjusts the goals for these types of organisations to “increasing the goal units” (Kendall, 2010; Ricketts, 2008).

TOC offers different tools and techniques for dealing with different kinds of constraints. Goldratt (Goldratt et al., 2002) paid significant attention to strategic and non-physical constraints. He developed the Thinking Process (TP) technique, comprised of five logical trees that focus on identifying the “real” causes of observable undesirable effects and developing appropriate solutions through the involvement of stakeholders. TP is another breakthrough in TOC and has assisted many organisations to develop their business and enhance their market position. The TOC TP supports managers to manage and lead change by providing a practical guide for assessing situations, revealing hidden assumptions, resolving conflict, as well as planning and implementing successful change (Choe & Herman, 2004). The Strategy and Tactic (S&T) tree is an addition to the TP logical trees and usually follows other TP trees in sequence. The S&T tree represents a means of communicating and linking the goals of a change program to the organisational goal.

### 1.3 Research Problem

A focus on mechanisms supports an investigation of “how” and “why” as it seeks to answer the question: “what works for whom in what circumstances?” (Pawson & Tilley, 1997, p. 85). Such a focus is the foundation of a “realist review”, for example, Best et al.’s (2012) realist review of large-scale system changes in the health arena:

Conventional change management research tends to focus on defining a set of abstracted variables and quantifying the (assumed) causal links between them - such as “top management support,” “dedicated budget,” and “training.” In contrast, the mechanisms that are the focus of realist review are considered to work either wholly or largely through the perceptions, reasoning, and actions of human actors. In other words, the mechanisms set out how the people on whose efforts large system transformation depends actually use program resources such as top management support, financial resources, or training to make the changes happen and sustain them - and how their efforts play out differently in different contexts (p. 427).

This thesis applied similar arguments to examine the outcomes of ISO accreditation in two case organisations by investigating the underlying mechanisms that support successful implementation and desired outcomes. This was done by proposing possible mechanisms (supported by TOC theory). The aim was to focus on context and describe “what works for whom in what circumstance” (Tilley, 2000). The open system suggested by CR involves constructing hypotheses as a way of uncovering the real mechanisms and structures assumed to exist, and acting in the postulated way would produce the empirical phenomena in question (Blaikie, 2009). In designing social research, questions and structures are fundamental for a critical realist explanation since they affect the progress the research and provide a continuous role for theory within the research (Dobson, 2003). The research questions in this thesis are:

#### **Mechanisms:**

1. What are the key mechanisms that drive successful QAP implementation, in particular in the examined organisations?
2. To what extent can TOC provide guidance in proposing possible mechanisms to encourage successful QAP outcomes?

#### **Context:**

1. What are the contextual factors that have the most impact (positive or negative) on QAP implementation in the organisations under study?

2. What conditions are needed for an intervention to trigger favourable mechanisms to produce particular outcome patterns?

**Outcomes:**

1. How do the key mechanisms and contexts interact to produce specific outcomes?

The Theory of Constraints was used to propose mechanisms and answer these questions in an accurate and scientifically rigorous manner. TOC is a management methodology which has been very successful in improving organisational, financial and operational performance. Moreover, the concept of mechanism is supported by certain TOC concepts and tools since the presence or absence of mechanisms might explain the observed outcomes.

#### **1.4 Significance of the Research**

The two main objectives of this thesis are to analyse the anomaly of quality programs, mainly ISO accreditation outcomes, and to provide knowledge about the underlying mechanisms causing such outcomes. In this way, the thesis aimed at delivering theoretical and practical contributions to the body of knowledge on the Theory of Constraints and its applications.

This research fills a gap in both TOC and QAP research and addresses the paucity of knowledge on ISO accreditation in relation to its application, why disappointing outcomes prevail, and how these programs can be used more effectively to achieve positive outcomes for organisations. The thesis investigates the extent to which TOC can provide an explanatory guide as to the causal mechanisms involved in QAP implementation, and seeks analytical resolutions for those mechanisms that bring about poor outcomes. The emphasis on mechanisms and TOC is a new approach and provides fresh insights on the subject.

Scholars have called for more practice-based academic studies to improve the analytical capabilities of the Theory of Constraints. For example, Mabin and Davies (2010) supported Ronen's (2005) recommendation to establish the credibility of TOC practices as a methodology in academia. They specifically addressed facilitating wider acceptance of TOC and better understanding of TP diagrams and TOC in general. In their attempt to address the absence of critical reflection about TOC methodology, Mabin and Davies (2010) argued that the lack of literature on the

methodological development of TOC had led to this circumstance. They proposed a further exploration of the link between TOC methodology and other methodologies to enhance understanding of the problems, and expressed the view that other methodologies can be used in conjunction with TOC to explain relationships and enhance performance, such as the Evaporating Clouds (EC) representations. Recently, in her paper presented at the TOCICO 2016 International Conference, Mabin (2016) emphasised the relevance of combining TOC tools with qualitative research methods in order to promote TOC and its practices in common research practice.

The TOC literature reviewed for this study revealed a dearth of research examining the depth of TOC analysis and the effectiveness of TP tools, despite the fact that such issues continue to be the subject of debate on TOC social media groups (such as TOC LinkedIn groups of TOC4U, TLS which stand for TOC, Lean and Six Sigma, and TOC TP group, plus blogs such as Eli Schragenheim blog: <https://elischragenheim.com/tag/theory-of-constraints/>) (Pirasteh, 2007a; Sproull, 2012). Finally, according to Ronen and Pass (2010, p. 855) TOC “has never developed a coherent methodology for quality improvement in an organisation”.

## **1.5 Thesis Outline**

The review of the literature occurs throughout this thesis. The rationale for this is that CR involves a continued search for mechanisms and subsequent analysis – this iterative cycle means that “theory” is introduced gradually as mechanism theory is explained. A basic summary upfront is therefore necessary to paint a picture of what is coming.

Chapter one presents the argument of this thesis through a discussion of the literature related to the topic, the proposal of the research, the problems and research questions, and the contribution of this study. Chapter two describes the research approach, and the stages undertaken to define the development of the research and research methods. In this chapter, I first discuss the research philosophy underpinning the research method, research procedures and selection of the case studies, participants, interview protocols, and analysis methods. The Theory of Constraints (TOC) is briefly introduced in chapter three and TOC tools and TP are also discussed

before proposing the possible mechanisms derived from this theory. Chapter Four discusses the literature on the concept of mechanisms as well as the use of TOC as a source for uncovering possible mechanisms. This chapter also includes a discussion of Treacy and Wiersema's (1993) strategic choice model.

In order to demonstrate how TOC TP tools were used for analysis in this study, chapter five discusses the case of organisation A and chapter 6 discusses the case of organisation B. These two cases are presented in sequential chapters because they share the situation of having the unexpected outcomes of ISO accreditation. The S&T tree model development for these case studies is presented in chapter seven, including a comparison between the traditional and the new proposed use of this tool. To test the new developed S&T tree model, the case study of organisation C is introduced in chapter eight and discussed in the context of the new use of the S&T tree. This chapter shows the processes of developing the S&T tree to arrive at Tracy and Wiersema's (1993) strategic choices. Chapter nine provides a discussion across the three cases. It discusses the case studies, defines the anomaly, defines the proposed mechanisms, and explains the case studies. Finally, chapter ten commences with answers to the research questions and outlines the implications of the research outcomes, followed by recommendations for quality management practices and future research.

## **1.6 Main Contribution of the Thesis**

The thesis covers Operations Management (TOC and the quality assurance program, ISO accreditation) plus the social context of such programs (using CR mechanisms as a foundation) and can therefore be described as multidisciplinary, since it connects implementation of routine, practical procedures of ISO accreditation with the social context of the environment in which the program is being implemented and practiced. In this thesis, I argue that identification of the mechanisms, derived from TOC, is more likely to result in beneficial QAP outcomes and specifically, that ISO accreditation implementation should only be considered if it targets those constraints preventing organisations from achieving their goals. This study, therefore, focused on constructing a theory for identifying mechanisms that leads to QAP success to more fully explain success or failure. It also seeks to understand under what circumstances such results occur.

The thesis makes major contributions in a number of areas. The first is the use of the TOC TP to link the goal of accreditation with the organisational goal. The second and more novel contribution is the new use of the TOC TP S&T tree to operationalise Treacy and Wiersema's (1993) strategic choice model and link it to the organisational goal. Since the S&T tree is the tool proposed for managing the change process in TOC, using it to instigate the procedures of the ISO accreditation helps to define the mechanisms that are more likely to lead to certain outcomes. This research demonstrates the value of this tool as a platform for managing QAP implementation by keeping the goal clearly in focus, helping to link the goals of implementing ISO accreditation with the organisational goal, and guiding the subsequent implementation of Tracy and Wiersema's (1993) strategic choices. While QAP and ISO accreditation research has identified reasons for the failure of such projects, the fact remains that there is an absence of contextual elements and data on the interaction between mechanisms and context. This is particularly significant when one considers the lack of impact of accreditation programs on overall organisational performance.

The use of the S&T tree to operationalise the implementation of organisations' strategic choices (Treacy & Wiersema, 1993) and guide organisations towards achieving their goal is a novel approach. The S&T Tree and Treacy and Wiersema's Value Discipline Model (1993) were integrated to align original goal and subsequent implementation; in this way, the S&T tree will encourage goal alignment. Initially, the S&T tree was designed as a planning tool to provide a clear vision for organisations of what they need to change and why. The new use of the S&T tree serves to link the goal of ISO accreditation with the goal and strategic priorities of the organisation. During the process of developing and communicating the S&T tree in the case studies in this thesis, participants were able to see a clear link between the change process and the organisational goal. Applying this approach in advance of implementing a quality program will help to clarify the goals and objectives and potentially minimise dissatisfaction with the program's outcomes.

In conclusion, the focus of the thesis is to drill down macro of the observed outcomes of QAPs into "why" and "how" these programs brought about such outcomes. This research provides better understand and deeper insights into organisations' motivations for implementing such programs.



## 1.7 Summary

The literature suggests poor results from QAPs occur for a wide variety of reasons, yet there is very little in the academic literature to explain the underlying causal reasons of such unfortunate outcomes. The novelty of this thesis lies in the identification of mechanisms, underlined by CR ontology, as a fresh approach to explaining poor outcomes. This philosophical position focuses not only on the observed event, but also on what the event tells us about the underlying mechanisms that generated the observed outcomes. Due to the previous successes of using TOC tools, the mechanisms in this thesis were derived from TOC. The proposed mechanisms are more likely to lead to successful outcomes if considered.

TOC has not been used extensively for examining quality programs (Ronen & Pass, 2010), which is difficult to understand given the many previous examples of its successful adoption. The use of TOC TP to link the goal of ISO accreditation to the organisational goal by means of the S&T tree model is a practical device that enables management to communicate its decisions to employees and relevant stakeholders in a practical and effective way. The novel use of the S&T tree as a standalone tool for operationalising and sequencing the implementation of Treacy and Wiersema's (1993) strategic choices is recommended for gaining a competitive advantage such as leading the market in one or more of the three value disciplines (Customer Intimacy, Operational Excellence and Product Differentiation).

This thesis argues that there is evidence to support the assertion that the S&T tree provides a useful and workable tool for organisations to focus and direct quality programs in order to achieve their strategic choices. It allows organisations to link the goal of the quality programs to their organisational goal, leading to the elimination of the system constraint and enhances performance and leading the market in certain area(s). This is only achievable by identifying and understanding the underlying key mechanisms and contextual conditions which disrupt implementation and derail desirable outcomes.



## Chapter 2 The Research Approach

The philosophy is presented as an underlabourer to social enquiry in that it can help with “clearing the ground a little...removing some of the rubbish that lies in the way of knowledge” (Locke, 1894, p. 14). This integral and important role for philosophy in the enquiry process can help to avoid many potentially false pathways and avenues.

(Dobson, 2009, p. 806)

This thesis adopts critical realism (CR) as its basic foundation. The philosophy of CR operates as an underlabourer to social enquiry; it “provides direction on the characteristics and behaviour of the underlying objects of enquiry, and provides direction as to how to examine these objects” (Dobson, 2009). CR has an important integral role in the investigation process because it helps to avoid potentially false pathways “removing some of the rubbish that lies in the way of knowledge” (Locke 1894 cited in Dobson, 2009; Dobson, Myles, & Jackson, 2007). The adoption of CR emphasises “thinking instead of experiencing” (Outhwaite, 1987 cited in (Dobson, 2009)); it involves, postulating possible mechanisms capable of explaining the observed phenomenon. This is crucial because the experienced world of events might not be explainable empirically, rather only via the interaction of the non-observable mechanisms in a deeper domain outside our domain of investigation. CR allows us to answer “how” and “why” questions. This chapter justifies the adoption of the philosophy of Critical Realism (CR) as underlabourer in this thesis.

### 2.1 Research Philosophy

Research philosophy refers to a set of overarching and interconnected assumptions about the development and nature of knowledge (reality). This philosophical structure justifies the strategy for data analysis and the type of data. It defines the basis of interpretation or explanation of the perceived knowledge. The two main components of research philosophy are ontology (way of seeing the world) and epistemology (way of knowing about the world). In any research, ontology affects epistemology, the research methodology and the research techniques (how to investigate it), the theories that can be constructed and the political stance we are ready to take (Fleetwood, 2005). Ontology and epistemology are the “assumption

guidelines” for the research methodology (Cooksey & McDonald, 2012; Grbich, 2007)

Ontology is the theory of nature (the fundamental nature of reality) and relates to the philosophical questions concerning the nature of being, reality and the purpose of existence (Grbich, 2007; Neuman, 2011; Somekh & Lewin, 2011). Ontology reflects the researcher’s assumptions about the things the research is examining and its place in the world (Neuman, 2011, p. 92). In realism, the world is “out there”, independently from the researcher’s (human) interpretation. In many cases perhaps unobservable mechanisms may cause the events (both observed and unobserved). In order to understand the social world in which we live we, therefore, need to understand these deep structures and mechanisms that generate the events.

## **2.2 Introduction to Critical Realism**

An understanding of cause and effect, and the postulation of why or how questions, need a convincing account of causation grounded in ontology (not just empirical accounts like in TOC). The research questions seek to define the mechanisms that cause the poor outcomes of quality assurance programs, and under what conditions those mechanisms act to make these poor outcomes to occur. The questions clearly need causal explanations and for this purpose, a critical realist approach will be used as the underlabouring philosophy because this philosophy directly addresses the notion of causation.

CR has received increasing attention over the last decade as an alternative philosophical basis to positivist and interpretive approaches in the area of information systems research (Dobson, 2002) as well as a range of other disciplines including business and organisational studies, and social sciences (Mingers, Mutch, & Willcocks, 2013).

An important function of CR is to provide an explanation of social phenomena by revealing the causal mechanisms that generate the phenomena. Abduction plays an important role in CR study. Peirce described abduction, also known as retroduction, as “the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea” (Peirce, 1877). In abduction a mechanism is hypothesised that might explain a particular outcome (2002, p. 205).

Nineteenth century philosopher, Charles Peirce, was the first to coin the term “abduction”. In his article “The Fixation of Belief”, Peirce (Bygstad & Munkvold, 2011, p. 3) argued that doubt is initiated by a surprising observation and prompts inquiry to bring about resolution. He proposed the scientific method of abduction for providing possible explanations for unusual outcomes, followed by testing the proposals for their explanatory power. The subsequent “inference to the best explanation” (IBE) involves both deductive and inductive inference to arrive at the most suitable explanation. Given that the focus of the inquiry was on hidden mechanisms only observable via their effects, the abduction process was heavily dependent on theory to derive possible explanations for the outcomes. Similarly, for this thesis theory is required to access the deep and hidden mechanisms behind the poor outcome of quality programs. The theory used was the theory of constraints (See Gupta & Boyd, 2008).

In the next sections, I discuss CR ontological realism and judgemental rationality in justification of CR as a basis for defining mechanisms, and how adopting this philosophy impacted the data collection and analysis.

### **2.2.1 Ontological Realism**

CR is “the view that entities exist independently of being perceived or independently of our theories about them” (Philips, cited in (Groff, 2004) while realism is the view that theories refer to the world’s real features in the natural and social sciences. “Features” refer to what exists in the universe (i.e. forces, structures, duty, quality and so on) that cause the phenomena we perceive with our senses (Schwandt, cited in (Maxwell, 2012).

One of the problems inherent in explaining a natural or social phenomenon is that reality is often reduced to what we can perceive with our senses and does not take into account the deeper structures and underlying mechanisms. This restricts our understanding of the world, whereby ontology is reduced to epistemology and hence reality becomes “flat” (Danermark et. al 2002). The philosophy of CR was born out of necessity to deal with the shortcomings of reducing reality to our senses and alleges that examination of society requires reference to its constitution.

According to CR, the world consists of experiences, events, relations, impressions and discourses organised in different strata of reality (Maxwell, 2012). CR addresses structure, power and tendencies that exist whether or not recognised by experience and/or discourse. Power and tendencies are often not apparent in experience; therefore, the world based on a CR view includes more than actual events and experiences and/or discourses of them. “The (real) world breaks through and sometimes destroys the complex stories that we create in order to understand and explain the situations we research” (Danermark et al., 2002, p.120). These perceptions impacted the data collection process in that the data was collected empirically in two stages. The first stage involved explorative interviews with staff members of the selected organisation. These interviews were used to analyse the situation of each organisation and understand the organisation’s goals and strategies, motives, policies, and QAP’s implementation procedures and techniques. It also aimed to theorise explanations for the observed QAPs’ poor outcomes using TOC concepts to postulate possible mechanisms. In the second stage, group meetings with the key stakeholders of each organisation were conducted to confirm the outcomes of the previous stage. Group meetings sought to define: the conditions around the proposed mechanisms, whether the proposed mechanisms were triggered or not, and finally, whether there was anything else that could explain the observed outcomes within these organisations. These processes require iterated processes of research which are inherent in the method of structured-case study (Carroll & Swatman, 2000). It helped to choose case studies and assisted in defining and investigating these mechanisms.

The core of Bhaskar’s argument on ontological realism’s role for experimentation is that in natural and social science, reliance on causal laws to explain an activity refers to the transformational activity of the mechanism but not the mechanism that caused the activity:

If the activity is to be rendered intelligible causal laws must be analysed as the tendencies of things, which may be possessed unexercised and exercised unrealized, just as they may of course be realized unperceived (or undetected) by people. Thus in citing a law one is referring to the transformational activity of mechanisms, that is, to their activity as such, not making a claim about actual outcome (which will in general be co-determined by the activity of other mechanism). Here again failure to make an ontological distinction between causal laws and patterns of events results in absurdity. For if causal laws are

constant conjunctions of events then one must ask: what governs phenomena in systems where such conjunctions do not obtain (Bhaskar, 1998, p. 10)

The difficulty of creating an artificial, closed system in the social sciences to investigate a social phenomenon suggests that theories cannot be used in a predictive role in the social investigation, but are only explanatory. This fundamentally affects the goal of the thesis to aim for an explanation of the contextual case studies rather than predicting or generalising the mechanisms proposed to explain.

Bhaskar argued that mechanisms identified by science are what they are regardless of our mediations and are limited to what we can know. In this sense, he connected generative mechanisms, and by extension causal laws and causality itself, to the behaviour of entities (Bhaskar, 2008b, p. 40). He stated that “reference to causal laws involves central reference to causal agents; to things endowed with causal powers [to the extent that] only things and materials and people have ‘powers’” (Groff, 2004). CR involves realism about entities, processes, powers and, according to Groff (Bhaskar, 2008b, pp. 40, 68), causality itself. It also embodies the idea that the natural world has its own intrinsic structure independent of our experience of it. Introducing the concept of mechanism to TOC, and TP in specific, will significantly evolve the applications and the perceptions underpinning TOC approach. It also will expand the usage of these applications. For example, TP tools can be used to define mechanisms to deliver a possible explanation of what generated the observed outcomes, as in the case of CRT.

The ontological notion of CR describes social reality as stratified into three hierarchically arranged and overlapping layers (2004): 1) the empirical domain, associated with the ontological phenomena of experiences; 2) the actual domain, associated with the ontological phenomena of events; and 3) the real domain, associated with the ontological phenomena of mechanisms. Bhaskar described CR principles in two categories. The first related to ontological depth as “a way of expressing the idea that mechanisms do not always produce the events that they have the power to bring about, and that, of those events that do occur, not all are experienced by a subject” (Groff, 2004, p.17). The relationships between mechanisms, events and experiences on one side, and CR domains of the real, actual and empirical on the other side are shown in Table 1:

**Table 2-1 Bhaskar’s Three Domains of Reality**

|             | <b>Real Domain</b> | <b>Actual Domain</b> | <b>Empirical Domain</b> |
|-------------|--------------------|----------------------|-------------------------|
| Mechanisms  | ✓                  |                      |                         |
| Events      | ✓                  | ✓                    |                         |
| Experiences | ✓                  | ✓                    | ✓                       |

(Groff, 2004, p. 16)

Bhaskar argued against the Humean approach of causality which is “an expectation that such regularities [constant conjunction of two events] will persist over time” (Groff, 2004, p.11), believing it to be ontologically problematic since it collapses the real and actual domains into the empirical domain (experience of events only). It does not give recognition to the deeper mechanisms behind events.

A central and exclusive element of CR, namely switching from events to mechanisms, involves shifting attention to what generates events. These mechanisms are one of the three domains of CR and by focusing on them we acquire knowledge about the underlying causal powers that generate the observable events (Bhaskar, 2008b, p. 2).

Bhaskar (Danermark et al., 2002) distinguished between transitive and intransitive dimensions as two representations of knowledge. The transitive domain refers to concepts and dimensions of the scientific experience (or the changing knowledge of things) and that the transitive object of science is purely conceptual in nature. On the other hand, the intransitive domain refers to relatively unchanging things which we attempt to know. It is an ontological dimension about the constituted independent reality of being (2008b). Intransitive objects of science are the real things and structures, mechanisms and processes, events and possibilities of the world [not] in any way dependent on our knowledge. These intransitive objects are the unchanging real objects that exist outside of scientific processes. CR ontological intransitivity allows us (during the investigation of the real or what generates the events) to recognise that the real things in the world (structures, mechanisms and processes, events and possibilities) exist independently of our knowledge. Dobson



(Archer, Bhaskar, Collier, Lawson, & Norrie, 1998) described the importance of the intransitive dimension of CR for a realist research methodology as follows:

For the realist, the most important driver for decisions on methodological approach will always be the intransitive dimension, the target being to unearth the real mechanisms and structures underlying perceived events. Critical realism acknowledges that observation is value-laden as Bhaskar pointed out in a recent interview [in Norris, 1999]: ...there is no conflict between seeing our scientific views as being about objectively given real worlds, and understanding our beliefs about them as subject to all kinds of historical and other determinations (2002).

Consequently, the knowledge of reality is a result of social conditioning: “real objects are subject to the value-laden observation”. Reality and value-laden derivations of reality operate in two different, intransitive (enduring) and transitive (changing) domains (p. 5). The distinction between transitive and intransitive objects cautions us about conflating the world with our experience of it. By ignoring the separation between the transitive and intransitive domains we are committing the epistemic fallacy (Dobson, 2009) of collapsing ontology into epistemology. CR rejects this notion of “ontological/ epistemological collapse” because ontology and epistemology are reflections of each other (Archer, 1996).

It can be argued that TOC suffers from the epistemic fallacy in that this theory often suggests that reality is equal to our knowledge of it. For example, it argues the real cause of any conflict is sometimes the erroneous assumptions underpinning the conflict and by defining them, the conflict can be evaporated. Yet, this cannot be accepted – knowledge does not change reality automatically; such knowledge must be recognised AND communicated AND accepted for it to cause change; recognition is not enough.

In general, social scientists tend to adopt theories with flat ontology, which according to CR, is a one-sided causal power positioned in one entity (Maxwell, 2012). This flat ontology is what Archer calls “conflation” referring to the “theoretical tendency in the structural domain and even more markedly in the cultural field, to elide the ‘parts’ and the ‘people’” (Joseph, 1998). Rather than postulating reality as unfolding and becoming, conflation defines reality as established and ongoing. Conflationary theories seldom account for the nature or origins of entities or the powers of those entities; instead, these theories explain causality in the frame

of interaction between existing entities (Archer, 1996, p. xv). For example, a constraint in TOC is seen as an event that occurs sometimes due to the lack of the critical resources, such as surgeons in a hospital. Yet TOC does not recognize that this constraint is in fact a structure which if triggered causes a bottleneck. The trigger plus structure defines a possible mechanism.

Archer classified conflation as upward, downward and central. Upward conflation is an overemphasis on the power of social agency (people) to shape social structure as well as themselves, while downward conflation treats social activity as determined by structural factors and overemphasises the power of social structures to determine human activity. Central conflation emphasises structure and agency co-constitution, whereby the powers of social structure and social agents meld together and dispossess individuals and societies of their powers. Instead, there is one mutual power that simultaneously constitutes them both.

The ontological richness of Critical Realism is matched by a conservative epistemology heavily dependent on the scientific argument (Plumb, 2013). Epistemologically the aim of Critical Realism is to explain the events we might observe and define the mechanisms and structures (at a deeper level) that generate these outcomes. The emphasis is on explaining the constitution of empirical phenomena (how and why) and not to make predictions ("Roy Bhaskar Interviewed. questions by Professor Christopher Norris,").

### **2.2.2 Judgemental Rationality**

Judgemental rationality is a core “pillar” of critical realism – it claims since scientific knowledge is fallible and socially grounded, the choice of theories is a rational choice. Bhaskar argued rational deliberation between scientific theories is possible and established by the fact that these theories are rival because selecting one theory over another requires a determination of the relative merits of each approach. According to Groff (2004), “the fact that [scientists] cannot compare a theory to unmediated sensory experience does not mean that there is no way to assess its explanatory power . . . or that scientific change is arbitrary and non-rational” (p.21). The major foundation of Critical Realism is the argument that science, including social science, is not possible without a belief in the progressive development of

theory-based around refutation of less successful explanatory theory. In other words, “the possibility of making judgmental evaluations is a necessary condition and fundamental to the critical realist argument” (Dobson, 2003, p. 157). According to Danermark et al. (2002):

Critical realism claims to be able to combine and reconcile ontological realism, epistemological relativism and judgemental rationality. The first part of this statement implies that there exists a reality, which is stratified, differentiated, structured and changing. The second part tells us that our knowledge about this reality is always fallible, but as the last characteristic suggests, there are some theoretical and methodological tools we can use in order to discriminate among theories regarding their ability to inform us about the external reality (p. 10).

This fundamental requirement for critical realist underlabouring means that theories such as TOC must include an ontological commitment, and they must be judged relative to their explanatory merit. TOC must be assessed as to its explanatory power. This will be done in the final chapters of the thesis.

It is also true that theories need to have an ontological commitment in line with CR focus on ontology. This will require some amendment of the traditional usage of TOC to make visible its ontological commitments – things like re-defining constraints as mechanisms and inventory accumulation as event traces of mechanisms.

### **2.3 Why Critical Realism**

This section clarifies the selection of CR as a suitable underpinning philosophy for this thesis. In general, the goal of the CR-guided research is to synthesise from available ideas and relevant data an account of what is happening to the key social mechanisms and processes under study (Dobson, 2003). You can ask “how” and “why” type questions, and since the purpose of this thesis is to explain the failure of the quality assurance programs, the fact that there is such regularity in the failure of these programs indicates that there exists an underlying problem. The questions in this thesis are to understand the mechanisms that cause the disappointing outcomes of the QAPs, and under what conditions those mechanisms may be caused to act. Therefore, the best conceptual underpinning philosophy for these kinds of questions is the one that directly addresses the causation notion: the Realist approach. The

problem addressed, in this thesis, needs causal explanations and CR is the approach that allows us to provide such explanations using it as the ontology of this thesis.

In addition, CR offers distinct advantages for research on management and organisational studies (Edwards, O'Mahoney & Vincent, 2014). For example, CR allows us to examine event anomalies like the surprisingly poor outcomes of quality programs by defining the possible mechanisms that generated such outcomes.

The purpose of realist research is to provide explanations that flow from an account of how different structures/mechanisms produce the observed events and to explain this linkage in context. In other words, CR does not consider regularities at the events level as causal – “correlation is not causation”. The fact that one event follows another often is not to say one is the cause of another. It may just be fortuitous. The purpose of CR is to propose underlying causal mechanisms behind events and steadily support or deny such proposals over the course of scientific research and argument. CR considers that the primary focus of research is to uncover and describe the causal powers of structures and mechanisms that generate these events. The focus is always at a deeper level than that of events – events being seen as traces of triggered causal powers. In this thesis, CR was used as the underlying philosophy to analyse the case studies in conjunction with TOC tools. This role enabled practical analysis of the collected data using TOC TP tools, followed by a suggestion of the mechanism(s) that resulted in such outcomes and an explanation of the studied phenomena. The merits of such theory and explanation are to be judged against the plausibility of their conclusions and their ability to explain more than other theories.

## **2.4 Defining Generative Mechanisms from a Theory**

CR purports the relationship between causal mechanisms and their outcomes are not fixed but contingent, and consequently causal explanation is not a result of statistical correlations between patterns or regularities accrued between events and variables. Instead, causal explanation is the outcome of articulating generative mechanisms that can explain the observed regularities (Jeppesen, 2005). In social science, an “open” system, according to CR, does not offer the same precision as the “closed” laboratories of natural science, but explanatory theories and concepts can be

developed to offer better explanations of social phenomena (Edwards, O'Mahoney, & Vincent, 2014).

Dobson, Jackson, and Gengatharen (1997) argued abduction is necessary to propose theories with a capacity to explain:

Abduction is used to propose likely theories (i.e., explanations) for actualities identified. In the movement from surface phenomena to a deeper, perhaps non-observable causal thing, the critical realist depends heavily on theory to propose possibilities. Such a perspective is consistent with a deep realism where explanation is not about prediction but about the steady unearthing of deeper levels of structures and mechanisms (Ogrinc & Batalden, 2009).

In other words, a theory is a necessary source for defining proposed mechanisms. In this thesis, I used mechanisms proposed from TOC to explain the anomalies in ISO accreditation outcomes. For example, the ideology of the constraint is a powerful TOC mechanism that underpins almost all its tools, and “targeting the system’s constraint” is an effective mechanism for guiding ISO application and thus explaining the variances in ISO accreditation outcomes. In addition, “aligning the goal of accreditation with the organisational goal” is another powerful mechanism for explaining disappointing ISO accreditation outcomes. Mechanisms (discussed in detail in Chapter 4) provide an understanding of the relationships between entities within the context of the organisations where the events occurred. This is equally valid in the natural and social sciences. Mechanisms are the core of critical or transcendental realism (Njihia & Merali, 2013) for aiding emergence of the effects of activities (O'Mahoney & Vincent, 2014). In his book *A Realist Theory of Science*, Bhaskar described his concept of mechanisms thus:

The world consists of mechanisms not events. Such mechanisms combine to generate the flux of phenomena that constitute the actual states and happenings of the world. They may be said to be real, though it is rarely that they are actually manifest and rare still that they are empirically identified by men. They are the intransitive objects of scientific theory. They are quite independent of men—as thinkers, causal agents, and perceivers. They are not unknowable . . . They are not artificial constructs . . . this is the arduous task of science: the production of knowledge of those enduring and continually active mechanisms of nature that produce the phenomena of our world (2013).

Like photosynthesis, carbon cycles or natural selection, mechanisms in social science have been used to explain natural phenomena and are as relevant as individuals in the context of programs, since actors and programs are rooted in social

reality (Bhaskar, 1978). An accumulation of mechanisms operating in a context produces outcomes of interest (Gorski, 2009), and in CR, provide deeper explanations and a better understanding of the causal powers that generate particular events. Mechanisms are derived either from the literature or from a theory, but in reviewing the QAP literature it is difficult to derive mechanisms due to the lack of emphasis on “mechanisms” and the paucity of research frameworks focused on a search for causes. However, one important mechanism commonly linked to successful outcomes in the literature is an alignment between organisational needs and motives for improvement (Disterer, 2012; Prajogo, 2011). Both authors argued that internal motives for ISO accreditation generally provide better outcomes. However, this is not such a simple conclusion. This suggests that QAP, in particular, ISO accreditation, may have better outcomes when it addresses internal organisational constraints. Such an argument does not consider the overall organisational constraint. Certainly, if the constraint is internal and the ISO addresses this issue then outcomes for the organisation can be expected to be improved. However, if ISO accreditation seeks symbolic advantage, for example, when the major constraint is internal production issues, this could not generally be expected to lead to ideal outcomes unless through luck or fortuitous circumstances.

This also suggests that a further “success” mechanism may be that the strategic choice adopted must be in line with the constraint also. If they are not in line then any alignment of ISO implementation with the goal will also be ultimately doomed. Prajogo (2011) makes an associated argument when he suggests that the fit between the motives and implementation might strengthen or weaken the outcomes of the ISO accreditation see (Table 2.2 The strategic choice versus QAP goal).

This mismatch between the orientation of external motives and the real purpose of implementation process undermines the effectiveness of the implementation process in achieving the expected benefits of ISO 9000 (Prajogo, 2011, p. 85).

In other words, alignment is the first requirement for achieving success. Of course being aligned does not guarantee success; success depends also on the QAP features, but we can say that QAP is more likely to be successful if they are aligned with the strategic choice (providing the strategic choice is the “right” choice – that is aligned with the constraint). For example, in Table 2.2 we see that if the QAP seeks to address external motives (quality “assurance”), then the constraint should be external and

strategic choice should be CI to provide the best conditions for successful outcomes. Similarly, if QAP has internal motives then the constraint should be internal and strategic choice should be OE to provide the best chance for successful outcomes. To achieve OE, QAP would logically provide a tactic for operational improvement. If Product Quality is the constraint, then the QAP needs to again have internal motives to most likely derive best outcomes. With PD as the strategic choice, and quality as the constraint, the QAP must have internal motives to be correctly aligned.

For case C, the audit process did have a quality internal focus but did not provide guidance for achieving the necessary quality. The audit conditions prompted a quality focus but did not materially direct improvement. The S&T tree became the tool to implement the PD goal because of its PD focus.

Table 2.2: The strategic choice versus QAP motives

|                         | CI      | OE      | PD      |
|-------------------------|---------|---------|---------|
| <b>External motives</b> | Aligned |         |         |
| <b>Internal motives</b> |         | Aligned | Aligned |

Although there is no established methodology for identifying mechanisms because they are often non-observable (Marchal, Van Belle, Van Olmen, Hoérée, & Kegels, 2012, p. 195), CR or the transcendental approach enables us to speculate on non-observable structures and mechanisms using theory. Instead of generalising at the events level, CR uses research at the abstract or theoretical level to provide a theoretical description of mechanisms and structures - developing a hypothesis and explanation for the observed events.

Abstract research in CR provides an explanation for the observed events. Bhaskar asserted “these structures are not spontaneously apparent in the observable pattern of events; they can only be identified through the practical and theoretical work of social science” (Pawson & Tilley, 1997). Wight (2015) proposes that the minimum for a mechanism-based approach must include:

1. Defining the phenomenon of interest, this could be in the form of emergence of some new practices or observed regularity;

2. Proposing one or more mechanisms, which if they exist, provide an explanation for these phenomena individually or collectively;
3. Describing the hidden powers or properties and powers generated by the interaction of mechanisms;
4. Describing the context in which the mechanism(s) operate;
5. Defining possible mechanisms that might interact with the proposed mechanisms and lead to the outcomes under investigation;
6. Indicating the expected outcomes and a way of measuring them; and
7. Identifying other contexts in which the defined mechanisms could operate.

These are not the only steps for suggesting mechanisms in CR research but represent minimum conditions. They do not necessarily have to be completed in the above order. Following these steps gives researchers a clear idea of how to proceed with empirical research in order to test the claims being made. The processes were followed throughout the thesis, starting by defining the phenomenon in the relevant literature to define the framework of research processes. This included also defining mechanisms from the literature which helped to define the anomalies within the selected case organisations. In addition, these steps underpinned the TP analysis conducted for organisations A, B and C to describe the situation of each organisation, defining the anomalies, and defining the possible mechanisms.

## **2.5 Research Method**

With the focus on explanation, an awareness that “explanations . . . depend on specific conditions and are partial, approximate, indeterminate in application to specific cases, inconclusive, uncertain, and typically limited to specific context” is required (Miles & Huberman, 1994, p. 144). Researchers aim to find causal explanations for random events and often believe that something is systematic, ordered and real when they are not (Bygstad & Munkvold, 2011). Miles and Huberman argued that explanations often miss the mark and the researcher ends up with biased interpretations of “seeing what we want to see” (Miles & Huberman, 1994). Sayer (1992) concluded that discovery of the absolute truth should not be viewed:



As a threatening statement because paradoxically, the common experience of making empirical errors, of mistaking the nature of the world supports rather than undermines realism. For it is precisely because the world does not yield to just any kind of expectation that we believe it exists independently of us and is not simply a figment of our imagination ( p. 67).

CR uses qualitative, quantitative and mixed methods depending on the type of knowledge aimed for, whether aimed at generalising knowledge or acquiring new knowledge from unique cases. Danermark et al. (Bygstad & Munkvold, 2011; Danermark et al., 2002; Radulescu & Vessey, 2008) argued:

...if we look at the social science practice, however, we find that many of the generalizations appearing in the literature are grounded precisely in qualitatively oriented case studies (Miles & Huberman, 1994, p. 144).

Arguments around a preference for qualitative or quantitative research are in fact arguments about the type of knowledge sought. A qualitative case study is an appropriate method for acquiring knowledge about mechanisms or laws (1994) and allows for exploration of participants' subjective interpretations of their world which necessarily includes their perceptions. According to Bryman (2012), qualitative data are not only suitable for grounded theory research it is also beneficial for testing a theory. The current study investigated the deeper reality behind the poor outcomes of ISO accreditation implementation and attempted to explain the mechanisms that contributed to those outcomes in order to propose alternative mechanisms that would generate better outcomes. Qualitative methods often emphasise obtaining comprehensive, subjective descriptions of a phenomenon (Sayer, 1992, p. 46) and are therefore compatible with a CR approach. However, issues with qualitative data were described by Miles and Huberman (2002) in the following way:

Qualitative data are not so much about "behaviour" as they are about actions (which carry with them intentions and meanings and lead to consequences). Some actions are relatively straightforward; others involve "impression management" – how people want others, including researchers, to see them. Furthermore, those actions always occur in specific situation within a social and historical context, which deeply influence how they are interpreted by both insider and the researcher as outsider. Thus, the apparent simplicity of qualitative "data" masks a good deal of complexity, requiring plenty of care and self-awareness on the part of the researcher (p. 75).

On the other hand, well-collected qualitative data offers several advantages as it provides the best strategy for discovery, exploring new areas, and developing and testing hypotheses (Danermark et al., 2002). Moreover, qualitative data are

representations of real-life situations. Using a qualitative method infers a strong possibility of understanding and underlining non-obvious issues because qualitative studies focus on investigating a specific case embedded in a particular context. Another advantage of qualitative data is the richness and comprehension with which it reveals and describes complexity. Miles and Huberman (1994) argued “the fact that data are typically collected over sustained periods makes them powerful for studying any process (including history). We can go far beyond “snapshots” of “what” or “how many” to just how and why things happen as they do – and even assess causality as it actually plays out in a particular setting” (p. 10). Finally, qualitative data helps to locate the meaning that people place on events, processes and structure and links these meanings to the social world around them.

Deep understanding of the complex phenomena dictated the use of qualitative case studies in this research, since they allow for “retaining the holistic and meaningful characteristics of real-life events such as individual life cycles, small group behaviour, organisational and managerial processes, neighbourhood change, etc.” (Croswell, 1998; Denzin & Lincoln, 1994, p. 120). Multiple case studies offer even a deeper understanding of the contexts and outcomes and provide a good picture of locally-grounded causality.

### **2.5.1 Structured Case Study**

In qualitative research, the identification of the ‘case’ refers to a phenomenon occurring in a bounded context (Miles & Huberman, 1994). In Yin’s case study approach (Yin, 2009), a ‘case’ is defined as the events and processes occurring over a certain time. It may also refer to an individual, role, small group, organisation, community or nation as the focus of the study and the boundaries of the studied phenomena (Miles & Huberman, 1994). Carroll and Swatman’s approach called structured-case, builds on the Yin case study approach, though the term ‘case’ in this method is used to express the formal process involving three structural components: a conceptual framework, a pre-defined research cycle and a literature-based scrutiny of the research findings. Carroll and Swatman (2000) developed the structured-case approach to guide researchers to undertake and assess theory-building research. They argued that the structured-case approach achieves convincing explanations linking the research theme including the collected data with the conclusion derived from

these data. This approach allows researchers to select and implement the tools and techniques suitable to develop a deep understanding of the complex interaction of people, processes, and technologies within the organisation for the purpose of building or developing a theory.

Carroll and Swatman structured case is the approach that provides the opportunity to describe the iterative process of developing or building a theory using qualitative data. Figure 2-1 shows the inherent recursion and backtracking of structure case research. This framework describes the continuous refinement of the research constructs, initial research question, and the ongoing comparison of data with new emerging themes, literature and outside expertise (Carroll & Swatman, 2000)

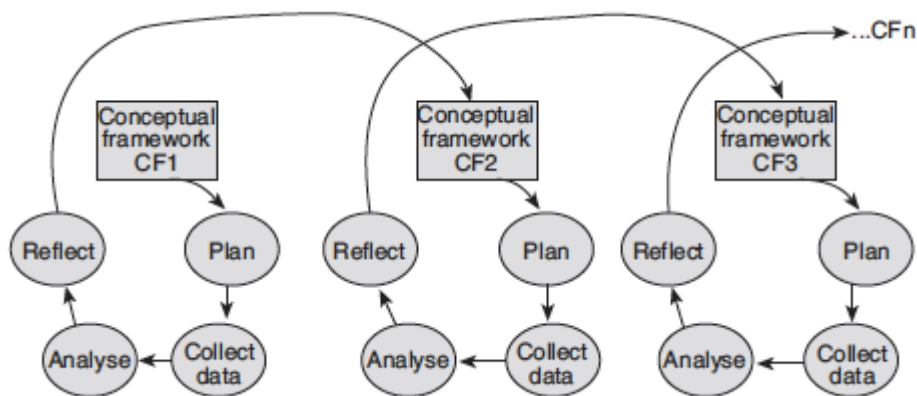


Figure 2-1: Structured-case spiral approach towards understanding

Source: Carroll, J. M., & Swatman, P. A. (2000). Structured-case: a methodological framework for building theory in information systems research. *European Journal of Information Systems*, 9(4), p. 240.

At the end of each research cycle (Figure 2-1), the research will be able to revise the process according to the emerging understanding developed about the research theme. Structured case approach enables researchers to achieve high-quality research.

In this thesis, each case study represents an experiment to deduce and test the theory using the data collected from each organisation and functions as an instrument to test predetermined theoretical assumptions. The selection of the case organisations A and B was mainly because both organisations had the experience of implementing an accreditation program. I chose organisation A because I worked there for a while, while Organisation B was chosen because, during the time of recruitment, they had recently received their ISO accreditation. In addition, the owner welcomed the

involvement of my research study. Therefore, both cases were chosen due to their accessibility. In order to develop the S&T tree for the third strategic choice product differentiation PD, organisation C was chosen. This is because the organisation was experiencing unsatisfactory performance and they had some undesirable outcomes. However, this organisation did not have ISO accreditation.

This is quite consistent with the CR argument that knowledge is fallible, temporary and expanding. CR justifies the study of any situation without consideration for the numbers of research units involved. It maintains over-extended inferences can be drawn from case studies: “a few intensive ‘case studies’ and a host of statements about relatively simple constituent elements or events, all informed by abstract theoretical knowledge” (Syers, 1992, p.23). In this thesis, the three case studies served two purposes: first, to develop and test a model; and second, to identify how the proposed mechanisms operated in the context of each organisation. The first two cases (organisations A and B) had achieved ISO accreditation before conducting this research. Their current situations were initially analysed, and this was followed by the development of a model for linking the goal of accreditation and the organisational goal seeking to achieve one or more of Treacy and Wiersema’s (1993) strategic choices to lead the market. The aim of the models was to gain a competitive edge in one or more strategic choices, which were tested for validity and reliability in the first two cases and subsequently applied in organisation C.

### **2.5.2 Data Collection and Method of Analysis**

In this research, the units of analysis were organisations who had or were in the process of applying QAP (ISO accreditation). The most appropriate data to achieve the research objectives of exploring and discovering the mechanisms of QAP implementation were the personal perceptions, assumptions, prejudgments and presuppositions (Miles & Huberman, 1994) about the implementation process, whether it had occurred in the past or was currently in progress. In this research, the focus was on what had already been accomplished, the consequences of the applied mechanisms, the what the next stage would be and why.

Cox and Hassard (2007) argued that a philosophical position along with the purpose of the research plays a crucial part in determining the accuracy of data. Since this study relied on CR as the research philosophy, the outcomes provided a naturally

critical assessment of the accuracy of the data, since reducing the errors or what Miller, Cardinal, and Glick (2000) called “bias recall” in retrospective data, involves multiple sources.

The case studies in this research were conducted to identify how ISO accreditation can be used to achieve Treacy and Wiersema’s (1993) strategic choices and the organisational goal. This involved relying upon the perspectives of the organisations’ managers and key personnel in different departments to describe the accreditation outcomes and conditions within the organisation. Data were obtained through semi-structured, in-depth interviews in addition to acquiring various documents related to the organisations’ ISO accreditation processes. Group meetings with key people in the three organisations served to verify and validate the proposed S&T tree models. These data provided a clear understanding of the organisations and the changes brought about by ISO accreditation. Key people included heads of departments and senior members of each organisation because of their extensive knowledge of the circumstances. The interview questions in appendix A were carefully designed to avoid provocation and inconvenience for the interviewees. Prior to each interview, I presented a PowerPoint presentation to explain the importance of the research, highlighting the advantages of the new S&T tree model for identifying the organisation’s strategic choice. Participants were assured of confidentiality in order to encourage their participation and feedback.

To support analysis of the case studies, other supporting documents supplemented the interviews and group meetings in each organisation. Many were confidential, and the management of two of the organisations asked that they not be published. The documents included but were not limited to:

- Operating manuals, procedures and organisation policy;
- Quality policy, internal audit reports and external audit reports;
- Business/Strategic plans and contingency plans/risk management;
- Assessment and performance reports; and
- Project diaries and records of what happened during the implementation process.

It is important to note that this study incorporates retrospective data in order to understand the circumstances leading to the organisations’ decisions to pursue ISO accreditation. The retrospective data used to define the context and derived

mechanism. Then, to verify any identified structures, the various data sources were cross-checked. A core philosophy of CR is to define the structures in which the agents are immersed. For example, the data collected from participants to illuminate their motives for seeking ISO accreditation as well as the processes around implementation were used to define the context within which the proposed mechanisms were operating. For the purpose of this study a review of the organisations' histories supported a causal explanation of the identified events and observed outcomes. To do so, it was necessary to provide context, that is, "why particular causal links are made between the past and the present and on individual cognitive processes in making causal explanations" (Sayer, 1992, p. 168). The description of context was always verified in interview and cross-checked with the sources indicated above.

CR does not deny issues with using retrospective data – if you use it to define context then you are also using it to derive mechanisms. The point is that you verify and check any structure identified through cross checking various sources.

All interviews and group meetings were audio-recorded and transcribed in their entirety, and provided a verbatim account of the interviews. In other words, the transcripts included elisions, mispronunciations, slang, grammatical errors and nonverbal sounds (e.g. laughs, sighs) (Cox & Hassard, 2007). To draw a causal link between the observed outcomes and the root causes of such outcomes, TOC TP tools were used for analysis, namely CRT and Conflict Clouds, as well as the Evaporating Cloud method to develop the S&T trees. Data collected from the group meetings were used to validate and amend these models. In the group meetings I explained the proposed S&T trees and the logical assumptions supporting each step, and then the participants had the opportunity to provide feedback and articulate whether or not they agreed with the assumptions. Results were fed back into the new model.

### **2.5.2.1 The Analysis tools**

Analysis of the research drew on the belief that TOC provides guidance to propose mechanisms capable of explaining ISO accreditation anomalies. In this study, TOC TP tools were used to investigate the causes of the observed ISO accreditation outcomes and to demonstrate their analytical capability in an academic context. The analysis commenced with building a CRT using the feedback from the

explorative interviews. The CRT was constructed in the traditional method by initially listing the undesirable effects (UDEs) of each organisation at the top of the CRT, and then linking them logically to define the root cause. Each link was validated using the roles of Categories of Legitimate Reservations (CLRs). The construction of the CRT for cases A and B are further described in chapters 3, 5 and 6.

After defining the possible root causes from the CRTs, Evaporating Clouds were constructed. Conflict Clouds (CCs) were defined first, followed by the generic cloud. I used the three UDE cloud methods for developing the EC by constructing conflict clouds for three unrelated UDEs that ultimately produced the generic cloud. Next, the underlying assumptions were exposed to define erroneous assumptions and identify the most effective injections or solutions for achieving the desired outcomes. However, these solutions had to be tested, so that only the strongest were implemented.

In the next phase, I developed S&T trees for Treacy and Wiersema's (1993) strategic choices to achieve alignment between the quality program and the strategic choice of each organisation. These new S&T tree models were validated in the group meetings. The S&T trees demonstrate how to align the goal of the ISO accreditation with the organisations' strategic choices, then the organisational goal. For the case of organisation C, the S&T tree was used for a different purpose. The development of this new S&T tree is explained in details in chapter 7.

For explaining the CRTs, CC and EC, TOC causal logic – necessary and sufficient logic – was used. The analysis and interpretation were guided by Wight's (1997) seven steps, which represent the minimum requirements for identifying underlying mechanisms. The process commenced with a description of ISO accreditation outcomes and the apparent incongruities. Next, the possible root causes and conflicts were identified using CRT and EC to look for non-observable mechanisms through abstraction. Finally, the S&T tree for Treacy and Wiersema's strategic choices was developed to align the QAP with organisational goals, represented by strategic choices.

Wight's (1997) seven steps guided these processes to reach the required specification on the bottom-line level (depth reality) and develop a theory to explain the generative causal propositions.

### 2.5.3 Research Validity

For qualitative, quantitative or mixed methods research, validity and reliability are used to evaluate the research applicability, relevance and generalisation. However, the terminology that expresses research validity and reliability in qualitative research is different (Guba and Lincoln cited in (Cox & Hassard, 2007):

- Credibility referring to internal validity in quantitative research;
- Transferability referring to external validity in quantitative research;
- Dependability referring to reliability in quantitative research; and
- Confirmability referring to objectivity in quantitative research.

These criteria validate positivist and empiricist interpretive research. This thesis adopted CR concepts; therefore, validity in realist research is the focus here. In realist research, validation is a gradual process and matter of social conversation rather than objective confirmation (Miles & Huberman, 1994); Wight (2015) illustrates that validity in CR is about the existence of the ways of assessing account.

CR assumes that we can have no direct knowledge of the objects of our accounts and thus no independent entity to which to compare these accounts. The application of the concepts of validity presented here does not depend on the existence of some absolute truth or reality to which an account can be compared, but only on the fact that there exist ways of assessing accounts that do not depend entirely on features of the account itself, but in some way relate to those things that the account claims to be about (Wight, 2015).

Accordingly, validation in realist research is developed within CR perceptions and principles. Smith and Johnston (2010; 2014) discussed CR's four principles and its impact on the validity of the research. These principles are:

- There is a difference between a theory and the mechanisms that the theory describes
- There is a difference between a mechanism and the events they cause to occur
- There is a difference between the events and its traces in the empirical domain
- CR iterative reasoning process

Consequently, CR focuses on measurement validity, internal validity, ecological validity and external validity. Measurement validity is the chain of evidence that the measurements are adequate and suitable to track the sequence of events (Smith & Johnston, 2014). The validity of the measurement of this thesis is the validity of the TOC TP tools. These tools are the measures that provide the evidence to detect a trace



of the actual event. Developing the evidence using these tools involves using TOC logic (Categories of Legitimate Reservations CLR) validation and a lengthy process of outcomes' refinement following TOC's causal logic (Smith & Johnston, 2014).

The aim of this thesis was to postulate mechanisms rather than define how they generated the event under study. Internal validity is about establishing a chain of evidence that identifies mechanisms as the ones that generated the actual event. In this study, CRT was used as a tool for confirming internal validity (Mabin, Davies, Kimani, & Mirzaei, 2016). On the other hand, ecological validity is about the strength of evidence and is related to internal validity (Smith & Johnston, 2014) in that the theorised mechanism underlying a phenomenon was operating to cause the observed phenomenon. External validity refers to generalisable evidence of the proposed mechanisms, and in this thesis, to mechanisms operating in contexts outside the area of study (Johnston & Smith, 2010). Based on evidence in the ISO accreditation literature and previous TOC applications, it was hypothesised that the postulated mechanisms were operating in other contexts.

Finally, (Mabin, 2016) argues that incorporating qualitative research methods with TOC tools in academic research will provide a means of validation: "these threads of validation drawn from both TOC and qualitative methods, provide greater clarity, process validity, transparency of process, and face validity of resulting analysis. Weaving between the two provides a stronger result than either on its own" (Mabin, 2016, p. 2)

#### **2.5.4 Limitations and Difficulties**

The limitations of this thesis arose from the difficulties encountered in this project and are in two areas: topic related limitations and operational limitations:

##### **Topic Limitations**

1. This thesis adopted and deployed TOC TP tools as the analysing tool. This theory adopts causality as its underpinning logic. It can be classified as an empiricist pragmatic theory; therefore, the outcomes of TOC's analysis are mostly empiricist underpinned by cause-and-effect logic. Consequently, the alignment between such outcomes and CR conclusions was quite difficult

because TOC does not comply with the CR principles. TOC is epistemologically focused – it consists of groups of tools and concepts to generate knowledge; it does not have a clear ontology. For example, Davies et al. (2005) suggested incorporating TOC with other methodologies to develop a multi-methodological approach across different domains. In addition, as previously indicated, TOC often conflates its epistemology with an ontology; it mixes reality with knowledge of reality. In other words, it is a conflationary theory.

2. The second limitation is that we can never achieve complete accuracy in our descriptions and explanations of reality (Flick, 2006). This is because critical realists acknowledge that people's perceptions about reality are historical, value-laden, situated (Creswell, 2009) and cognitively biased (Cooksey & McDonald, 2012). In other words, the flexible nature of our knowledge highlights the crucial role of the researcher's position in any context (Flick, 2006).
3. The third limitation is because the CR approach was not closely followed in this thesis; CR only underpinned my understanding about things such as events and mechanisms and the stratified levels of reality that we cannot see. In this thesis, CR concepts were adopted as a guideline and an underlabouring philosophy to explain the ISO accreditations' anomalies and define the generative mechanisms.
4. Finally, given the sensitivity of the thesis topic, the anomalous outcomes of ISO accreditation and whether or not ISO accreditation implementation contributed to achieving the organisational goals' increased the likelihood of "participant bias" because discussing failure or disappointment with an external person (the researcher) is not easy. This is because, and according to Bryman (2012), participants will be inclined to present a good image of themselves and their workplace when discussing sensitive topics and strive to present the best image of their organisation by avoiding discussing negative aspects. This was clearly observed during the interviews in the three case studies in this research and mitigated by creating a level of trust through repeated visits, emphasising the benefit of the study for their organisation, and

I avoided asking direct questions about negativities to reduce the possibility of being judgemental.

### **Operational Limitations**

1. The investigation of the anomalies of ISO accreditations involved, to some extent, the historical implementation of the accreditations and its processes, which raised a concern about the accuracy of the data. However, the process of implementation was not the focus of the research: it was the outcomes. Together with document collection from multiple resources, multiple interviews in the same case study maximised the level of accuracy.
2. Finally, the fact that I am an international student meant low accessibility to organisations. However, building effective networks through the University profoundly helped to overcome this limitation. In addition, my supervisor provided a great deal of support in this area. He introduced me to a valuable local TOC consultant who played a significant role in validating my analysis's outcomes. Also, with the assistance of my supervisor, I recruited the case of organisation C, which was significantly important to the development of the S&T tree model for Treacy and Wiersema's strategic choices.

### **Summary**

Realist-based mechanisms research requires a theory to support the process of identifying possible mechanisms that can explain the observed phenomena. In this thesis, I proposed the use of TOC as the theory for describing invisible mechanisms evident only by their effects. The research method followed Wight's (2015) seven steps, the minimum conditions of a realist approach to mechanisms and the multiple case studies developed and tested the proposed S&T tree models for linking the organisational goals to Tracy and Wiersema's (1993) strategic choices for attaining market leadership. This research used the structured-case method to provide convincing explanations for linking the research theme to the field of collected data.



# Chapter 3 The Theory of Constraints

## 3.1 Introduction

In this study, TOC was used to propose mechanisms and develop a new approach to the S&T tree for operationalising Treacy and Wiersema's (1993) strategic choices. This new model provides a platform for stakeholders to define and address the assumptions underpinning the organisation's decisions and actions. The TOC TP, discussed later in this chapter, proposes a linkage between TOC and the concept of mechanisms, and demonstrates how TOC can help explain the mechanisms behind poor QAP outcomes.

The Theory of Constraints is an Operations Management (OM) theory that has been successfully deployed in different fields to improve the performance of systems. Despite its widespread success, this theory has not been investigated for its capabilities in the area of quality programs, specifically ISO accreditation. In this thesis, I argue that TOC has the potential for identifying mechanisms that, if they were considered, are more likely to lead to achieving the desired outcomes successfully. Defining TOC based mechanism(s) represent a significant development in the application of TOC and provides an opportunity for the theory and its tools to be used in different contexts and for new purposes.

The TOC literature reviewed in this chapter builds a foundation for the theoretical concepts and terms in order to propose mechanisms that can explain the anomalies of ISO accreditation programs' outcomes.

In this chapter, I discuss TOC in three sections: the first provides a background of the theory, its development, and its tools; the second is a detailed outline of the Thinking Process (TP) and its tools, most notably the Strategy and Tactic (S&T) tree, which is further discussed in chapter 7; and the third section substantiates TOC as the most appropriate theory for this study.

### 3.2 Overview and Development

TOC or Constraint Management (CM) was originally an attempt to develop a theory in the field of OM in the 1980s through a collaboration between Eliyahu M. Goldratt, Oded Cohen and Eli Schragenheim (Goldratt Group, 2009) to produce operations management software (Optimised Production Timetable). Later this software subsequently became known as Optimised Production Technology (OPT) for commercial purposes (Heron, 2011; Rahman, 1998). Since its advent, TOC has evolved from a method for scheduling manufacturing to a management philosophy for systems improvement (Rahman, 1998, 2002).

Goldratt's first book, *The Goal* (Goldratt & Cox, 1986), published in 1984, introduced the principles of the theory in a story format. His second book, *The Race* (Goldratt & Fox, 1986), was written to overcome the difficulties encountered in the implementation of the proposed approach. Goldratt's work (Cox III & Schleier Jr., 2010, pp. 1137-1144) created the foundations for TOC and supported its evolution over more than thirty years as additional cases and new applications were added to the literature (Barnard, 2009; Budd & Cerveny, 2010; Heron, 2011; Jin, Abdul-Razzak, Elkassabgi, Zhou, & Herrera, 2009; Newbold, 1998; Pass & Ronen, 2003; Polito, Watson, & Vokurka, 2006; Ronen & Pass, 2010; Watson, Blackstone, & Gardiner, 2007).

The core idea of TOC is the existence of constraint(s) in each system represented by the weakest link in the process of achieving profitability. Goldratt classified constraints as physical (materials, machines, people, and demand levels) and non-physical (policy related) (Rahman, 1998), while Watson, Blackstone and Gardiner (2007, p. 391) classified constraints as one of three types:

- Physical (resources, capacity);
- Market (shortage in demand); and
- Policy (formal and informal factors that control the system's productive capacity)

On the other hand, Pass and Ronen (2003, p. 716) classified constraints into these four groups:

- Physical constraints;

- Policy constraints;
- Market constraints; and
- Dummy constraints (these occur when an inexpensive resource is the constraint of the system)

According to Pass and Ronen's classification, a non-physical constraint refers to an environmental or organisational constraint, such as low demand, inefficient management policy, inflexible work rules, inadequate labour skills and poor management. Notably, TOC literature pays little attention to the non-physical constraint of "culture". Constraints can also be classified as internal or external (Collier & Evans, 2009; Ricketts, 2008). Ricketts (2008) argued for a third type of constraint in addition to the internal and external constraints: the interface constraint, which is positioned between service providers and their external suppliers, such as subcontractors, service partners and clients.

The TOC have common requirements to other OM theories, namely, systemic thinking, functional integration, and flatter organisational structure – such aims are similar to other theories of OM such as Just in Time (JIT), Six Sigma (SS), and Lean Manufacturing (LM). However, these programs focus their effort on the operational function in the organisation, while TOC starts from the constraint and identifies it as an opportunity for improvement. Regarding the scope of focus, TOC has a wider focus than other improvement programs because the main interest of this theory is the overall performance and not the suboptimal improvement consequent from addressing non constraints. Cox III et al (2010) discusses how TOC theory avoids many of the dysfunctional area and pitfalls of other previous theories (Cox III & Schleier Jr., 2010).

According to The Theory of Constraints International Certification Organisation Dictionary, the terms *bottleneck* and *constraint* are often mistakenly used interchangeably (Cox III et al., 2012). Bottleneck has a physical nature, for example, the different capacity of a production line's machines which affects the flow of the process. Constraint, on the other hand, is the lack of capacity in the production line. Over time, the concept *constraint* has been used more frequently to allow for broader application of the theory and to overcome the physical nature of the term bottleneck; therefore, *constraint* has become a comprehensive term that covers all kinds of obstacles. In this thesis, I argue for the difference between the two concepts, and

suggest constraints when activated cause bottlenecks, which are events that may or may not be observed. The separation between the concepts of constraints and bottlenecks is consistent with the research philosophy of CR; it places the constraint as a structure and part of a possible mechanism that may interact in the non-observable real domain to generate the event of bottleneck in the actual and the empirical domains. This separation was useful as it enabled the proposal of the concept of the constraint as a mechanism.

According to TOC, apart from family businesses and Not-For-Profit (NFP) Organisations, organisations have only one real goal; that is to make money now and in the future (Noreen, Smith, & Mackey, 1995). For service and NFP organisations, this goal was amended to “increasing the goal units” to achieve stability and sustainable growth (Barnard, 2010; Motwani, Klein, & Harowitz, 1996); collectively these goals cover all possible motivations for the establishment and existence of organisations, and stating the organisational goal is crucial for smooth operations and ongoing development, yet many organisations stray from their real fundamental goal of existence and replace them with “buzzword” goals such as “resources efficiency”, “better quality”, and “increased customer satisfaction”. Usually, organisations use these goals as a means to increase their profits. From a TOC perspective, these distract from the true purpose, and a “focused” approach to identifying the “real” goal is recommended (Goldratt, 2010), most importantly, isolating the barriers that prevent them from achieving the goal (the system’s constraint).

TOC is considered one of the novel methodologies in operations management because it shifts organisations’ focus from cost thinking to throughput thinking as the major criteria for performance. In TOC, performance is measured by increasing throughput (T), reducing inventory (I), which consequently will lead us to controlling operating expenses (OE) and not vice versa. Throughput is the rate at which the organisation generates revenue through sales of their products or services (Goldratt, 1990), while inventory is the organisation’s investment in the things it intends to sell, such as facilities, equipment, raw material, work in process, and finished goods. It also represents all the money tied up in the organisation (Goldratt, 1990). Inventory was recently changed to “investment” and includes things such as equipment, fixtures and buildings owned by the organisation, in addition to its inventory in the form of raw materials, work-in-process and finished goods (Cox III et al., 2012). Operational



expenses are all the direct labour, utilities, supplies, and assets that an organisation utilises to turn inventory (I) into throughput (T) (Goldratt, 1990). The core argument of TOC is that every organisation at one time has at most one or two constraints hindering the achievement of their goal, and proposes a focus on these specific constraint/s for improving performance. Shoemaker and Reid (2005) summarised the three interrelated principles of TOC as:

- Each system has a goal, and to achieve this goal, a set of necessary conditions must be satisfied;
- The overall performance of the system is not the sum of its components' performance; and
- Only a few constraints limit the system's performance at any one time

TOC tools were used in the analysis of the case studies in this thesis, and these are discussed in more detail in the next sections.

### **3.3.1 TOC Premise and Techniques**

TOC changed significantly from being a theoretical management concept to a practical application when it shifted its focus from software application tool "OPT" to a process for continuous improvement. It expanded the scope of change implementation (Mabin & Balderstone 2003, p. 570) with two important recommendations: a systemic approach to the improvement process and consideration of employee behavioural issues. Since TOC rejects the principle of optimising subsystems to bring about optimisation of the whole, a systemic approach infers that the organisation is one holistic system and not comprised of interrelated subsystems. It emphasises the principle of "thinking globally and acting locally", suggesting fewer improvements in the weakest areas will produce positive improvements in overall performance of the entire business. As far as employee behavioural issues are concerned, TOC pays significant attention to communicating change with the employees and for this TOC deploys the Thinking Process (TP) techniques and the Strategy & Tactic tree. According to Noreen, Smith and Mackey (1995), TOC renounces traditional methodologies which focus on improving systems through reducing costs, increasing profits and improving the performance of the subsystems, and considers the production process a cost centre. In contrast, TOC

focuses on three main paradigms: the Thinking Process (TP), throughput world, and logistics (Cox III, Blackstone Jr, & Schleier Jr, 2003, p. 73) with associated tools and techniques designed to control constraints, whether they are physical or non-physical, internal or external, until they no longer have any negative effect on the production process. For this purpose, the next section examines the ideological premise of TOC and the technical methods, mainly the Five Focusing Steps (5FS).

### **3.3.1.1 TOC Ideological Premises**

The following points describe the ideological premise of TOC and the foundation of its techniques:

- The real goal of every business organisation is making money, now and in the future;
- Improving the performance and profitability should follow a sequence of increasing throughput first, minimising inventory levels second, and finally, controlling operating expenses (Noreen et al., 1995).
- The organisation is like a synchronised chain, not interdependently connected subsystems. This implies that the organisation to be viewed as a whole;
- Optimal performance of subsystems will not lead to optimal performance of the whole organisation;
- In every system there is at least one constraint (the weakest link in the chain) that prevents it from reaching its goal (improving performance, mainly profitability);
- The constraint is anything that prevents the organisation from reaching their goal, and this constraint could be physical (resources such as low-capacity machinery and/or shortages of material) or non-physical (policy, behaviour, culture). Constraints can be also internal or external;
- The principle of focus, which is doing only what should be done (Goldratt, 2010) and avoid doing what should not be done, is the cornerstone of TOC for identifying and managing the system's constraint;
- Improving the organisation's position should be viewed in a global perspective;
- Every conflict can be removed
- Every system, no matter how complex it seems, is in fact inherently simple. Inherent simplicity is TOC's approach for looking for deep causes or "reality" (Goldratt & Goldratt-Aslag, 2010), and this principle underpins many of TOC tools and applications, such as the Current Reality Tree (CRT) and Evaporating Clouds (EC). It presupposes every observable phenomenon can be explained

by the defining the assumptions underlying them which make them much simpler to deal with; and

### **3.3.1.2 TOC Technical Premise**

TOC encompasses a group of techniques and methodologies (Davies et al., 2005) specifically developed to manage physical constraints including but not limited to the following: 5 Focusing Steps (5FS), Drum Buffer Rope (DBR) – a “TOC method for scheduling and managing operations when there is an internal resource constraint” (Cox III et al., 2012, p. 46)); and Buffer Management (BM)– a systemic approach for managing and controlling constraints. These steps represent the first stage of managing a constraint and can be applied to a certain function within the organisation or to an entire organisation or supply chain (Barnard, n.d). 5FS aims to maximise system improvement and encourage a process of ongoing improvement. The five Focusing Steps are:

1. Identify the constraint;
2. Exploit or get the most out of the constraint without extensive investment;
3. Subordinate all other areas to address and break the constraint;
4. Elevate or allocate resources to break the constraint and make other change to break the constraint; and
5. Go back to the first step to avoid inertia.

TOC recommends using the five Focusing Steps (5FS) for managing one constraint at a time to create a continuous improvement culture. The power of this technique lies not only in identifying the constraints, but also strengthens the constraint point to the level where the constraint can no longer limit the system performance (Pegels & Watrous, 2005). For service and NFP organisations, the 5FS were adjusted by Pass and Ronen (2003) to seven steps by adding two steps: a) state the organisational goal; and b) define global performance measures. Including these two steps breaks the constraint early on in the process and avoids elevation or investment in additional resources to remove the constraint.

Goldratt and other TOC scholars have explored adding new techniques to improve existing TOC tools (Mabin & Davies, 2010) and closing the gaps identified in practice. These additions include the Thinking Process, the Strategy and Tactic (S&T) tree, Process of Ongoing Improvement (POOGI), and TOC for Professional,

Scientific, Technology and Service (PSTS) organisations, all of which have significantly enhanced the theory and its outcomes. A recent development has been the creation of web apps of Evaporating Clouds (<http://evaporatingclouds.com/>) enforced by technology development (Andersen, Gupta, & Gupta, 2013).

Regardless of the area of improvement or the type of organisation involved, TOC facilitates the change process by providing tools for focusing on general principles rather than specific areas of change. However, a specific tool for implementing quality programs is still lacking, despite its attractiveness for organisations today.

### **3.3.2 TOC in Not-For-Profit and Service Organisations**

The existing literature makes several references to a specific TOC approach for service and NFP organisations. Eliyahu Goldratt recognised the differences in goals and strategies for service organisations, family businesses and NFP organisations. For example, NFP organisations are more likely to focus on a mission like “humanitarianism” instead of increasing business goals. For organisations such as those under study in this thesis, their goals are connected to what they do, and it is, therefore, necessary to review TOC within this context.

Service organisations are labour intensive, making it difficult to identify constraints, and are also more likely to experience permanent bottlenecks with IT resources because they require high levels of IT capability as a core part of their operations (Ronen & Pass, 2010). Service businesses either provide services for profit, like healthcare, tourism, and private education; or services for humanity and community development, such as government agencies, and the Red Cross and public education. Some also provide professional or specialised services, like scientific laboratories, information technology services, and research companies. Organisations with a higher level of customisation were classified by Ricketts (2008, 2010) as Professional, Scientific, and Technical Service (PSTS) organisations, which, despite producing tangible products possess almost the same characteristics as service organisations. For example, the outcome from service and NFP organisations are relatively customised, in many instances require the customer to be a part of the operating process, and generally speaking, cannot be made in advance or stored as inventory. It is for these reasons that TOC performance measures were adjusted to suit the nature of these organisations. Accordingly, Ronen and Pass (2010) concluded

improving performance in service organisations depends on increasing sales throughput, increasing information technology (IT) throughput, and reducing lead times rather than operating expenses (OE). In addition, these authors included Lead Time (LT), Quality (Q), and Due-Date Performance (DDP) as performance measures in service and NFP organisations.

Service organisations predominantly face two types of constraints: sales and marketing, and IT (Pass & Ronen, 2003; Ronen & Pass, 2010). Pass and Ronen (2003) recommended TOC targets these as “permanent constraints” in service and NFP organisations, proposing a focus on reducing non-production time (efficiency) and directing the process to the most valuable services (effectiveness); bridging between manufacturing and customising/designing solutions is underdeveloped. The next section outlines the Thinking Process trees in more detail, how to construct them and their functions.

### **3.4 TOC Thinking Process (TP)**

To deal with non-physical constraints Goldratt developed a problem-solving technique called the Thinking Process (TP). Although originally designed to overcome non-physical constraints it has also been applied to physical constraints. TP tools were initially designed to lead the improvement process by determining the responsibility of each part of the system for achieving the overall goal, in other words, who is doing what and why. The original set of TP tool encompasses three questions that fulfil the requirements of all the different stages of the improvement process:

- What to change? Identifying the weakest link in the system;
- What to change to? Aimed at designing a stronger link that will allow the system to eliminate the weakest link; and
- How to cause the change? Designed to operationalise the stronger link in the solution chain.

To answer the above three questions, Goldratt proposed the Socratic method of self-discovery. In his book, *It's Not Luck* (1994), he suggested deploying five “trees” for empowering management with a clearer vision of what exactly needs to be done and why. The TP trees are constructed on the basis of either sufficient logic or necessary logic (Cheng, 2010). Necessary logic follows the principle that “every action taken is forced by an underlying need” and the cause-and-effect relationship

depends on meeting minimum requirements. The narrative of necessary logic is “in order to...we must...because...”

On the other hand, sufficiency logic provides an understanding of the consequences of actions and improves half-mature ideas. The cause-and-effect relationship of this logic depends on sufficiency and reads as: “if...and if...then....because” (Cheng, 2010). The TP trees empower management and clarify the vision of exactly what needs to be done and why. The process involves a series of logical tools used in sequence or separately as standalone instruments (Choe & Herman, 2004). These trees are listed below (Mabin & Davies, 2010, p. 634):

- Current Reality Tree (CRT): the first tree was designed to answer the question “what to change?” The CRT is a sufficient-based logic tree effective for identifying non-physical constraints (policy constraints);
- Evaporating Clouds (EC): uses necessity-based logic (in order to...we must...) to articulate the problem as a conflict and reveal, then resolve the root causes of the problem/s identified in the CRT;
- The Future Reality Tree (FRT): a “what-if” exercise that identifies the possibilities to reach the desirable outcomes by aligning these outcomes with possible solutions and analyses the organisation’s ability to reach the goal;
- The Prerequisite Tree (PRT): builds on the FRT by a team often to identify the obstacles preventing the organisation from attaining its goal; and
- The Transition Tree (TRT): outlines the tree define the necessary and sufficient tasks and activities necessary to overcome the constraints and achieve the goal (step-by-step implementation plan).

In 2002, Goldratt developed a further addition called the “Strategy and Tactic Tree” (S&T) to answer the question: “how to cause the change?”. The S&T tree is a communication tool that facilitates and encourages collaboration and co-ownership of the improvement process among participants (Choe & Herman, 2004). It specifically targets resistance and high expectations (Barnard, 2009) and is a powerful catalyst for transforming disharmony to harmony with its functions of formulation, communication, validation and auditing change (Barnard, 2010, 2012).

Moreover, this tree gives a clear understanding of the role of every part of the organisation in the improvement process (Barnard, n.d). In addition to the TP questions, the S&T tree also answers the question:

- What not to change and how to implement the changes and why? (Barnard, 2013).

The above question places specific boundaries around the change process and forms part of the systemic implementation. The S&T tree allows managers to assess the value of the proposed changes, and most importantly, identify what not to change so as to maintain a focus on a specific goal. It not only provides guidelines for how to think, but also indicates how and where to start implementation by simplifying some of the most difficult steps.

Mabin (1990) described the TOC Thinking Process as “a suite of logic trees that provide a roadmap for change” (p. 1). According to Mabin, the trees guide users through a detailed process of making decisions including problem structuring, problem identification, solution building, defining the barriers to be overcome, and how to implement the solution. These processes require focused brainstorming of the relevant stakeholders to construct TP trees, which was not applicable in the cases of this thesis.

In the next section the CRT, EC, and FRT are discussed in more detail since they were used in the analysis of the two case studies to describe the circumstances in organisations A and B. The Intermediate Objective (IO) Map, another tool in the TP family used in the case study of organisation C, is also introduced and reviewed. The (IO) Map plots the goal of the organisation and identifies the conditions necessary to achieve that goal, this map usually results from the PRT. Recently, Dettmer (2007b, 2011) has switched to describing it as the Goal Tree. It is recommended to build the Goal Tree prior to the S&T tree, if the S&T tree constructed without other TP tools (Lowe, 2015).

### **3.4.1 Current Reality Tree (CRT)**

The CRT is the first step in answering the question: what to change? It follows sufficiency logic (“if... then”) and shows the existing situation in a map format to logically connect the undesirable symptoms (problems, challenges or issues) within

the organisation. It describes the cause-and-effect relationships between these entities as a diagrammatic representation of the current reality (Dunbar, 2013a; Scheinkopf, 2010); helps to define what to change, and highlights the areas that need to be focused on (Scheinkopf, 2010). At this stage, it may not be obvious what the system is, its purpose, its scope or what is constraining its performance. Consequently, a Current Reality Tree (CRT) is developed when there is a lack of consensus on the problem, or when there is a lack of confidence in the quality of the analysis that led to the construction of the core conflict (Lepore & Cohen, 1999).

TOC is based on the belief that logically connecting the undesirable effects (UDEs) (Dunbar, 2013a) will eventually lead to their root causes. UDEs can be defined as the negative aspects of the current reality relative to the organisation's goal or necessary conditions. Constructing a CRT involves asking questions about the reasons for UDEs until the root causes are uncovered; it connects the UDEs to the intermediate effects, preconditions and actions that created them. An intermediate effect is neither negative nor positive, but the result of other causes. Nor are preconditions negative or positive; they exist because of the larger context in which the system operates and exert significant influence. Action is the result of something under one's control, and once again, it is neither a negative nor a positive entity (McNally, 2011).

Linking entities must be validated by rules of logic or what is called the Category of Legitimate Reservation (CLR), developed by Goldratt (Scheinkopf, 2010). CLR is a protocol for identifying and challenging the existing cause-and-effect thinking and logic (Mabin & Davies, 2010), and is defined by the TOC Dictionary (Cox III et al., 2012) as "the rules for scrutinizing the validity and logical soundness of thinking processes logic diagrams" (p. 20). The function of CLR is to verify the accuracy of the Thinking Process diagrams and to improve communication during the construction and checking of the TP trees. It is recommended for identifying errors in the constructed tool relating to entities in the logic diagram (Dunbar, 2013a; Scheinkopf, 2010) and consists of seven logical reservations in three different levels:

- Level I: clarity reservation;
- Level II: causality existence and entity existence reservation; and
- Level III: cause insufficiency, additional cause, predicted effect existence, cause-effect reversal or tautology reservations



Level I is aimed at understanding the causes and their connections, including wording the entities to reflect what they really mean and how they are being used. Level II determines whether the entity and the causal relationship really exist by validating the entities and their connections to one another. Level III proposes improvement in the supporting logic underpins TP tools diagrams by adding or changing the wording to include missing conditions or entities (Cox III et al., 2012). These three levels of CLR provide depth and logical validation for the TP analysis.

It is important to discuss in further details the two methods of constructing CRT. The first method is the traditional method that starts by defining the UDEs, and this is the method that I used to construct the CRT for organisations A and B. The second method is the 3 clouds method, which is a method for developing conflict clouds but it would result in the Communicated Current Reality Tree (CCRT). The choice of the method depends mainly on the purpose and the circumstances at the time of building the CRT. For example, the traditional method is suitable when there is a lack of information about the problem; it commences by defining and listing the undesirable effects and linking them logically to define the real problem. However, if a sound knowledge of the problem and the undesirable effects were available, then the 3 clouds method can be used. The 3 Cloud Method has been described as a Socratic tool that can be constructed for determining the core conflict and building consensus amongst different members of the group (Youngman, 2015). This method starts off by designing the conflict clouds for any three UDEs (some say the first three) that address the general problem and combines them with their underlying assumptions, and their logical prerequisites and requirements. This resulting tree CCRT does not replace the Current Reality Tree in determining the core conflict. The underlying assumption of the 3 Clouds Method is that there is a deeper generic conflict generating each cloud and the conflict can be explained by the assumptions underlying each arrow. After linking the selected 3 clouds, and transferring the necessity-based logic of the conflict clouds to sufficiency-based logic... 'as in the CRT' by turning the arrows to read: if objective and assumptions (since we already know the assumptions behind the conflict), then requirement; additional assumptions are required to transfer the sufficiency-based logic to causal logic (Dunbar, 2013a). The CCRT needs to be developed using the undesirable effects that constructed the clouds, and the prerequisites of the linked conflicts. However, if CRT has already

been constructed it needs to be tied back with cause–effect to the prerequisites. In this case, the purpose of the tool changes from analysis to informing.

The purpose of conducting CRT in this thesis is analysis rather than to inform management. Due to the lack of knowledge about the problem in organisation A and B, the traditional method of constructing CRT has been used in this thesis.

CRT is a tool that investigates specific problems starting at the level of observable outcomes (UDEs) and aims to define the reality of what is observed. A well-constructed CRT will reveal the causes of these UDEs, and more importantly, by defining the sphere of influence and the span of control, will identify the most needed improvement and the how and where. Similarly, Dunbar (2013a) suggested it is necessary to identify the “terrain of change: where the change is needed and required” as well as the “sphere of influence” after completing the CRT. The terrain of change is anticipated to also imply span of control, since that it is where the organisation has control and can make changes.

### **3.4.2 Conflict Clouds (CC) and Evaporating Clouds (EC)**

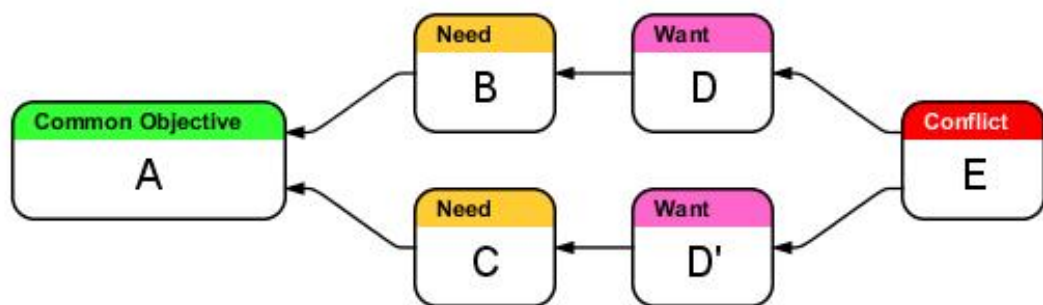
The peak efficiency of knowledge and strategy is to make conflict unnecessary.

(Sun Tuz cited in Scheinkopf, (2010)).

In TOC TP literature, the natural sequence of the analysis processes is to construct the conflict clouds and expose the assumptions behind the conflict after constructing the CRT. Dunbar (2013a) suggested it is necessary to identify the “terrain of change: where the change is needed and required” and the “sphere of influence” after completing the CRT. Usually, the root causes will be in the terrain of change which has the entity(s) that caused the majority of the outcomes – according to the principle that the source of approximately 70% of the UDEs were caused by only one or two causes. Dunbar defined the terrain of change as those areas where change, when implemented, will have the highest impact and overcome as many UDEs as possible, and turn UDEs to desirable effects. The sphere of influence, however, is a determination of the areas under management control where changes can be made.

Evaporating Clouds (EC) is part of the process of answering the question of what to change and begins with a construction of Conflict Clouds (CC) or a conflict diagram to evaporate these conflicts. The TOC dictionary defines EC as “a necessity-based logic diagram that describes conflicts and helps identify erroneous assumptions and resolve conflicts in a win-win manner” (Cox III et al., 2012, p. 51). It is designed to precisely identify a problem for the purpose of identifying a solution (Barnard, 2010) and verbalises the problem as a conflict (Scheinkopf, 2010) by means of understanding the conditions (underlying assumptions) that create the conflict, mainly the underlying erroneous assumptions. By defining these assumptions, EC can identify the few changes needed to “evaporate” the core conflict or all conflicts.

Conflict clouds are considered to be the foundation of the TOC TP due to their role in defining the system’s conflict (Cohen, 2010). The basic structure of a cloud is a five-box conflict frame; however, and as shown in Figure 3.1 below, a six box has been added to clearly state the conflict. Entity A is the system objective that requires two entities, B and C, as necessary conditions that need to be met to achieve the system’s objective (A). In order to attain the necessary conditions (B and C), two actions, D and D’ must be fulfilled. These are in conflict (E) and cannot coexist simultaneously.



**Figure 3-1 A Model of Evaporating Clouds (EC)**

Constructing a conflict cloud can begin from any entity if it is clear and known. It most often starts from the conflict between two actions that cannot co-exist simultaneously. It also could begin from the necessary conditions (B and C). Accordingly, Fedurko (2013b) argued different cloud types require different building sequences. For example, a cloud can be constructed to solve or evaporate day-to-day

conflict or organisational interest conflict, and can also be constructed for evaporating the inner dilemmas conflict, fire-fighting or the UDE clouds (Cohen, 2010; Fedurko, 2013b).

Three approaches are discussed in Scheinkopf (2010) as methods for constructing CCs: The Snowflake Method, the 3 Clouds Method, and the UDEs clouds and generic cloud method. However, these methods are more relevant for constructing the CRT than building the conflict clouds, an aspect not clearly demonstrated in the literature of the conflict clouds. For example, the outcomes of the Snowflake Method and the 3 Cloud method result in CCRT and CRT, though the process of constructing these CRTs involves building to understand the CC of the systems.

The traditional snowflake method summarises the core problem resulting from the CRT. It is usually constructed after the CRT and it results in a better understanding of the conflict that is preventing harmony in the system (Scheinkopf, 2010). Snowflake consists of six steps, starting with choosing an area that matters and needs to be understood in order to improve. Two criteria are necessary: a) deep personal interest and b) having experience of it. The next step is to list between six and twelve UDEs related to this area. The third step is to connect these UDEs based on the cause-and-effect map. Constructor “intuition” is an important factor in this step (Scheinkopf, 2010) and results in a tree that logically connects all the UDEs. The following step involves checking the validity and accuracy of the tree and whether it depicts the whole story, and, if not, amending it and removing the UDEs that are not really UDEs and adding the real UDEs. This is followed by checking for the entities that cause the issue, either by choosing the cause that is the source of at least 70% of the UDEs in the tree, or a group of causes that collectively cause a majority of the UDEs. If this not possible, the EC can still be constructed according to the CRT. The final and sixth step is to construct the EC to highlight the core conflict of the system in one of two ways: a) by summarising the CRT, or b) by representing the core problem defined in CRT as D and its opposite as D’, then setting the goal of the system as A, and identifying B and C based on an understanding of the system. This method of constructing EC was not mentioned in the TOC dictionary (Cox III et al., 2012) as a technique for resolving conflicts.

The second method is the 3 Clouds Method or “consolidated cloud approach” according to the TOC 2<sup>nd</sup> Ed. dictionary (Cox III et al., 2012). It starts with the same two steps of the previous method (define the issue that matters and select six to twelve UDEs). In step three, 3 UDEs not connected by a cause-and-effect relationship and chosen from different aspects are chosen to construct the clouds. From these three clouds, a generic cloud is constructed in step four. Scheinkopf (2010) suggests connecting the three UDEs’ clouds and the generic cloud for constructing the CRT in step 5 to facilitate communication of the current reality tree (CCRT) with management and show UDEs as outcomes of a systemic conflict rather than the result of individuals’ actions or attitudes (Cox III et al., 2012). These methods are more relevant for constructing the CRT than building the conflict clouds, which was not clearly demonstrated in the literature of the conflict clouds.

In the analysis of my case studies, I used the third method of the UDEs clouds and the generic cloud, since this technique has been used effectively to define the core conflict when the problem is not known. For example, Mabin et al. (2011) used this approach to identify the core conflict of a large health system. Without clearly defining the problem, the proposed solution will be ineffective and will create resistance (Dunbar, 2013a). This method has much similarity to the 3 Clouds method, but results in different outcomes. The processes of constructing the UDEs’ CCs and defining the CCC to evaporate the conflict are completed by exposing the assumptions underlying the relationships between the entities and revealing the false assumptions that created the conflict. This is followed by proposing possible injections (see chapter five, the Organisation A and B case studies) to break the core conflict, eliminate the UDEs and close the gap without creating other UDEs (Dunbar, 2013a).

### **3.4.3 Future Reality Tree**

The Future Reality Tree (FRT) is defined by the TOC dictionary (Cox III et al., 2012) as “a thinking process sufficiency-based diagram that facilitates answering the question ‘what to change to?’ by presenting a sequence of cause-and-effect relationships that links proposed injections to attain desired effects” (p. 59). To begin the FRT uses the optimal solution (injections) i.e. the outcome of the previous TP tool (EC), to build upwards to a set of Desirable Effects (DE). It is important that the

FRT is constructed prior to implementing any changes since it will logically verify the proposed injections that will lead the organisation to its goal, and at the same time avoid the Negative Branches (NBs) that might result from implementing the proposed injections (Dettmer, 2010). The FRT predicts the impact of the proposed changes in order to avoid potential negative outcomes (Negative Branches, NBs), maximise the chances of success and attain the desired outcomes. It is important to identify NBs, the predicted undesirable outcomes of implementation, upfront of implementation and indicate how the organisation will overcome these issues. It is also necessary to state the assumptions behind these negative branches for proposing injections that will not create other UDEs. This is known as “trimming the negative branches” and represents a proactive approach (McNally, 2011) to predicting the effects of the proposed changes in order to increase the likelihood of success, and at the same time, reduce the risks associated with this solution. In other words, it is a mapping exercise of the required changes and the possible resulting scenarios. The goal of FRT is to attain as many desirable effects as possible and move the organisation towards its goal by implementing only a few solutions, also ensuring that all the gaps/UDEs will be overcome on the condition that no new problems (or UDEs) are created. However, if too many injections/solutions are enforced to attain the desirable effect it is likely that the CRT did not sufficiently identify the core problem (Cox III & Schleier Jr., 2010).

According to the sequence of the TP trees, the FRT is followed by the Prerequisite Tree (PRT) and the Transition Tree (TRT). However, the advent of the S&T tree created opportunities for using it immediately after the FRT. PRT and TRT can still be utilised by organisations to establish collective buy-in and support for change implementation (Mabin & Davies, 2010).

The Strategy and Tactic (S&T) tree is discussed in Chapter 7. The next section discusses the Goal Tree/Intermediate Objective (IO) Map, which is a tool used as a means for “establishing the benchmark of required performance for whatever system is the subject of a thinking process analysis. The Goal Tree helps users establish . . . the standards by which success or failure of any system are measured” (Dettmer, 2007a, p. 1). This tool has been used as part of the analysis of organisation C.

#### **3.4.4 The Goal Tree/ Intermediate Objectives (IO) Map**

Lowe (2015) recommended TOC practitioners develop an IO Map or a Goal Tree prior to constructing a S&T tree in order to clarify two issues: the overall goal of the organisation and how the organisation can achieve its goal. The Goal Tree is a TOC approach for developing and applying strategy (Dettmer, 2007a, 2010). It is a necessity-based logic diagram, consisting of injections, intermediate objectives and a final goal (Cox III et al., 2012). According to Dettmer, a Goal Tree delineates the activities and outcomes required to achieve the system's goal, regardless of what is currently occurring. Cohen (2010) defined the IO map as a plan that determines the sequence for achieving the Intermediate Objectives (IOs) (IOs) in the implementation of injections. It provides a consensus or "unified vision" for all parties regarding where the organisation is heading and what is required to get there, and it also limits UDEs to those that are limiting goal performance.

In analysing organisation C, a Goal Tree was constructed prior to constructing the S&T tree in order to provide clarity of purpose for the management and staff. Unlike organisations A and B, defining the organisational goal and the UDEs in Organisation C was a straightforward process. In addition, using the S&T tree in isolation of other TP tools for analysing organisation C necessitated having Goal Tree for this organisation.

### **3.5 Why TOC?**

The choice of TOC was initially motivated by the interest of my supervisors. Over time, I developed the required understanding of this theory to realise its potential for defining and explaining the observed QAP outcomes. The availability of a local expert, Gordon Dunbar, who offered invaluable support by reviewing all TOC outputs, also encouraged use of this theory.

During the initial study in organisation A, I came to realise that poor outcomes were related to unclear and incorrect goals. TOC has a strong focus on the importance of a clear purpose and thus seemed a sensible choice and as the study developed, the power of its arguments became more apparent. Over time, I developed the required understanding of this theory to realise its potential for defining and explaining the observed QAP outcomes. The availability of a local expert, Gordon Dunbar, who

offered invaluable support by reviewing all TOC outputs, also encouraged use of this theory.

The CR grounding also prompted the use of TOC since CR provides no real methodological assistance on how to derive the mechanisms for explanation; it suggests abduction without any primary supporting theory, the search for a useful tool lead to the usage of TOC thinking processes for defining important mechanisms.

TOC has become well known for its successful application stories in a large number of organisations across different fields ( Mabin & Balderstone, 1999; 2003), where it made a significant impact on operational and financial performance (For more see (Barnard & Immelman, 2010; Mabin & Balderstone, 1999; Noreen et al., 1995). The theory has assisted many organisations to not only to survive, but also transform themselves into successful enterprises and achieve a competitive advantage (Mabin & Balderstone, 1999).

The purpose of using the S&T tree in organization C was the recognition that the main issue with the research centre was related to implementation. This was also true to a limited extent for the other organizations. It is argued that the creation of the S&T tree can be a powerful success mechanism for ISO by ensuring that the goal of the ISO accreditation is in line with the organisational goal. The S&T tree can be used to operationalise the strategic choices of Treacy and Wiersema (1993) for leading the market.

Other theories and improvement approaches in organisational management, such as Just in Time (JIT), Six Sigma (SS), and Lean Manufacturing (LM), have requirements in common with TOC, namely: systemic thinking, functional integration and flatter organisational structures (Gupta & Boyd, 2008). In fact, some of the OM methodologies have been considered as a complement to one another; for instance, Noreen et al. (1995) considered TOC as the ideal complement for Total Quality Management (TQM) practices since this approach focuses on almost every aspect within the organisation without a special consideration for the constraint of the system. Unlike SS and LM, TOC is distinctive from other approaches in that it does not need to be specifically applied to the operations of an organisation because the starting point of TOC is the constraint, which is identified as an opportunity for improvement. Regarding the scope of focus, TOC also has a wider focus than other



improvement programs since the main interest of this theory is the overall performance rather than suboptimal improvement. For example, adding TOC's focus -system wide scope - to lean and SS produced 4 times better results (Pirasteh, 2007a, 2007b).

It is evident from the development of the literature related to OM and Management theories that there is no single solution for the issue of improving organisational performance – the problem is best approached with a combination of solutions (methodologies and techniques). TOC as a problem solving approach with multi-methodologies meets this criterion by combining practical implementation with strategic thinking in the form of a management philosophy (Watson et al., 2007) that merges global performance, logistics systems and thinking processes. TOC's multi-methodologies unify hard and soft approaches for all levels and activities within the organisation (Davies et al., 2005). Moreover, it has the ability to redirect an organisation and set proper goals for implementation with checkpoints throughout the process.

The following success story is provided as an example of TOC's potential. It involves the case of "First Solar Inc." (Barnard & Immelman, 2010, pp. 485-489). TOC was deployed to manage and control different types of constraints and enable the organisation to attain its goals. In 1994, Harold McMaster started a company with 54 investors producing solar panels. His dream was to produce 2000 square miles of high quality solar panels in the Arizona desert to satisfy the needs of the entire United States for light and heat. This private company aimed to create a demand and find new markets for an unknown product (at that time), such as solar refrigeration and power water pumping, but encountered great difficulties and high employee turnover. In 2003 the company's fortunes changed when a new owner, Mike Ahearn, realised its potential. He started with the difficult task of "hiring and firing" to build his management team, who subsequently applied different methodologies for different purposes. First, they applied Taguchi's quality method to create the proper commitment. Then Six Sigma was introduced to reduce process variation, and finally, the management team used TOC to increase throughput and support the company's main objective: creating market demand by controlling a market constraint. Ahearn applied three general rules and mechanisms to achieve the company's goal. The first mechanism was to set clear, measurable, challenging goals. The second mechanism

was to identify the constraints preventing the company from its goal, and the third mechanism was to promote the culture of excellence. First Solar Inc. then adopted the TOC throughput orientation, including educating senior employees who had been with TOC for over six years. Using these mechanisms resulted in:

- Capacity growth from 25MW in 2005 to 1000MW in 2009;
- 90% improvement in resources utilisation;
- An almost 10-fold growth in net profits in 2009; and
- Company's recognition on Wall Street.

It is evident that TOC has the ability to reveal the deep causes of given outcomes with effective tools, as well as having the potential and flexibility for use and integration with other theories.

### **3.6 Summary**

TOC tools have been used as the main tool for analysing the three case studies on different level in each case. For example, analysing Organisations A and B commenced by designing the CRTs using the inputs of the explorative interviews conducted with the staff in both organisations. Then, the CCs were defined for the purpose of evaporating the inherent causal conflicts defined by the CRT. To provide an understanding of how the future might look, the FRT was constructed for the two organisations, and to clearly define how growth and improvement can be achieved the S&T trees were designed for both organisations. These S&T trees aimed to link the quality programs in both organisations to achieving one or more of Treacy & Wiersema's (1993) strategic choices.

Using the S&T tree for achieving Treacy & Wiersema's (1993) strategic choices in organisations A and B promoted the idea of conducting the case of organisation C, where the S&T tree was used as stand-alone tool to plan the improvement and growth of the organisation. Building the S&T trees in stages defined the causes of them not meeting their goals and shed light on the mechanism of not defining the tactics as an important mechanism that can explain the unsatisfactory outcomes of this organisation.

Using structured-case as the research method provided the required autonomy for selecting case studies according to the outcomes of the analyses and the advancement of knowledge.

# Chapter 4      **Generative Mechanisms and the Theory of Constraints**

## **4.1      Introduction**

This thesis is about explaining poor outcomes from quality assurance programs such as ISO. This involves providing an explanation for the observed poor performance through a description of the deep mechanisms behind such outcomes. In this chapter, I provide a theoretical foundation for the concept of mechanisms and propose that mechanisms grounded in TOC theory are able to explain such outcomes.

First, a background of the concept of mechanisms is presented, including the development of the concept. The chapter then goes on to define what a mechanism is and what is not, thereby defining the boundaries of the concept. Next, the use of mechanisms in different approaches, including social science, is outlined, followed by the TOC-based proposed mechanisms. It is suggested that these mechanisms have the capacity to explain the poor outcomes from the quality assurance programs examined. Finally, the chapter describes TOC factors that need to be considered necessary conditions for any organisation to achieve successful implementation of improvement programs

This chapter is significant because it provides the foundation for the first research question in the mechanism category: “What are the key mechanisms that drive successful QAP implementation in the examined organisations?”

## **4.2      The Critical Realist View on Mechanisms**

In the seventeenth century, the term “mechanism” emerged to explain phenomena in the natural world such as the motion of planets, tides, properties of light and the motion of blood (Craver & Tabery, 2016). Over time, the concept has transformed to reflect an evolving understanding of causal forces in the universe.

Theories founded in positivism and empiricism identify causality as synonymous with regularity between events. So if event X and event Y are regularly conjoined, it is presumed that one causes the other. Such reasoning inherently limit representations

of causal processes (Mayntz, 2004) by its suggestion that correlation reflects causation. This focus on empirical regularities perceived to describe causal connections: “causal conclusions are based on observations of how something is relatedly followed by something else in time, that is to say universal/law-like regularities between events” (Danermark et al., 2002, p. 106). As Martin (2009) suggests “Bhaskar rejects this notion of causality and argues that the concept of causal powers is more consistent with the ontology of the natural and social world. He argues that the real basis of causality lies in the independence of the generative mechanisms from the events they generate and that mechanisms endure when not acting” (Martin, 2009, p. 303).

In order to validate the use of TOC suggested mechanisms, it is necessary to first define the concept and boundaries of “mechanism” as they apply to this research.

### **4.3 Definitions of Mechanisms**

Mechanisms exist in different forms; however, most are not exclusively mechanical since the principles activating these mechanisms can range from physical and chemical processes to psychological and social processes. Mechanisms are typically advocated by sociologists and philosophers and those who oppose the dominant tradition of statistical correlation or multivariate analysis in quantitative research (Mayntz, 2004). Mechanisms exist in thermo–mechanical, chemical, biological, ecological and social forms. In these contexts, the definition of a mechanism is consistent with the dictionary definition as a piece of machinery, such as the “workings” of a watch, but at variance with the meaning of the word “mechanism” as a process in a system when it refers to a technological operation intended to force a system to change in a prescribed way (Bunge, 2004, p. 183). For example, natural selection, “the process that results in the adaptation of an organism to its environment by means of selectively reproducing changes in its genetic constitution” (Williams, 1996), was the first causal-mechanistic account of the existence of adaptations in nature - the mechanism that Charles Darwin and other biologists in the nineteenth and early twentieth century provided (Barndon, 2014).

Mayntz (2004) asserts that mechanisms are not covering-law models but law-like propositions since they do not provide understanding or offer explanations based on

nomological deduction –deduction from scientific laws. In the social sciences, covering-law explanations are referred to as black-box explanations; they give no clue as to why the relationship exists in the first place (Mayntz, 2004). Mechanisms are perceived as regularities of less scope than laws, “plausible only when the terms “law” and “lawful” refer to propositions of near-universal applicability” (Mayntz, 2004, p. 240). The law-like proposition (if A, then B) does not require universal laws but might include *ceteris paribus* – the more common English translation reads “all other things being equal” – clauses that restrict the applicability of these law-like mechanisms in time and space. However, this argument neglects the varying degrees of abstraction or generality of mechanism statements. The difference between mechanisms and covering laws is not so much related to the fact that mechanisms are less general, but rather that laws define causal factors, not processes (Mayntz, 2004). Machamer, Darden, and Crave (2000) defined mechanisms as follows:

Entities and activities are organised such that they are productive of regular changes from start or set-up to finish or termination conditions . . . mechanisms are composed of both entities (with their properties) and activities. Activities are the producers of change. Entities are the things that engage in activities (p. 3).

Mahoney (2003) categorised mechanisms into four groups:

- Mechanism as a cause of an outcome
- Mechanism as a form of intervening variable, process, or event
- Mechanism as an underspecified causal process
- Mechanism as an unobserved entity which generates outcomes

In the first group, mechanisms are causes or processes that produce outcomes. Mahoney cited Elster’s (1998) definition of mechanisms as “nuts and bolts, cogs and wheels – that can be used to explain quite complex social phenomena” and Tilly’s definition as “events that alter relations among some specified set of elements” (Mahoney, 2003, p. 10). According to Mayntz (2004), the (the context, mechanism, outcome relationship – CMO) formula of Pawson and Tilly (1997) can be understood in the same way (mechanisms as processes), in that the causal link provided by mechanisms in this formula proposes an alternative to correlation analysis.

Pawson and Tilly (1997) distinguished between two types of mechanisms: those built into the program design known as “program measures”, and “social mechanisms” that constitute the context within which the program operates. They

argued the importance of understanding the theory underlying the program design in order to identify under what conditions the program might work, for whom, and in what circumstance. For example, the theory underlying the ISO accreditation is that the assurance provides confidence to organisation and their customers. This assurance is built through evidenced and detailed documentation processes of their tasks and procedures.

From the perspective of Pawson and Tilley (1997), both actors and programs are rooted in social reality, and in this sense mechanisms are as relevant as individuals (Marchal et al., 2012, p. 195). In their detailed process of realistic evaluation therefore, mechanisms can be defined as underlying entities, processes, or (social) structures which operate in particular contexts to generate outcomes of interest (Wong, Greenhalgh, Westhorp, & Pawson, 2012).

Like Astbury and Leeuw (2010), social programs and realistic evaluation (RE) view mechanisms as a process. Hence, they are not activities or variables but explain how and why things happen within the program's activities and how variables are related. Astbury and Leeuw attributed three general characteristics to mechanisms:

- They are underlying and possibly unobservable, therefore to explain the program's outcomes one cannot rely on repeated observations; instead, the investigation should go beyond the empirical domain;
- They are sensitive to variations in context; and
- They generate outcomes.

Astbury and Leeuw (2010) described the important role for mechanisms in social programs and concluded they can explain "...how and why programs work (or fail to work) in different contexts and for different program stakeholders. This is where the explicit use of mechanisms can play an important role in assisting theory-oriented evaluators to articulate more precisely the causal linkages between programs and their desired effects" (Astbury & Leeuw, 2010, p. 364) also see (Pawson, 2006; Pawson & Tilley, 1997).

In the second of Mahoney's (2003) four categories, mechanisms take the form of intervening variables, processes and events, and explain the power of independent variables to influence (as a causal effect) other dependent variables. In this group, the

differentiation between an independent variable and a mechanism is arbitrary, since a mechanism is identified and analysed as a statistical association.

In the third group, mechanisms are considered “underspecified causal propositions that can be applied to a fairly wide range of cases” (Mahoney, 2003, p. 4). In this context, mechanisms identify cause-and-effect relationships by referencing the non-observed analytical constructs. While they identify the probabilistic relationship between underspecified independent and dependent variables, they fail to explain the reasons why. In other words, even though these underspecified causal propositions (mechanisms) do not have empirical content, they nevertheless derive empirical hypotheses.

The fourth definition of mechanisms is based on realist philosophy, where mechanisms are “unobserved entities, processes or structures that act as an ultimate cause in generating outcomes. An ‘ultimate cause’ is a cause that does not require explanation but nevertheless can generate outcomes” (Mahoney, 2003, p. 4). In this circumstance, mechanisms are unobservable entities, structures, powers and processes that generate outcomes in the form of either events or relationships between variables (e.g. economic growth is positively associated with democracy), thereby overcoming the black box problem of merely viewing a system in terms of its inputs and outputs without any knowledge of its internal workings. The definition of mechanisms in the latter (fourth) group is the definition adopted in this thesis and is best described by Bhaskar’s (1998) definition:

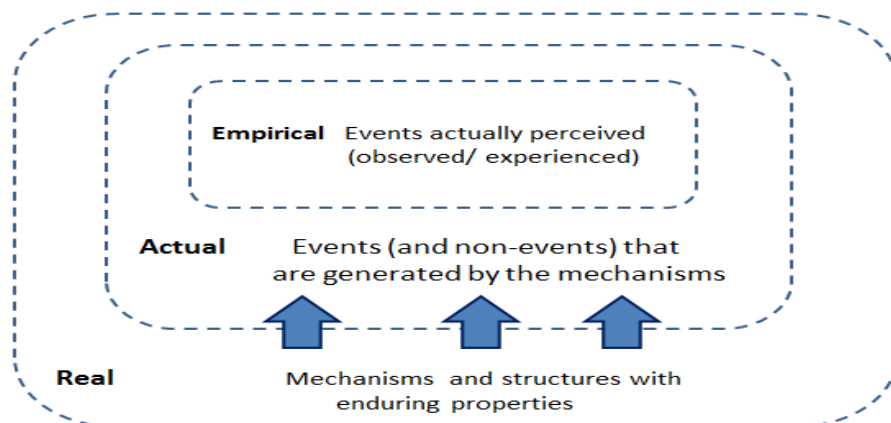
Control of something like logic of analogy and metaphor, of a mechanism, which if it were to exist and act in the postulated way, would account for the phenomenon in question . . . Natural mechanisms are of course nothing other than the powers of ways of acting of things (Bhaskar, 1998, pp. 13, 193).

Realism introduced the concept of mechanisms to provide an explanation for social phenomena and understand the relationship between the context in which events occur and the outcomes of these events. According to Pawson, Greenhalgh, Harvey and Walshe (2005), certain contexts may “trigger” mechanisms to generate outcomes in the social world (the context, mechanism, outcome relationship – CMO) or an accumulation of mechanisms operate in context to produce outcomes of interest (Julnes, Mark, & Henry, 1998). Accordingly, mechanisms are “social processes having designated consequences for designated parts of the social structure to



identify mechanisms and to establish under which conditions they come into being, fail to operate and so on” (Merton cited in Hedström & Swedberg, 1998, p. 6)).

CR is included in the fourth category where mechanisms are unobservable entities that generate outcomes. This is because mechanism is central to the discipline of CR. Mechanisms represent “objective existence” which distinguishes CR from other forms of reality by focusing on what the observed event says about the underlying causal relationships or social mechanisms that are enduring and lie beyond the common experience (Mingers, 2004). Bhaskar (1978) argued the existence of these reality domains are totally independent of our representation of them (Dobson, 2012) and concluded that investigation of these domains will reveal that “what happens in the world is not the same as that which is observed” (Danermark et al., 2002, p. 20). For this purpose, Bhaskar (1978) proposed an ontological map of empirical, actual and real domains of reality (see Figure 4.1) (Mingers, 2004). The empirical refers to direct or indirect experiences of events; the actual relates to the occurrence of these events regardless of our experience of them, and the real is the whole of reality.



**Figure 4-1 The Three Domains of Reality**

Mingers, J. (2004, 94). Realizing information systems: critical realism as an underpinning philosophy for information systems. *Information and Organization*, 14(2), 87-103.

Mechanisms are any powers, structures, processes and entities operating within a context to generate outcomes of interest. Often they are unobservable and they can only be observed via their effects; in these cases, theory is often necessary to suggest their existence. Mechanisms are sensitive to context, in other words, a mechanism might work in one context and fail to work in another due to differences in the

structures of each system. Furthermore, a mechanism may or may not be activated in a particular context due to contingent conditions or possible countervailing mechanism(s). The characteristics of mechanisms adopted in this thesis were: a) they are unobservable and operate at a deeper level, so they are only recognisable via their effects; b) mechanism(s) generate outcomes (events and/or social phenomena), therefore the function of a mechanism is to explain the outcomes as well as the associations that exist between variables; and c) mechanisms cause events and their associations.

Before discussing approaches for defining mechanisms it is important to briefly discuss the non-existence of mechanisms, also known as the “mechanism of absence”. Bhaskar (2008a) called this the “negation mechanism”. Absence and existence are the dialectical functioning of realist concepts in historical realities (Agar, 2004). Absence is significant because it has considerable impact, while other kinds of absence can be insignificant due to the lack of impact of their absence. In this research, the proposed TOC-based mechanisms are intended to derive a successful implementation of ISO accreditations; and the absence of these mechanisms is suggested to explain the disappointing outcomes in the organisations investigated. The various approaches for identifying mechanisms using different tools and methods are outlined below.

#### **4.4 Approaches for Defining Mechanisms**

The above discussion shows the term *mechanism* lacks a unified perspective for several reasons. Firstly, it is interdisciplinary (Hedström & Swedberg, 1998); secondly, it can be part of different ontological positions such as heterogeneity, Critical Realism, Bourdieuan, Marxism and many others; and thirdly, mechanisms can be identified using a wide range of methodologies such as qualitative, quantitative, experimental and non-experimental, cross-case, case study and others (Wan, 2011, pp. 141-143). Moreover, theoretical orientation influences one’s consideration of mechanisms, the levels at which phenomena are explored, and the methods and methodologies used (Wynn Jr, Volkoff, Williams, & Strong, 2013). The following section presents an overview of the ways in which mechanisms have been identified in different approaches, including CR and Analytical Sociology (AS).

The definition of mechanisms in CR presupposes all phenomena manifest themselves through their effects; therefore, in order to develop a deeper knowledge about mechanisms and their generative power, conceptual abstraction is the most effective tool for isolating certain aspects of thought (Danermark et al., 2002; Reed, 2009). This implies the existence of a variety of structures, mechanisms and events within a complex system (Sayer, 1992).

Bhaskar (1978) proposed events or phenomena should not be the core focus of CR research, but rather:

...the structures and mechanisms that generate phenomena; ... These objects are neither phenomena (empiricism) nor human constructs imposed upon the phenomena (idealism), but real structures which endure and operate independently of our knowledge, our experience and the conditions which allow us access to them (p. 25).

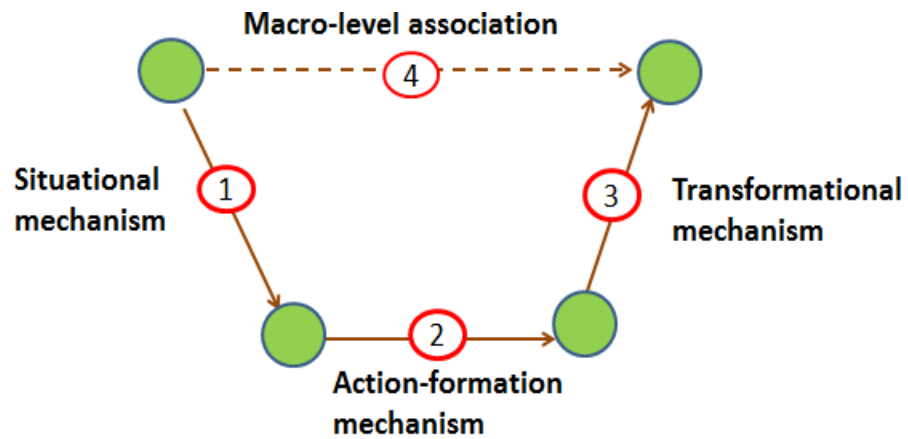
To identify mechanisms or causal powers, CR proposes two complementary research strategies – retroduction and retrodiction. In retroduction we identify the real causal power, while in retrodiction the causal powers become the building blocks in retrodictive construction of explanations about actual events. Retroduction provides insights into how all the elements interact to produce the observed phenomena in certain circumstances in an identified context. Identifying causal powers requires observation of partial empirical regularities and hypothesising these regularities, so retroduction is the process of analysing these regularities to “theorise the underlying causal mechanisms that are responsible, subject to circumstances, for the observable degree of regularity” (Elder-Vass, 2010, p. 48). On the other hand, retrodiction is the process where we explain specific events to identify the causal powers that interacted to generate the event and how they affect each other (Elder-Vass, 2010; Wan, 2011).

In analytical sociology (AS), also known as a mechanism-based explanation, Hedström and Swedberg (1996) defined mechanisms as hypothetical causal models or theoretical constructs that provide hypothetical links between observable events. The word “analytical” in analytical sociology was described by Demeulenaere (2011) as:

Any description or explanation necessarily involves separate “elements” to be considered in respect of their specificity, status and role. This separation leads on to an elucidation of the manner in which they are reciprocally articulated, and in particular are said to “cause” one another. This is why the “mechanism” issue is necessary to any explanation (Demeulenaere, 2011, p. 2).

Hedström and Swedberg proposed three reasons for using mechanisms as explanations. First, they encourage direct, deep, fine-grained explanations; second, searching for causal mechanisms supports the researcher in expanding upon why we observe what we observe; and finally, mechanisms differentiate between genuine causality and coincidental association (Hedström & Swedberg, 1996). They described the search for generative mechanisms is better to explain observed events, unlike the Black-Box approach – an approach for defining causality – which focuses mainly on the relation between inputs and outputs. The content of the Black Box approach contains no information that is not already in the event or its variable; therefore, saying something about why we observe what we observe is doubtful.

A mechanism-based explanation approach was also adopted by Coleman (1994) in what is known as Coleman's Boat and was adopted by Hedström and Swedberg (1996) amongst others. This model states that deeper levels of human motivation and their activities must explain the connection between two macro-phenomena. Coleman's Boat was also used by Max Weber's methodological individualism to explain that sociology aims to "reduce such collective concepts as 'state' and 'feudalism' to 'understandable' actions, that is without exception, to the actions of participating individual men" (Wan, 2011, p. 161), due to a clear connection between the tradition of methodological individualism and the development of analytical sociology (Demeulenaere, 2011). Despite Hedström's argument, mechanisms are not required to be individualistic in nature, even though individual-level mechanisms make perfect sense for studying macro-sociological claims, specifically assumptions related to individual behaviour and confirmed accounts of individual behaviour (Wan, 2011).



**Figure 4-2 Causal Mechanisms in the Social Sciences**

Hedström, P. and Ylikoski, P. (2010, 59). *Annual Review of Sociology*, 36, 49-67.

Hedström and Ylikoski (2010) also used Coleman’s Boat and introduced a micro-macro graph. This diagram explains large-scale social phenomena that focus on groups of actors or collectivities (Hedström, 2005). The changes and properties within these social phenomena can therefore, be referenced to individuals’ actions over time because according to Analytical Sociology (AS), it is individuals, not social entities, who possess the causal powers (Hedström, 2005). Arrow 4 in Figure 4.2 illustrates that a proper explanation for general phenomena requires deeper scrutiny to show how social phenomena influence individuals’ actions at certain times and how these actions lead to social outcomes. The connections at arrow 4 do not assist with identifying causal mechanisms. Instead, this is achieved by the macro-micro situational mechanism (arrow 1) which refers to the causal mechanisms that generate macro-level observable phenomena and require deeper exploration to identify the social structure constraining individuals’ actions and orienting their desires and beliefs. Arrow 2, the micro-micro action mechanism, describes the link between individuals’ actions and their desires, beliefs, etc. Finally, arrow 3, the micro-macro transformational mechanism, specifies how individuals’ actions and interactions intentionally and unintentionally generate social outcomes. Hedström & Ylikoski (2010) claimed that understanding this chain of situational, action-forming and transformational mechanisms leads to understanding the macro-level relationship within the observed event.

In Figure 4.2, the transformational mechanism (arrow 3) is the main intellectual obstacle to explaining the social context. It is easy to recognise the influence of beliefs, desires, opportunities, actions, and social context (or situational mechanisms) on individuals' orientations (arrow 1) and how their orientations affect their actions (arrow 2), i.e. the interactional and action-forming mechanisms. However, the transformational mechanism (arrow 3) requires an appropriate methodology to analyse the embedded social phenomena. According to Coleman (1990), cited in (Hedström, 2005), this diagram was “too dependent on rather implausible assumptions about the logic of actions and the structure of interaction” to capture the attention of the social community (Hedström, 2005).

#### **4.5 Proposing Possible TOC Mechanisms**

In this research, the following suppositions underpinned the use of proposing mechanisms: a) the world consists of events, realised possibilities and causal powers that things have and act in certain ways such as the power of aspirin to ease headaches; b) causal powers are real and exist independently of our knowledge of it; and c) the prioritisation of causal powers over event regularities (Runde, 1998).

The growing body of literature on mechanisms supports their crucial role in developing deeper and more fine-grained explanations of social phenomena (Astbury & Leeuw, 2010). Blom and Morén (2011, p. 63) argued that “hypotheses about generative mechanisms are based in part on empirical observations, but we can only draw conclusions about them by analytical means” (p. 63). Gorski (2009, p. 189) defined mechanisms as “the emergent causal power of related entities within a system”, therefore mechanisms form the basis of a necessary concept for acquiring a better understanding the causal powers that trigger particular events in certain contexts. Therefore, to explain the disappointing outcomes associated with implementing ISO accreditations, this thesis proposes that TOC-based mechanisms for explanation are employed.

TOC tools, such as the CRT and EC, are capable of providing explanations for observable undesired events. In such explanations, TOC aims to expose assumptions, in particular the erroneous ones, these so-called false assumptions often being responsible for causing undesirable effects including conflict. TOC, in effect can

suggest explanation (i.e. mechanisms) to explain the issues of poor performance or failure. The Theory of Constraints has been successfully used to improve the performance of systems, but its capability in the area of quality programs, specifically ISO accreditation, has not been explored to date (Mabin, 2009; 2014; Ronen & Pass, 2010). This thesis represents a significant development for TOC application to new and different contexts.

From the perspective of ISO accreditation, the following mechanisms emerged from a TOC analysis as viable explanations for the observed anomalous outcomes in the organisations under study: a) the goal alignment mechanism, b) the mechanism of constraint, and c) the mechanism of defining the tactics.

#### **4.5.1 The Constraint Mechanism (Targeting the Constraint)**

The first proposed mechanism, derived from the concept of “constraint” in TOC, was constructed on the premise that failure to address the constraint is a causal factor for not achieving the real goal in any system. Goldratt (2010) emphasised the importance of targeting the constraint for the purpose of increasing throughput, and argued that targeting non-constraints have no effect on improving organisational performance or increasing throughput. Because of non-constraint points have no real impact on improving the flow rates, they should be treated as thresholds, and efforts to do more will not result in the desired outcomes. Other researchers and academics (Barnard, 2010; Boyd & Gupta, 2004; Davies et al., 2005; Mabin et al., 2011) supported the conclusion of Goldratt and Cox (1986) that a system’s constraint controls the throughput of the entire system, and any improvement should therefore, focus on targeting the constraint to control its effects and prevent it from impacting other processes.

Identification of a constraint, in TOC provides an opportunity for making and addressing the throughput goal by making changes and improvements in the area where the constraint is located. However, this mechanism can only be useful if the goal of the organisation is in line with TOC and focuses on increasing throughput or goal units. Defining the TOC goal, which is throughput oriented, is more likely to activate the mechanism of targeting the constraint, since defining the real goal necessarily leads to defining the system’s constraint for improvement. Conversely, it

is probable that the improvement might be “constrained” by unclear or unrealistic goals focused on local optima rather than being focused on the throughput of goal units.

Although the terms “constraint” and “bottleneck” are often used interchangeably in TOC, there are differences between them. For example, the TOCICO dictionary defines “bottleneck resource” as “any resource whose capacity is less than or equal to the demand placed on it for the specified time horizon” (Sullivan, Reid, & Cartier, 2007, p. 6), while “constraint” is defined as “the factor which, if organisations had more of, could more fully exploit or could more effectively subordinate to, and would result in achieving more of the goal” (p. 13). I argue that “constraint” cannot be interchanged with “bottleneck” since a constraint is a structure (mechanism) which may cause a bottleneck to occur if conditions are right.

In TOC, constraints may include a range of resources, including skilled people, capacity and materials, policy, market, strategy, IT, marketing and sales (Pass & Ronen, 2003). They can also be internal or external. Yet, there is little guidance in TOC as to identifying constraints. In a production environment, it is often suggested to look for unusual inventory accumulation. In non-production environments there are less clear guidelines. The CRT is often promoted as a tool to identify root causes or perhaps constraints. In effect, the logical chain of argument developed within the CRT links causes to events (UDEs) – this is in fact an explanation or mechanism.

Not defining the constraint is a mechanism for failure that can explain the anomalous outcomes of the ISO accreditation in the organisations investigated in this thesis. Once the constraint has been identified, QAPs, including ISO accreditations, should only be implemented if they are aimed at exploiting and controlling the system’s constraint. The mechanism of not defining the constraint is a negative mechanism as this absence has the power to cause disappointing observable outcomes, as evidenced in this research.

#### **4.5.2 The Goal Alignment Mechanism**

In TOC the organisational goal is a core consideration since it defines the organisation’s focus and growth direction. The Goal Alignment Mechanism requires that the goal align with TOC’s goal focus on throughput, and as evidenced in this



thesis, aligning the goal of implementing ISO accreditation with the organisational goal by addressing the constraint is also a significant mechanism. Defining the organisational goal according to TOC logic is important - the main purpose of the organisation, also known as the “real” goal, must be in terms of throughput or value contribution. The TOC derived goal or “real” goal for-profit organisations is “making money now and in the future”, and for NFP, service and family businesses, the goal is “increasing the goal units”.

Aligning the goal of any improvement program to address the organisation’s real goal is a necessary step for a QAP to lead to successful outcomes. The QAP must focus on the constraint to this goal to be successful.

One could argue that as long as the mechanism of goal alignment is activated, regardless of whether the organisation has identified the right goal or not, the program will achieve the required outcomes (see the case of Organisation A in the cross-cases discussion) since the perception of goal alignment will support the QAP. Yet, real improvement is unlikely (unless through luck) unless the goal is correctly defined and the QAP subsequently targets the system’s constraint. As in the case of Organisation A, which appeared to have achieved the desired outcomes of the ISO accreditation, but did not succeed in controlling or defining the constraint; ISO accreditation did not improve organisational performance. In this instance, the accreditation was merely a means of attaining a threshold for the business. Unless the goal alignment mechanism is associated with the enabler of defining the real goal of the organisation, it will act as a mechanism for failure and result in arduous implementation and undesirable outcomes. This is particularly true if the ISO accreditation does not aim to achieve the system’s goal and remove the constraint. The lack of goal alignment or the absence of goal alignment is the mechanism that can explain the undesirable outcomes of ISO accreditations.

To derive the goal alignment mechanism, we needed a tool. In this thesis, the S&T tree to achieve Treacy and Wiersema’s strategic choices was the tool used for deriving the goal alignment mechanism. First, it triggers the enabler of defining the real goal of the organisation, then, S&T tree links implementing accreditation to the real goal of the organisation in order to target the constraint by achieving Treacy and Wiersema strategic choices.

### 4.5.3 The Mechanism of Defining Tactics

The third TOC-based proposed mechanism of “defining the tactics” was identified as a mechanism to facilitate successful implementation of accreditation and improvement programs. In this thesis, the failure of ISO accreditation to achieve the desired outcomes can be partly attributed to the “absence of tactics” mechanism. The S&T tree includes tactics as a critical part of the tree; they are required activities necessary for achieving the strategies and the desired outcomes. This is not the same as this proposed mechanism of “defining the tactics”; this mechanism is not about the S&T tree tool or the role of tactics in this tool; rather it is about identifying the tactics and encourages a process of reviewing the strategy, and sometimes even the goal (as observed in the case studies). The mechanism of defining the tactics more likely will lead to successfully implanting changes by encouraging the organisation to state the actions necessary for achieving the goal. As observed during the validation of the proposed S&T trees for Treacy and Wiersema’s strategic choices and its assumptions, defining the tactics was the mechanism that led management in all three organisations to ask questions such as: “what do my staff need to do to achieve the goal and why?” or “how do my staff understand the goal?” Validating and redefining the tactics needed to achieve the organisation’s strategy encouraged communication, which is an important built-in mechanism of the S&T tree. In Organisation C, the management team moved up and down the logical assumptions tables of the S&T trees to develop a realistic plan that suited the needs of their organisation.

The following enabling factors are required to activate the mechanism of “defining the tactics”: a) defining the organisation’s real goal, b) defining the strategy suitable for achieving the organisational goal, and c) defining the tactics needed to target the constraint. The absence of any of these factors will create a constraining factor and will activate the “absence of tactics” mechanism. In addition, to explaining the failure of improvement programs, the “absence of tactics” mechanism is also capable of explaining disappointing performance (as in the case of Organisation C). The absence of tactics implies members of the organisation have little or no knowledge about the steps and activities needed to achieve the goal; in other words, they have no rudder to steer them towards the desired goal. Similarly, the wrong tactics equate to not having the right tools to achieve the intended outcomes.

The “absence of tactics (or tactical plan)” mechanism would be activated by the lack of a tool that facilitates communication and ‘enforces’ it. For example, as in the case studies in this thesis, top management defined the strategy of the organisation and developed a plan, yet the process did not include suggesting tactic(s) needed to achieve their goals. Management assumed employees had the required knowledge of the actions and activities needed to realise the plan. The “absence of tactics” mechanism was evident from its outcomes in the actual domain where the events in a form of conflicts occurred – i.e. conflicts around the focus theme and the conflict around research as a voluntary activity (see the analysis of organisation C and the cross-cases discussion). These events were identified via their effects in the empirical domain as failure to publish in the targeted research journals. In other words, the absence of a tactical plan caused confusion and then conflict about research as a voluntary activity versus research as a “must do” activity (see the cross-cases discussion). The outcomes of this mechanism in both the actual and empirical domains were identified by the new use of the S&T tree, where it was used for critique by senior management. In this way, the S&T tree for Treacy and Wiersema’s strategic choices acted as a communicative tool for bringing members of the organisation together.

These mechanisms to function, there are some necessary conditions that are required for them to surface and impact the outcomes of accreditation.

#### **4.6 Necessary Conditions for QAP Success**

In this thesis, the mechanisms discussed above have been proposed as key factors for successful change:

- Alignment of the goal of the change to the organisational goal;
- Targeting the constraint; and
- Defining the tactics to achieve a strategy

Despite references in the literature to the causes of disappointing QAP outcomes, the fact remains that contextual elements and mechanisms are absent in the analyses of these failures. This is particularly concerning when one considers the lack of impact that QAPs have had on overall organisational performance. TOC theory and tools, aimed at constraints, are well suited to a quality assurance environment and can

be harnessed effectively to strengthen the theory with rigorous explanation and integration of additional mechanisms. Coupled with a fundamental approach that links change goals with organisational goals, TOC mechanisms are capable of explaining QAP failures in organisations. This is a major step forward in our existing knowledge of ISO accreditation in particular and TOC in general.

#### **4.7 Summary**

Mechanisms are a core explanatory tool within the social and natural sciences; they have been used in this study in the context of a new definition and broader application to answer the research questions. The core argument in this chapter is:

1. The organisation's goal must align with TOC definition of the goal; in that the focus is on maximisation throughput or goal units. This is a necessary condition for defining the constraint.
2. The organisation must identify the constraint to their throughput goal. This mechanism is able to derive successful QAP implementation
3. The QAP must target the constraint. In other words, the goal of the QAP need to align to the organisational goal, the throughput oriented goal.
4. The strategic choice must be in line with constrain; in other words, achieving the strategic choice leads to achieve the organisational goal

The use of TOC for defining mechanisms and explaining issues related to ISO accreditations' implementation in organisations represents a novel and innovative contribution to existing research. Similarly, the absence of mechanisms proved to be a mechanism itself, since it had the causal power to generate the disappointing outcomes or "anomalies" observed in the case studies.



Chapters 5, 6, 7 and 8, are not available in this version of the thesis.

# Chapter 9 Across Case Discussion

## 9.1 Introduction

This chapter describes how the critical realist method was used to propose and support identified mechanisms. The process of identifying the mechanisms responsible for generating the observed QAP outcomes involved: a) defining the QAP anomaly in each organisation; b) distinguishing the possible mechanisms that best explained the observed phenomena of interest; and c) examining the evidence for the existence of these mechanisms within each case organisation.

The Structured-case method was also used as an approach to integrate the knowledge gained from each individual case into the next case. This approach is proposed to support theory-building research (Carroll & Swatman, 2000). The method helped to reflect the growth in the understanding of the underlying mechanisms behind QAP outcomes. For example, Case A explored the possible mechanisms/explanations for the anomalies identified within the outcomes of their ISO accreditation. The analysis showed that targeting the constraint and seeking goal alignment are possible mechanisms that explain the observed anomalies within this case. After reviewing these outcomes, it was important to verify the proposals using another case organisation, case B, a for-profit organisation who also recently achieved their ISO accreditation. The knowledge gained from these two cases is that targeting the constraint is a strong mechanism that can affect the outcomes of the quality program. Similarly, the goal alignment mechanism has a significant impact on the outcomes of the quality program.

Case C was then introduced to explain the observed anomalous performance outcomes for this organisation; the aim being to better prepare the Centre for their upcoming. This case enabled us to develop the S&T tree for the strategic choice of Product Development/ Product Differentiation. The analysis of the case showed that using the S&T tree to achieve Treacy and Wiersema's (1993) strategic choice of Product Differentiation (PD) is an important tool in its own right to enable goal alignment. Most importantly, it worked as a mechanism to achieve PD.

In this thesis, defining the mechanism(s) that generated the observed outcomes was facilitated by using the TOC TP to analyse the situation in each organisation. For example, the CRT helped to propose the root causes of the observed poor outcomes (UDEs). These root causes and the logic chain can be seen to provide an explanation or proposed mechanism. In addition, for cases A and B, defining the inherent conflicts within the system and the EC (the second stage of the analysis) formed an integral part in defining the mechanisms more clearly; they were part of the process of retrodiction. In case C, the process of developing the conflicts clouds and S&T tree were more related to confirming the proposals made about Case C – they were part of the retrodiction process in that the development of the S&T tree confirmed the importance of defining tactics. This supported the argument that the mechanism of a ‘lack of defining the tactics’ –poor implementation– was an important explanatory mechanism for explaining the poor QAP outcomes.

Conflict, in general, cannot always be observed instantly, but can be defined via their symptoms; thus, conflicts are qualified to be considered as events occurring in the actual domain of reality. The identification of these core conflicts is an essential part of the TP and a core element in defining “what to change”. In a similar fashion, critical realism suggests that identification of inequitable structures is the first step in their demolition (Dobson, 2003). It is important to acknowledge this recognition that identification is not enough – something has to be done about the inequities. This commonality between critical realism and the TOC is important – they offer a practical grounding for not only identifying “what to change” but “how to cause the change”.

In this thesis, the S&T tree to achieve Treacy and Wiersema’s strategic choices suggested a means to address the mechanisms of poor alignment and unclear tactics. In other words, the S&T trees sought to show how to address the identified mechanisms (“how to cause the change”), while CRT, Goal Tree, EC were instrumental in proposing explanatory mechanisms.

## **9.2 The Identified Anomalies in the Three Organisations**

In this section the anomaly –the outcome that prompted surprise – identified in each case study organisation is discussed. Organisation A was classified as a small business, a PSTS (Professional, Scientific, and Technical Service) (Ricketts, 2008); it is a



service provider operating within the structure of a public Australian university. Organisation A, primarily, collects data for research purposes following implemented ISO standards and procedures.

In 2008, this organisation needed to upgrade their accreditation from IQCA (Interview Quality Control Australia) to an ISO accreditation. The aim was mainly to comply with the market and the clients' requirements. Achieving the accreditation primarily gained the organisation advantage in terms of their external assurance. In addition, the accreditation helped to formalise the internal procedures. Yet, as detailed, they had conflicting views on the success of the program.

Such an anomaly was also identified in Organisation B - a medium sized privately owned business striving for profitability and leading the market by "being the best". This organisation successfully achieved an ISO accreditation after two previous unsuccessful attempts. They implemented ISO accreditation mainly to comply with government requirements to apply for tenders. In addition, organisation B aimed to gain an advantage over its competitors and achieve a personal goal of the owner. In organisation B, two advantages from accreditation stand out among several - mainly streamlining operations to achieve consistency of processes and reducing the cost of mistakes and rework. Despite such significant outcomes, there were also other unsatisfactory outcomes, since some staff did not understand the importance of following ISO accreditation procedures and standards. The dissatisfaction was evident only a short time after achieving the accreditation, and signalled a lack of understating of the linkage between accreditation and the organisational goal.

Finally, in the case of organisation C, a research centre within a public Australian university, the anomaly was that despite the goal of the research centre being clear, the execution of the goal was poor and the centre was not achieving the major desired outcomes, the goal being to publish papers on the focused research theme in a targeted list of journals. This anomaly was diagnosed using the Goal Tree and developing the S&T tree model for the Treacy and Wiersema (1993) strategic choice of PD.

This organisation had been operating successfully for three years and had achieved several notable outputs such as publications, conferences and collaborations with international academic institutes. In 2015, co-director A of this research centre

reframed the focus theme as well as redefined the purpose of the research centre. These actions were prompted by not having achieved the desired outcomes - in particular, the publications of members of this research centre did not adhere to a focal theme of innovation. Furthermore, the published papers and journal articles were not appearing on the targeted list of high-impact journals suggested by co-director A as the important journals in the centre's field of research. In an attempt to align the members of the research centre with the centre's goals, co-director A introduced a process of instilling simple norms for centre-based publications, such as "if you don't have the word innovation in your publication title, then it is not in the [theme] of innovation for this research centre".

### **9.3 Proposed mechanisms**

To explain the anomalous outcomes of these organisations, the method of structured-case was used to derive possible explanations using three structural components: a conceptual framework, a pre-defined research cycle and a literature-based scrutiny of the research findings (Carroll & Swatman, 2000).

As discussed earlier, the Theory of Constraints was used to explain poor outcomes. It was anticipated that TOC-based proposed mechanisms were most likely to have the capacity to explain the anomaly in these organisations. Defining a mechanism involves retroduction and retrodiction as the two major parts of the abduction process. As Easton (2010, p. 123) suggests "Retroduction means "moving backwards" and that is what the process involves. It asks "What must be true in order to make this event possible?". In using the TOC TP tools, I found that retroduction is inherent in the processes of applying the TP tools; these means are tools for deriving explanations and have the capacity, specifically CRT, to provide logical explanation of anomalous outcomes - 'UDEs'.

Elder-Vass (2015) distinguishes between retroduction and retrodiction, suggesting "In retroduction we identify individual causal powers and the mechanisms that produce them, and in retrodiction we investigate what mix of causal powers interacted in what way to produce any particular event". Retrodiction confirms the role of the identified mechanism in actual situations; it provides a contextual explanation (Elder-Vass, 2015). This second part of abductive reasoning, retrodiction, was practiced in the

process of validating the proposed S&T trees. The process of defining and refining the strategy, tactics and the assumptions underlying the S&T steps is in fact a retrodiction. It involved discussing with the employees of each case organisation to track back through the cause and effect relationships and to define the way the proposed mechanism would achieve the observed/required outcomes in actual practice.

For example, it was proposed that a lack of goal alignment mechanism led to the observed outcomes in Organisation A. This organisation had not clearly stated its real goal – the TOC perspective of the goal, defined in terms of throughput. Instead, their stated goal related to continuity of the business, including to continue producing good quality data and a reliable professional service. The absence of a real goal acted as a constraining factor for effective goal alignment. In addition, the criteria for measuring the progress towards achieving the goal was consequently unclear, approximate and not clear to everyone within the organisation.

Repeating the research cycle in organisation B also identified the lack of goal alignment as the responsible mechanism for poor QAP outcomes. The enabler of this mechanism – defining the real goal – did not exist. The real goal of organisation B had been replaced by “buzzwords” such as “being the best”, due to a belief that the TOC definition of the real goal (to make money now and in the future) was common sense and should be understood by all, and there was therefore no urgency to state and define it. In organisation B, therefore, not clarifying the real (TOC focused) goal constrained the mechanism of goal alignment.

In the two case of Organisations A& B, the CRT was used to track the observed anomalies or ‘UDEs’ to the root cause. In fact, the CRT defines the chain of logical connections between UDEs and root cause – it suggests an explanatory ‘mechanism’.

Using the retrodictive approach founded by developing the S&T tree it became evident that another mechanism interacted with the lack of goal alignment mechanism to trigger the observed outcomes in Organisation B, that is, the absence of defining the constraint. For example, since the goal of Organisation B had not been defined in terms of throughput (the “enabler factor”), the organisation was unable to define the constraint of their system. Moreover, the constraint concept was not in the

organisation's line of sight and had in all likelihood not been introduced to the organisation.

Organisation C did not undergo ISO accreditation although they were audited every three years. The research cycle involved using only the Goal Tree and S&T trees to analyse the disappointing outcomes; the outcomes of this analysis showed that the explanatory mechanism to best explain the poor quality outcomes was **not defining the tactics** for implementing a clear goal. The analysis showed that, although the identified goal of the research centre was clear to members, the activities required to achieve this goal (the how) were unclear.

The analysis also showed that the auditing role was rather a necessary condition for continuity (see the S&T tree Model 2), and had no role in driving the organisation towards achieving the desired quality outcomes (see S&T tree Model 3). The development of the S&T tree became the means to define the tactics for implementing their goal alignment. Developing the S&T tree provided a mechanism for communicating and implementing the necessary tactical approach.

#### **9.4 Summary**

The proposed mechanisms suggested from TOC grounding, namely targeting the constraint, goal alignment and defining the tactics can explain the observed anomalous outcomes within the three case organisations. The iterative stages of the structured-case method enabled the process of suggesting and refining the proposed mechanisms or explanations.

The incorporation of Treacy and Wiersema (1993) three strategic choices with the S&T tree helped to clarify the core focus required for each organisation. It demonstrated how the particular focus can help these organisations to achieve their desired outcomes and QAP goals, and how the S&T tree can provide a useful instrument for a smooth and successful implementation of this focus.

# Chapter 10 Discussion and Recommendations

## 10.1 Overview

The objective of this thesis was to explain the disappointing outcomes, poor performance and conflicts associated with the implementation and outcomes of Quality Assurance Programs (QAP) in three case examples. The research proposed mechanism(s) or explanations based on the Theory of Constraints to explain the observed outcomes.

Implementation and outcomes of ISO accreditation programs in the literature were extensively researched to identify possible reasons and causes of disappointing outcomes (Bell, 2011; Boiral, 2012; Costa & Lorente, 2003, 2007; Disterer, 2012; Douglas, Coleman, & Oddy, 2003; Evans & Lindsay, 2008; Feng et al., 2008; Heras-Saizarbitoria, Landín, & Molina-Azorín, 2011; Manders, 2015; Prajogo, 2011; Williams, 2004). However, previous studies did not clearly articulate the causal chain leading to the observed outcomes. This thesis, with its use of various TP tools, like the Goal Tree, CRT, EC and the S&T tree to provide a contextual causal argument, has remedied the situation.

Chapter 10 begins by revisiting the research questions, followed by a discussion of the implications and contributions of the research, and recommendations for both professionals and academics in the areas of TOC and QAP. Finally, the main limitations of the thesis are discussed.

## 10.2 Revisiting the Research Questions

Answering the research questions is crucial for concluding the thesis and presenting recommendations. In this thesis, the answers to the research questions were based on analysis of the three case studies, as well as a review and analysis of the Theory of Constraints. The research questions covered three areas: Mechanisms, Context and Outcomes.

**Mechanisms:**

1. What are the key mechanisms that drive successful QAP implementation in the particular examined organisations?
2. To what extent can TOC provide guidance in proposing possible mechanisms to encourage successful QAP outcomes?

**Context:**

1. What are the contextual factors that have the most impact (positive or negative) on QAP implementation in these organisations?
2. What conditions are needed for an intervention to trigger favourable mechanisms to produce particular outcome patterns?

**Outcomes:**

1. How do the key mechanisms and contexts interact to produce specific outcomes?

The first question is about defining the key mechanisms that lead to successful ISO accreditation and QAP outcomes in each organisation. TOC was chosen as a suitable theory for deriving such mechanisms, having never been used to derive mechanisms or in concert with critical realism to access the “deep” mechanisms behind observed events. As Mabin et al. (2010) suggested, the development of TOC has largely been practice led across many different disciplines and domains. The core concept underlying TOC is often presented as Systems Thinking, a term recently coined by Goldratt. Systems Thinking is largely constructivist in its grounding and application of soft system methodologies (Davies et al. (2005). An example of a traditional “soft system” approach is Checkland’s methodology that places a great deal of emphasis on achieving consensus about the problem via tools like the Rich Picture. Such an emphasis is not dissimilar to TOC, which uses the CRT and S&T tree as tools for achieving consensus about what to change and how to bring about the change. TOC continues to evolve and develop in response to calls from experts to further investigate its tools, concepts and underpinning logic in academic research (Kim, Mabin, & Davies, 2008; Mabin, 2016; Mabin et al., 2011; Mabin & Davies, 2010).

As discussed in the case studies, the mechanisms of Targeting the Constraint, Goal Alignment, and Defining the Tactics are vital for driving successful outcomes from ISO accreditations' implementation. These proposed mechanisms were the outcome of insights provided by the TOC literature. For example, the lack of goal alignment between the implementation of the accreditation and the organisational goal in Organisations A and B was an important causal mechanism to explain the poor QAP outcomes. TOC literature asserts the necessity of linking the goal of any change initiative to the organisational goal (AGI-Goldratt, 2010; Barnard, 2010; Budd & Cerveny, 2010), and the lack of this goal alignment was identified as the root cause and main contributing factor to the ISO implementation UDEs in both organisations A and B. Similarly, poor identification of the constraint to growth (Goldratt, 2010; Kendall, 2010) was observed in all three organisations A, B and C. Defining the tactical path for quality assurance was proposed as a significant success mechanism in all cases, particularly in case C, while the absence of a defined path was a significant causal element of the observed poor outcomes.

The primary explanatory mechanisms for poor QAP outcomes in organisations A and B were poor constraint identification and lack of goal alignment. In organisation C, it was poor implementation processes, where the absence of a tactical plan for implementing goals led to the observed anomalies.

The proposed mechanisms of Targeting the Constraint, Goal Alignment, and Defining the Tactics required testing. The CRT, Goal Tree and EC were used to derive possible mechanisms by defining hypothetical conjectures that could explain the observed outcomes (retroduction). Then, the S&T tree was used to validate this proposal by demonstrating the benefits of addressing these mechanisms (retrodiction).

Despite a foundation steeped in causal analysis and the principle of cause and effect, the TP demonstrated little linkage to a mechanism-based argument. This was surprising given the plethora of academic literature on the topic, and is perhaps a reflection of the practical and instrumental nature of this approach.

Some tools relied on the logic of necessary conditions, while others were based on sufficient cause logic (see Chapter three). For example, the outcome of the CRT revealed the root cause of the problem, but not what generated the problem,

Nevertheless, it served to direct the researcher to the absence of the goal alignment mechanism. Similarly, Conflict Clouds (CC) were explored to evaporate the conflict (EC) and define injections (solutions). Since conflicts' outcomes, viewed as events, were triggered by the interaction of mechanism(s) in a deeper domain, developing the EC and CCC assisted the search for mechanism(s) that could explain the disappointing outcomes. TOC largely supports the search for mechanisms, while CRT and EC define them and offer possible explanations.

This study demonstrates that TOC was not only useful for proposing possible mechanisms, but also for directing implementation of solutions. Goal alignment was facilitated by using the S&T tree for one or more of Treacy and Wiersema's (1993) strategic choices: Customer Intimacy (CI), Operational Excellence (OE) and Product Development (PD). By using the S&T tree in this way the organisational goal was represented by one or more of Treacy and Wiersema's (1993) strategic choices in sequence, and goal alignment was a natural outcome of developing the S&T tree. The integral dynamics and communication required to develop the S&T tree ensured successful alignment. This was demonstrated in Organisations A and B where the S&T tree linked the organisational goal of ISO accreditation to the strategic choices of CI and OE respectively. The same S&T tree was tested and validated in Organisation C and ultimately provided a program for quality improvement in its own right. Iterative development of the S&T tree through discussions with research centre staff clarified and focused the purpose of the centre and directed how best to achieve quality outcomes. The audit process had negligible quality implications, and the "big stick" approach from the university was not a significant factor for achieving goal alignment. The strategic choice of PD requires a clear plan with quality emphasised throughout, and the S&T tree provided such a plan.

In all three case studies, the S&T tree for Treacy and Wiersema's strategic choices was used as an effective tool to define appropriate constraint-focused goals and encourage alignment with QAP. The EC injections and S&T tree provided guidelines for putting this alignment into practice.

In terms of Context, the first research question was: "What are the contextual factors that have the most impact (positive or negative) on QAP implementation in these organisations?"



The first and foremost condition relates to clear agreement about why such intervention is needed, referring to the goal of the change which should either be to achieve the organisational goal or to eliminate the constraint that hinders achievement of that goal. ISO accreditation should therefore only be implemented if it targets the constraint in the system, thereby achieving the TOC-defined throughput goal. Linking ISO accreditation to one or more of Treacy and Wiersema's strategic choices, chosen to target the constraint, will achieve the organisational goal and the objective of leading the market in one or more of these strategic choices. The second condition needed to trigger favourable mechanisms for producing particular outcome patterns is related to understanding the specific role of QAP in meeting the organisational goal. In Organisation A, QAP was a tactic for achieving CI and possibly OE, the assumption behind this being that the organisation had to comply with market requirements (strategy) to attract the required projects. In organisation B, it was the tactic for achieving OE and then CI, underpinned by the assumption that improving operations and processes would allow the organisation to build and control their internal systems, reduce costs and achieve a competitive advantage. To achieve PD in Organisation C the role of QAP was more holistic, and the S&T tree assisted in defining the pervasive role of quality, in the sense of "fitness for use", throughout the organisation.

### **10.3 Research Implications and Contribution**

The implications of this thesis are threefold: a) methodological; b) theoretical or philosophical; and c) practical.

#### **10.3.1 Methodological Implications: Developing a new methodological approach**

It was necessary to develop a methodological approach for this thesis that enabled the use of TOC TP tools to define mechanisms that could explain the anomalies in the organisations under investigation. This was a novel approach, both for defining mechanisms and the use of TP tools.

In critical realism, there is no specific method to arrive at possible mechanisms. This research used TOC TP tools to assist in identifying such mechanisms. The CRT itself provided a clear and logical argument for linking root causes to UDEs, and sections of

the CRT can be seen to explain the observed UDEs, that is, to provide an explanatory mechanism. CRT development and the use of CLR logical arguments support this process of retrodiction.

TP tools also support retrodiction by extending the identified causal powers as building blocks in the construction of plausible events and outcomes. This leads us to the methodological implication of defining mechanisms. Mechanism-focused research lacks the tools to define mechanisms, and in this thesis the TOC TP functioned as a suitable tool for guiding and facilitating identification (and to a lesser extent verification) of the underpinning mechanisms. Further research will be valuable for developing these tools to support deeper analysis that goes beyond the empirical and actual domains. Linking an abstract concept like mechanisms to the pragmatic theory of TOC is a novel addition; it enriches and expands the application of the Theory of Constraints. More importantly, its linkage to the widely accepted concept of mechanisms holds the promise of an enhanced platform for the use of TOC TP tools and their wider application.

### **10.3.2 Contribution to the Theory of Constraints**

“Theory cannot be improved until we improve the theorizing process, and we cannot improve the theorizing process until we describe it more explicitly, operate it more self-consciously, and decouple it from validation more deliberately” (Weick, 1989, p. 1).

In this thesis, TOC was used in an innovative way. First, development of the S&T tree for Treacy and Wiersema’s (1993) strategic choices offers a new approach for operationalising these strategic choices. Second, construction of the S&T tree did not follow the natural sequence and outcomes of other TP tools, and was used as a standalone instrument for stakeholders’ critique along with the Goal Tree. Third, TOC was the source of the proposed mechanisms that explained the anomalies in the organisations under study.

Theoretical integration of the concept of mechanisms and TOC TP tools signifies an extension of knowledge since it combines an abstract concept like mechanisms with a pragmatic theory, and enhances performance of the tools by linking their outcomes to reality. Furthermore, development of the S&T tree as a new framework for achieving Treacy and Wiersema’s (1993) strategic choices of CI, OE, and PD adds to the existing

body of knowledge. While development of the S&T tree as a standalone tool is not new, using it in this way for the purpose of stakeholder critique is original, and significantly impacts the planning and execution of change. This thesis provides ample evidence that the S&T tree assists with execution and implementation.

### **10.3.3 Contribution to QAP Implementation**

The empirical findings of this study provide a new understanding of linking ISO accreditation to organisational goals, defined in terms of specific strategic choices such as CI and OE. They demonstrate that QAPs, including ISO accreditation, must effectively target the constraint in the system to be successful. In this way, ISO accreditation can be used to eliminate an external market constraint or an internal operational constraint. One of the issues identified in this thesis is that organisations tend to focus on processes and results rather than the goals of the improvement program. The evidence suggests that any quality program should be directed at eliminating or controlling the constraint targeted organisational goal; otherwise, it is a waste of resources and effort.

### **10.3.4 Recommendations for QAP Professionals**

The findings of this thesis suggest two courses of action for implementing QAPs or ISO accreditation:

1. Implementing ISO accreditation is expensive and time consuming. Therefore, it should only be considered if the processes of exploiting the constraint and subordinating everything to it were unsuccessful. In other words, ISO accreditation should only be implemented after all attempts to exploitation or subordination have failed.
2. Linking the goals of implementing ISO accreditation to the organisational goal will encourage successful outcomes. Creation of a contextualised S&T tree is an important tool for defining the tactical role of ISO implementation for operationalising Treacy and Wiersema's (1993) strategic choices.

### **10.3.5 Recommendations for TOC Professionals**

Knowledge translation of from this study is not only beneficial for the development of theory but also for the practices of individuals and businesses that use TOC TP tools. The S&T tree is a powerful tool for planning the implementation and execution of change, including ISO accreditation, and for identifying what to change and how to effect change. It is also capable of activating the goal alignment mechanism. More importantly, it can be used to operationalise Treacy and Wiersema's strategic choices of CI, OE and PD.

Integrating the concept of mechanisms, and more particularly the role of absence of mechanisms, with TOC TP tools is an important addition, since mechanisms enrich TOC TP tools by expanding their coverage further than just empirical cause-and-effect observations. Recognition of the real, actual and empirical domains is also a powerful addition to TOC TP, as is understanding that a constraint is a mechanism requiring a trigger to exert causal outcomes - both have potential for clarifying TOC arguments. By incorporating this heavily researched academic area of interest, The TOC discipline will have a clearer means for Goldratt (2009) "standing on the shoulder of the giants"

## **10.4 Limitations and Future Research**

### **10.4.1 Limitations**

As with any research, this study encountered limitations. Specifically there were three: case study limitations, limitations related to the nature of TOC, and limitations related to CR.

Despite the strengths of case study research (Reis, n.d.), limitations associated with qualitative case study include difficulty to replicate, lack of transparency and issues of generalisation (Bryman, 2012). Moreover, case study researchers must decide a) how much of the story to report; b) how much comparison to draw with other cases; c) how much to generalise or leave to the reader's discretion; d) how much description to include in the report; and e) protection of anonymity (Stake, 2005). Added to these limitations was the researcher's personal status as an international student, which posed difficulties accessing appropriate case studies and negotiating with organisations for their participation. This consumed a significant amount of time.

The second limitation of this research comes from the practical nature of TOC as a pragmatic theory that focuses on what can be explained within the empirical domain – that which we can understand and sense. It is a practical theory that does not adequately recognise the deeper levels of reality; the empirical focus on that which is observed means that TOC lacks the capacity to analyse deeper levels where mechanisms are operating.

Finally, the application of critical realism to any research requires consideration of the extensive linkage between ontology, methodology and epistemology, since the way we see the world significantly affects the way we examine it and interpretation of knowledge. The thesis presented here does not address these issues and focuses instead on a mechanism-based examination using critical realism as the underpinning philosophy and TOC as an explanatory theory. While this deficiency is recognised, it was necessary due to the timeframe for a PhD and other practical considerations. Since the primary aims of the thesis were practical in nature, the role of critical realism was to guide the achievement of practical outcomes.

#### **10.4.2 Future Research**

Introducing the concept of mechanisms in the analysis of QAP outcomes creates a new paradigm for examining QAPs and change initiatives in any organisation. Furthermore, integrating mechanisms as an abstract concept into TOC presents a new area of research and professional practice. This thesis provides a foundation for further studies to define the philosophical underpinnings of TOC, including establishing an ontology for it. Previous attempts by Mabin and Balderstone (Mabin & Balderstone, 1999), Schragenheim (2013) and Schragenheim and Passal (2005) are useful and important grounding for further development, but their benefits are limited by the lack of a clear philosophical grounding. Adopting CR as a foundation for TOC seems sensible.

The use of TOC in association with CR highlighted a focus on the transitive domain of acquired knowledge (epistemology) and a tendency to neglect the intransitive domain of ontology. TOC has a long history of practical application but there is less evidence of ontological grounding. This needs to be addressed to stimulate academic

dissemination and growth, and this thesis represents a first step in the process of linking TOC with a critical realist grounding.

The case studies in the current research illustrate the difficulties encountered by organisations when implementing ISO accreditation and reflected their disappointment associated with not achieving the undesirable outcomes. It is expected that the rich data gained from this investigation will be useful for other researchers who seek to further our understanding of the mechanisms responsible for generating disappointing QAP outcomes.

## **10.5 Summary**

The findings of this study suggest that TOC TP and the concept of mechanisms have reciprocal benefits, and they provide new insights about the complementary use of TP tools and a mechanism-based approach. The thesis opens up new and interesting opportunities for further research. More importantly, it offers a practical tool for linking the goals of implementing ISO accreditation with the organisation's constraint-focused goals, and guides the organisation to leading the market in one or more of Treacy and Wiersema's (1993) strategic choices. The TOC-based argument is a valuable tool for encouraging successful QAP outcomes, yet it needs to be recognised that TOC, as an epistemology, lacks a clear ontology, offering opportunities for future researchers to define a solid philosophical grounding and further evolve this theory and its applications.

## References

- Agar, J. (2004). Towards Objectivity: From Kant to Marx. In M. S. Archer & W. Outhwaite (Eds.), *Defining Objectivity: Essays in Honour of Andrew Collier*. London: Routledge.
- AGI-Goldratt, I. (2010). Project management in a lean world-translating Lean Six Sigma (LSS) into the project environment. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, The United States of America Mc-Graw Hill.
- Al-Hameed, L., Dobson, P. J., & Jackson, P. (2014). *A Framework for Clarifying the Goal and Implementation of ISO*. Paper presented at the The 25th Australasian Conference on Information Systems., Auckland, NZ.
- Al-Hameed, L., Dobson, P. J., & Jackson, P. (2016). *The Strategy and Tactic (S&T) tree for achieving the Treacy and Wiersema (1993) strategic choices* Paper presented at the ECU Business Doctoral and Emerging Scholars Colloquium Edith Cowan University, Perth, Australia Peer reviewed conference retrieved from
- Andersen, S., Gupta, M., & Gupta, A. (2013). A managerial decision-making web app: Goldratt's evaporating cloud. *International Journal of Production Research*, 51(8), 2505-2517.
- Archer, M. S. (1996). *Culture and agency: The place of culture in social theory*. Cambridge, UK: Cambridge University Press.
- Archer, M. S., Bhaskar, R., Collier, A., Lawson, T., & Norrie, A. (Eds.). (1998). *Critical Realism: Essential Readings*. USA: Routledge.
- Astbury, B., & Leeuw, F. L. (2010). Unpacking black boxes: mechanisms and theory building in evaluation. *American Journal of Evaluation*, 31(3), 363-381.
- Australian Bureau of Statistics. (2013). 8155.0 - Australian Industry. Retrieved from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/8155.0Glossary12012-13?opendocument&tabname=Notes&prodno=8155.0&issue=2012-13&num=&view=>
- Barnard, A. (2009). *How to Identify and Unlock Inherent Potential within Organisations and Individuals using a Systems Approach: Developing and testing a new simplified Theory of Constraints based 5-Day Constraint Analysis Workshop with special focus on the application to the Public Sector*. (PhD), The Da Vinci Institute for Technology Management, Modderfontein, South Africa
- Barnard, A. (2010). Continuous Improvement and Auditing. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook* (pp. 403-454). New York, USA: McGraw Hill.
- Barnard, A. (2012). *New applications of and developments in Theory of Constraints' Strategy & Tactic*. Paper presented at the TOCICO 2012 Conference.
- Barnard, A. (2013). What is TOC strategy & Tactic Trees? *Introduction to TOC's Strategy & Tactic Tree Thinking Process*. Retrieved from [http://www.goldrattresearchlabs.com/documents/What%20is%20Strategy%20&%20Tactic%20Trees\\_by%20Dr%20Alan%20Barnard.pdf](http://www.goldrattresearchlabs.com/documents/What%20is%20Strategy%20&%20Tactic%20Trees_by%20Dr%20Alan%20Barnard.pdf)
- Barnard, A. (n.d). What is theory of Constraints(TOC)? Retrieved from [www.goldrattresearchlabs.com](http://www.goldrattresearchlabs.com) website: <http://www.goldrattresearchlabs.com/documents/What%20is%20Theory%20of%20Constraints%20by%20Dr%20Alan%20Barnard.pdf>
- Barnard, A., & Immelman, R. E. (2010). Holistic TOC Implementation Case Studies: lessons learned from the public and private sector. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, The United States of America: McGraw Hill
- Barndon, R. (2014). *Natural Selection* (Spring 2014 Edition ed.). <https://plato.stanford.edu/archives/spr2014/entries/natural-selection/>.

- Barnes, D. (2008). *Operations Management: An International Perspective*. London, United Kingdom: Thomson Learning.
- Bashkar, R. (1978). *A realist theory of science*: Brighton: Harvester.
- Bell, M. A. (2011). *Determinants of success in ISO 9000 implementation*. (PhD. 3456314), University of Miami, United States -- Florida. Retrieved from <http://search.proquest.com.ezproxy.ecu.edu.au/docview/872062085?accountid=10675> ProQuest Dissertations & Theses (PQDT) database.
- Best, A., Greenhalgh, T., Lewis, S., Saul, J. E., Carroll, S., & Bitz, J. (2012). Large - System Transformation in Health Care: A Realist Review. *Milbank Quarterly*, 90(3), 421-456.
- Bhaskar, R. (1978). *A Realist Theory of Science*. Sussex, UK: Harvester Press.
- Bhaskar, R. (1989). *Reclaiming reality: a critical introduction to contemporary Philosophy*: London, Verso.
- Bhaskar, R. (1998). *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences* (3rd ed.). London: Routledge.
- Bhaskar, R. (2008a). *Dialectic: The Pulse of Freedom*: Routledge.
- Bhaskar, R. (2008b). *A Realist Theory of Science*. New York, USA: Routledge.
- Blaikie, N. (2009). *Designing social research* (2nd Ed.): Polity.
- Blom, B., & Morén, S. (2011). Analysis of generative mechanisms. *Journal of Critical Realism*, 10(1), 60-79.
- Boiral, O. (2012). ISO certificates as organizational degrees? Beyond the rational myths of the certification process. *Organization Studies*, 33(5-6), 633-654.
- Boyd, L., & Gupta, M. (2004). Constraints management: what is the theory? *International Journal of Operations & Production Management*, 24(4), 350-371.
- Bryman, A. (2012). *Social research methods* (4th ed.). New York, The United States of America: Oxford University Press Inc.
- Budd, C. S., & Cerveny, J. (2010). A Critical Chain Project Management Primer. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook* (pp. 45-77). New York, USA: McGraw-Hill.
- Bunge, M. (2004). How does it work? The search for explanatory mechanisms. *Philosophy of the social sciences*, 34(2), 182-210.
- Bygstad, B., & Munkvold, B. E. (2011). *In Search of Mechanisms. Conducting a Critical Realist Data Analysis*. Paper presented at the ICIS.
- Caro, L. M., & García, J. A. M. (2009). Does ISO 9000 certification affect consumer perceptions of the service provider? *Managing Service Quality*, 19(2), 140-161.
- Carroll, J. M., & Swatman, P. A. (2000). Structured-case: a methodological framework for building theory in information systems research. *European Journal of Information Systems*, 9(4), 235-242.
- Cheng, C. (2010). Theory of Constraints in Prisons. In J. F. Cox III & J. G. Schleier Jr (Eds.), *The Theory of Constraints Handbook*. New York, USA: McGraw Hill.
- Choe, K., & Herman, S. (2004). Using theory of constraints tools to manage organizational change: a case study of Euripa Labs. *International Journal of Management & Organisational Behaviour*, 8(6), 540-558.
- Choi, T. Y., & Behling, O. C. (1997). Top Manages and TQM success: One more look after all these years. *The Academy of Management Executive*, 11(1), 37-47.
- Cohen, O. (2010). Daily management with TOC. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of Constraints Handbook*. (pp. 671-727). New York, USA: McGraw-Hill.
- Coleman, J. S. (1994). *Foundations of social theory*: Harvard university press.
- Collier, D. A., & Evans, J. R. (2009). *Operations Management*. The United State of America: Cengage Learning.
- Cooksey, R. W., & McDonald, G. M. (2012). *Surviving and thriving in postgraduate research*: Tilde University Press.



- Costa, M. M., & Lorente, A. R. M. (2003). Effects of ISO 9000 certification on firms' performance: a vision from the market. *Total Quality Management and Business Excellence*, 14(10), 1179-1191.
- Costa, M. M., & Lorente, A. R. M. (2007). ISO 9000: 2000: The key to quality? An exploratory study. *Quality Management Journal*, 14(1).
- Cox III, J. F., Blackstone Jr, J. H., & Schleier Jr, J. G. (2003). *Managing operations: A focus on excellence*. The United States of America: North River Press Great Barrington, MA.
- Cox III, J. F., Boyd, L. H., Sullivan, T. T., Reid, R. A., & Cartier, B. (2012). *The Theory of Constraints International Certification Organisation Dictionary* (2nd ed.).
- Cox III, J. F., & Schleier Jr., J. G. (Eds.). (2010). *Theory of constraints handbook*. New York, The United State of America: McGraw-Hill New York.
- Cox III, J. F., & Schleier Jr., J. G. (Eds.). (2010). *Theory of constraints Handbook*. New York, The United State of America: McGraw-Hill New York.
- Cox, J. W., & Hassard, J. (2007). Ties to the past in organization research: a comparative analysis of retrospective methods. *Organization*, 14(4), 475-497.
- Craver, C., & Tabery, J. (2016). Mechanisms in Science. In E. N. Zalta (Ed.), *Stanford Encyclopedia of Philosophy*. <http://plato.stanford.edu/cgi-bin/encyclopedia/archinfo.cgi?entry=science-mechanisms>.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). California, The United States of America: Sage Publications, Incorporated.
- Croswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. California, USA: Sage Publications.
- Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. c. (2002). *Explaining society: Critical realism in the social sciences*: Psychology Press.
- Davies, J., Mabin, V. J., & Balderstone, S. J. (2005). The theory of constraints: a methodology apart?—a comparison with selected OR/MS methodologies. *Omega*, 33(6), 506-524. doi:10.1016/j.omega.2004.07.015
- Demeulenaere, P. (2011). *Analytical Sociology and Social Mechanisms*. UK: Cambridge University Press.
- Denzin, N. K., & Lincoln, Y. S. (1994). *Handbook of qualitative research*: Sage Publications, Inc.
- Dettmer, H. W. (2007a). The Intermediate Objectives Map. *Goal Systems International*, 1-13.
- Dettmer, H. W. (2007b). *The Logical Thinking Process: A Systems Approach to Complex Problem Solving*. Milwaukee, Wisconsin: ASQ Quality Press.
- Dettmer, H. W. (2010). Strategy In J. F. Cox III & J. G. Schleier Jr. (Eds.), *Theory of constraints handbook*. New York, USA: McGraw Hill Professional.
- Dettmer, H. W. (2011). Our goal is... What is our goal? *Goal Systems International*.
- Disterer, G. (2012). Why Firms Seek ISO 20000 Certification-A Study of ISO 20000 Adoption.
- Dobson, P. J. (2002). Critical realism and information systems research: why bother with philosophy? *Information Research*, 7(2), 7-2.
- Dobson, P. J. (2003). *Moving from interpretivism to critical realism in IS research : an exploration and supporting IT outsourcing example* (PhD), Edith Cowan University, Edith Cowan Library.
- Dobson, P. J. (2009). Critical Realism as an Underlying Philosophy for IS Research. In M. Khosrow-Pour (Ed.), *Encyclopaedia of Information Science and Technology, Second Edition* (2nd ed.) (pp. 806-810). Hershey, PA, USA: IGI Global.
- Dobson, P. J. (2012). Critical Realism and IS research: Some Methodological Implications. In M. Mora, O. Gelman, A. Steenkamp, & M. Raisinghani (Eds.), *Research Methodologies, Innovation and philosophies in software engineering and information system*. The United States of America: IGI Global.

- Dobson, P. J., Jackson, P., & Gengatharen, D. (2013). Explaining Broadband Adoption in Rural Australia: Modes of Reflexivity and the Morphogenetic Approach. *Mis Quarterly*, 37(3), 965-991.
- Dobson, P. J., Myles, J., & Jackson, P. (2007). Making the case for critical realism: Examining the implementation of automated performance management systems. *Information Resources Management Journal* 20(2), 138-152.
- Dooley, K. J., & Flor, R. F. (1998). Perceptions of success and failure in TQM initiatives. *Journal of Quality Management*, 3(2), 157-174.
- Douglas, A., Coleman, S., & Oddy, R. (2003). The case for ISO 9000. *The TQM Magazine*, 15(5), 316-324.
- Dunbar, G. S. (2013a). *Theory of Constraint study guide—fundamentals Exam*
- Dunbar, G. S. (2013b). *TOC & BPM: The Performance Framework*. Lecture. School of Business. Edith Cowan University. ECU blackboard.
- Dunbar, G. S. (Producer). (2014). Problem Solving Part 4 Testing the logic. Retrieved from <https://www.youtube.com/watch?v=jkF80ixJqu8>
- Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management*, 39(1), 118-128.
- Edwards, P. K., O'Mahoney, J., & Vincent, S. (2014). *Studying organizations using critical realism: A practical guide* (Vol. 17): OUP Oxford.
- Eichen, M. (2006). Value Disciplines: A Lens for Successful Decision Making in IT. *Educause Quarterly*, 29(2), 32-39.
- Elder-Vass, D. (2010). *The causal power of social structures: emergence, structure and agency*. New York, USA: Cambridge University Press.
- Elder-Vass, D. (2015). Developing Social Theory using Critical Realism. *journal of critical realism*, 14(1), 80-92.
- Evans, J. R., & Lindsay, W. M. (2008). *Managing for Quality and Business Excellence* (7th ed.). Mason, Ohio, The United State of America: Thomson South-Western.
- Fedurko, J. (2013a). *Leading people through change using S&T Trees*. Paper presented at the TOCICO 2013 international conference, Frankfurt, Germany.
- Fedurko, J. (2013b, 3rd-6th of June 2013). *Looking into UDE Clouds— how to get them right*. Paper presented at the TOCICO 2013 international conference, Frankfurt, Germany.
- Feng, M., Terziovski, M., & Samson, D. (2008). Relationship of ISO 9001: 2000 quality system certification with operational and business performance: A survey in Australia and New Zealand-based manufacturing and service companies. *Journal of Manufacturing Technology Management*, 19(1), 22-37.
- Ferguson, L. A. (2010). Application of strategy and tactics trees in organizations. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, USA: McGraw Hill.
- Fleetwood, S. (2005). Ontology in organization and management studies: A critical realist perspective. *Organization*, 12(2), 197-222.
- Flick, U. (2006). *An introduction to qualitative research* (3rd ed.). New Delhi, India: SAGE Publications.
- Goldratt, E. M. (1990). *What is this thing called theory of constraints and how should it be implemented?* Great Barrington, Mass. The United States of America: North River Press.
- Goldratt, E. M. (1994). *It's not luck*. Aldershot, England North River Press.
- Goldratt, E. M. (2009). Standing on the shoulders of giants: production concepts versus production applications. The Hitachi Tool Engineering example. *Gestão & produção*, 16(3), 333-343.
- Goldratt, E. M. (2010). Introduction to TOC—My perspective. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook* (pp. Chapter 1). New York, The United States of America: McGraw-Hill.

- Goldratt, E. M., & Cox, J. (1986). *The Goal: A Process of ongoing Improvement* (Rev. ed.). New York, The United States of America: North River Press.
- Goldratt, E. M., & Fox, R. E. (1986). *The Race*: North River Press New York.
- Goldratt, E. M., & Goldratt-Aslag, E. (2010). *The choice* (Revised Edition ed.). The United States of America: North River Press.
- Goldratt, E. M., Goldratt, R., & Abramov, E. (2002). Strategy and Tactics. Retrieved from [www.goldrattresearchlabs.com](http://www.goldrattresearchlabs.com) website:  
<http://www.goldrattresearchlabs.com/documents/The%20TOC%20Approach%20to%20Strategy%20and%20Tactics%20by%20Eli%20Goldratt.pdf>
- Goldratt Group. (2009). Goldratt Schools. Retrieved from <http://goldrattschools.org/faculty/>
- Gorski, P. (2009). Social 'mechanisms' and comparative-historical sociology: A critical realist proposal. In P. Hedström & B. Wittrock (Eds.), *The frontiers of sociology*. Boston, MA, USA Brill Academic Publishers.
- Grbich, C. (2007). *Qualitative data analysis An introduction*. Wiltshire, Great Britain: SAGE Publication Ltd.
- Groff, R. (2004). *Critical Realism, Post-positivism and The Possibility of Knowledge*. London Routledge
- Gupta, M., & Boyd, L. H. (2008). Theory of Constraints: a theory for Operations Management *International Journal of Operations & Production Management*, 28(10), 22. doi:10.1108/01443570810903122
- Hareton, K. N., Leung, H. K. N., Chan, K. C. C., & Lee, T. Y. (1999). Costs and benefits of ISO 9000 series: a practical study. *International Journal of Quality & Reliability Management*, 16(7), 675-691.
- Hedström, P. (2005). *Dissecting the Social: On The Principles of Analytical Sociology*: Cambridge University Press Cambridge, UK.
- Hedström, P., & Swedberg, R. (1996). Social mechanisms. *Acta Sociologica*, 39(3), 281-308.
- Hedström, P., & Swedberg, R. (1998). Social mechanisms: An introductory essay. In P. Hedström & R. Swedberg (Eds.), *Social Mechanisms: An Analytical Approach to Social Theory* (pp. 1-31). The United States of America: Cambridge University Press.
- Hedström, P., & Ylikoski, P. (2010). Causal Mechanisms in The Social Sciences. *Annual Review of Sociology*, 36, 49-67.
- Heras-Saizarbitoria, I., Landín, G. A., & Molina-Azorín, J. F. (2011). Do drivers matter for the benefits of ISO 14001? *International Journal of Operations & Production Management*, 31(2), 192-216.
- Heravitorbati, A., Coffey, V., & Trigunarsyah, B. (2011). Assessment of requirements for establishment of a framework to enhance implementation of quality practices in building projects. *International Journal of Innovation, Management and Technology*, 2(6).
- Heron, G. (2011). *Exploring Alternative Models of Localisation in Food Supply Chains: A Theory of Constraints Approach*. (PhD), Northumbria, Newcastle, United Kingdom.
- <https://www.safeworkaustralia.gov.au>. (2018). Fatigue Management: A worker's guide Retrieved from <https://www.safeworkaustralia.gov.au/system/files/documents/1702/fatigue-management-a-workers-guide.pdf>
- Huang, C. L., Li, R. K., Chung, Y. C., Hsu, Y. W., & Tsai, C. H. (2013). A Study of Using Critical Chain Project Management Method for Multi-Project Management Improvement. *International Journal of Academic Research in Economics and Management Science*, 2(3).
- International Organization for Standardization. (2015). ISO. Retrieved from <http://www.iso.org/iso/home/standards/benefitsofstandards.htm>

- International Organization for Standardization. (2016). ISO. Retrieved from <http://www.iso.org/iso/home.htm>
- Jeppesen, S. (2005). Critical realism as an approach to unfolding empirical findings: thoughts on fieldwork in South Africa on SMEs and environment. *The Journal of Transdisciplinary Environmental Studies*, 4(1).
- Jin, K., Abdul-Razzak, H., Elkassabgi, Y., Zhou, H., & Herrera, A. (2009). Integrating the Theory of Constraints and Six Sigma In Manufacturing Process Improvement. *International Journal of Business, Finance, and Management Science*, 1(4), 239-243.
- Johnson, D. M. (2004). Adaptation of organizational change models to the implementation of quality standard requirements. *International Journal of Quality & Reliability Management*, 21(2), 154-174.
- Johnston, R. B., & Smith, S. P. (2010). How critical realism clarifies validity issues in theory-testing research: analysis and case. In D. N. Hart & S. D. Gregor (Eds.), *Information System Foundations: The Role of Design Science* Canberra, Australia: Australian National University E Press.
- Joseph, J. (1998). In defence of critical realism. *Capital & Class*, 22(2), 73-106.
- Julnes, G., Mark, M. M., & Henry, G. T. (1998). Review: Promoting Realism in Evaluation Realistic Evaluation and the Broader Context. *Evaluation*, 4(4), 483-504.
- Kendall, G. I. (2010). Theory of Constraints Strategy In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, The United States of America: McGraw-Hill
- Kim, S., Mabin, V. J., & Davies, J. (2008). The theory of constraints thinking processes: retrospect and prospect. *International Journal of Operations & Production Management*, 28(2), 155-184.
- Kotas, M. (2015). Identifying of Critical Success Factors of Social Services Organizations in the Public Sector. *The Business & Management Review*, 6(4), 84.
- Lepore, D., & Cohen, O. (1999). *Deming and Goldratt: The theory of constraints and the system of profound knowledge*: North River Press Great Barrington, MA.
- Lowe, D. (2015). Strategy and Tactics. Retrieved from <http://www.donlowe.org/poogi/toc-lean/strategy-and-tactics/>
- Mabin, V. J. (1990). Goldratt's " Theory of Constraints" thinking processes: A systems methodology linking soft with hard. *history*, 1990, 1-12.
- Mabin, V. J. (2009, 20-23 Nov 2010). *Eating the Elephant! Applying Theory of Constraints in Assurance of Learning*. Paper presented at the 41st Annual Meeting of the Decision Sciences Institute, San Diego.
- Mabin, V. J. (2014). *Using Systems Thinking Tools to Guide the Establishment of an Assurance of Learning System*. Paper presented at the ICERI2014 Conference, 7th International Conference of Education, Research and Innovation
- Mabin, V. J. (2016). *TOC for Academic Research - Moving From Common Sense to Common Practice*. Paper presented at the 2016 TOCICO International Conference 'Sustainability: Moving from Common Sense to Common Practice', Leesburg, Virginia, United States of America
- Mabin, V. J., Babington, S., Caldwell, V., Yee, J., & Moore, R. M. (2011). *A Change is as Good as a Rest: Using the Theory of Constraints to Resolve Resource Constraints in a Large Public Hospital*. Paper presented at the 42nd Annual Meeting of Decision Sciences Institute., Boston, Atlanta.
- Mabin, V. J., & Balderstone, S. J. (1999). *The World of the Theory of Constraints: a review of the international literature* (1st ed.). Boca Raton, Florida, The United States of America: CRC Press LLS.

- Mabin, V. J., & Balderstone, S. J. (2003). The performance of the theory of constraints methodology: Analysis and discussion of successful TOC applications. *International Journal of Operations & Production Management*, 23(6), 568-595.
- Mabin, V. J., & Davies, J. (2010). The TOC Thinking Process: Their nature and use-reflections and consolidation. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, The United States of America: McGraw Hill.
- Mabin, V. J., Davies, J., Kimani, S., & Mirzaei, M. (2016). *TOC for Academic Research - Moving From Common Sense to Common Practice*. Paper presented at the 2016 International Conference, Leesburg, VA - National Conference Center [http://www.tocico.org/mpage/Mabin\\_Bio2\\_2016](http://www.tocico.org/mpage/Mabin_Bio2_2016)
- Machamer, P., Darden, L., & Craver, C. F. (2000). Thinking about Mechanisms. *Philosophy of science*, 67(1), 1-25.
- Mahoney, J. (2003). *Tentative Answers to Questions about Causal Mechanisms*. Paper presented at the Annual Meeting of the American Political Science Association, Philadelphia, PA.
- Manders, B. (2015). *Implementation and Impact of ISO 9001*. (PhD), Erasmus University Rotterdam (EUR). Retrieved from <hdl.handle.net/1765/77412>
- Marchal, B., Van Belle, S., Van Olmen, J., Hoérée, T., & Kegels, G. (2012). Is realist evaluation keeping its promise? A review of published empirical studies in the field of health systems research. *Evaluation*, 18(2), 192-212.
- Martin, L. (2009). Critical Realism and creativity: A Challenge to the Hegemony of Psychological Conceptions. *Journal of Critical Realism*, 8(3), 294-315.
- Maxwell, J. A. (2012). *A Realist Approach for Qualitative Research*: Sage Publications.
- Mayntz, R. (2004). Mechanisms in the Analysis of Social Macro-Phenomena. *Philosophy of the Social Sciences*, 34(2), 237-259.
- McNally, R. (2011). *Flying Logic: Thinking with Flying Logic*. Glendora, CA: FlyingLogic.com.
- Miles, M. B., & Huberman, M. A. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.): Thousand Oaks, Sage Publications.
- Miller, C. C., Cardinal, L. B., & Glick, W. H. (1997). Retrospective reports in organizational research: A reexamination of recent evidence. *Academy of Management Journal*, 40(1), 189-204.
- Mingers, J. (2004). Real-izing information systems: critical realism as an underpinning philosophy for information systems. *Information and organization*, 14(2), 87-103.
- Mingers, J., Mutch, A., & Willcocks, L. (2013). Critical Realism in Information Systems Research. *MIS Quarterly*, 37(3), 795-802.
- Molina-Azorín, J. F., Tarí, J. J., Pereira-Moliner, J., López-Gamero, M. D., & Pertusa-Ortega, E. M. (2015). The effects of quality and environmental management on competitive advantage: A mixed methods study in the hotel industry. *Tourism Management*, 50, 41-54.
- Motwani, J., Klein, D., & Harowitz, R. (1996). The theory of constraints in services: part 1-the basics. *Managing Service Quality*, 6(1), 53-56.
- Naveh, E., & Marcus, A. (2004). When does the ISO 9000 quality assurance standard lead to performance improvement? Assimilation and going beyond. *IEEE Transactions on Engineering management*, 51(3), 352-363.
- Naveh, E., & Marcus, A. (2005). Achieving competitive advantage through implementing a replicable management standard: Installing and using ISO 9000. *Journal of Operations Management*, 24(1), 1-26.
- Neuman, W. L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Boston, The United States of America: Allyn & Bacon.
- Newbold, R. C. (1998). *Project management in the fast lane: Applying the Theory of Constraints* (Vol. 6): CRC Press.

- Njihia, J. M., & Merali, Y. (2013). The Broader Context for ICT4D Projects: A Morphogenetic Analysis. *MIS Quarterly*, 37(3), 881-905.
- Noreen, E. W., Smith, D., & Mackey, J. T. (1995). *The Theory of Constraints and its Implications for Management Accounting*. Massachusetts, USA: North River Press.
- O'Mahoney, J., & Vincent, S. (2014). Critical realism as an empirical project: a beginner's guide. In P. I. K. Edwards, J. O'Mahoney, & S. Vincent (Eds.), *Studying Organizations using Critical Realism*. Oxford Scholarship Online: Oxford University Press.
- Ogrinc, G., & Batalden, P. (2009). Realist evaluation as a framework for the assessment of teaching about the improvement of care. *Journal of Nursing Education*, 48(12), 661-667.
- Ormerod, P. (2006). *Why most things fail: Evolution, Extinction and Economics* (Vol. 44).
- Pass, S., & Ronen, B. (2003). Management by the market constraint in the hi-tech industry. *International Journal of Production Research*, 41(4), 713-724.
- Pawson, R. (2006). *Evidence-based policy: A realist perspective*: Sage Publications Limited.
- Pawson, R., Greenhalgh, T., Harvey, G., & Walshe, K. (2005). Realist review—a new method of systematic review designed for complex policy interventions. *Journal of health services research & policy*, 10(Suppl 1), 21-34.
- Pawson, R., & Tilley, N. (1997). *Realistic evaluation*: SAGE Publications Limited.
- Pegels, C. C., & Watrous, C. (2005). Application of the Theory of Constraints to a bottleneck operation in a manufacturing plant. *Journal of Manufacturing Technology Management*, 16(3), 302-311.
- Pirasteh, R. (2007a). *Lean, Six Sigma and TLS (TOC-Lean-Six Sigma) at Sanmina*. Paper presented at the TOCICO 2007 International Conference
- Pirasteh, R. (2007b). *"TLS Continuous Improvement Trio" Is It Not The Time To Think Differently?* Paper presented at the 2007 TOCICO International Conference., United States.
- Plumb, D. (2013). *A Regional Emergent Ontology of Critical Reflection*. Paper presented at the Annual Conference of the Canadian Association for the Study of Adult Education, Canada.
- Polito, T., Watson, K., & Vokurka, R. J. (2006). Using the Theory of Constraints to improve competitiveness: An airline case study. *Competitiveness Review: An International Business Journal*, 16(1), 44-50.
- Prajogo, D. I. (2007). The relationship between competitive strategies and product quality. *Industrial Management & Data Systems*, 107(1), 69-83.
- Prajogo, D. I. (2011). The roles of firms' motives in affecting the outcomes of ISO 9000 adoption. *International Journal of Operations & Production Management*, 31(1), 78-100. doi:10.1108/01443571111098753
- Radulescu, C., & Vessey, I. (2008). *Causality in Critical Realist Research: An Analysis of Three Explanatory Frameworks*. Paper presented at the International Association for Critical Realism Annual Conference 2008.
- Rahman, S. (1998). Theory of Constraints: A review of the philosophy and its applications. *International Journal of Operations & Production Management*, 18(4), 336-355. doi:http://dx.doi.org/10.1108/01443579810199720
- Rahman, S. (2002). The Theory of Constraints' Thinking Process approach to developing strategies in Supply Chains. *International Journal of Physical Distribution & Logistics Management*, 32(10), 809-828. doi:http://dx.doi.org/10.1108/09600030210455429
- Reed, M. I. (2009). Critical realism: Philosophy, method, or philosophy in search of a method? In D. A. Bunchanan & A. Bryman (Eds.), *The SAGE handbook of organizational research methods* (pp. 430-448). India: SAGE publication.
- Reis, R. (Producer). (n.d, 2017). Strengths and Limitations of Case Studies. [Lecture] Retrieved from <http://cgi.stanford.edu/~dept-ctl/tomprof/posting.php?ID=1013>

- Ricketts, J. A. (2008). *Reaching the goal: how managers improve a services business using Goldratt's theory of constraints*: Pearson plc, IBM Press.
- Ricketts, J. A. (2010). Theory of Constraints in Professional, Scientific, and Technical Services In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook* (pp. 859-878). New York, USA: McGraw-Hill.
- Ronen, B. (2005). Special issue on the Theory of Constraints-Practice and Research. *Human Systems Management*, 24(1), 1-2.
- Ronen, B., & Pass, S. (2010). Services Management. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, USA: McGraw Hill Professional.
- Ross, M., & Heaney, J.-G. (2007). *Using the value discipline strategy typology to describe services marketing strategies*. Paper presented at the Welcome to the Australian and New Zealand Marketing Academy (ANZMAC) Conference 2007, University of Otago, Dunedin, New Zealand.
- . Roy Bhaskar Interviewed. questions by Professor Christopher Norris.). *The Philosophers' Magazine*
- Runde, J. (1998). Assessing causal economic explanations. *Oxford Economic Papers*, 50(2), 151-172.
- Santos, L., & Escanciano, C. (2002). Benefits of the ISO 9000: 1994 system: some considerations to reinforce competitive advantage. *International Journal of Quality & Reliability Management*, 19(3), 321-344.
- Sayer, A. (1992). *Method in social science: A realist approach*: Routledge.
- Scheinkopf, L. J. (1999). *Thinking for a Change: Putting the TOC Thinking Processes to Use*. Boca Raton, FL St. Lucie Press.
- Scheinkopf, L. J. (2010). Thinking Process Including S & T Trees. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, United States of America: McGraw Hill Professional.
- Schrageheim, E. (2013). *Learning from One event: A structure organizational learning process to inquire and learning the right lesson from a single event* Paper presented at the TOCICO 2013 International Conference, Frankfurt, Germany.
- Schrageheim, E. (2015). Short-Term and Long-Term TOC Or the Two Critical Flows [Blog post]. Retrieved from <https://elischrageheim.com/2015/10/25/short-term-and-long-term-toc-or-the-two-critical-flows/>
- Schrageheim, E., & Passal, A. (2005). Learning from Experience: A structured methodology based on TOC. *Human Systems Management*, 24(1), 95-104.
- Senge, P., Kleiner, A., Roberts, C., Ross, R., Roth, G., & Smith, B. (2007). *The dance of change*. London: Nicholas Brealey Publishing.
- Shoemaker, T. E., & Reid, R. A. (2005). Applying the TOC thinking process: a case study in the government sector. *Human Systems Management*, 24(1), 21-37.
- Smith, S. P., & Johnston, R. B. (2014). How Critical Realism Clarifies Validity Issues in Information System Theory-Testing Research *Scandinavian Journal of Information System*.
- Somekh, B., & Lewin, C. (2011). *Theory and methods in social research* (2nd ed.). New Delhi, India: SAGE Publications Limited.
- Sproull, B. (2012). *The Ultimate Improvement Cycle: Maximizing Profits through the Integration of Lean, Six Sigma, and the Theory of Constraints*. Boca Raton, FL, the United States of America CRC Press, Taylor and Frances Group.
- Stake, R. (2005). Qualitative Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3rd ed., pp. 443-466): Thousand Oaks, CA: Sage.
- Sullivan, T. T., Reid, R. A., & Cartier, B. (2007). TOCICO Dictionary.
- Terziovski, M., Samson, D., & Dow, D. (1997). The business value of quality management systems certification. Evidence from Australia and New Zealand. *Journal of operations management*, 15(1), 1-18.

- The CASRO Institute for Research Quality. (2016). The CASRO Institute for Research Quality Retrieved from <http://www.cirq.org/why-certification.php>
- Tilley, N. (2000). *Realistic evaluation: an overview*. Paper presented at the founding conference of the Danish Evaluation Society.
- Treacy, M., & Wiersema, F. (1993). Customer intimacy and other value disciplines: Three paths to market leadership. *Harvard business review*, 71(1), 84-93.
- Treacy, M., & Wiersema, F. (1997). *The discipline of market leaders: Choose your customers, narrow your focus, dominate your market*: Basic Books.
- Wadhwa, G. (2010). Viable Vision for Health Care System. In J. F. Cox III & J. G. Schleier Jr (Eds.), *Theory of constraints handbook*. New York, The United States of America McGraw Hill Professional.
- Wahid, R. A., & Corner, J. (2011). Critical success factors and improvements in ISO 9000 maintenance. *Business Management Quarterly Review*, 2(2), 1-13.
- Wan, P. (2011). *Reframing the social: Emergentist systemism and social theory*. Great Britain: Ashgate Publishing Limited.
- Watson, K. J., Blackstone, J. H., & Gardiner, S. C. (2007). The evolution of a management philosophy: The theory of constraints. *Journal of Operations Management*, 25(2), 387-402. doi:10.1016/j.jom.2006.04.004
- Weick, K. E. (1989). Theory Construction as Disciplined Imagination. *Academy of management review*, 14(4), 516-531.
- Wight, C. (2015). Mechanisms and Models: Some Examples from International Relations. In M. S. Archer (Ed.), *Generative Mechanisms Transforming the Social Order* (pp. 49-64). Switzerland: Springer.
- Williams, G. C. (1996). *Adaptation and Natural Selection*. New Jersey, USA: Princeton University Press.
- Williams, J. A. (2004). The Impact of Motivating Factors on Implementation of ISO 9001: 2000 Registration Process. *Management Research News*, 27(1/2), 74-84.
- Wong, G., Greenhalgh, T., Westhorp, G., & Pawson, R. (2012). Realist methods in medical education research: what are they and what can they contribute? *Medical education*, 46(1), 89-96.
- Wuisman, J. J. (2005). The Logic of Scientific Discovery in Critical Realist Social Scientific Research. *Journal of Critical Realism*, 4(2), 366-394.
- Wynn Jr, D., & Williams, C. K. (2012). Principles for conducting critical realist case study research in information systems. *Mis Quarterly*, 36(3), 787-810.
- Wynn Jr, D. E., Volkoff, O., Williams, C. K., & Strong, D. (2013). *Critical Realism and Mechanisms: Moving from the Philosophical to the Empirical in the Search for Causal Explanations*.
- Yeung, A., Lo, C., & Cheng, T. (2011). Behind the iron cage: an institutional perspective on ISO 9000 adoption and CEO compensation. *Organization Science*, 22(6), 1600-1612.
- Yin, R. K. (2009). *Case study research: design and methods* (4th ed.). California, The United States of America Thousand Oaks, Sage Publications.
- Youngman, K. (2015). Online Guide to Theory of Constraints. Retrieved from <http://www.dbrmfg.co.nz/Thinking%20Process%20Cloud.htm>
- Zatzick, C. D., Moliterno, T. P., & Fang, T. (2012). Strategic (MIS) FIT: The Implementation of TQM in Manufacturing Organizations. *Strategic Management Journal*, 33(11). doi: 10.1002/smj.1988



# Appendix A

## Case study's interviews questions

1. I understand that your organisation/company implemented a quality programs (the specific quality program that they implement) could you tell me how it went? (How is it going?)  
What were the goals of the QAP implementation?

Probes:

- What is the goal of the organisation?
  - Does the goal of the implementation work towards the organisational goal?
2. Could you please tell me how the quality program was implemented?
    - **How did you measure the success** (?) Did you set your performance metrics?  
What were these metrics?
    - Did you identify the reasons for adopting this program?
    - Where did the implementation start? In which business area?
    - Was there resistance to the change? How did individuals adapt to the changes?
    - What other initiatives took place with this program (if any)?
    - If the program was implemented under a different leader (manager) would you get different outcomes? Why?
  3. What were the motives for the program implementation?

Probes:

- Operational performance (financial, quality, performance measurements)
  - Policy (formal and informal roles that control the productive capacity)
  - Strengthen your market position (symbolic)
  - Customer satisfaction (marketing strategy)
  - Gain a competitive edge (quality, speed or due date, reliability, low cost, flexibility, innovation, environment friendly) (marketing strategy)
  - Part of a large strategy
  - Pressure from competitors
  - Shortage in demand
  -
- Does increasing throughput (sold services or sales), controlling the costs including inventory, or both were a part of your motives?
  - Where do you want to improve your company? What are the problems that this program is meant to target?
4. Why did the organisation choose this particular program? Why not others?

Probes:

- Can the market accept all that you produce?
  - Does this program (e.g accreditation) make your organisation or your product more reliable/acceptable in the market?
- **What are the constraints to fill your order?** Do you have problems fulfilling your orders?
  - What are these resources
- Does IT is a part of the problem?

- How can you improve the IT performance?
    - Was your problem quality related? In what aspect?
    - Do you have problem within the rules that control the productive capacity?
- 5. Could you please tell me about your role in the implementation process according to these aspects?
 

Probes:

  - The roles and tasks?
  - Stages
  - What were the performance measurements that you aim to fulfil?  
Performance/improvement criteria
- 6. How satisfied are you with the program's outcomes?
 

Probes:

  - What went well and what went badly? Why?
  - What could be done differently? Why?
  - If I ask you to rate the success out of ten, what is the rate of success of the program?  
Why?
- 7. What were the circumstances that led to this level of success?
- 8. How has the implementation of this program changed the organisation in regards to?
  - Work procedure (work flow)
  - Revenues
  - Work load
  - Customer satisfaction
  - Employee satisfaction (attitude)
  - Costs
  - Market demand
- 9. What is your next step in quality and improvement? Why?