UNIVERSITY OF KWAZULU-NATAL

SYSTEMIC APPROACHES TO IMPROVEMENT IN SUGARCANE PRODUCTION AND SUPPLY: UMFOLOZI & FELIXTON MILL AREAS

By

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DECLARATION

I, Sandra Hildbrand, declare that:

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ii. This dissertation has not been submitted for any degree or examination at any other university.

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ABSTRACT

Within the South African sugar industry, several possibilities for performance improvement exist. Present inefficiencies arise largely from the complexity of integrated sugarcane production and supply systems. Research has mainly concentrated on technical, hard aspects, such as mill and transport efficiency and sugarcane quality in an attempt to optimise these systems by optimising their parts. Soft issues, like communication, trust, and values have been neglected. This study considers sugarcane production and supply systems more holistically and places a particular focus on soft and leadership issues.

Two systems methodologies, Soft Systems Methodology (SSM) and the Viable System Model (VSM) were applied to investigate the complexity of two large sugarcane production and supply systems in KwaZulu-Natal, South Africa in the Felixton and Umfolozi milling areas. These methodologies were combined with a qualitative approach which facilitated a thorough exploration of crucial soft and leadership issues. The outcome of the empirical work showed that a core issue challenging both milling areas and the entire sugar industry is the presence of fragmentation. Factors that contribute to fragmentation and suggestions for its handling are presented.

SSM and VSM fostered an in-depth understanding of the studied system, yet their ability to suggest improvements was not confirmed. Since it is argued that this was largely impeded by the conditions of the study, the thesis overall supports the suitability of both methodologies in the sugar industry context and encourages their further use. The thesis emphasises the necessity to adopt a holistic approach and pay attention to soft issues when dealing with sugarcane production and supply systems. By implication, systemic approaches in general seem significant in this context.

Neither SSM nor VSM were previously utilised to investigate a sugarcane production and supply system, hence this thesis makes a meaningful contribution to the existing body of SSM and VSM knowledge. It highlights the strengths and shortfalls of these systems methodologies in the applied context and presents derived methodological lessons. These lessons broaden the knowledge of employing SSM and VSM and support their application in practice.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

CANEGROWERS	South African Cane Growers‟ Association
CTS	Cane Testing Service
DRD	Daily Rateable Delivery
FCGA	Felixton Canegrowers' Association
LSG	Large scale grower
MGB	Mill Group Board
RV	Recoverable Value
SASA	South African Sugar Association
SASRI	South African Sugar Research Institute
SSG	Small scale grower
SSM	Soft Systems Methodology
THS	Tongaat Hulett Sugar Ltd
UCGA	Umfolozi Cane Growers Association
UCOSP	Umfolozi Co-Operative Sugar Planters Ltd
VSM	Viable System Model

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Within the South African sugar industry, possibilities for performance improvement exist (Bezuidenhout and Baier, 2011, Le Gal et al., 2008, Giles et al., 2006). Inefficiencies constrain the effectiveness of the sugarcane production and supply systems (Bezuidenhout et al., 2012, Perry and Wynne, 2004).

The complexity which characterises the sugarcane supply chain contributes to these shortcomings, and is generally higher compared to other manufacturing supply chain systems (Higgins et al., 2007, Bezuidenhout, 2010). The complexity arises from the interaction and interdependency of multiple stakeholders with diverse perspectives and partially conflicting aims, and the present multidimensionality and fragmentation of sugarcane supply and production systems (Bezuidenhout, 2008, Bezuidenhout et al., 2012, Le Gal et al., 2008). This results in the reality that each stakeholder group focuses on their own benefits without taking the whole system into account (Perry and Wynne, 2004). A holistic solution that encompasses these challenges is needed (Bezuidenhout and Baier, 2011). The outlined circumstances engender poor relationships, tension, increased opportunity costs, and an insufficient implementation of beneficial innovations (Bezuidenhout et al., 2012, Wynne, 2009, Lejars et al., 2008, Giles et al., 2009).

The current study was embedded in a larger project, which influenced it and defined its main scope. Parts of the field-work were conducted in collaboration with other project members. The study was conducted in two large mill areas in South Africa, namely Felixton and Umfolozi, via the use of systems approaches and qualitative methodologies.

The term supply chain does not refer to any specific concept in the supply chain literature, but to an integrated sugarcane production and processing system. This system comprises the sugarcane production, harvest, transport and processing and is often operated by three independent parties; *viz.,* growers, hauliers and millers (Le Gal et al., 2008, Wynne, 2009).

1.2 Problem statement and motivation for this research

Much research has been done in the sugar industry (SASA, 2009, Higgins et al., 2007, Bezuidenhout and Baier, 2011) and focuses largely on mill efficiency, transport optimisation, harvesting, and the agricultural aspects of sugarcane growing, such as variety improvements, crop

performance and protection and management (for example Singels et al., 2009, Berry and Rhodes, 2006, Gers et al., 1999, Butterfield et al., 2004, Marion et al., 2002, Way et al., 2010, Peacock and Schorn, 2002, Greenfield, 2001, Hahn and Ribeiro, 1999, Allen and McDonald, 1999, Olson and Pope, 2004). These aspects are seen as pivotal to increasing the profitability of sugarcane production and supply (Gaucher et al., 2003, Le Gal et al., 2004).

Although the South African sugar literature is rich in studies on, and recommendations for supply chain improvements in the areas of, for example, trashing, mechanical harvesting, advanced harvesting patterns and transportation, these recommendations have been poorly implemented (Bezuidenhout and Baier, 2011, Le Gal et al., 2008, Higgins et al., 2007). Bezuidenhout (2008) mentions a limited number of successful advancements of the entire supply chain. A vehicle scheduling system, for instance, has not been broadly employed, despite its merit regarding the advanced loading, transportation and coordination of cane supply (Giles et al., 2006). This reality results in over-capitalisation and an underutilisation of equipment, which increases cost for growers, hauliers and millers (Giles et al., 2009, Stutterheim et al., 2008). The opportunities to increase the overall effectiveness of the sugar industry and to ultimately enhance everyone‟s income are not fully exploited (Le Gal et al., 2008, Giles et al., 2006). Since this situation arises from the effects of the degree of complexity that characterises the sugar industry, this complexity and its impacts on a sugarcane supply chain need to be better understood (Higgins et al., 2007, Bezuidenhout, 2010).

Research, thus far, has concentrated predominately on operational and technical aspects (Higgins et al., 2007), like mill efficiency (Wienese, 1995, Peacock and Schorn, 2002, Moor, 2000), harvesting and transport systems (Arjona et al., 2001, Le Gal et al., 2009) and cane supply and quality (Diaz and Perez, 2000, Lejars et al., 2003, Wynne, 2001, Culverwell, 1992, Parfitt, 2005). The existing research attempts to optimise the sugarcane production and supply system by improving its constituent parts (Higgins and Muchow, 2003). Despite the importance of these „hard“ aspects for the effective functioning of the sugarcane supply chain, it seems insufficient to focus solely on them. A sugarcane production and supply system has to be holistically considered. Higgins et al. (2007) emphasise the need for more studies that investigate the multidimensionality of sugarcane supply chains, and the interactions and interdependencies of their parts.

Only a minor proportion of sugarcane supply chain research has concentrated on non-logistical possibilities for efficiency increase, and this research barely touched on „soft“ and relational aspects (Higgins et al., 2007). Perry and Wynne (2004) indicated the relevance of communication and information transparency, but research has very seldom investigated such soft issues in any detail. Soft issues comprise goals, values, perceptions, relationships, collaboration, trust and

communication, but also include leadership, behavioural, managerial and strategic issues (Gerwel et al., 2011).

These soft issues play an important role in the miller, grower, and haulier interplay and hence in the working of sugarcane production and supply systems (Todd and Forber, 2005, Perry and Wynne, 2004, Le Gal et al., 2008). Supply chain relationships influence supply chain performance, which benefits from trust and mutual respect (Fynes et al., 2005, Masuku and Kirsten, 2004). The sugar industry is challenged by soft issues, since they add to complexity, fragmentation and inefficiencies (Bezuidenhout et al., 2012, Gerwel et al., 2011). Soft issues, such as conflict (Le Gal et al., 2008), lack of trust (Masuku and Kirsten, 2004) and deficient collaboration (Bezuidenhout et al., 2012), impair the adoption of improvement proposals, as they prevent the essential buy-in and co-operation (Giles et al., 2006).

Based on the above, many shortfalls seem to stem from soft issues, which, seem to be disregarded or often poorly understood. Although soft issues surface in various studies (Bezuidenhout and Baier, 2011, Bezuidenhout et al., 2012, Higgins et al., 2007), no study that holistically investigates a sugarcane supply chain and places a special emphasis on soft issues was found in the literature. Stakeholders‟ diverse perceptions, the underlying reasons for their behaviours, and the impacts of these aspects on the system are disregarded. Higgins et al. (2004) cite deficient collaboration with industry stakeholders as a further reason for the poor adoption of research outcomes. This statement substantiates a present neglect of soft issues, since stakeholders‟ motives and concerns are often insufficiently considered in the first place.

Supply chain research needs to consider hard and soft aspects as well as the social and historical context of a sugarcane supply chain (Higgins et al., 2007, Gerwel et al., 2011). By implication, new ways to acknowledge the present complexity, the underlying soft issues, and the implicit fragmentation, tension and conflicts have to be found. This will assumingly support the handling of operational and technical shortcoming and the implementation of pertinent improvements, and thus advance the efficiency of the whole system, as well as its individual stakeholders (Le Gal et al., 2008, Bezuidenhout and Baier, 2011, Higgins et al., 2007).

The above discourse highlighted the necessity for a holistic approach that takes cognisance of soft issues. The current study, in particular, emerged out of the need to investigate these soft issues to enable an in-depth understanding of the current complexity, politics and problems of the sugarcane production industry. A thorough investigation of existing soft, managerial, behavioural, strategic, and leadership issues within the respective sugarcane production and supply systems was required,

whereby the connections and interrelationships between issues and problems had to be explored. The study further intended to unlock some of the disclosed issues to engender a process of incremental improvements. Sugar industry stakeholders increasingly acknowledge the necessity to understand a sugarcane production and supply system holistically and especially its soft issues to promote the sustainable and profitable development of the industry.

1.3 A Different approach to research in a sugarcane production and supply

Since a holistic approach which investigates the respective milling areas comprehensively, was required, systems thinking formed the theoretical framework of this study and systems methodologies were applied. Systems thinking distinguishes between hard and soft systems thinking, as elaborated below. This study is located in soft systems thinking.

Hard systems thinking coincides with functionalist systems approaches. It affiliates with realist ontology and with a positivist philosophy and epistemology (Jackson, 2000). Hard systems thinking assumes that there is a reality that can be objectively examined (Zhang, 2010). From a hard systems thinking perspective, systems that are explicitly and independently defined, pursue a goal seeking behaviour and can be optimised through systematic methods, exist in the real world (Jackson, 2000, Kayaga, 2008). By implication, objectives or problems are either predetermined or clearly specified upfront and an optimal solution for their handling exists (Jackson, 2000, Zhang, 2010). Hard systems thinking methodologies seek optimisation through the implementation of the best possible approach that meets predefined objectives or solves explicit problems (Checkland and Haynes, 1994, Fuenmayor, 2000). These methodologies compare organisations to machines and assume that the behaviour of people can be „engineered", thereby neglecting their ability to create meaning (Checkland, 2000a). These methodologies originate primarily from natural science. Although hard systems thinking aims to study the interactions between the parts of the system, and acknowledges that their optimisation may not lead to an overall optimum, its methodologies often feature a reductionist approach (Jackson, 2000, Dias, 2008).

Soft systems thinking concurs with interpretivist systems approaches. Its philosophical underpinning is phenomenology and interpretivism. Therefore, soft systems thinking focuses on subjectivism, acknowledges various views of reality and perceives the world as socially constructed (Jackson, 2000). It denies the independent existence of systems in the world, but rather perceives them as mental models or constructs, which are used to engage with the world and reflect upon it (Jackson, 2000, Christis, 2005).

Soft systems thinking argues that problem definition in itself is problematic, because there are always diverse perceptions about the problem (Jackson, 2000). Problems and objectives are vague and complex, rather than distinctly determinable (Checkland, 2000b). Soft systems thinking aspires to grasp the complex and constantly changing „messiness" of today's world holistically (Fougner and Habib, 2008, Bell and Warwick, 2007). It particularly focuses on the human component in a system and considers people's diverse views, objectives, values, and assumptions (Jackson, 2000, Molineux and Haslett, 2007). According to soft systems thinking, stakeholders have to be involved in the improvement of problem situations, as this inevitably requires a shift in their perceptions about the situation (Jackson, 2000). Soft systems thinking methodologies consequently intend to facilitate the needed mindset shift (Jackson, 2000).

Soft systems thinking focuses on *what* the problem situation is, and on changes that would be required to improve it, while hard systems thinking concentrates on *how* a specific problem can be addressed (Reisman and Oral, 2005). The different understanding of the notion of „system" clearly differentiates hard and soft systems thinking. As illustrated in Figure 1-1, hard systems thinking argues that the world is systemic and composed of systems which an observer can detect and engineer (Checkland, 2000b). Soft systems thinking counters that the world is complex and that the observer uses the system concepts only to better understand it. This shift in systemicity, "from the world to the process of inquiry into the world" constitutes the core distinguishing feature between soft and hard systems thinking (Checkland and Haynes, 1994, p. 193).

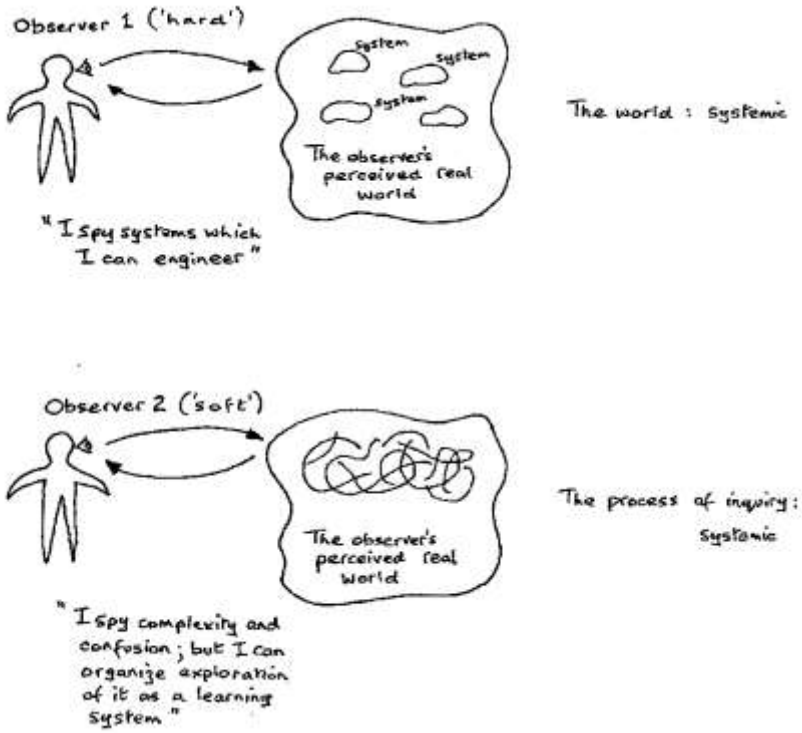

Figure 1-1: View of the world and systems from a hard and a soft systems thinking stance (Checkland, 2000b, p. 18)

From the range of soft systems thinking methodologies, I applied Soft Systems Methodology (SSM) in one mill area and the Viable System Model (VSM) in the other mill area. Although some authors, like (Jackson, 2000), classify VSM as hard systems thinking, I take a soft systems perspective based on VSM‟s interpretive nature, as will be clarified later in this thesis.

While there are a range of systemic approaches, including hard, soft and critical methods (Jackson, 2000, Reynolds and Holwell, 2010), it was a crucial focus of this study to investigate the suitability of SSM and VSM to problems within the sugarcane industry. The two methodologies were thus selected in relation to the larger project. Neither SSM nor VSM have been applied in the sugarcane supply chain context before, and the following reasons supported their selection.

Soft Systems Methodology (SSM) constitutes a structured method which facilitates the comprehension and handling of social complexity and supports the improvement of problematic situations (Checkland and Poulter, 2006). It enables a thorough understanding of the studied system and reveals critical issues (Checkland and Winter, 2006). SSM demonstrates its competence under conditions that feature multiple stakeholders with diverse perspectives and conflicting views, which

is similar to present circumstances in sugarcane production and supply systems (Luckett and Grossenbacher, 2003, Gregory and Midgley, 2000).

A VSM diagnosis is characterised by its thoroughness, its capacity to guide improvements and its swiftness (Jackson, 1988, Beer, 1984). It enables a holistic comprehension of the studied system, by examining systemic relationships, managerial responsibilities and present challenges amongst other things (Jackson, 1988). VSM has been successfully applied to investigate organisational problems, like shortcomings in its structures, communication patterns, information flows, transformations and systemic relations (Cezarino and Beltran, 2009, Nystrom, 2006). Compliance with VSM‟s principles increases a system‟s efficiency and facilitates an adequate distribution of power (Schwaninger, 2006). VSM was seen to be applicable to a sugarcane production and supply system due its generality to other context (Leonard, 2008). Further reasons for choosing SSM and VSM will be explained in the relevant chapters.

1.4 Research questions

The following research aims and questions arose from the problem statement and the different approach to sugarcane supply chain research that was taken in this study.

The main objective of this study was to identify the extent to which systems methodologies are able to address the challenges within a sugarcane production and supply chain. Using this methodology, I sought a holistic understanding of the system, which comprises the present complexity, underlying soft issues and contemporary constraints. The study intended to make a contribution to the body of knowledge on SSM and VSM, which included the deduction of some methodological lessons to enhance the use of both methodologies in practice. Moreover, I endeavoured to set the stage for incremental systemic improvements by unlocking some of the identified problem areas.

The questions which were explored in the study are:

1. What are the leadership and management challenges within the sugarcane supply and processing chain in the investigated milling areas?
2. What are the critical soft, managerial, behavioural, strategic and leadership issues, and how can they be addressed?
3. What are the high level goals between the various stakeholder groups, and to what extent are they compatible?

4. To what extent can Soft Systems Methodology and the Viable System Model be applied to address the leadership and management challenges within the sugarcane supply and processing chain?

1.5 Brief outline of the methodological approach

SSM and VSM, which both support a holistic understanding, were combined with a qualitative approach which collectively promotes a thorough insight (Hannabuss, 1996, Checkland, 2000b, Leonard, 2009). This seemed most appropriate to facilitate the desired in-depth investigation of the studied mill areas. The qualitative approach supported the thorough understanding of the complexities and constraints that characterise both the Umfolozi and the Felixton milling areas. Since I sought stakeholder involvement for an interactive intervention which explores improvement opportunities in collaboration with stakeholders, a participatory approach was required (Irvine and Gaffikin, 2006). By using SSM and VSM along with qualitative methods I aspired to guarantee that stakeholders played a key role in uncovering issues, as well as in their resolution.

Besides interviews and observations, three SSM-based workshops were held in each milling area. The study involved a broad range of stakeholders, including millers, growers, hauliers and sugar industry representatives.

1.6 Limitations of the study

The study focused on the entire sugarcane production and supply system, from sugarcane growing to raw sugar production, which concentrated on the large scale and commercial sector. I neglected the consideration of the upstream industry, such as farming inputs like fertiliser or machinery, and the downstream industry, such as sugar refining or additional value adding. Sugar marketing and the broader market drivers were equally disregarded. In this study, I concentrated on the local dynamics in the studied milling areas, rather than the national industry matters. While small scale growers were originally included in the study, as the process unfolded their contributions exceeded the scope of the study and thus had to be excluded.

1.7 Structure of this study

The remainder of this thesis unfolds as follows.

Chapter 2 provides an overview of the study context. It introduces the South African sugar industry by outlining its setting, structures, regulations, history and challenges. It further describes the two milling areas in which the study was conducted.

Chapter 3 and 4 comprise the literature review that underpins this study with Chapter 3 focusing on SSM, while Chapter 4 provides a comprehensive account of VSM. Both chapters reason the usage of these systems methodologies and indicate the appropriateness of this choice for the current study. This includes the consideration of critiques concerning SSM and VSM application.

Chapter 5 outlines the research design and explains the methodological approach taken in this study, the employed data collection and analysis techniques, and the course of the SSM-based workshops.

Chapter 6 and 7 present the findings and recommendations that emerged from the SSM and VSM applications. Chapter 6 illustrates the outcome of the VSM diagnosis of the Felixton milling area and the respective suggestions. Relevant issues that surfaced during the SSM application in Umfolozi milling area are elucidated in Chapter 7. It further describes the results of the entire four-stage SSM process, including a reflection on Analysis Two, and Three, and some recommendations.

Chapter 8 comprises two parts. Firstly, the performed empirical work is discussed from a theoretical perspective. This synthesises theory and practice and aims to make a meaningful contribution to present knowledge. The second part answers the research questions that guided this study.

Chapter 9 reflects on the entire study. It highlights the key contributions and limitations of the study and makes recommendations with regard to the appropriateness of systemic approaches in the sugar industry context. This includes suggestions for future research.

1.8 Concluding remarks

Checkland‟s (2010) understanding of complexity applies to this work. Complexity encompasses the human component, which strongly contributes to its development. It is characterised by an inscrutable messiness, uncertainty and a competitive environment. Complexity results from the plethora of interlinking events, elements, and ideas, which constantly change, evolve, and interact with each other. The constant state of flux epitomises complexity and often induces the associated problem situations.

Throughout the thesis I refer to the facilitator, researcher, user, or practitioner as he, regardless of the gender for ease of reading. The same applies for growers, hauliers and miller. The attributes of the sugar industry and the characteristics of the Umfolozi and the Felixton milling areas are outlined in the following chapter.

CHAPTER TWO: THE SOUTH AFRICAN SUGAR INDUSTRY

2.1 Introduction

This chapter introduces the South African sugar industry and the two study areas of the current research. It presents the features of the Felixton and the Umfolozi milling areas and the framework in which they are embedded. The industry framework is described because the mill areas cannot be investigated in isolation without an appreciation of this framework, which greatly impacts on them. The illustration of the industry structures, regulations, expected developments and contemporary challenges, and of the characteristics of both milling areas intends to facilitate a better understanding of the issues that emerged from this study. The chapter thus provides an overall basic appreciation of the setting in which this study was conducted.

2.2 The Industry setting

The South African sugar industry emerged in the mid-nineteenth century (Lewis, 1990). Today, it is the seventh biggest sugar exporter and the twelfth largest sugar producer in the world (Funke, 2011). The sugar industry contributes greatly to South Africa‟s economy (McCarthy, n.d.), creating approximately R8 billion direct income per year, 85 000 first-hand employment, and 350 000 indirect employment opportunities (DAFF, 2006, Maloa, 2001). About one million people are dependent on the sugar industry in their daily living (KZN-Transport, 2010). Compared to other agricultural sectors, the sugar industry is the most significant for the national, and KwaZulu-Natal‟s provincial, economy (Bernstein and McCarthy, 2008). Its contribution to economic development in remote areas and the bringing about of further benefits, such as training and education, local reinvestment of gained surpluses, infrastructure generation and health, environmental and modernisation initiatives, are highly valued (Maloa, 2001, McCarthy, n.d.).

The following activities characterise the sugar industry:

- Sugarcane production,
- Manufacturing raw, refined and specialised sugar and syrups and
- Generation of several by-products.

The industry operates on the basis of a miller-grower partnership (SASA, 2009, SMRI, n.d.) which is governed by the 1978 Sugar Act and the 2000 Sugar Industry Agreement (CANEGROWERS,

2010b). The sugar industry comprises the entire sugarcane supply chain from sugarcane production, including the intermediate consumption industry, until the sugar reaches the end consumer.

Figure 2-1 shows the industry's 14 different sugarcane production areas and their mills. The sites of the current study are also heighted. Sixty-eight per cent of sugarcane is produced by coastal growers in KwaZulu-Natal and the rest is produced in the Midlands (17%), Pongola and Mpumalanga (15%) (SASRI, n.d.)

Figure 2-1: Sugarcane growing areas in South Africa (adapted from SASA, 2009, p. 44)

Large scale growers (LSG), miller-cum-planters, small scale growers (SSG), and so called emerging growers form the grower body. The latter arose from the provisions of the Land Reform (labour tenants) Act (Act No. 3 of 1996). These growers cultivate commercial farms which were bought

from LSGs. A grower who produces over ten thousand tons of sugarcane is categorised as LSG and these growers cultivate the majority of sugarcane (>85%) (Funke, 2011). Miller-cum-planters operate mill-owned farms. SSGs form the biggest grower group, but produce less than ten per cent of the total crop (SASA, 2011). They farm primarily on tribal land and lack land ownership (Kumwenda, 2010, Sparks et al., 2011). Table 2-1 summarises core production factors.

Variable	Value	Reference
Production		
Total amount of sugarcane production (ha)	400.000	SASR, n.d.
Average sugarcane production (t/year)	20 million	SASA, 2010
Resulting average sugar production (t/year)	2.2 million	SASA, 2010
Grower number		
Registered grower number	35.300	SASA, 2010
Estimated grower number	49.000	DAFF, 2006
Estimated SSG number	33.700	SASA, 2010
Estimated LSG number	1.570	SASA, 2010
Average grower productivity		
LSG (t/ha)	72	Funk, 2011
MCP (t/ha)	55	Funk, 2011
SSG (t/ha)	44	Funk, 2011
Average farm size		
SSG (ha)	> 3	International-Sugar-Organisation, 2008
LSG (ha)	Approx. 233	Bernstein and Carthy, 2008

Table 2-1: Estimates of the industry's sugarcane production

Sugarcane is a relatively capital intensive perennial plant and the sugarcane grower needs to be skilled to cope with various influencing factors such as plant husbandry, farm management and soil fertility (Madiba, 2011b, Umfolozi-MGB, 2012).

Six milling companies operate the fourteen different milling areas. These companies are Tongaat Hulett Sugar Ltd (THS), Umfolozi Sugar Mill (Pty) Ltd, Illovo Sugar Ltd, UCL Company Ltd, Tsb Sugar RSA Ltd, and Gledhow Sugar Company (Pty) Ltd. Illovo, THS and Tsb are corporate companies while the remaining three are privately owned and offer grower involvement via shares.

Sugarcane haulage constitutes another necessary component in the sugar industry. Initially, millers took care of the sugarcane haulage, but the central unified transport system was changed to an

independent system, and the growers became responsible for the sugarcane transport to the mill (Grantham, n.d.). Growers can choose their mode of transport whether by road or rail. They either can commission a haulage company or transport the sugarcane themselves.

2.3 The Industry structure

The sugar industry is well organised. It comprises millers‟ and growers‟ own structural setup, and organisational structures for millers and grower to interact at industry and local level. Figure 2-2 provides an overview of the basic industry structure. The left side shows the grower structure and the right side the miller structure. All growers have to belong to a member organisation in their milling area. These member organisations fall under the area‟s local grower council, which delegates deputies to the South African Cane Growers‟ Association (CANEGROWERS). Likewise, the milling companies organise themselves within the South African Sugar Millers‟ Association. Eleven representatives of both associations interact at industry level in the council of the South African Sugar Association (SASA), which essentially governs the industry.

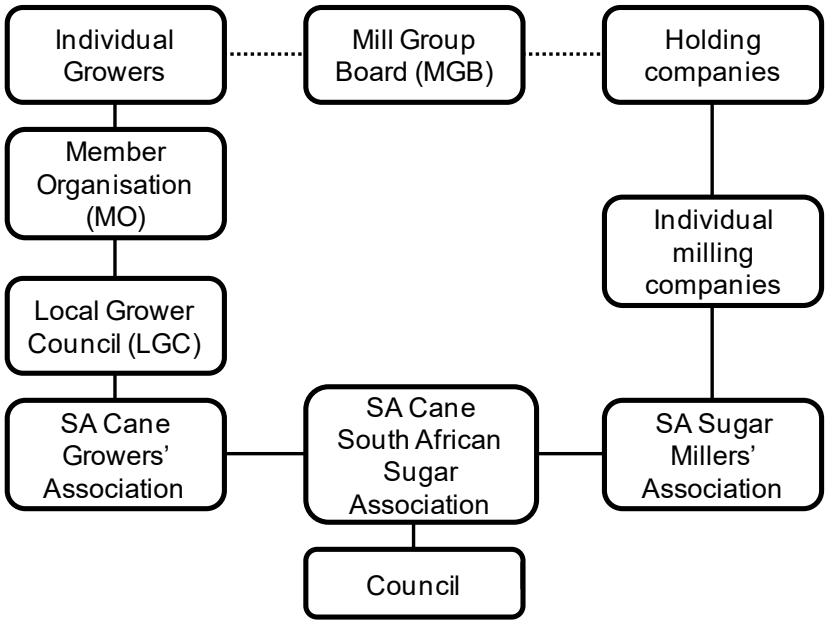

Figure 2-2: Structure of the South African sugar industry (adapted from Tongaat-Hulett-Sugar, 2010b)

At mill area level, miller and grower representatives interact in the Mill Group Board (MGB), which can be seen as the local SASA council. In Mill Group Board meetings matters that concern

the mill area, such as the milling season length, sugarcane quality, rateable supply of sugarcane and other operational miller-grower issues are discussed and determined.

Compared to other agricultural industries, this organisational structure is unique. The overarching grower body facilitates, for example, a better bargaining position in negotiations with the miller. The well-structured industry setup itself offers several advantages. For instance, a strong lobbying power supports the industry‟s protection from adverse external impact factors (Madiba, 2011a). However, this setup also has drawbacks, such as delayed decision-making. For instance, the Sugar Industry Agreement should have been revised for several years, but the miller-grower disagreement ensures that the status quo remains.

2.3.1 The South African Sugar Association (SASA)

SASA constitutes the industry‟s statutory body. It aims at the industry‟s profitability and competitiveness and oversees administrative affairs (Maloa, 2001, SASA, 2009). It promotes the industry‟s interests, such as its participation in downstream activities, like co-generation or ethanol production (SASA, 2009). Furthermore, SASA is concerned with sugar marketing, sugar sale, agricultural research, cane testing, training, and the industry‟s national and international representation (SASRI, n.d.). Within the SASA council, all industry related matters, such as the review of the Sugar Act or the Sugar Industry Agreement and the arrangement of the industry‟s possible involvement in downstream activities, are addressed (SASA, 2010). Decisions reached by the SASA council apply to the entire industry.

2.3.2 The South African Cane Growers' Association (CANEGROWERS)

The South African Cane Growers‟ Association (CANEGROWERS) represents growers‟ interests, promotes them in negotiations with the millers, and lobbies for grower support from the Government (International-Sugar-Organization, 2008). Moreover, it offers information and agricultural and economic advice to its members (CANEGROWERS, 2010a). CANEGROWERS has a democratic structure and the principle of regional and equal representation applies (CANEGROWERS, 2012, Maloa, 2001). This facilitates adequate SSG representation at all levels and enables any grower to become a member of the CANEGROWWERS‟ Executive Committee.

The structure of CANEGROWERS is outlined in Figure 2-3. In total, there are 26 member organisations, with at least one per mill area. Their representatives constitute the local grower council for a specific mill area. The thirteen local grower councils support growers at local level, especially in their interactions with the miller (Maloa, 2001, Funke and Gabriel, 2011). The local

grower councils elect fifty-four representatives on CANEGROWERS Board of Directors. This Board presides on behalf of growers over affairs that apply to the entire industry, and thus is answerable towards its member organisations (Funke and Gabriel, 2011). Annually, eleven representatives are elected to the Executive Committee, which implements matters determined by the Board of Directors and engages with miller representatives at the SASA council (Funke and Gabriel, 2011).

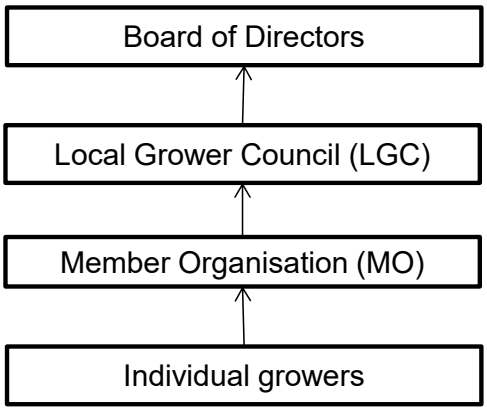

Figure 2-3: Overview of the grower structure

2.3.3 The South African Sugar Millers' Association

The South African Millers" Association represents the interests of the millers, especially in terms of their concerns and goals in interactions with grower representatives on the SASA council. Moreover, it deals with the partnership between the milling companies and handles training, legislative matters and research (SASA, 2011).

2.3.4 The South African Sugarcane Research Institute (SASRI)

Research and knowledge transfer describes the focus of the South African Sugarcane Research Institute (SASRI). SASRI concentrates on sugarcane production parameters, such as crop performance, crop protection and crop management, variety improvements and optimisation of the system (SASRI, n.d.). Additionally, SASRI provides advice and training (SASRI, n.d.).

SASRI considers the needs of the different milling areas via its extension officers who are placed in each mill and facilitate the communication between SASRI researchers and growers to identify research that is user-oriented and to encourage the implementation of research outcomes (SASA, 2009, Naidoo, 2008).

2.3.5 Cane Testing Service (CTS)

The Cane Testing Service (CTS) is a non-profit service provider to the sugar industry. It is contracted by the different Mill Group Boards to test the quality and recoverable value content of sugarcane consignments. The latter is critical for the sugarcane payment (SASA, 2010). CTS is characterised by integrity, independence and objectivity and acts as an intermediary between miller and growers.

2.4 The Industry regulations

The Sugar Act (Act No. 9 of 1978) and the Sugar Industry Agreement 2000 regulate the industry and provide the statutory framework that administers and governs industry affairs and the miller-grower partnership (Tongaat-Hulett-Sugar, 2010b, SASA, 2011). This framework specifies the industry‟s main regulations (e.g. division of proceeds) and the mandate of industry bodies, such as CTS or Mill Group Board. It is a binding framework and applies to all milling areas (Tongaat-Hulett-Sugar, 2010b). This implies that the operations of the local milling areas are essentially guided by decisions made at the sugar industry level.

The Sugar Act and the Sugar Industry Agreement are determined within the SASA council. Amendments require the approval from millers and growers, otherwise the status quo remains (Lewis, 1990). The Sugar Industry Agreement addresses the following matters (Tongaat-Hulett-Sugar, 2010b):

- Administration of sugarcane production,
- Coordination of sugarcane supply,
- Miller-grower dispute resolution,
- Export of raw sugar,
- Division of proceeds and industry costs and
- Control of pests and diseases.

The difference between the domestic and the export sugar price led to the establishment of a local market proceeds-sharing agreement, which balances the otherwise differential remuneration of milling companies (Lewis, 1990). The agreement determines the amount of sugar that a milling company can sell into the local market. Exceeding this quota compels the respective company to compensate other companies accordingly (Lewis, 1990). The agreement gives security and

alleviates possible competition between milling companies, yet engenders higher retail prices, as the domestic sugar price normally remains close to the import parity price (Lewis, 1990).

Since the division of proceeds was identified as a contentious issue (Todd and Forber, 2005), it is further explained below.

2.4.1 Division of proceeds

Figure 2-4 outlines the composition of industry proceeds and their distribution. These proceeds comprise the totality of sugar and molasses sales. After the deduction of industry costs, the proceeds are split between growers and millers according to a set 64/36 ratio respectively (Lewis, 1990). This ratio can be renegotiated in the SASA council. The growers‟ share is divided by the industry-wide total amount of delivered recoverable value (Funke and Gabriel, 2011). This defines the price per ton recoverable value (RV). This price applies to all growers independent of the mill to which they deliver their sugarcane.

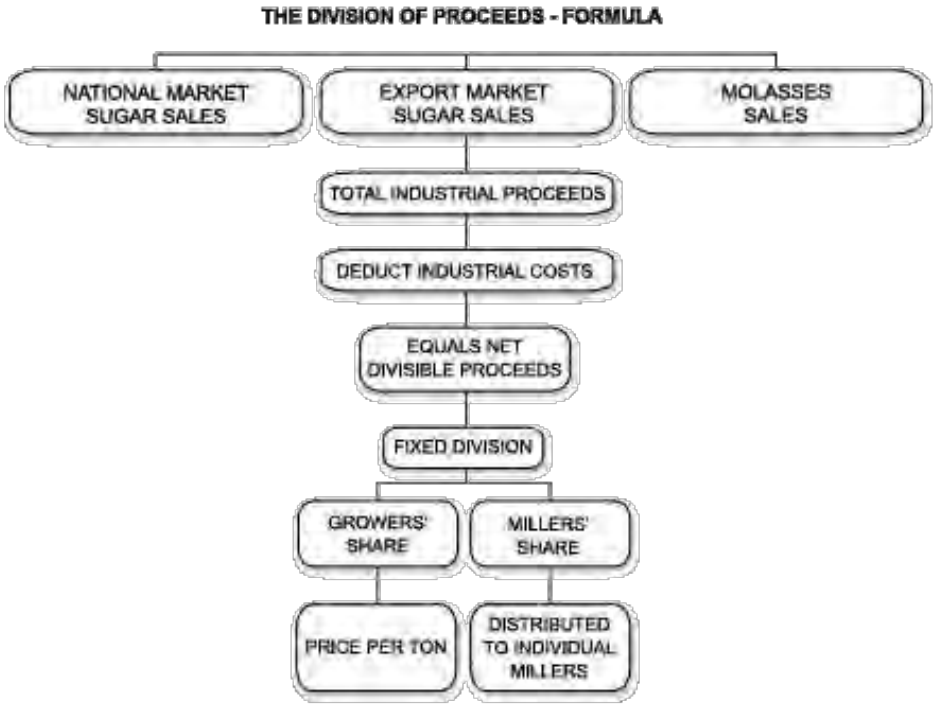

Figure 2-4: Composition of industry proceeds and their division to remunerate growers and millers (Tongaat-Hulett-Sugar, 2010b)

In 2000/2001 the cane payment system changed from paying growers per ton of delivered sucrose to remunerating them per ton of supplied recoverable value (CANEGROWERS, 2011). The recoverable value (RV) payment system comprises the sugar and molasses that is recoverable in the milling process (Funke and Gabriel, 2011). It takes into account the losses that are caused by the fibre and non-sucrose portions in sugarcane (Funke and Gabriel, 2011). The non-sucrose coefficient takes into account the sucrose lost that results per unit of non-sucrose, while acknowledging the return gained from molasses per unit of non-sucrose (Funke and Gabriel, 2011). The fibre coefficient caters for the sucrose lost per unit of fibre. The exact recoverable value calculation is shown below (Funke and Gabriel, 2011).

$$RV\% = S - dN - cF \qquad \textbf{(Equation 1:1)}$$

S: Content of sucrose %

N: Content of non-sucrose %

F: Content of fibre %

d: Non-sucrose coefficient

c: Fibre coefficient

2.5 The History and anticipated future development of the industry

According to Grantham (n.d.), the history of the industry can be divided into two different phases. Until the early 1980‟s the industry was characterised by family-owned mills and a close miller-grower relationship. Growers felt that the millers cared about them and involved them in various matters. Later, the mill ownership changed from private to corporate ownership. This apparently led to a deterioration in the miller-grower relationship. The millers‟ emphasis shifted from being equally concerned about grower matters, to a greater focus on profits, return on investment and shareholder dividends. Besides causing conflict, this development supposedly contributed to a sugarcane supply decrease (Grantham, n.d.).

Currently, the sugar industry seems to be in a new era, namely that of vertical slicing (Grantham, n.d.). Vertical slicing means that each milling company and all its growers, irrespective of the mill to which they deliver sugarcane, are considered as one „slice“. The industry bodies are reviewing the Sugar Act and Sugar Industry Agreement to develop a legislative framework that accommodates this modified structure and the general changes in the sugar industry environment (CANEGROWERS, 2011). This framework intends to facilitate the best possible development of the industry and Government‟s assistance with the mitigation of the negative effects of a distorted

global sugar market (CANEGROWERS, 2011). Although this has been a slow process, the SASA council has progressed substantially in the 2010/2011 season and vertical slicing is expected to be approved and realised soon (Grantham, n.d., CANEGROWERS, 2011). This arrangement assumingly implies a reduced miller-grower interaction at industry level, but an increased miller-grower interplay within the respective slices, since local levels reportedly will have more negotiation power (McCarthy, n.d.).

Moreover, the changed legislative framework should facilitate the industry‟s involvement in downstream activities, which is seen as a promising venture (Wynne, 2009). The expected higher industry revenues could compensate growers for increased production costs and thus mitigate their financial difficulties (CANEGROWERS, 2011). However, this development also requires a refinement of the present renewable energy policy, as currently the industry‟s possibilities of downstream involvement are limited. The refined policy needs to improve the attractiveness of biofuel production and approve sugarcane fibre as an adequate component for electricity generation (CANEGROWERS, 2011). Respective industry bodies are lobbying for these changes and a new government strategy is expected by 2013 (CANEGROWERS, 2011).

Neither the exact constitution of the refined Sugar Act and the Sugar Industry Agreement, nor the modified renewable energy policy is clear. The finalisation of the former is impeded by disagreements between millers and growers (Wynne, 2009). Discord about the revenue distribution in this new setup entrenches the status quo (Wynne, 2009, Bezuidenhout et al., 2012). The new framework needs to determine the division of all proceeds that result from sugarcane production and processing, including the revenues from downstream activities. This shall ensure an equitable miller-grower profit sharing (CANEGROWERS, 2011). The present uncertainty about the new industry framework compromises the industry‟s efficiency and progress (e.g. investment in downstream initiatives) and the framework needs to be finalised urgently (Wynne, 2009). Its finalisation is a precondition for the enablement of the needed changes in the energy policy (Wynne, 2009).

All growers were informed and consulted regarding the expected changes and CANEGROWERS investigated structural changes required within its own organisation to best assist its growers in this new setting (CANEGROWERS, 2011). The considerations revolve around opportunities to capacitate growers to interact locally with their millers in their respective slices.

2.6 The Current industry challenges

Besides refining the legislative framework, the following circumstances, of which some will be elaborated below, challenge the industry:

- Sugarcane supply reduction,
- External impact factors,
- Labour issues,
- SSGs sustainability,
- Land reform,
- Black Economic Empowerment and Employment Equity and
- Fragmentation and contention among stakeholders.

The industry needs to address these challenges and increase its efficiency to ensure its sustainability (Madiba, 2011b, Le Gal et al., 2008). Given circumstances meant that cane growing on marginal land became economically unviable (McCarthy, n.d.). Growers either had to reduce their farming input and maintenance activities, risking their farm‟s viability, leave the industry, or acquire neighbouring farms to extend their land (Bernstein and McCarthy, 2008). The latter allowed for the realisation of economy of scales, but a decrease in grower numbers (Wynne, 2009, McCarthy, n.d.).

2.6.1 Sugarcane supply reduction

Sugarcane supply reduction is one of the industry‟s prime concerns (Kumwenda, 2010). A mill has to reach its breakeven point for its own and the area‟s viability. As outlined in Figure 2-5, many challenges intensify a supply reduction. In particular, the financial difficulties of growers effect supply reduction as they limit the affordability of crucial input factors and the implementation of best management practices, such as proper replanting, ripening and adequate fertiliser application (CANEGROWERS, 2012).

- Shift from sucrose to RV payment system meant that sugarcane production became uneconomical for some growers.
- Biological and climatic factors (e.g. drought, flood, fire, hail, the effects of parasites such as Eldana) impair cane production.
- Decline in SSGs' productivity.
- Unsatisfactory productivity on land reform farms.
- Decreasing revenue for sugarcane versus increasing production costs (e.g. fertilizer, transport, mechanical maintenance, minimum wages, electricity, property rates).

Figure 2-5: Factors that cause sugarcane supply reduction (derived from, CANEGROWERS, 2012, Grantham, n.d., Groom, 2009, McCarthy, n.d.)

2.6.2 External impact factors

Economic, environmental, climatic, managerial, legislative and regulatory aspects describe external impact factors that can compromise the industry or even threaten its viability (DAFF, 2006, MacNicol et al., 2008). In 2010 and 2011 low global sugar prices, and the restricted access to the European market particularly restrain the profitability of the industry (Braude, 2010, Gass, n.d., Madiba, 2011b). The significant increase in production costs is alarming (Kumwenda, 2010). In addition, milling companies might favour other African countries, which feature higher returns on investments and better market access over South Africa (Wynne, 2009, McCarthy, n.d.). .

2.6.3 Labour issues

Labour productivity impacts on the profitability of farms. Labour costs account for a large cost-share and there is a correlation between yield and labour productivity (CANEGROWERS, 2012). The labour productivity benefits from economy of scale, in the sense that the productivity on farms larger than 200ha is much higher than on smaller farms (Funke, 2011). The reduced cutter availability displays an industry-wide concern. It results from an enhanced education level, which reflects in a decreased interest in agricultural activities and a reluctance to work as cane cutters.

2.6.4 SSG sustainability

The industry is aware of the needs of SSGs and is committed to support SSGs due to their importance in cane supply and rural development (Nothard et al., 2004). Various initiatives have been implemented to assist SSGs (Maloa, 2001) and the handling of SSG challenges constitutes a difficult undertaking (Ferrer, 2011, Madiba, 2011b). These challenges cause a constant decrease in SSG numbers and productivity levels (Kumwenda, 2010, Bernstein and McCarthy, 2008). This is shown in Figure 2-6.

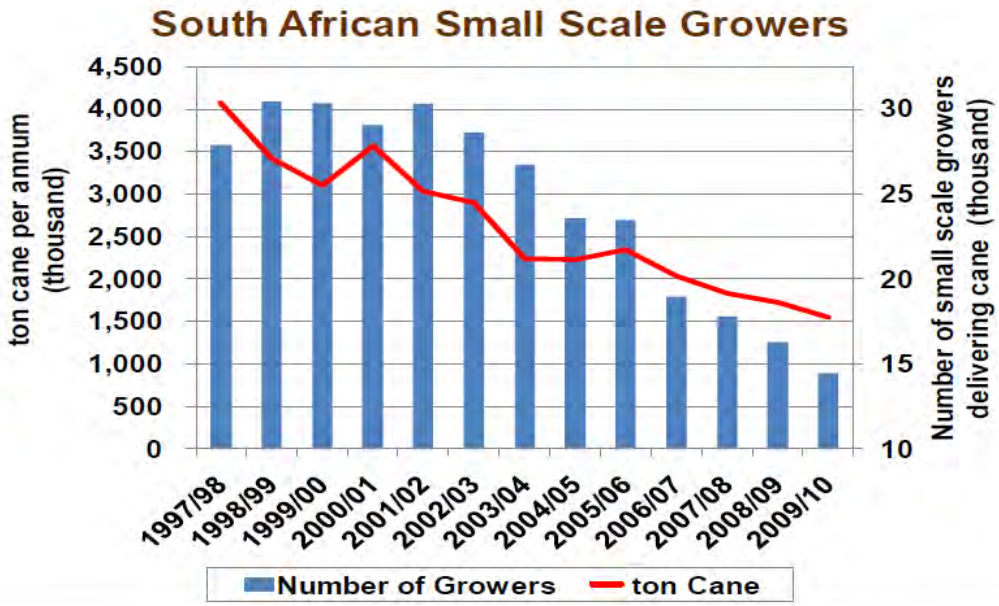

Figure 2-6: Declining SSG number and productivity (Funke, 2011, p. 5)

The traditional land tenure system is seen as a major constraint, because it limits land ownership and thus the possibility to lease or buy land to benefit from economy of scale (Ferrer, 2011, International-Sugar-Organization, 2008). The continuity of the SSG sector is further threatened by a lack of interest in sugarcane production among the younger generation and a the associated view that sugarcane growing is not economically viable (Ndebele, 2011, Sparks et al., 2011).

2.6.5 Land reform

Land reform encompasses three major activities which seek to locate formerly disadvantaged growers on viable farms; *viz.*, restitution of land that was incorrectly acquired, reform of the land tenure system and land redistribution (Madiba, 2011a). The slow land redistribution progress causes

uncertainty, which results in a reduced investment in farmlands under claim and thus impairs the industry‟s effectiveness (Kumwenda, 2010, Wynne, 2009, Bernstein and McCarthy, 2008).

Land reform farms generally underperform (Madiba, 2011a, Ferrer, 2010). LSGs whose land is under claim generally reduce their investment in their farm and the emerging growers often lack the skills, knowledge and resources for an optimal production. The implementation of land reform affects the entire industry (SASA, 2010) and considering the vast amount of land under claim, the industry cannot afford a failure of this reform (McCarthy, n.d.). The inadequate realisation of land reform, including the possibility that the majority of the land reform beneficiaries fail to continue with sugarcane production, could threaten the entire industry (Bernstein and McCarthy, 2008) Therefore, the industry is committed to a successful realisation of land reform and to emerging grower support (SASA, 2010). A successful approach, that facilitates a sustainable redistribution while retaining productivity levels has to be found (Wynne, 2009).

2.6.6 Fragmentation and conflict

Fragmentation, conflict and tension between stakeholders leads to inefficiencies at all levels, limits the adoption of improvement opportunities and prohibits the industry from realising its full potential (Bezuidenhout and Baier, 2011, Bezuidenhout et al., 2012). At industry level, millers and growers disagree about the division of proceeds (Section 2.5). Growers generally request an improved remuneration for molasses and fibre and coastal growers argue that the recoverable value payment system is to their disadvantage (McCarthy, n.d.). At local level, conflicts compromise the day to day management of the milling areas (Guilleman et al., 2003).

2.7 Felixton mill area

2.7.1 Overview

The Felixton milling area is located on the North Coast of KwaZulu-Natal, in close proximity to Richards Bay and Empangeni. Tongaat Hulett Sugar Ltd operates the Felixton mill, which is the largest South African sugarcane mill (SASA, 2010). The mill consequently realises economy of scale and automation and thus features a high labour productivity (Tongaat-Hulett-Sugar, n.d.). The milling area benefits from producing for Tongaat Hulett Sugar Ltd, since its brand is well recognised (SASJ, 2010a). High sales imply security and continuity for the milling area.

Table 2-2 outlines some production characteristics of the Felixton mill area, which ranges from Mtuzini in the South, to Mkuze in the North and Melmoth in the West. The majority of sugarcane is delivered via road transport and only a minority via rail transportation (KZN-Transport, 2010).

Variable	Value
Total sugarcane growing area	38.550 ha
Thereof irrigated area	13.730 ha
LSGs' growing area	29.050 ha
SSGs' growing area	9.500 ha
Sugarcane production	
LSG production (107 LSGs)	1.438.054 t
SSG production (6.187 SSGs)	213.359 t

Table 2-2: Production parameters of the Felixton milling area (derived from Felixton-Canegrowers-Association, 2012, CANEGROWERS, 2010c)

2.7.2 History

In 1911, Sir JL Hulett established the first mill at Felixton (Tongaat-Hulett-Sugar, 2012). In 1957, Hulett & Sons purchased the Empangeni Mill. Together, these two mills crushed the cane supply until the late 1970s (Tongaat-Hulett-Sugar, n.d.). However, the age of the mills and their inability to handle a growing supply without expensive capacity extension, made them inefficient in later years (Tongaat-Hulett-Sugar, 2012). The decision was made to replace the two mills with one efficient mill that became operative in 1983 (Tongaat-Hulett-Sugar, 2012). The vast investment in this new mill demonstrates the commitment of Tongaat Hulett Sugar Ltd to the Felixton milling area. This mill can crush over three million tons of sugarcane per year (Tongaat-Hulett-Sugar, n.d.).

2.7.3 Characteristics

The Felixton Mill already engages in some value adding activities in addition to sugarcane crushing by selling some of its bagasse to a neighbouring paper mill. Bagasse is a residue that results from the sugarcane processing. In the sugar mill the bagasse is burnt to heat the boilers which produce steam. This steam is either directly used in the milling operations or electricity is generated to drive other processes. Since the mill produces more bagasse than it needs for its own operations, it has

surplus capacity for electricity generation. The possibility of selling electricity into the grid is a intention of the mill (Tongaat-Hulett-Sugar, n.d.).

The Felixton Canegrowers‟ Association (FCGA) constitutes the only member organisation of CANEGROWERS and thus operates as the local grower council. This is a peculiarity which indicates unity in the Felixton grower body, as normally milling areas have more than one member organisation (Felixton-Canegrowers-Association, 2012). SSGs and LSGs are equally represented in the FCGA. The coalition of Felixton and Amatikulu growers in the North Coast Forum (NCF) describes a further peculiarity in the Felixton grower structure (CANEGROWERS, 2011).

2.7.4 Challenges

Decreasing cane supply and permanent sugarcane shortages are the greatest challenges of the Felixton system (Tongaat-Hulett-Sugar, 2010a). The mill has always been underutilised and experienced a supply decrease from 2.29 million to 1.64 million tons between 2005 and 2010 (SASA, 2010). The poor economic viability of rain-fed regions and the uncertainty regarding the realisation of land claims contributed to this supply reduction (Tongaat-Hulett-Sugar, 2010a). Felixton growers were affected by financial difficulties, which constrained growers‟ reinvestment capacity and the implementation of best management practice (McCarthy, n.d.). The lack of treated seedcane, SSGs‟ challenges and environmental impact factors like Eldana or Thrips describe further operational aspects that compromise sugarcane production (CANEGROWERS, 2011). The construction proposal of additional Eskom lines across current sugarcane growing areas might reduce cane supply to such an extent that it threatens the mill‟s sustainability (CANEGROWERS, 2011). The reality that the growers of two adjacent mills hold shares is perceived as an additional threat to Felixton‟s cane supply as sugarcane supply has already migrated to these mills (McCarthy, n.d.).

2.8 Umfolozi mill area

2.8.1 Overview

The Umfolozi Sugar Mill (USM) is located approximately 4 km south of Mtubatuba, close to St Lucia. After a period of constant change, the mill is now equally owned by four shareholders; *viz.*, the largest sugarcane grower in Northern KwaZulu-Natal, Umhlatuzi Valley Sugar Company Ltd (UVS), NCP Alcohols, and the former farmer cooperative, Umfolozi Co-Operative Sugar Planters Ltd (UCOSP), generally referred to as UCOSP, which is now registered as Umfolozi Sugar Planters

Ltd (CANEGROWERS, 2010a). Via UCOSP all floodplain growers indirectly hold mill ownership. The floodplain growers comprise all growers that farm on the Umfolozi floodplain and hence use the tramline system. The tramline system is a rail transport system that transports the sugarcane with locomotives on track and loop line (UCOSP, 2011a). To date, SSGs possess no shares, but efforts to obtain shares for them will continue (CANEGROWERS, 2011).

Table 2-3 outlines the main production characteristics of the Umfolozi milling area (CANEGROWERS, 2010a). The majority of sugarcane is produced on the floodplain and transported via a tramline system. The residual sugarcane is delivered by road (SASJ, 2010b).

Variable	Value
Total Sugarcane growing area	**17 858 ha**
Area on flood plain	8 400 ha
LSGs' growing area	13 128 ha
SSGs' growing area	4 730 ha
Total sugarcane supply	**1 217 579 t**
LSG production (app.68 LSGs)	1 109 626 t
From flood plain	793 921 t
SSG production total (over 6000 SSGs)	107 953 t
From flood plain	7 700 t

Table 2-3: Overview of Umfolozi's production characteristics (Umfolozi-MGB, 2012, UCOSP, 2011a)

2.8.2 History

The ownership of Umfolozi Sugar Mill has frequently changed. In 1916, the St. Lucia Sugar Company established the mill. However, the flood in 1918 damaged the mill to such an extent that it had to be sold (SASJ, 2010b, UCOSP, 2012). The floodplain growers allied and established Umfolozi Co-Operative Sugar Planters Ltd (UCOSP) to purchase the mill in 1923 (UCOSP, 2012). Floods recurrently affected the area. This led to the mill's resettlement to its current position in 1925 (CANEGROWERS, 2010a), and the replacement of two thousand hectare of lost farmland on the western side of the floodplain by an extra two thousand hectare on the eastern side as a result of the 1984 Demoina cyclone (SASJ, 2010b). The constant exposure to floods and wet conditions led to flood protection measures and the establishment of the tramline system, which is most appropriate for these circumstances (SASJ, 2010b).

UCOSP operated the mill until 1992, thereafter it was sold to Illovo Sugar Ltd (CANEGROWERS, 2010a). Illovo resold it in 2005 to the Sokhela Family Trust (SASJ, 2010b). However, this group failed to run the mill successfully and it consequently reverted back in Illovo‟s ownership in 2008 (SASJ, 2010b). Illovo aspired to sell the mill again. This initiated an endeavour among local growers to reacquire the mill (SASA, 2009). In addition, the involvement of three other shareholders to raise sufficient capital for the mill repurchase was required. UCOSP was transformed into Umfolozi Sugar Planters Ltd and obtained only 25% ownership instead of the former full ownership (UCOSP, 2011b). Eventually, the Umfolozi Sugar Mill (Pty) Ltd was established in April 2009 (CANEGROWERS, 2010a).

Future plans for the mill include cane supply increase, enhanced crushing capacity and efficiency and further value adding, such as co-generation or ethanol production, once an adequate legislative framework has been established (SASJ, 2010b). Furthermore, mill management is seeking a sales increase on the local market to increase its profit margins (SASJ, 2010b).

2.8.3 Characteristics

The fact that three quarter ownership of the mill lies in grower possession is a peculiarity of the Umfolozi milling area compared to most other milling areas (CANEGROWERS, 2010a). UCOSP‟s existence describes a further distinctiveness. UCOSP is primarily responsible for flood protection, sugarcane transport via the eighty-seven kilometre long tramline system and the maintenance of the floodplain‟s communal infrastructure (UCOSP, 2011a) It transports sugarcane on a cost recovery basis (KZN-Transport, 2010, UCOSP, 2011a). UCOSP also operates a quarry, sugarcane farms and timber plantations, which intends to reduce growers‟ levies for sugarcane transport and flood protection (UCOSP, 2011b). Floodplain growers are obliged to become UCOSP members.

Like in Felixton, the Umfolozi Cane Growers Association (UCGA) operates as the local grower council and is the sole member organisation of CANEGROWERS. This suggests unity among the Umfolozi growers. UCGA features equal LSG and SSG representation on its Executive Committee.

2.8.4 Current challenges

The intention to at least maintain, but preferably increase, cane supply is challenged by the declining SSG productivity (Groom, 2009). Different stakeholders accomplish various initiatives to counteract this trend (CANEGROWERS, 2011). Likewise, the productivity and sustainability of emerging growers is an issue of concern since Umfolozi, like other milling areas, is affected by land reform (Madiba, 2011b). However, support initiatives sometimes lack success (Madiba, 2011b).

The unsatisfactory mill performance constitutes a concern. It results from insufficient off-crop maintenance in the past and the mill‟s age (CANEGROWERS, 2011). The new ownership is committed to addressing this challenge (UCOSP, 2011b). Nonetheless, the intent to realise the mill‟s potential crushing capacity of 1.5 million tons, depends on the acquisition of extra cane supply (SASJ, 2010b).

Droughts and the risk of another destructive flood are further crucial environmental threats. These need to be adequately handled to ensure the sustainability of the Umfolozi milling area.

2.9 Concluding remarks

This chapter provided a basic understanding of the sugar industry in general, the specific milling areas of the study and some current matters of relevance in these contexts.

The sugar industry operates on the basis of a miller-grower partnership which is governed by the 1978 Sugar Act and the 2000 Sugar Industry Agreement. In comparison to other agricultural industries, the sugar industry distinguishes itself by being well structured, organised and regulated. This facilitates a strong lobbying power, but also that decision-making and changes in the industry configuration are characterised by a lengthy process that often implies the remaining of the status quo. Currently, the industry seems to be in a transition process and a development towards vertical slicing is likely. The reduction in sugarcane supply is a key challenge for the sugar industry as a whole and for the two studied milling areas. The fact that a large portion of the Umfolozi Sugar Mill is in grower possession is a core feature of the Umfolozi milling area. The Felixton mill, in contrast is owned by Tongaat Hulett Sugar Ltd.

Soft Systems Methodology constitutes one of the systems methodologies which were applied in this study and is introduced in the following chapter.

CHAPTER THREE: SOFT SYSTEMS METHODOLOGY

3.1 Introduction

This chapter provides a comprehensive overview of Soft Systems Methodology (SSM). It outlines the emergence of SSM and its theoretical underpinnings, which includes its core concepts, principles, features and strengths. The four-stage SSM process is explicitly explained and criteria to assess the adequacy of a claimed SSM usage are presented. The chapter illustrates potential challenges that require consideration when applying SSM and engages in critique concerning SSM use. It concludes with an account of the appropriateness of SSM for this study.

First of all, the meaning of two frequently used terms in SSM, namely problem situation and worldview, needs to be clarified.

Based on my understanding, a problem situation is characterised by its messy, unstructured, complex and ill-defined nature. It is composed of multiple, ambiguous and partially conflicting objectives and notions, various interlinked issues and people who perceive the problem differently. Rittel and Webber (1973, p. 155) define such situations as “wicked” problem situations. The described notion of problem situations coincides with the perspective of soft systems thinking.

Worldview describes a person‟s individual understanding of the world. This means the way humans perceive and construct their world and make sense of it, which is always in a manner comfortable to them. The concept of „worldview“ includes our inherent images of the world and the things we take for granted. It implies the notion that humans have individual assumptions, values, perceptions, intentions, norms, beliefs, personalities, backgrounds and experiences, which shape and influence their respective worldview.

The expression user, practitioner, researcher and facilitator are applied interchangeably and always refers to the person applying SSM.

3.2 Theoretical underpinnings of SSM

The following statement summarises the essence of SSM:

> “SSM is an action-oriented process of inquiry into problematical situations in the everyday world; users learn their way from finding out about the situation to defining/taking action to improve it. The learning emerges via an organised process in

> which the real situation is explored, using as intellectual devices – which serve to provide structure to discussion – models of purposeful activity built to encapsulate pure, stated worldviews." Checkland and Poulter (2006, p. 22)

The researcher engages in a problem situation and is mandated to facilitate the change processes, instead of simply observing the situation and making recommendations (Platt and Warwick, 1995).

3.2.1 Emergence and underlying assumptions

SSM emerged from an intense application during 30 years of action research (Checkland and Winter, 2006). Checkland developed SSM with the assistance of his colleagues at Lancaster University (Platt and Warwick, 1995). They intended to generate methods, more capable than existing ones, to handle the complexity of the 21st century and associated problem situations (Checkland, 2010). The long development process, which led to SSM‟s current state, is based on applying systems thinking concepts to a problem situation. SSM‟s theoretical concepts developed parallel to their practical application (Checkland, 1985). Figure 3-1 shows how theory and practice contributed to each other and thus SSM unifies both. This process implied that only significant concepts were integrated into SSM (Checkland, 2000b). Likewise, concepts initially included in SSM representations faded and others became more relevant at a later stage.

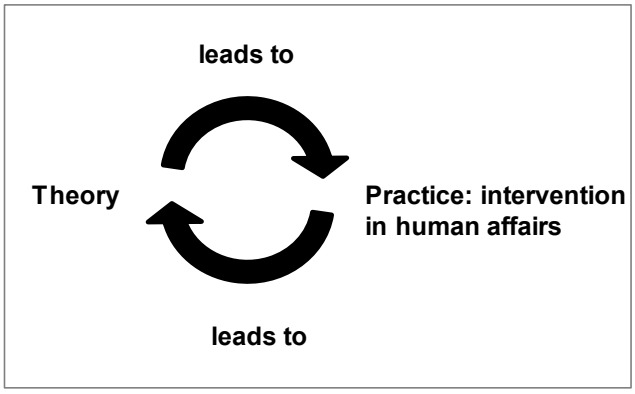

Figure 3-1: Theory and practice were important in the development of SSM (redrawn from Checkland, 1985, p. 758)

Originally, Checkland used Systems Engineering which is founded in a hard systems paradigm, to deal with management functions and challenges (Winter, 2000, Kayaga, 2008). However, Systems Engineering failed to handle the complexity that characterises human systems. This failure eventually led to the development of SSM and soft systems thinking (Checkland, 2000b, Molineux

and Haslett, 2007). Accordingly, Checkland contributed significantly to the advancement of systems thinking through his promotion of the interpretive paradigm and in his contributions to the distinction between hard and soft systems thinking (Holwell, 1997).

In time, SSM moved away from traditional Management Science. It views organisations as complex, purposeful, pluralistic and dynamic entities, which pursue operative and ethical matters and recognise the significance of concealed meanings (Cordoba and Farquharson, 2008, Simmons et al., 2005). SSM no longer referred to „the problem" but to problem situations, focuses on improvement rather than solutions, and emphasises Accommodation instead of consensus (Platt and Warwick, 1995, Winter, 2000). Moreover, SSM stresses the relevance of the human aspect, which is typical in most problem situations (Checkland, 2000a, Shankar et al., 2009). The human aspect refers to any issue that arises from the interaction of people.

SSM belongs to the class of interpretive systems approaches and applies a soft systems paradigm (Jackson, 2000). It is in line with phenomenology (Holwell, 1997), subjectivism, hermeneutics and constructivism, (Zhang, 2010). Based on its interpretive framework, SSM perceives reality as interpreted and continuously socially constructed by the interacting and ever changing flow of ideas, events and interactions (Paucar-Caceres, 2009).

3.2.2 Concepts and principles of SSM

The underlying concepts and principles of SSM are based on the following assumptions that seem to characterise a complex real-world situation (apadpted from Checkland, 2010, p. 130):

- Individuals possess diverse worldviews,
- Worldviews change with time and
- Humans always aim to act deliberately based on their rationality.

Checkland and Haynes (1994) derived five notions that underlie SSM from their varied applications. Later, Checkland (2000b) suggested further characterising principles. Figure 3-2 summarises these elementary SSM concepts.

- SSM sees the real world as a complexity of interactions.
- Models of purposeful activities comprise an explicit worldview.
- Models of purposeful activities are used to explore relationships and to structure a discussion about a situation and not to model the real world.
- Action to improve requires accommodation.
- SSM is adaptable to ensure suitability for specific circumstances.
- Theory and practice are strongly connected and integrated with each other; their interaction forms an on-going learning process .
- SSM itself constitutes a continual learning system, which facilitates and anticipates learning.
- SSM is most beneficial when used as a participatory approach, but is not limited to such.

Figure 3-2: A Summary of SSM principles (derived from Checkland and Haynes (1994, p. 195) and Checkland (2000b, p. 16)

The concept of models of purposeful human activity systems originates from SSM‟s assumption that people always try to act purposefully (Checkland and Haynes, 1994). The activities described in the models are assumed to be appropriate to improve a perceived problem situation (Checkland, 2000b). In theory, these activities can exist in the real world, yet for this context, the systems and the pertaining models merely constitute conceptual means (Checkland, 2000b). I refer to them as purposeful activity models, conceptual models or merely models.

Two different approaches of using SSM have evolved during its development, namely Mode 1 and Mode 2. In Mode 1, SSM is used to guide the investigation of a situation from the outside (Checkland and Scholes, 1990). The user rigidly follows the sequential stages of the SSM process (Connell, 2001). Mode 1 constitutes a methodology-driven, more prescriptive procedure. In Mode 2, which developed out of Mode 1, the practitioner conducts Mode 2 usage with increasing experience (Checkland, 2000b). In Mode 2, SSM is internalised and applied in a more sophisticated manner from within the situation (Checkland, 2000b). It serves as a mental framework, which facilitates sense-making and directs the interaction with the situation (Checkland and Scholes, 1990). Mode 2 holds more flexibility and focuses on stakeholder interaction, rather than intervention (Connell, 2001). The two modes can be combined according to situation specific needs (Turner, 2008). Table 3-1 summarises their core differences.

Mode 1	Mode 2
Using SSM to do a study	Doing work using SSM
Intervention	Interaction
Mentally starting from SSM	Mentally starting insider the flux, providing a coherent way of describing or making sense of it
Stage by stage; logic-driven stream and cultural stream of analysis	SSM as thinking mode, used in internalised form takes SSM itself as a framework; meta-level use of SSM compared with mode 1

Table 3-1: Presentation of the differences between Mode 1 and Mode 2 (redrawn from Kreher, 1994, p.1300)

SSM can be used for two distinct purposes. It can either be applied to handle the content or the context of a problem situation (Checkland and Poulter, 2010). The former is referred to as SSM(c) (SSM content) and the latter as SSM(p) (SSM process) (Winter, 2006). These two different application areas are depicted in Figure 3-3, where the practitioner reflects whether to apply SSM(p), SSM(c), or both to deal with the problematic situations.

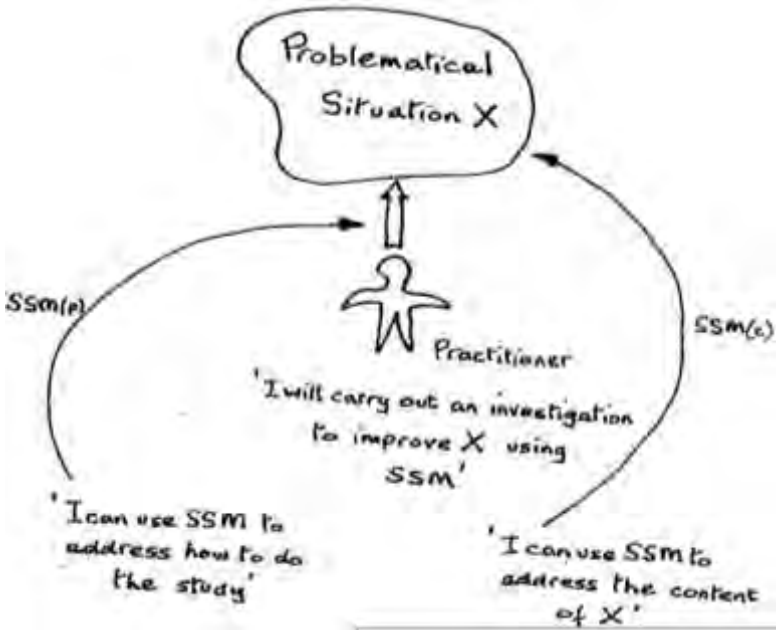

Figure 3-3: Two different ways of using SSM in a problem situation: SSM(p) and SSM(c) (Checkland and Poulter, 2006, p.31)

An experienced user generally employs these two approaches concurrently, which further enriches the study (Winter, 2006). In essence, any intervention starts with SSM(p), even without explicitly applying SSM, because one needs to develop a suitable strategy to approach a situation (Checkland and Winter, 2006). The establishment of SSM(p) and SSM(c) shows the comprehensiveness of SSM, which includes the provision of practical means for holistic inquiries. This allows the user to plan an intervention and to reflect on it.

A further characterising distinction within SSM constitutes the dividing line which separates occurrences in the real world from the consciously-structured systemic thinking about these occurrences (Wilson and van Haperen, 2010, Rose, 1997). This line is shown in Figure 3-4 which illustrates the seven-stage SSM model.

The seven-stage SSM model (Figure 3-4) constitutes the original representation of the SSM process, which now holds relevance only for teaching purposes (Checkland, 2000b). Checkland (2000b) abandoned this representation because its mechanistic appearance might incorrectly suggest that SSM is a descriptive procedure. Moreover, practical SSM applications require more flexibility for which the current four-stage model caters (Section 3.4). The fact that the four-stage model emerged from the original seven-stage process of enquiry, constitutes one example of SSM‟s developmental maturation.

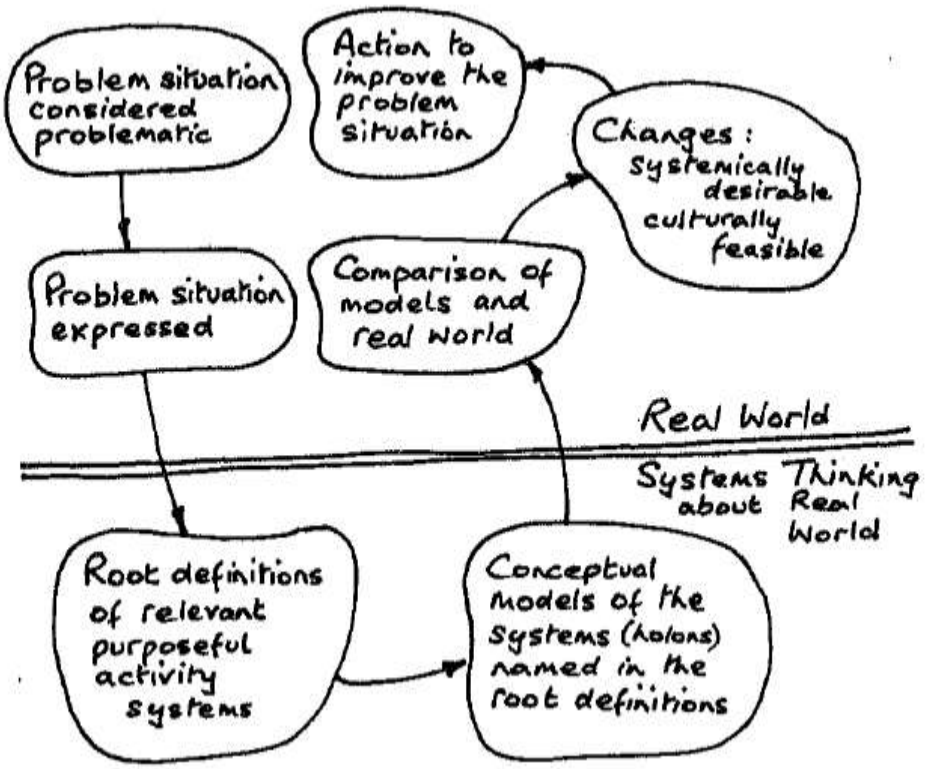

Figure 3-4: Illustration of the original seven-stage SSM model and the dividing line (Checkland and Scholes, 1990, p. 27)

The conscious differentiation between real-world activities (above the line) and systemic reflections about them (below the line) nevertheless possesses validity. However, not in the sense of a rigid division into two completely separate entities, which prevent any interaction, as it might have been originally discerned (Tsouvalis and Checkland, 1996). Checkland (2000b) supports this by omitting the dividing line in his later SSM illustrations. In addition, a strict separation in above and below the line activities seems contradictory with the concept of Mode 2 use, where both activities are simultaneously conducted, as internalised SSM concepts are applied to real-world situations. Accordingly, Tsouvalis and Checkland's (1996) notion of two levels seems more appropriate. It encourages the crucial systemic reflections as an integral part of the intervention itself.

Distinguishing between a cultural-based and a logic-based stream of analysis illustrates another SSM principle (Christis, 2005). Besides facts and logic, human situations feature myths, sentiments, moral, values and politics, which influence the process of meaning creation (Bell and Warwick, 2007). These aspects are explored in the cultural-based stream. The logic-based analysis compares

conceptual models with real world situations and hence deals with more tangible issues (Bell and Warwick, 2007). The two analyses are concurrently accomplished and support each other. The logic-based analysis focuses on the systemic desirability of actions, while the cultural-based analysis investigates their cultural feasibility (Checkland and Scholes, 1990). The completion of both analyses is a necessity. Although recent SSM illustrations refrain from explicitly illustrating the cultural stream, it is contained in the four stages of the SSM learning cycle (Checkland, 2000b).

3.2.3 Features and strengths of SSM

SSM seeks a holistic understanding, learning and improvement of the problem situation, thus contributing to the realisation of SSM‟s full potential. The features and strengths of SSM demonstrate its broad application.

SSM constitutes a methodology and thus comprises principles rather than a prescriptive method. This implies user-dependence, flexibility, adaptability and light-footedness (Checkland, 2000b). The user is free to select the methodological elements that are most suitable for a particular situation (Kreher, 1994). This freedom is only limited by the necessity "to be able to give an account of what one did (or is doing) by using in a precise way the language of SSM" (Checkland and Haynes, 1994, p. 195). By implication, each SSM usage features some uniqueness, which restricts generalisation about SSM (Checkland and Haynes, 1994). The user needs to reflect on how situation-specific features impact the SSM usage. This adaptability implies that any SSM application can lead to methodological lessons about its use (Checkland and Scholes, 1990).

Based on my extensive literature review (Checkland and Winter, 2006, Cordoba and Farquharson, 2008, Molineux and Haslett, 2007, Callo and Packham, 1999, Rose, 1997, Checkland, 2010, Wilson and van Haperen, 2010, Ledington and Donaldson, 1997), I regard the SSM features in Figure 3-5 as its core strengths. They illustrate SSM‟s merit and highlight its relevance and its capacity to deal with complex problem situations.

- SSM reveals, acknowledges and deals with the diverse worldviews that underlie and strongly impact a situation.
- SSM facilitates a holistic understanding of all aspects that contribute to a situation.
- SSM enables people to discover their own ways to handle problem situations by means of employing an organised process of interrogating and thinking.
- SSM structures messy problem situations.
- SSM unveils change and improvement possibilities.
- SSM facilitates accommodation, a precondition for sustainable change.
- SSM seeks stakeholder involvement.
- SSM allows for flexibility and user-dependent application.

Figure 3-5: SSM's core features and strengths

The introduction of the worldview concept appears to be particularly significant and clearly distinguishes SSM from reductionist approaches (Checkland, 2000b). This notion acknowledges that people perceive a problem situation differently and ensures that multifaceted perspectives are taken into account (Fougner and Habib, 2008, Platt and Warwick, 1995). SSM considers the social, cultural and political dimension of a situation (Holwell, 1997). Its implicit competence as a sense-making device is highly appreciated (Wilson and van Haperen, 2010, Sewchurran and Barron, 2008) as it often enables the generation of a shared understanding (Jackson, 1993, Cordoba and Farquharson, 2008) and facilitates the handling of hidden issues (Checkland, 2000a).

SSM acknowledges the necessity of considering stakeholders in its methodological process and hence encourages their rich involvement (Reisman and Oral, 2005, Fougner and Habib, 2008, Kayaga, 2008, Rose, 1997). This participative nature promotes stakeholder dedication, interaction and collaboration and the overcoming of fragmentation (Checkland, 2000a, Molineux and Haslett, 2007). Furthermore, it is critical to achieve stakeholders‟ support, which is a necessity for change realisation (Simmons et al., 2005, Kayaga, 2008).

Bringing about change and improvements in perceived problematic situations describes another core SSM feature (Checkland, 2010, Kalim et al., 2006, Winter, 2006, Wilson and van Haperen, 2010). SSM seeks fruitful debate, prompts new ideas, aspires to shift one‟s appreciative setting, and

supports the Accommodation of diverse interests (Molineux and Haslett, 2007, Checkland, 2000a, Checkland, 2000b).

By virtue of these manifold strengths, SSM forms a well-established methodology which is successfully applied around the world in the public and private sectors on various topics and in diverse fields, such as:

- Health services (Kreher, 1994, Connell, 2001, Checkland, 2000b, Ledington and Donaldson, 1997, Luckett, 2004),
- Agricultural and ecological context (van de Water et al., 2007, Sørensen et al., 2010, Kayaga, 2008),
- Education and educational development (Ledington and Donaldson, 1997, Fougner and Habib, 2008),
- Communication and information technology and development of information management systems (van de Water et al., 2007, Connell, 2001, Sørensen et al., 2010),
- Development of knowledge management systems (Shankar et al., 2009),
- Performance evaluation and challenges with performance measurements (Wilson and van Haperen, 2010, Paucar-Caceres, 2009, Kayaga, 2008),
- Strategy and strategic reviews (Kreher, 1994, Wilson and van Haperen, 2010),
- Change and reorganisation (Platt and Warwick, 1995),
- Organizational design (Kreher, 1994) and
- Individualist (Brocklesby, 2007) and group creativity and collaboration (Molineux and Haslett, 2007).

3.3 The SSM process

Figure 3-6 outlines the current four-stage SSM process. It constitutes the core part of the logic-based stream of analysis and essentially describes a never-ending learning cycle. The learning cycle has to be on-going because the world constantly changes (Winter, 2000). The four stages are elaborated in the following subsections.

As shown Figure 3-6, the stages comprise:

1. Finding Out about a perceived problem situation,
2. Generating models of purposeful activity systems,

3. Comparing these models with the problem situation to reach Accommodation on changes and
4. Implementing agreed Action To Improve.

Although one stage leads to the next stage (Figure 3-6), there is no obligation to follow them rigidly or sequentially (Checkland, 2010). The user can execute the stages simultaneously, proceed iteratively or move backwards and forwards between them (Checkland and Poulter, 2006).

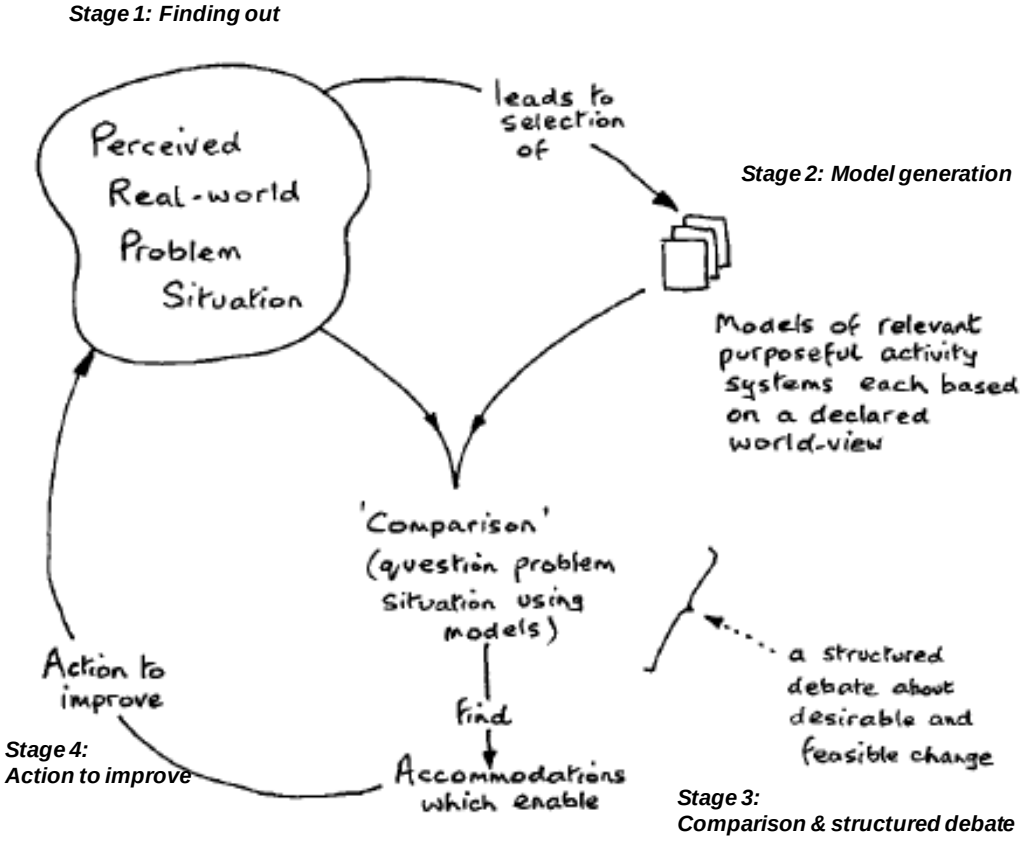

Figure 3-6: The four-stage continuous learning cycle of SSM (adapted from Checkland, 2000b, p. 16)

3.3.1 Stage 1: Finding Out

Stage 1 explores a perceived, real-world problem situation. It finds out about crucial stakeholders, present issues, perceptions, relationships and interactions (Reid et al., 1999, Sørensen et al., 2010). The gained impressions are subjective (Rose, 1997). The researcher determines the research boundaries by defining the data collection techniques and the included stakeholder groups (Soares

et al., 2008). Finding Out never ceases, because a situation continuously evolves and cannot be understood in its entirety (Checkland, 2000b). Analysis One, Two and Three and rich pictures support the desired holistic insight and the intended determination of critical issues and relevant human activity systems.

Analysis One focuses on the intervention itself (Checkland, 2000b). It investigates three relevant stakeholder groups: issue owners, clients and practitioners (Checkland and Winter, 2006). Issue owners are determined by the practitioner and comprise any person with a relation to the issue. This group should be as encompassing as possible to enable a thorough comprehension of the situation and its underlying worldviews (Checkland, 2000b). The client initiates the intervention and can stop it at any point. The practitioner conducts the intervention by means of applying SSM. Analysis One sets the scope for feasible actions (Checkland and Winter, 2006).

Analysis Two and Analysis Three are derived from Vickers‟ appreciative system, which explores how we add understanding to a problem situation (Checkland, 2005, Checkland, 2000b). They belong to the cultural stream of analysis and are crucial for the definition of culturally feasible changes (Checkland and Poulter, 2006, Bell and Warwick, 2007). Analysis Two investigates the culture, history and social reality of a situation, whereas Analysis Three explores its politics. The latter mainly examines how power is evinced, executed, distributed and controlled (Checkland and Poulter, 2006). It helps to make sense of power-related issues and control processes and facilitates a discussion of these issues about (Checkland, 2000b).

A Rich Picture constitutes an expressive illustration of a situation and supports its structuring (Monk and Howard, 1998). Ideally, it shows the relevant stakeholders, institutions, structures, components, issues and opinions and their interrelationships in a situation to reveal deficiencies, facilitates a common understanding and encourages discussions (Checkland, 2000b, Ramirez, 2002, Sørensen et al., 2010).

3.3.2 Stage 2: Model Generation

3.3.2.1 Conceptual models and root definition (RD)

From a variety of critical issues identified in the problem situation, significant ones are chosen for the development of conceptual models of purposeful human activity systems (Checkland, 2000b). A so called root definition precisely defines the activity system (Checkland, 2000b). It clearly states the system‟s purpose, its emergent properties, implicit assumptions and the transformation that emerges from the implementation of this system (Sørensen et al., 2010). The transformation is at the

centre of a root definition and describes the conversion of certain inputs into a changed state (Checkland, 2000b). From the root definitions, conceptual models are generated (Pala et al., 2003). The models contain the essential activities to realise the system as described in the root definition (Checkland and Poulter, 2006). The activities are linked in a logical manner (Checkland and Haynes, 1994). For illustration purposes, the reader is referred to the root definitions and conceptual models that emerged from this study (Figure 6-11and Figure 6-12 in Chapter 6).

3.3.2.2 PQR-formula and CATWOE

The PQR-formula and CATWOE support the generation of root definitions and models (Sørensen et al., 2010). CATWOE serves as an mnemonic, naming the key stakeholders and aspects that need to be included in the root definition as shown in Figure 3-7 (Fougner and Habib, 2008).

- C Customers: beneficiaries or victims affected by the system's activities.
- A Actors: agents who carry out, or cause to be carried out, the main activities of the system, especially its transformation.
- T Transformation: the means by which defined inputs are transformed into defined outputs.
- W Worldview or Weltanschauung: an outlook, framework or image that makes this particular root definition meaningful.
- O Owners: some agency having a prime concern for the system and the ultimate power to cause the system to cease to exist.
- E Environmental Constraints: features of the system's environment and / or wider system which it has to take as 'given'.

Figure 3-7: The meaning of the CATWOE elements (adapted from Checkland, 1981, p. 224-225)

The PQR-formula describes a purposeful activity system in the form of „do P by Q in order to achieve R" (Checkland and Poulter, 2006). P states what the system needs to do, Q determines how it can accomplish this, and R identifies why it should do it (Christis, 2005). Determining R, the underlying rationale, enriches the model creation and shows why Q forms an adequate method to perform P (Pala et al., 2003).

The models built during this SSM stage are required for the next stage.

3.3.3 Stage 3: Comparison and Structured Debate

Stage 3 seeks Structured Debates about improvement options and accommodation on possible changes (Kayaga, 2008). Accommodation describes a situation in which all stakeholders can live, despite their diverse worldviews and aims (Checkland and Winter, 2006). The changes need to be systemically desirable (Callo and Packham, 1999). This means that they must be practically relevant and culturally feasible. The latter requires the consideration of people‟s specific circumstances, history, relationships and ambitions (Checkland, 2000b). Generated models are matched against the present problem situation and serve as source for exploratory questions (Winter, 2000, Wilson and van Haperen, 2010). The debates are structured by means of assessing which of the model activities are already performed, how, by whom and why. Comparison guides the path towards appropriate changes that will be implemented in the following stage.

3.3.4 Stage 4: Action To Improve

This stage implements changes that were approved in the previous stage. In other words, a relevant human activity system is translated into action (Checkland and Poulter, 2006). The ensuing changed situation leads to a new problem situation. This demands re-investigation and thus the SSM learning cycle starts again, which explains its continuous nature (Checkland, 2010).

3.4 Criteria to claim SSM usage

With increasing SSM usage Constitutive Rules that enable an assessment of the appropriateness of an asserted SSM use became necessary (Ledington and Donaldson, 1997). The original rules became out-dated due their limited application to Mode 1 SSM usage (Checkland and Scholes, 1990). Checkland and Scholes‟ (1990) redefined version, which sought to provide the scope for a broader range of SSM usage, is outlined in Figure 3-8. Checkland and Scholes (1990) stated the impossibility to evaluate an extreme version of Mode 2 use, as its conceptual nature is beyond judgment. They further emphasised that the rules are meant to facilitate a critical dialogue about SSM usage, rather than clearly setting SSM on rigid rules. Moreover, I propose that SSM principles, which were introduced in Figure 3-2 in Section 3.2.2, can equally be used as evaluation criteria.

1. SSM is a structured way of thinking which focuses on problematic real-world situations with the intention of bringing about improvements.
2. The structured thinking is based on systems ideas. SSM's whole process has yielded an explicit epistemology. Consequently, any usage claiming to be SSM needs to be expressed in terms of that epistemology.
3. Claiming SSM use requires that:
    - There is no automatic assumption that the real world is systemic; taking parts of the world to engineer them as systems can only be done by conscious choice.
    - Careful distinction is made between engaging in the everyday world and conscious systems thinking about it; the user iteratively and consciously moves between the two.
    - Holons, like `purposeful activity systems', are constructed during the system thinking phases. They embody 4 basic ideas: emergent properties, layered structure, process of communication and control.
    - The holons are used to interrogate the real world in order to articulate a dialogue about desirable and feasible changes.
4. Based on SSM's flexibility and user-dependency, any usage needs to entail conscious reflection about the adaptation to a particular situation.
5. Since SSM is a methodology, any use of it will potentially yield methodological lessons concerning , for example ,its framework of ideas, its processes, or the way it was used; these await extraction.

Figure 3-8: Checkland and Scholes' Constitutive Rules (1990, adapted from p. 286-287)

Based on these rules, the practitioner is at least obliged to fulfil the following conditions to justifiably claim SSM usage, *viz.;* (a) being explicit concerning the conducted systems thinking, (b) to generate conceptual models and (c) to apply these models to structure an inquiry that seeks improvements.

Holwell (1997, p. 398) asserts that presently rules are "at the same time too loose and not extensive enough". They lack SSM"s indispensable concepts, namely its interpretive paradigm, constrain a genuine discourse about SSM and limit its further development. Accordingly, she argues for the more prescriptive Constitutive Rules in Figure 3-9. They cover three levels: SSM"s underlying philosophy – soft systems thinking, its process, and its techniques. Although she proposes that their fulfilment describes a precondition to claim SSM usage, they shall neither restrain the flexibility of SSM nor its adaptability to specific situations.

Philosophical level: statements of principles or assumptions

1) Social reality is socially constructed continuously.

2) Use explicit intellectual devices consciously to explore, understand and act in the respective problem situation.

3) Include in the intellectual devices 'holons' in the form of systems models of purposeful activity built on the basis of declared worldviews.

SSM process

- Uses activity models.
- Entails an understanding of the history of the situation, the cultural, social and political dimensions of it.
- Focuses on learning and on accommodation which either facilitates action to improve or sense making is possible.
- Applies discourse and debate for learning and achieving accommodation.
- Is necessarily cyclical and iterative.

SSM techniques

- A selection from RP, RD, CATWOE, Formal Systems Model, the what/ how distinction, or structures such as the PQR-formula is used in the process, but it is not limited to this pool of techniques.

Figure 3-9: Holwell's Constitutive Rules (1997, adapted from p.401-402)

Checkland identifies that SSM use is characterised by four elements:

> "A perceived real-world problem situation, a process for tackling that situation in order to bring some kind of improvement, a group of people involved in this process and the combination of these three (intervention in the problem situation) as a whole with emergent properties." (Checkland, 2000a, p. 821)

To me, these elements describe further means to assess SSM usage, as they allow for the necessary light-footedness and a wide range of SSM applications. Nonetheless, they cannot be used as minimal necessary requirements. The user needs to at least regard reality as socially constructed and apply some mental concepts to explore it, to comply with SSM's interpretive paradigm (Holwell, 1997).

3.5 Potential challenges in applying SSM

SSM usage requires a suitable mastery of some practical challenges, which often constitutes a point of criticism. SSM can be beneficial without stakeholder participation, but the lack of crucial stakeholder groups or stakeholders‟ poor commitment seems to limit the realisation of SSM‟s full potential (Kreher, 1994, Callo and Packham, 1999, Checkland and Haynes, 1994). All stakeholders that are related to the situation should be involved in the SSM process (Reisman and Oral, 2005). Particularly during Stage 1 and Stage 3, stakeholder participation appears indispensable.

Since research often lacks an official mandate, stakeholder confidence and their dedication to the research process needs to be gained. This requires the researcher‟s ability to relate to stakeholders and a good relationship among participants (Callo and Packham, 1999). Participation is encouraged by (a) adequate communication structures between the client, practitioner and issue owners, (b) competent use of participatory approaches, (c) appropriate management of the entire engagement and (d) natural SSM usage in an atmosphere that supports genuine discussions (Kreher, 1994, Checkland, 2000a). Leadership‟s agreement to an SSM process, their sincere commitment to it, and their assistance in recruiting participants further foster participation (Molineux and Haslett, 2007).

In addition, SSM requires stakeholders‟ willingness to engage in genuine debate, to learn and take Action To Improve (Kreher, 1994, Checkland, 2000a). Ascertaining the readiness to learn is challenging, as it requires time, a self-critical attitude and sincerity in debates (Kreher, 1994). In cases where crucial stakeholder groups are represented by a few of their members only, SSM‟s success depends on their capability to transmit gained insights and agreed changes into their respective groups (Connell, 2001). Non-participating group members do not benefit from the first hand learning experiences and thus might be resistant to proposed changes. Therefore, an appropriate communication structure and the documentation and distribution of discussion outcomes to all stakeholders are vital. It supports a universal appreciation of the achieved common understanding.

For a successful SSM application the facilitator plays a key role (Molineux and Haslett, 2007) and should display the following attributes and abilities:

- Communication and advisory competence (Kreher, 1994),
- A systemic perspective, including clear reasoning throughout the entire engagement (Reisman and Oral, 2005) and critical reflection on own assumptions (Winter, 2000). This abstract systemic thinking requires concentration and diligence(Kreher, 1994),

- Sensitivity and the capability to consider the world from the perspective of other stakeholders (Winter, 2000), including the acknowledgement of their perceptions, opinions, beliefs and impressions (Callo and Packham, 1999),
- To create space for sincere debates and enable participants to express their views openly (Callo and Packham, 1999, Cordoba and Farquharson, 2008)
- To be flexible and able to „go with the flow" and facilitate a light-footed debate, whose outcome is unpredictable and for which real guidelines are non-existent; avoid getting stuck in controversial topics and rather focus on concrete discussion outcomes (Kayaga, 2008, Gregory and Midgley, 2000, Pala et al., 2003),
- Empathy with stakeholders and the ability to interpret situations rather than solely observe them to disclose the underlying worldviews (Zhang, 2010) and
- Establish rapport and a real relationship with stakeholders, which entails ensuring confidentiality (Cordoba and Farquharson, 2008).

Given these requirements, some authors argue that intensive facilitator training is necessary (van de Water et al., 2007). Other authors, however, counter that learning SSM is not difficult and some practitioners conduct soft systems thinking naturally, without even naming it (Reisman and Oral, 2005, Checkland, 2000a). No specific competencies are required to perform SSM and learning by doing induces a rapid natural employment (Checkland, 2000b). Everyday life decision-making, by default, unconsciously applies SSM (Checkland, 2000b).

Although this section elaborated on practical challenges of SSM, to my knowledge, a coherent guideline which equips the SSM user with aspects he should consider to realise SSM's full potential, is not available. Such a guideline should be based on methodological lessons learned (Checkland and Scholes, 1990, Connell, 2001). A guideline that comprises the methodological lessons learned would particularly facilitate the novice SSM user and thus boost SSM applications.

3.6 Critical voices

Critical voices question the adequacy, merit and feasibility of SSM. This section outlines and discusses these criticisms of SSM. It contains a brief discourse on paradigm incompatibility, as combining SSM with other approaches is suggested to overcome some alleged deficiencies. The core points of concern are as follows and will be elaborated below:

- SSM fails to engender change and improvement and to guide the execution of the different SSM stages adequately,
- SSM focuses on consensus only, rather than a holistic understanding,
- SSM fails to handle conflict and power imbalances,
- SSM lacks the means to guarantee appropriate stakeholder engagement,
- SSM lacks worldwide usage and applicability to real world situations and
- SSM lacks methodological adequacy.

A prime criticism questions SSM‟s ability as a real change driver (van de Water et al., 2007). This implies a querying of its overall appropriateness. The critique comprises two components: firstly, it claims SSM‟s deficiency in directing the change process, and secondly, it states that SSM is unable to assure the implementation of change and improvements (Pala et al., 2003, Connell, 2001). Detractors argue that SSM reveals *what* needs to be improved, but not *how* it can be improved (Kinloch et al., 2009, van de Water et al., 2007). Similarly, Reid et al. (1999) argue that SSM insufficiently indicates how Analysis Two and Three should be accomplished. Several reasons for SSM‟s ineffectiveness are proposed.

Critics claim that SSM is primarily applied to generate insight and focuses excessively on accommodation at the expense of facilitating improvements (van de Water et al., 2007). In particular, the lack of approval for consented transformations from hierarchically higher levels or „power-holders“ constrains the change process (Kreher, 1994, Jackson, 2000). This is exacerbated by a poor ownership over agreed changes (Callo and Packham, 1999). Even Checkland (2000b) admits to difficulties in accomplishing change, as it requires transformation at three levels: structural, procedural and attitudinal change.

Fuenmayor (2000) argues that SSM largely focuses on accommodation, which from his perspective mostly seeks the preservation of a given order, instead of changing it. SSM thus insufficiently facilitates a comprehensive understanding of a problem situation.

SSM is accused of a lack of competence in dealing with conflicts and power issues (Kreher, 1994, Jackson, 2000). Basden and Wood-Harper (2006) argue that other than revealing conflicts, SSM fails to master them. Cordoba and Farquharson (2008) propose that there should be a stronger focus on power issues. Power imbalances compromise authentic discussions as these are dominated by powerful stakeholders (Jackson, 2000). Should the SSM process endanger the influence of these stakeholders, they might limit it to topics of which they approve, which would restrain the richness

of the SSM process and the development of alternative and more adequate ways to deal with issues (Jackson, 2000). Connell (2001) showed that conflicting cultural interests were insufficiently handled by SSM and thus limited change implementation. The prevailing culture seems to determine the changes (Callo and Packham, 1999).

As elaborated in Section 3.5 stakeholder participation is crucial. SSM‟s inability to ensure appropriate stakeholder involvement and their commitment to the process describes a further point of critique, which questions SSM‟s adequacy as a participatory methodology (Callo and Packham, 1999, Kreher, 1994). In the light of this criticism, great effort must be taken to ensure adequate stakeholder participation.

The applicability of SSM to real world problem situations is also questioned. Van de Water et al.(2007) query SSM‟s worldwide application in a broad field, which explores its practicality in dealing with problem situations. They argue that SSM usage has focused only on the development of SSM itself. This ignores Checkland‟s vast contribution to systems thinking and the implicit benefits in dealing with management challenges (Holwell, 1997).

Finally, Pala et al. (2003) contest SSM‟s adequacy as a methodology. They doubt its validity as learning system because SSM apparently fails to consider the bias in human judgments and present learning barriers that result from this bias. Furthermore, they argue that SSM fails to determine the likelihood of success of made suggestions. Since this limits the distinction between more or less promising alternatives prior to their implementation, SSM supposedly leaves the practitioner with a time and energy wasting trial and error approach.

Checkland (2000b) responds to these critiques by asserting that they show insufficient knowledge of SSM. Although Checkland‟s statement is easily deniable, it holds some truth. Certain accusations contradict SSM‟s intentions, principles or underlying assumptions. Holwell (1997) revealed the faultiness of some secondary literature, which subsequently needs to be considered with great care.

> “It is clear from the secondary literature that the nature of SSM is not understood, and not only because it is a relatively simple task to find flawed accounts of it. At the most basic level of what SSM 'is' or what its purpose is there are not only different views, there are clearly contradictory views.” (Holwell, 1997, p. 321)

The accusation that SSM fails to engender a holistic understanding is addressed by many authors who particularly stress the merits of SSM in this area (Cordoba and Farquharson, 2008, Luckett and Grossenbacher, 2003, Kalim et al., 2006, Checkland, 2000b). Likewise, SSM‟s participative nature and its emphasis on stakeholder engagement assumingly facilitates adequate stakeholder involvement (Kinloch et al., 2009, Fougner and Habib, 2008, Kayaga, 2008, Checkland, 2000a, Brocklesby, 2007). This alleviates another presented critique (Callo and Packham, 1999, Kreher, 1994). Nevertheless, I acknowledge a potential inability to ensure sufficient stakeholder participation. Since this would limit SSM‟s potential, I constantly sought adequate participation.

Concerning politics and power issues, Kreher (1994) argues that they present a challenge to any approach, but SSM at least recognises and reflects on these aspects by means of Analysis Three. Nonetheless, power issues determine how people view themselves, act, and relate to others (Cordoba and Farquharson, 2008) and they might impair open debate (Kalim et al., 2006). Therefore, I perceive it is my responsibility as researcher, to be aware of power issues, to reflect on their impact, and to seek voluntary stakeholder participation. Regardless, SSM‟s sensitivity towards power issues and its capacity to handle conflicting interests and reach accommodation seems to outweigh present critiques (Turner, 2008, Gregory and Midgley, 2000, Checkland, 2000a).

Contrary to accusations, SSM proponents have demonstrated SSM‟s practicality in various fields and across several countries (Luckett and Grossenbacher, 2003, Cordoba and Farquharson, 2008). SSM users and stakeholders, involved in the SSM process, reinforce SSM‟s practical virtue (Molineux and Haslett, 2007, Kalim et al., 2006, van de Water et al., 2007).

SSM has clearly demonstrated its merit as a learning system (Checkland, 2000b, Molineux and Haslett, 2007, van de Water et al., 2007, Paucar-Caceres, 2009). Contrary to Pala et al. (2003), I suggest that learning is not confined to evaluating the successfulness of implemented actions, but rather that learning opportunities exist at each SSM stage. Rich picture drawing broadens participants‟ perception because it confronts them with the views of other stakeholders (Monk and Howard, 1998). Model Generation and Comparison also add to learning (Reid et al., 1999, Checkland and Poulter, 2006, Paucar-Caceres, 2009).

Although critics desire a precise guideline on how to realise change, Checkland (2000b) had no intention to determine the precise *how* of the SSM process, as this would suggest that SSM is a rigid recipe-like methodology comparable with systems engineering out of which SSM freed itself. In contrast, a methodology that advocates flexibility and enables people to develop their own way of thinking and acting was intended (Checkland, 2000a, Holwell, 1997).

Nevertheless, SSM comprises several means which support change realisation (Kalim et al., 2006, Wilson and van Haperen, 2010). Its focus on accommodation means that debates seek the definition of concrete actions that can be realised (Checkland and Winter, 2006). This, by implication, should indicate the *how* of improvement. In addition, the questions, outlined in Figure 3-10, further ease change realisation. Finding an answer to these questions while discussing suggestions for moving from a problematical to an improved situation, enhances the feasibility of these suggestions. Moreover, I propose that the holistic understanding, which results from SSM usage, promotes its ability as a change driver, as this understanding is a precondition for the determination of sustainable changes. Subsequently, the accusation that SSM fails to engender Action To Improve problematic situations appears incorrect.

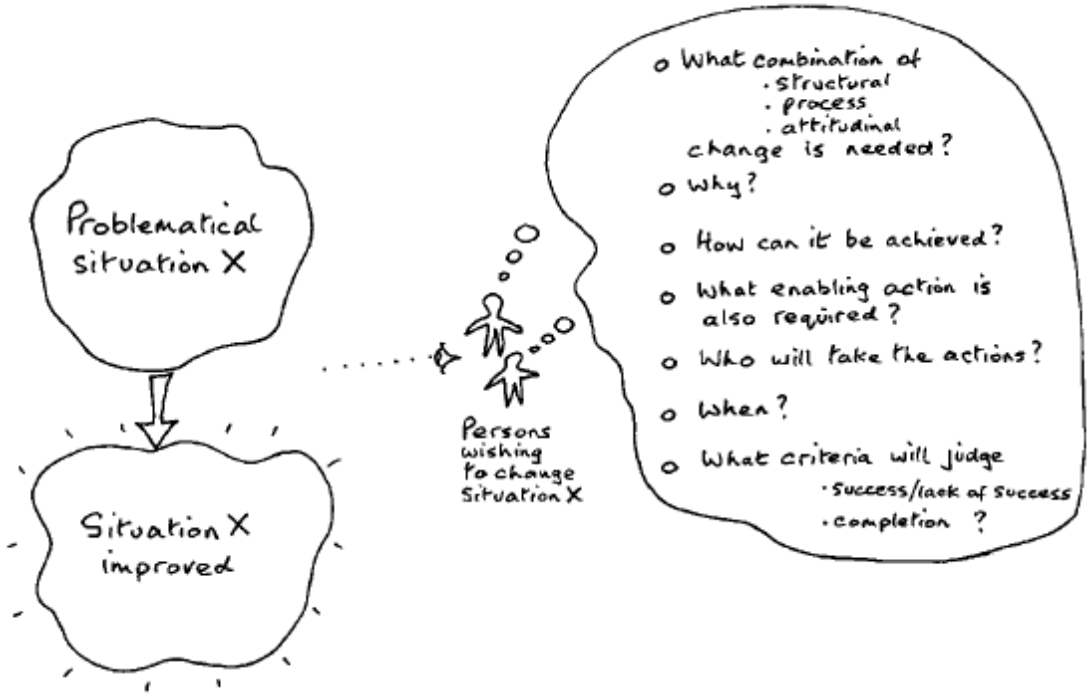

Figure 3-10: Reflection on the desirability and feasibility of potential changes to support Action To Improve (Checkland, 2000b, p. 34)

Some authors suggest combining SSM with other approaches, in particular from hard systems thinking, to master its alleged difficulty with change implementation (Simmons et al., 2005, Bell and Warwick, 2007). Applied in combination, SSM provides the essential insight and facilitates agreement of changes, for whose realisation other, more prescriptive, approaches are employed (Kinloch et al., 2009, van de Water et al., 2007). SSM identifies the *"*right problem*",* whereas the

added hard systems approaches define the *"right way"* to tackle it (Reisman and Oral, 2005, p. 173). Thanks to their complementary nature, hard and soft systems thinking approaches assist in overcoming the inherent weaknesses of each of these approaches alone (Reisman and Oral, 2005). Several researchers validated this method of combining soft and hard systems approaches and its benefits (Sørensen et al., 2010, Simmons et al., 2005, Bell and Warwick, 2007). This kind of methodology combination belongs to the group of „multi-methodology" approaches.

3.6.1 Multi-methodology and paradigm incompatibility

Multi-methodology implies combining either entire methodologies or merely parts thereof. These methodologies can be based on different paradigms (Mingers and Brocklesby, 1997). Given the limitations of a single system methodology, multi-methodology emerged and is receiving growing interest (Jackson, 1999, Jackson, 2000, Flood, 1989). Figure 3-11 outlines reasons for a claimed necessity to apply multi-methodology approaches.

- A single methodology cannot handle the entire complexity of the mess, because it is multi-dimensional and contains technical, social and personal components. This richness requires several methods to be fully grasped, and applying a single methodology would limit a sophisticated handling of real world problems (Jackson, 1999, 2010).
- A comprehensive insight depends on applying methodologies from diverse paradigms (Midgley, 2011).
- Pluralism ascertains flexibility and effectiveness (Mingers and Brocklesbey, 1997).
- An intervention has several phases, for which different methodologies are more or less appropriate. Therefore, diverse methods need to be used in the various phases (Mingers, 2000).
- Multi-methodology has already been used successfully (Mingers, 2000).

Figure 3-11: Reasons illustrating the relevance of multi-methodology

Since multi-methodology comprises the combination of methods and techniques from divergent paradigms, their compatibility with each other needs to be assessed (Jackson, 2010). The multi-methodology movement needs to deal with the issue of paradigm incommensurability (Mingers and Brocklesby, 1997). Paradigm incommensurability suggests the impossibility of combining diverse paradigms, because each paradigm has its discrete assumptions concerning ontology and epistemology, which might contradict with other paradigms (Mingers and Brocklesby, 1997).

Furthermore, different paradigms inevitably develop autonomously, are committed to their theoretical underpinnings, pursue mutually exclusive objectives, and use their own unique jargon, which prevents the essential communication between the different paradigms (Burrell and Morgan 1979, cited in Jackson and Carter, 1991).

Paradigm incompatibility is acknowledged for several reasons. It facilitates the integrity, probity, identity and advancement of individual paradigms, ascertains the consideration of diverse and opposing perspectives, assures a variety of investigations, supports meaningful inter-paradigmatic debates, and challenges the dominant scientific view (Jackson and Carter, 1991). It is argued that without paradigm incompatibility, the functionalist paradigm might dominate all other paradigms (Jackson and Carter, 1991).

Within the multi-methodology movement several possibilities exist to handle paradigm incompatibility. These can be described as isolationism, imperialism, pragmatism or pluralism (Gregory, 1996, Flood, 1989). Within pluralism, different deliberations are distinguishable: complementarism, a meta-theory as a new paradigm, and discordant pluralism (Brocklesby and Cummings, 1995, Mingers and Brocklesby, 1997, Midgley, 2011). I discern discordant pluralism as the most appropriate way to enable multi-methodology and deal with paradigm incompatibility (Jackson, 2000).

Discordant pluralism underpins critical systems thinking. It acknowledges the merit of paradigm incompatibility, as it recognises the limitations of a single knowledge domain and the subsequent necessity to explore various theories (Midgley, 2011). Therefore, discordant pluralism advocates a multi-methodology that encourages and protects paradigm diversity (Gregory, 1996). It further promotes the use of methodologies from diverse paradigms, whereby their relevant theoretical underpinnings need to be explicitly expressed (Mingers and Brocklesby, 1997).

Multi-methodology also has to master several other difficulties, *viz.*; cultural challenges, theoretical difficulties in the alliance of different methods, practitioner incompetence in moving between the various paradigms, and opponents denying the merit of multi-methodology (Brocklesby and Cummings, 1995, Mingers and Brocklesby, 1997, Jackson, 1999, Jackson and Carter, 1991).

3.7 Relevance of SSM for the study

This section explains my usage of SSM despite critical voices. It highlights the SSM features that seem important for my study. Since this study largely sought an in-depth understanding of a sugarcane production and supply system, SSM seemed particularly well suited, due to its emphasis

on a holistic exploration of a problem situation. I especially valued its ability to pay attention to underlying soft issues and diverse stakeholder perceptions as indicated by Cordoba and Farquharson (2008), as these aspects, thus far, appeared insufficiently explored. Moreover, its participative nature aligned with my intention of rich stakeholder engagement. The ability of SSM to facilitate feasible and desirable improvements further explains its usage. I intended to bring about some minor advancement in the studied milling area. In the course of this, I additionally aimed at investigating the ability of SSM to cause improvements in my study context, because severe critics queried this competency of SSM.

A typical sugarcane supply chain is challenged by stakeholders with diverse and partly conflicting views and objectives and multiple interrelated issues. Gregory and Midgley (2000) for example, handled comparable challenges by applying SSM. They dealt with poor organisational cooperation and stakeholder groups who pursued various interests despite a common goal and who depended on each other, yet without belonging to one „unifying force". These conditions are similar to a sugarcane milling area, where stakeholders are mutually dependent, and in principle want to collaborate, yet fail to do so in practice. Fragmentation, poor communication and opportunistic behaviour limit efficiency (Bezuidenhout et al., 2012). Gregory and Midgley (2000) showed that SSM application helped to address these causes of cooperation shortcomings. Other authors confirmed SSM"s adequacy for situations characterised by conflicting interest and fragementation (Checkland, 2000a, Simmons et al., 2005).

Gencoglu et al. (2002) and Soares et al. (2008) propose SSM"s relevance for supply chain management. They highlight its ability to improve supply chain management and to cope with three of its major challenges: conflict, fragmentation and the human aspect. Figure 3-12 contains SSM strengths that were presented as significant for supply chain management and indicates implied practical challenges in using SSM. Since a sugarcane production and supply system is comparable with a general supply chain, SSM appears suitable for this study.

SSM strengths relevant for supply chain management

- Improves understanding .
  - •Acknowledges different ideas and perspectives.
  - •Conceptual nature of the approach prompts questioning, thinking and critical analysis.
  - •Incorporates social and political environment, including social, political and cultural issues.
  - •Adds structure to messiness by providing a disciplined formal way to proceed.
  - •Focuses on the purpose of the chain, systems, needs, outputs.
- Promotes creativity and builds confidence.
- Allows for questioning the current arrangements.
- Participative and collaborative nature promotes a holistic insight, overcoming fragmentation and inducing dedication and buy-in.
- Iterative nature allows for on-going improvement.

Challenges encountered by stakeholder when applying SSM to supply chain management

- Learning how to draw rich pictures.
- Problems in reaching accommodation.
- Generating conceptual models.

Figure 3-12: Strengths and challenges of SSM in a supply chain management context (Gencoglu et al., 2002, adapted from p. 54 & 55)

Soft systems methodology has hardly been used in supply chain management and little research has been conducted to investigate its benefits, challenges and feasibility in the supply chain context (Gencoglu et al., 2002). Its relevance needs to be explored and validated. By implication, this study contributes to the body of knowledge concerning SSM usage in the supply chain context. It critically appraises the extent to which SSM facilitates supply chain management in the sugar industry, with reference to the assertions of Gencoglu et al. (2002) and Soares et al. (2008).

A further reason for this SSM application was that I intended to explore how the situation specific characteristics of a sugarcane production and supply system impacted on the SSM usage, as such reflections were encouraged by Checkland and Scholes (1990). In addition, SSM‟s merit and

challenges in practical applications need to be further explored (Connell, 2001, van de Water et al., 2007, Pala et al., 2003). Applying SSM to one particular milling area enabled me to evaluate the practical capabilities of SSM in this practical context and to derive methodological lessons from this application. Until now, SSM was only used by Smajgl et al. (2006) in the sugar industry setting, albeit, in the context of exploring the impacts of a water reform on sugarcane irrigation. This study, thus, contributes to the body of knowledge on practical SSM applications in general and on SSM usage in the sugar industry context in more specific terms.

3.8 Concluding remarks

This chapter introduced SSM and provided a rationale for its application to the current study. Potential weaknesses and challenges were considered, but SSM‟s relevancy, especially in situations comparable with my study context, exceeds these possible shortcomings. Accordingly, SSM usage seems justified. Its suitability is explored in the course of this thesis. The following chapter introduces the Viable System Model (VSM) in a comparable way.

CHAPTER FOUR: THE VIABLE SYSTEM MODEL

4.1 Introduction

This chapter provides a detailed overview of the Viable System Model (VSM) and a rationale for its usage. The model‟s theoretical underpinnings are illustrated, including its development process and theoretical classification, its principles and concepts, and its core features and implicit strengths are also discussed. Thereafter, the essential elements of a viable system are introduced. The chapter further discusses some criticisms of VSM and concludes with an illustration of VSM‟s merit under conditions similar to this study context, thus explaining my choice of VSM in the current study.

4.2 Theoretical underpinning of VSM

4.2.1 Theoretical origin and classification

The deployment of VSM started approximately 60 years ago in response to Stafford Beer‟s question about the "necessary and sufficient conditions" that make systems viable and allow them to survive (Beer, 1984, p. 8). His confidence that there is some invariance in the behaviour of systems, which enables them to continue to exist, boosted the development of VSM (Espejo, 2004). In the quest for an answer to his question, Beer studied the functional principles of homeostasis in human organisations, neurocybernetics, psychology, biology, philosophy, and communication theory amongst other subjects (Leonard, 2009, Espejo, 2004). VSM eventually emerged from a continuous development process (Jackson, 1988, Thomas, 2006). This explains its comprehensive theoretical underpinning and its thoroughness.

Essentially, VSM deals with the "mechanisms of adaption, communication and control" (Beckford, 2002, p.267). Systems Theory and Cybernetics constitute its prime theoretical underpinnings and many of its principles are premised on cybernetic rules (Leonard, 2006, Watts, 2009). These rules apply to the animate and inanimate world (Gregory, 2007, citing Wiener 1948). The cybernetic grounding of VSM thus reasons its universal applicability and its relevance for management science (Snowdon and Kawalek, 2003).

Cybernetics comprises two trends: Management Cybernetics and Organizational Cybernetics. VSM was originally classified in a functionalist, hard systems paradigm due to the positivistic flavour of traditional management science (Schwaninger, 2004). Management Cybernetic belongs to this paradigm, which assumes the possibility to describe reality objectively. This paradigm further

assumes a goal-seeking behaviour and management‟s ability to follow predefined aims effectively via certain communication and feedback mechanisms (Paucar-Caceres, 2009). The impact of humans on a system, individual‟s diverse perspectives, power relations, and complex organisational settings are neglected (Espejo, 1994, Paucar-Caceres, 2009). Since VSM features a conceptual character, is observer dependent and acknowledges subjectivity (Schwaninger, 2004, Beckford, 2002), I perceive its later classification in the interpretative-constructivist paradigm as suggested, for example, by Espejo (1994) as more appropriate. This paradigm, which applies equally to Organizational Cybernetics, acknowledges the human component in a system and abandons pure mechanistic thinking (Paucar-Caceres, 2009).

Any cybernetic model features three building blocks; *viz*. variety engineering, a black box technique, and self-regulation via feedback loops (Beckford, 2002). Beer successfully incorporated these three constituents in VSM, but particularly emphasises the consideration of existing feedback mechanisms (Beer, 1973). Cybernetic models, and thus VSM, assume that organisations pursue goals, interact with their environment and need to manage change (Bassett-Jones et al., 2007). These models focus on the dynamic relationships within a system.

The concept of a black box implies that the complexity of an organisational unit or any other studied system cannot be entirely grasped. The black box technique applies the principle input – transformation – output. Only the inputs and outputs are visible, but not the transformation process within the black box (Beckford, 2002). This technique frees managers from involvement in the detail of the operations and interactions inside the black box, allowing them to manage the system by controlling its inputs and monitoring the subsequent outputs, which enables them to detect irregularities in the system (Beer, 1979, Beckford, 2002). The black box technique is implemented in the recursive nature of VSM and facilitates the execution of Ashby‟s Law of Requisite Variety, which is discussed in a later section.

Feedback loops are composed of negative and positive feedbacks. Negative feedbacks operate as attenuators and positive feedbacks as amplifiers (Leonard, 2006). An attenuator describes an error-correcting mechanism which softens unwanted effects and brings the system back in balance (Bassett-Jones et al., 2007). A thermostat is an example of a negative feedback (Beckford, 2002). An amplifier, in contrast, fortifies messages, trends and intended behaviours. Feedback loops facilitate self-regulation and assist in directing and controlling a system. Efficient feedback transmission also involves transducers which code and decode information whenever it crosses a boundary (Bassett-Jones et al., 2007). This ensures the comprehensibility of messages for the sender

and the recipient. Transducers further act as input or output filters, which select what enters the system or check the quality of products that leave the system (Beer, 1979).

Stability describes another cybernetic principle to which VSM adheres as it immediately strives towards equilibrium after disturbances, by means of self-regulation and variety engineering (Beer, 1973). The complexity and variety in today‟s world has increased the number of disturbances that interfere with a system‟s stability. Past management approaches have attempted to restore stability through variety reducers (Beer, 1973). These approaches focused on maintaining the status quo and short-term goals rather than viability. The resultant rigidity implied the inability of these approaches to handle increasing perturbations as new disturbances challenged the organisation before it had overcome the previous ones (Beer, 1973). This precarious situation highlights the need for new approaches to manage complexity and VSM offers a qualified option (Beer, 1973, Britton and McCallion, 1989).

4.2.2 Principles and concepts of VSM

This section introduces Ashby‟s Law of Requisite Variety and Recursion.

4.2.2.1 Ashby‟s Law of Requisite Variety

The integration of Ashby‟s Law of Requisite Variety into VSM describes one of the key principles of VSM and reasons for its competence in complexity management (Beer, 1984). The Law asserts that “only variety can absorb variety” (Beer, 1973, p. 11). The variety of a system defines its complexity and depends on the number of possible states a system can embrace (Beer, 1979). Compliance with Ashby‟s Law enables a system to handle its own, and a degree of external, variety (Thomas, 2006).

Ashby‟s Law requires a system to embrace the variety of its environment to ensure stability despite external disturbances (Jackson, 1988, Brocklesby and Cummings, 1996, Beer, 1973). The system has to create a variety that is equivalent to the diversity that is conveyed from the outside into the system (Leonard, 2006). The law further urges a system‟s management to match the variety created by its own operational units to handle the system‟s internal variety (Tejeida-Padilla et al., 2010). This implies that a regulatory system needs equal or higher variety than the system it regulates (Snowdon and Kawalek, 2003). The fulfilment of Ashby‟s Law coincides with achieving homeostasis and systemic equilibrium (Medina, 2006).

VSM realises Ashby‟s Law through variety engineering. Variety engineering means balancing the variety difference between the regulated and the regulatory system, or between the environment and

the system where the variety of the former is generally higher than the variety of the latter. The variety difference is shown by the diversely sized boxes in Figure 4-1. Variety engineering applies attenuators and amplifiers to equalise variety disparities and to fulfil Ashby‟s Law. The amplifier increases the variety of the regulatory system, whereas the attenuator dampens the variety of the regulated system (Beer, 1984). In VSM, variety engineering reduces the diversity of the operational units, enhances the variety of their management, and adjusts the variety differences between the environment and a system. Intrinsic control mechanisms, feedback loops and communication channels assist in this variety attenuation or amplification (Beckford, 2002). Moreover, the principle of Recursion supports variety engineering.

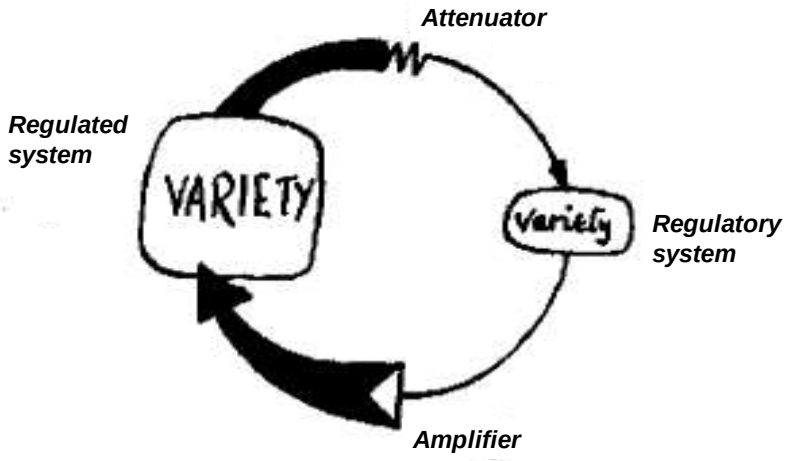

Figure 4-1: Attenuator and amplifier balance variety difference between the regulated system and the regulatory system (adapted from Beer, 1973, p. 11)

A traffic light constitutes an example of an efficient regulatory system, composed of a basic structure, which guides group behaviour and hence reduces variety (Leonard, 2009). The formation of customer groups or the neglect of unimportant information are further examples of attenuators. A company can group customers with similar desires and then address the demands of this homogenous group rather than individual demands. The company consequently has less diversity to handle. Car manufacturers, for example, produce their cars for a certain customer group. Likewise, a research group concentrates on specific information regarding its research focus, rather than the entirety of research conducted in a certain field.

Illustrations of amplifiers in an organisation are research and development, marketing, advertising, employee training and the distribution of decision-making power throughout the organisation

(Clemens, 2009, Beer, 1979, Stokes, 2006). The latter, for example, enables upper management to deal with an overall higher variety, because it is not required to handle each detail that contributes to the variety (Stokes, 2006). Training extends the capabilities of the employees and thus the diversity of an organisation.

4.2.2.2 Recursion and local autonomy

The inclusion of recursion constitutes another crucial VSM principle. Recursion means the nesting of systems with increasing complexity. This concept is often compared to a set of Russian dolls (Beer, 1984). A viable system contains further viable units, its operational units, and is itself embedded in a higher viable system (Thomas, 2006). These nested systems are composed of exactly the same structure. This is illustrated in Figure 4-2. Each operational unit, here named ONE, contains another similar system, mapped at a 45 degree angle. The outside square box, at the top right, indicates the next higher level of recursion.

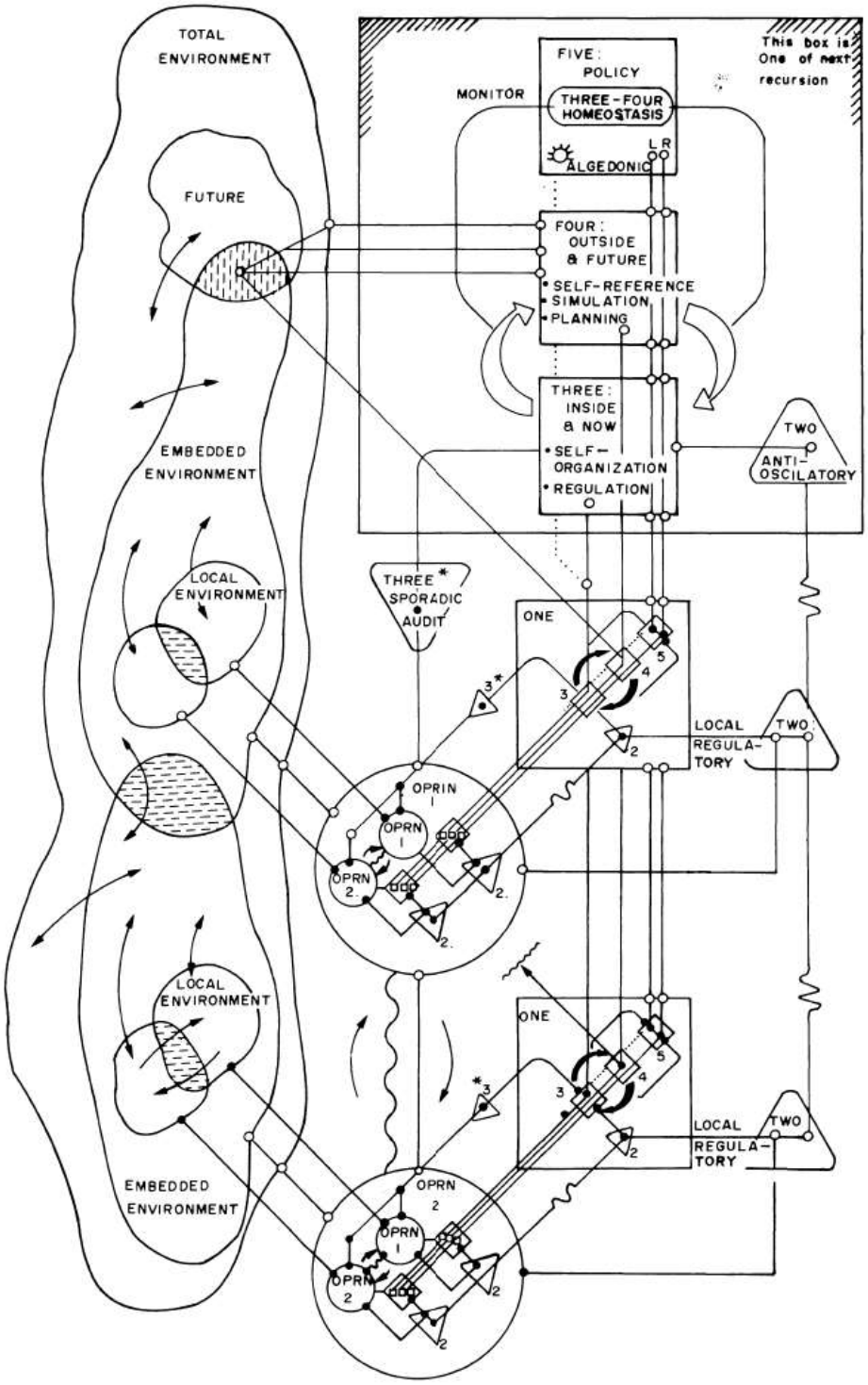

Figure 4-2:Overview of VSM including its recursive embedment (Beer, 1984, p. 15)

Recursion implies a certain degree of autonomy within the operational units, which are viable systems on their own (Schwaninger, 2006). Their discretion is limited only by their belonging to an overall system and the implicit necessity to ensure systemic cohesion (Schwaninger, 2006, Beckford, 2002). This restriction is vital to safeguard the system‟s stability and viability, which otherwise might be endangered by the self-centred behaviour of individual operational units (Beer, 1973, Medina, 2006). The limits within which operational units can act autonomously, are determined by the system in which they are embedded. Besides knowledge and authority, this recursive principle requires responsibilities and self-organisation (Hoverstadt and Bowling, 2005). This means that each recursive level makes decisions directly, handles problems locally and interacts with its respective environment (Lewis, 1997, Leonard, 2007).

Recursion facilitates the realisation of Ashby‟s Law and thus complexity management. Local autonomy establishes sufficient internal variety to capture the complexity that confronts a system (Schwaninger, 2004, Espejo, 1989). The overall variety is distributed across the system‟s recursive structure, which reduces the diversity variety each recursive level has to handle (Devine, 2005, Espejo, 2004). This unfolding of complexity diminishes the residual complexity that challenges top management and hence prevents its overload (Hoverstadt and Bowling, 2005, Espinosa and Walker, 2006). The recursive principle supports appropriate reaction to disturbances and change, flexibility, adaptability, and workforce empowerment and motivation (Nystrom, 2006, Stokes, 2006, Jackson, 1988).

The division of recursive levels is variable and could be based on factors such as product, market or location. Figure 4-3 provides an example of the recursive segmentation. It compartmentalises the sugar industry in its typical groups. The sugar industry (Recursion 0) contains the three main groups: miller, grower, haulier (Recursion 1). They can be divided in further groupings, such as SSGs or LSGs, which belong to the next lower level of recursion (Recursion 2). Recursion 1 is the system-in-focus which refers to the system that is studied.

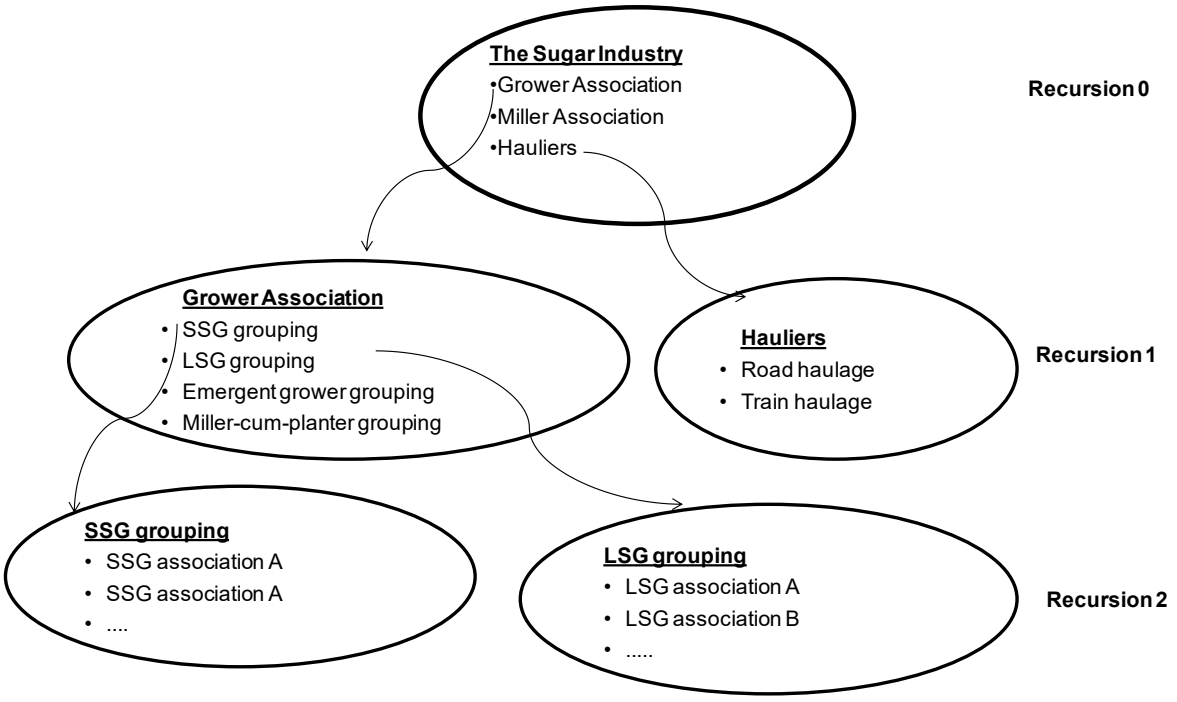

Figure 4-3: One possible recursive division of the sugar industry

4.2.3 Features and strengths of VSM

Systems approaches such as VSM, have strongly enriched the field of management practices (Paucar-Caceres, 2009). The main features of VSM were derived from principles that the human body and its nervous system apply to remain viable (Leonard, 2006). This implies the use of monitoring and response mechanisms and the distribution of responsibilities; the heart is for example responsible for blood circulation and the immune system reacts to infections. Accordingly, VSM supports localised problem solving and decision-making (Espejo, 2004).

Applying VSM enables a system to reach its aims, comply with regulations and develop while maintaining stability (Beer, 1973, Devine, 2005).

VSM comprises the essential and necessary elements for any system to be viable (Beer, 1984). These elements are described in the following section. By implication, VSM constitutes a generic approach that is applicable to all kinds of systems and can be applied to human beings, companies, organisations or even entire countries (Lewis, 1997, Johnson and Liber, 2008, Jackson, 1988). It facilitates the management of diverse problems. The essential and sufficient elements enable a system to generate, change and sustain itself. The existence and proper functioning of these

elements form a precondition for viability (Leonard, 2007, Schwaninger, 2004). In an organisation, they comprise the necessary management functions, information flows, control mechanisms and communication channels (Schwaninger, 2004, Flood and Zambuni, 1990, Hoverstadt and Bowling, 2005).

The ability of VSM to assist managers with complexity management (Hoverstadt and Bowling, 2002, Johnson and Liber, 2008) explains the growing interest in this model among managers, consultants, political analysts, entrepreneurs and public authorities (Schwaninger, 2006). It provides a suitable model for complexity management due to the realisation of three key concepts: organisational closure, ultra-stability and recursion (Espejo, 2004). Organisational closure implies self-awareness and the connection of system components via closed interaction loops. Ultra-stability keeps crucial variables within critical limits by means of adaptability and the integration of checks and balances. Recursion assists in complexity management as previously described.

The differentiation of VSM from hierarchical organisational charts and its rejection of hierarchical top-down management approaches displays a further relevant characteristic (Tejeida-Padilla et al., 2010). Top-down management approaches are conventionally known for neglecting the human component in a system and as strongly focused on control measurements rather than localised problem handling (Beer, 1979, Leonard, 2006). This contradicts VSM principles and seems to lack the stability, efficiency and capacity to manage complexity (Hoverstadt and Bowling, 2005, Stokes, 2006). VSM, among other approaches, regards the human component, formal and informal networks, interpersonal relationships and soft issues as pivotal (Beer, 1973). It respects individuals‟ free will and facilitates operational freedom and localised emergence of change (Espinosa and Walker, 2006, Harwood, 2009). Furthermore, VSM encourages a collective determination of the system‟s identity and goals and thereby empowers lower level involvement (Nystrom, 2006, Leonard, 2006). It consequently recognises the importance of stakeholder involvement. The emphasis on a joint goal definition arises from the notion that this automatically creates sufficient dedication for the implementation of these goals and thus reduces the necessity for top-down intervention (Leonard, 2006). Although some hierarchical decision-making is still required, it should only occur within the scope of ensuring systemic cohesion (Nechansky, 2010).

The ability to design viable systems and diagnose weaknesses in existing systems describes a further significant competence of VSM (Espinosa and Walker, 2006, Leonard, 2006). A VSM diagnosis, which is expanded on in Chapter 5, reveals weaknesses that decrease the efficiency of a system and possibly endanger its viability (Hoverstadt and Bowling, 2005, Beer, 1981). It considers the internal and external interactions of a system, relationships and interdependencies, and shows

where the advancement focus should be placed, thereby deriving adequate improvement suggestions (Leonard, 2009, Watts, 2009, Espinosa and Walker, 2006). The thoroughness of this diagnosis is particularly valued. Consequently, VSM distinguishes itself from most other scientific models and Jackson (1988) even claims that it outperforms other analyses conducted in organisation theory.

VSM constitutes a powerful device for the establishment of efficient and sustainable organisations because VSM‟s concepts guide the creation of viable systems (Schwaninger and Rios, 2008, Leonard, 2009). These concepts facilitate, for example, decentralisation, while ensuring the cohesion of the system and an appropriate intervention from upper management (Medina, 2006, Schuhmann, 2004, Jackson, 1988). They also direct the handling of boundary disputes between different systems or functions, which is crucial for the design and continuity of a viable system (Hoverstadt, 2004).

VSM is compatible with concepts, methods and tools from other approaches, which further fortifies its virtue, and can be used as a theoretical framework for new approaches (Snowdon and Kawalek, 2003, Hoverstadt, 2004, Bustard et al., 2006). The combination of VSM with other approaches, however, requires the consideration of paradigm incompatibility as explained in Section 3.6.1.

4.3 Essential and necessary elements of VSM

The essential and necessary elements of VSM comprise five systems (S1-S5), also called functions or sub-systems and six vertical channels. These elements are equally significant and serve one another (Jackson, 2000). The five sub-systems are summarised as

- S1: Implementation (this sub-system is also referred to as operational units),
- S2: Coordination,
- S3 and S3*: Daily management and control,
- S4: Outside and future of the system-in-focus and
- S5: Normative management.

Figure 4-4 illustrates these five sub-systems whose features are explained in the following subsections. The amoebic shape of the environment suggests the absence of fixed boundaries (Leonard, 2009). Within the system, an individual can perform one or several of these five functions, even at different recursive levels (Leonard, 1989). However, possible role-conflicts, such

as conducting a S3 function instead of the supposed S4 or S5 function, are possible, and impair the system and need to be avoided.

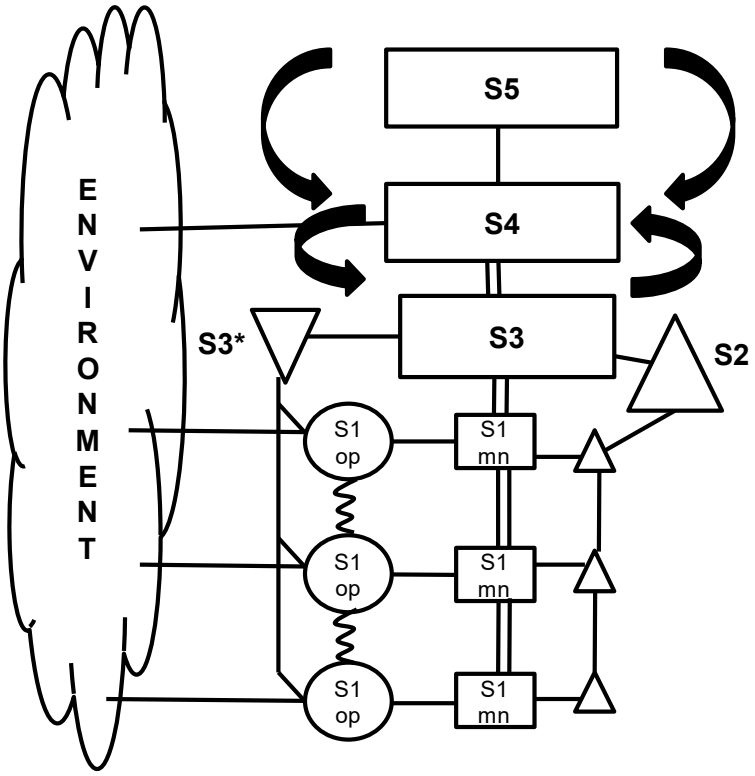

Figure 4-4: Illustration of the five sub-systems (adapted from Hoverstadt, 2010, p. 89)

VSM requires continuous communication between the operative management (S1, S2, S3 and S3*), the meta-system (S3-S5) and the environment (Beckford, 2002). The operative management deals with daily, internal matters and is guided by the meta-system, which considers external and future aspects (Beer, 1981). The meta-system is supposed to support the operative management rather than exerting a dictatorial function (Jackson, 1988). The operative management concentrates on "doing things right", while the meta-system is concerned about "doing the right things" (Leonard, 2006, p. 89).

The horizontal channels in Figure 4-4, which connect S1 and S4 with the environment, describe the core frame for environmental interaction (Leonard, 2006). The total environment comprises natural, cultural, political and commercial aspects and these aspects can overlap (Leonard, 2007). The local

environment of the operational units can intersect (Beckford, 2002). The consequences of these overlaps impact the relationships between operational units and can either encourage or restrain collaboration (Leonard, 2007).

The six vertical channels of VSM operate as communication, information and control loops (Jackson, 1988). Figure 4-5 shows an extraction of VSM to indicate the six channels, which are referred to as C1-C6. As outlined, C1 and C2 connect the operational units (S1) with the management (S3). These two channels form the centre of the vertical command axis (Flood and Zambuni, 1990). The functions of these channels are as follows:

- C1 is the corporate intervention channel. It facilitates the transmission of instructions and corporate standards from the meta-system to the operative management (Beer, 1985),
- C2 is used for resource provision and resource bargaining between the operational units (S1) and the management (S3) and for accountability purposes (Beer, 1985),
- C3 is depicted and referred to as a squiggly line, links the operational units and facilitates their interplay and exchange (Leonard, 2006),
- C4 deals with interactions within the environment,
- C5 enables the proper functioning of the coordination system (S2) and
- C6 provides the audit function (S3*) direct access to the operational units.

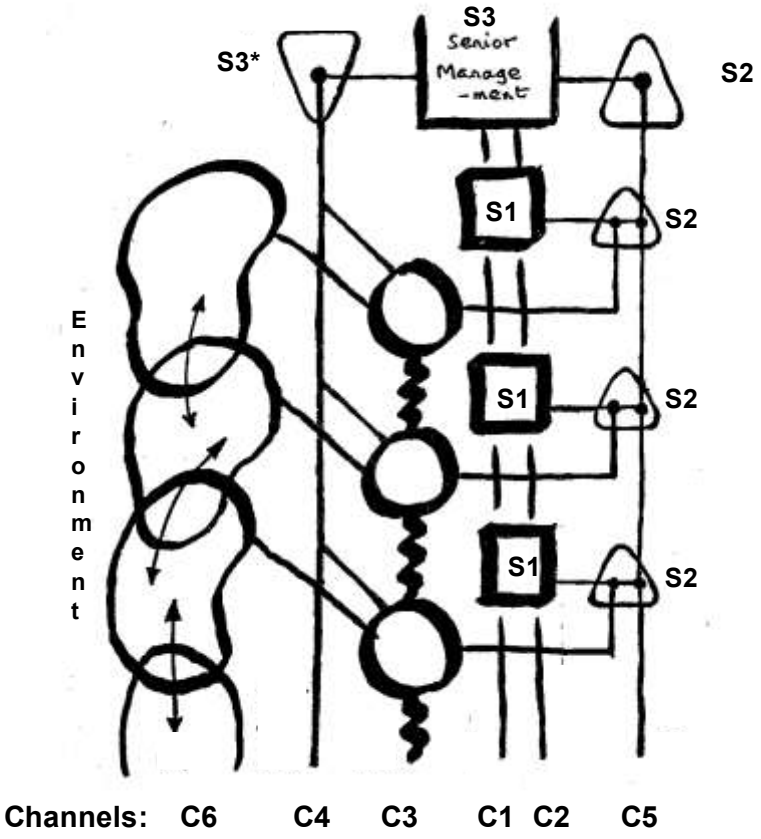

Figure 4-5: Illustration of the six vertical channels (adapted from Beer, 1985, p. 83)

4.3.1 S1: Implementation

S1 consists of the operational units and their direct management. It establishes the purpose of the system, seeks to achieve its essential duty and is indispensable for the generation of the system‟s revenue (Leonard, 2006, Burnett and Durant-Law, 2008, Hutchinson and Warren, 2002). The remaining sub-systems are meant to assist S1 in the execution of its tasks (Watts, 2009). S1 interacts directly with its associated environment and absorbs and adapts to much of the external variety (Gregory, 2007).

S1 receives resources, instructions and corporate standards from S3, has to implement given policies, and deliver set outputs (Beer, 1981, Jackson, 2000). It is obliged to report back to S3 for accountability purposes and to S2 for coordination purposes (Beer, 1981, Beckford, 2002). The following three managerial restrictions need to limit the autonomy of the operational units:

- The behaviour of S1 needs to serve the objectives of the system,
- S1 has to obey to coordinative instructions of S2 and

- S1 is obliged to follow commands from S3.

Despite the necessity of these managerial restrictions, insufficient autonomy causes deficiencies, whereas increased authority enhances the performance of S1. This requires a certain level of trust between S1 and S3 (Hoverstadt and Bowling, 2002). The operational boundaries determine S1‟s frame of function and matters that exceed these boundaries are handled by S3 (Hoverstadt and Bowling, 2005). Examples of S1 include:

- The sub-system glass production in a factory (Jackson, 2000),
- Meal preparation, pouring of drinks and waitressing in a restaurant,
- The immune system in the human body (Devine, 2005),
- A single branch of a company (e.g. Pick „n Pay in Westwood Mall as one branch of Pick „n Pay South Africa),
- Providing lectures and conducting research in a university and
- The milling areas in the South African Sugar Industry.

These examples show the universality of VSM and its applicability to diverse scales.

4.3.2 S2: Coordination

S2 performs an anti-oscillatory, coordination function (Sung et al., 2008). It balances fluctuations, provides feedback, and aligns S1‟s activities to prevent conflicts around commonly used resources (Devine, 2005, Johnson and Liber, 2008). It supports a harmonious and smooth operation of the system by operating within the scope of given standards, protocols, and routine decisions (Tejeida-Padilla et al., 2010, Leonard, 2006). S2 is vital to prevent turf wars, bottlenecks, contradictory information exchange, poor production planning and higher management interference (Hoverstadt and Bowling, 2002).

S2 consists of divisional and corporate regulatory centres, as indicated in Figure 4-6. The divisional regulatory centres are connected to each other and to the corporate regulatory centre. The centres gather performance measurements and statistical evaluations. This enables coordination, timely detection of deviations and appropriate reactions (Beer, 1981).

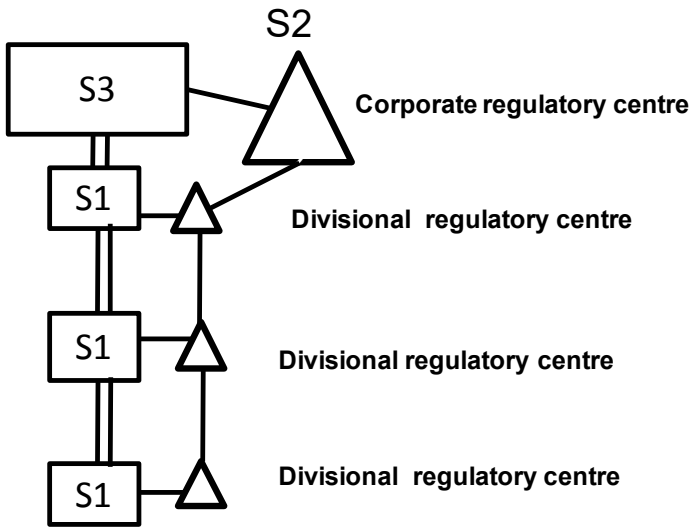

Figure 4-6: Corporate and divisional regulatory centres of S2 (adapted from Beer, 1981, p. 157)

Moreover, S2 assists S3 in monitoring the resource usage and performance of operational units. It screens them and provides the information needed by S3 to accomplish the essential accountability checks (Burnett and Durant-Law, 2008).

Various authors offer examples of S2 activities:

- Any scheduling tool, such as timetables or production schedule,
- A common understanding of used procedures,
- Informal controls or meetings,
- Health, safety and security regulations,
- Compatible information and budgeting systems,
- Recordkeeping protocols,
- Set standards of behaviour,
- Standardised knowledge bases,
- Definition and transmission of production indices, and
- Alignment of different production lines, e.g. tyre and wheel production in a car manufacturing company.

(derived from Flood and Zambuni, 1990, Leonard, 2000, Leonard, 2007, Medina, 2006, Schwaninger, 2006, Snowdon and Kawalek, 2003)

Although indices, standards and procedures serve as coordination means, they are determined by S3 (Espinosa and Walker, 2006). This demonstrates a close connection between the systems.

4.3.3 S3 and S3*: Daily management and control

S3 deals with daily, short-term management and control requirements and governs the operational units (Bustard et al., 2006, Clemens, 2009, Gregory, 2007). It seeks internal stability, synergies and an overall optimum among the units. It further seeks to ensure that their activities serve the interest of the system as a whole (Beer, 1981, Schwaninger, 2006). This includes the prevention of possible self-serving behaviours. Also, S3 might favour one operational unit at the costs of another, but for the benefit of the greater whole (Beer, 1981).

Although S3 holds implementation power, the emphasis is on facilitation, monitoring, and cohesion, rather than an autocratic top-down management (Sung et al., 2008, Leonard, 2006). The principle of local autonomy limits excessive interference in S1 via C1 (Leonard, 2007). Nevertheless, S3 cannot fully rely on the sincerity of S1 (Espejo, 2004). Therefore, a suitable balance between giving S1 latitude and intervening in S1 activities is needed (Espejo, 2004).

In fulfilling its responsibility, S3 performs two major activities; *viz.*: corporate intervention and resource-bargaining (Leonard, 2006). Corporate intervention includes the implementation of decided policies, the transfer of legal requirements and the establishment of the rights and responsibilities of S1, as specified by S5 (Beckford, 2002, Jackson, 2000). S3 forms an interface between the operative management and the meta-system and equips the latter with required information about operational matters (Burnett and Durant-Law, 2008).

For resource-bargaining purposes, S3 and S1 discuss resource provision and requested performance delivery (Hoverstadt and Bowling, 2002). Resource-bargaining seeks the best possible resource use among competing operational units and implies continuous re-negotiation (Harwood, 2009, Johnson and Liber, 2008). S3 oversees the accountability of operational units regarding resource usage and performance delivery (Espinosa and Walker, 2006).

The following S3 examples are related to the S1 examples in Section 4.3.1:

- The management of the factory‟s total production,
- The restaurant management,
- The brain as the management system that controls the human body,
- The corporation‟s management (e.g. the management of Pick „n Pay South Africa),

- The university management and
- The management of the sugar industry.

S3 is supported by S3* which performs an audit function and thus sporadically monitors variables that are not covered by normal S3 and S2 controls (Beckford, 2002). It probes deeper into operational units and derives additional data. The operational units should be involved in the design of S3* to support its functionality (Flood and Zambuni, 1990). S3* requires direct access into operational units to perform its audit. Internal audits or the control of maintenance procedures are examples for S3* (Schwaninger, 2006).

4.3.4 S4: Outside and future of the system-in-focus

S4 has direct access to the environment (Leonard, 2000). It gathers intelligence about the environment and the future which facilitates adaptation and the development of adequate future strategies. S4 presents the obtained insight internally to enable strategic discussions between S3, S4 and S5 and an appropriate S3-S4 balancing (Clemens, 2009).

S4 considers all relevant external and future information to detect threats and opportunities and generate appropriate strategies (Tejeida-Padilla et al., 2010, Nechansky, 2010). The development of future strategies implies that S4 creates a model of the system itself and compares this model with those of various anticipated futures to assess the adequacy of the strategies (Beer, 1985, Leonard, 2009). The Comparison results in an adjustment between an expected future and the intended strategies and supports the feasibility of these strategies, as it ensures that they are within the system‟s capabilities (Bustard et al., 2006, Johnson and Liber, 2008).

S4 could focus on individualised areas, as each operational unit has its own future and external concerns, but the total intersect of these areas shows where the emphasis should be placed (Beer, 1985). Given the diversity of requirements, S4 needs to be equipped with a broad range of skills and resources (Clemens, 2009).

S4 comprises the following aspects:

- External and international relations, marketing and communication,
- Mapping customers preferences and suppliers‟ offers,
- Market research,
- Company and product development,

- Financial planning, capacity planning and quality planning,
- Employees training, recruitment and succession, knowledge creation and
- Monitoring relevant legislative amendments.

  (derived from Leonard, 2009, Leonard, 2000, Lewis, 1997, Schwaninger, 2006, Beckford, 2002)

Furthermore, S4 acts like a „big switch" that mediates the interactions between operational levels and the meta-system (Beer, 1981). It sends downwards instructions, whereby it ensures they are understood, and upwards information that S5 requires for decision making (Tejeida-Padilla et al., 2010, Warren and Hutchinson, 2003). S4 selects and aggregates operational and environmental information that is meaningful for S5 to prevent information overload (Jackson, 2000).

An adequate S3-S4 balancing is vital for internal stability and appropriate change (Leonard, 2000). It requires a homeostatic relationship between the two systems and a balanced resource allocation (Leonard, 2000). On-going, dynamic negotiations and mutual appreciation are consequently needed (Hoverstadt and Bowling, 2002, Beckford, 2002). Achieving an adequate S3-S4 balance is challenging, due to the likely disagreement between S3 and S4 (Leonard, 2009). The former advocates the preservation of the status quo, while the latter fosters change (Beckford, 2002). S5 has to moderate this balance which is indicated by the arrows in Figure 4-7.

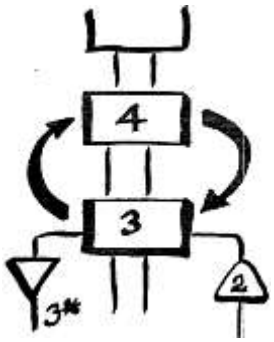

Figure 4-7: Illustration of the essential S3-S4 balancing (Beer, 1985, p. 111)

4.3.5 S5: Normative management

S5 completes the VSM framework. It logically closes any viable system, ensures coherence, represents the system to a wider environment, and links primary activities to the next higher level of recursion (Jackson, 1988, Beer, 1984, Hoverstadt and Bowling, 2002, Tejeida-Padilla et al., 2010). S5 defines the direction of the system, and determines its identity, culture, policy, rules, values,

norms and goals, and balances the various requests from different organisational parts (Sung et al., 2008, Clemens, 2009, Beer, 1984, Schwaninger and Rios, 2008).

Since VSM seeks the involvement of operational units in the determination of the system‟s direction, they need to be represented in S5 and considered in its decision-making (Beer, 1979). This informs the direction of the system and prevents possible planning shortcomings (Hoverstadt and Bowling, 2002). It further shows that VSM is not a simple command and control system, but includes lower levels in decision-making. Nevertheless, the decided direction ultimately determines the activities that operational units perform (Bustard et al., 2006).

Furthermore, S5 is responsible for achieving the S3-S4 balance and thus needs to consider the requirements and objectives of both sub-systems (Leonard, 2008, Gregory, 2007). Clarity about the current state, the intended future state and the required adaptations, is critical to fulfil this responsibility. A failure of S5 implies poor decision-making, because S3 dominance implies stasis and S4 dominance leads to unachievable plans (Hoverstadt and Bowling, 2005).

Espinosa and Walker (2006) state that fragmentation, the lack of a common culture and vision, and insufficient mutual appreciation indicate S5 weaknesses. They propose that an emphasis on unification and cooperation and an incentive for cohesive stakeholder behaviour assist in the handling of fragmentation. Losses, which result from operating in a manner beneficial to the system, but not to the individual comprising the system, could be compensated.

VSM demands S5 to intervene in only serious problems, which are problems that cannot be handled locally and possibly jeopardise the viability of the system (Leonard, 2006, Medina, 2006). This led to the incorporation of the algedonic signal into VSM (Clemens, 2009). The signal bypasses S3 and S4 and directly alerts S5, as shown by the dotted line in Figure 4-8. It constitutes an „emergency“ mechanism, which filters out and fast tracks very important signals that require the attention of senior management (Jackson, 1988). The algedonic signal supports an adequate balancing of centralised and decentralised control (Medina, 2006).

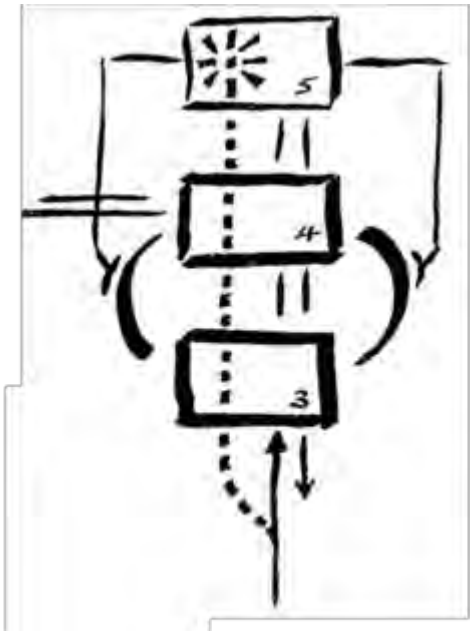

Figure 4-8: An illustration of the algedonic signal (Beer, 1985, p.133)

4.4 Critical voices

Despite being praised for its significance in operational management, VSM is discounted in organisational theory and other management sciences (Jackson, 1988). Critics contest its merit, adequacy and applicability (Thomas, 2006).

A core critique accuses VSM of approaching organisations like machines, with an overemphasis on organisational structures, and a disregard of the human aspect in a system, such as individuals‟ freewill, their purposeful nature, reflectiveness, and capability to direct the organisation in any deliberate position (Jackson, 1988, Paucar-Caceres, 2009). VSM, allegedly fails to facilitate the development of a genuine corporate culture, including shared values and beliefs (Jackson, 1988). VSM is described as too mechanistic, overly centralised, dictatorial, control-focused, and abusive towards the operational units (Harwood, 2009, Jackson, 2000, Thomas, 2006). Since VSM, in principle, comprises several possibilities to concentrate on control mechanisms, particularly in the S1-S3 interaction, critics argue that it constrains liberty and endangers human freedom (Thomas, 2006). Some critics even accuse Beer of being irresponsibly satisfied with building a model that allows for autocratic use and fails to generate a mutually shared overall purpose, instead of generating a more appropriate system which establishes intrinsic motivation (Jackson, 1988).

VSM reportedly impedes social and democratic processes, fails to handle power issues and conflicts, insufficiently reveals political aspects and does not deal with social systems (Luckett and Grossenbacher, 2003, Paucar-Caceres, 2009, Devine, 2005). People‟s objectives might be in contradiction with the objectives of their respective social system and VSM fails to accommodate this as it is allegedly unable to reconcile contradicting values and perspectives (Schuhmann, 2004).

The challenges implied in ensuring adequate autonomy of operational units, while simultaneously ensuring cohesion might detract from the virtues of VSM (Lewis, 1997, Beckford, 2002). VSM cannot enforce compliance with its principles. Therefore, it is dependent on a democratic milieu, which averts the misuse of VSM and thus the establishment of a control state that strengthens the powerful (Jackson, 1988).

Jackson (1988) states that the applicability of VSM is queried. It is seen as a complex monitoring and control system, which lacks accuracy, requires many variables that cannot be easily determined, and fails to correct the deviations from target states. VSM‟s allowance for a range of variables supposedly hampers proper measurements and adequate reactions. Critics insist that VSM‟s alleged strength disappears once its practical application is attempted.

Achieving competency in VSM requires time and is challenging. These circumstances decrease VSM‟s appeal among individuals and researchers, who seek an easily applicable method, to the detriment of learning a sophisticated methodology which would enable them to handle managerial challenges in an advanced manner (Gregory, 2007, Beer, 1979).

Jackson (1988) developed a guideline which enables an appraisal of VSM‟s suitability and a consideration of raised criticism. He views organisations as open socio-technical systems, whose management is supported by organisational models. Pertinent models need to facilitate the management of technical issues, the human and social aspect, and the exertion of power. VSM‟s adequacy can be evaluated based on its proficiency in these aspects.

Technical issues comprise effective target seeking and tracking, which VSM accomplishes appropriately (Jackson, 1988). Likewise, VSM adequately deals with human and social aspects and the exertion of power through the advocacy of decentralised control structure (Jackson, 1988). It stresses the importance of stakeholder involvement in decision-making and the need to define the system‟s identity, purpose, direction and values in a participatory manner (Beer, 1979, Jackson, 1988, Espejo, 2004, Espinosa and Walker, 2006). VSM seems to consider political issues by default, because it explores existing perceptions, roles, and internal and external influence factors (Leonard, 2006, Harwood, 2009, Watts, 2009). Espejo and Harden (1989) further show that VSM

contributes to conflict prevention, because it explicitly assigns functions, distinctly structures the interaction between individuals, and clearly allocates overlapping work areas. Furthermore, VSM‟s recursive structure facilitates power distribution, and examines who determines the system‟s purpose, which reveals any potential power misuse (Jackson, 1988).

In arguing against the criticism that VSM endangers human freedom, it is noted that senior management is not entitled to oppress the operational units, but to support them (Jackson, 2000). It further concentrates on an element‟s function rather than its identity and individuals are free to leave the system at any time, without effecting its function (Beer, 1984). VSM additionally seeks a move away from an obedience and authority based coherence, towards a cohesive network of intertwining self-directed systems (Espinosa and Walker, 2006).

The above arguments indicate that the claim that VSM is mechanistic and disregards or compromises the human aspect, contradicts the characteristics and intentions of VSM. Beer (1981) emphasises the imperative to consider the human component and Schwaninger (2006, p. 344) confirms that the *"*human aspects such as ethos, meaning, sense-making and self-reference" is a recurrent theme within VSM. Its classification in the interpretive paradigm and its emphasis on autonomous operational units further highlights VSM‟s appropriateness in this regard (Espejo, 1994, Beckford, 2002), as this should provide space for human‟s purposeful and creative nature.

The broad and successful application of VSM demonstrates its practicability. Demanding more accurate variables might indicate an insufficient appreciation of the benefits of VSM‟s generality. I propose that adaptability, an essential ingredient for survival in a complex world, requires flexibility. This flexibility, however, depends on a range of possible states and case specific reactions, rather than predetermined variables. A set system might fail to handle complexity.

In the light of these realities, I reject the assertion that VSM is a dictatorial model. This assertion seems to contradict with the very essence of VSM and to ignore VSM‟s sophisticated development which demonstrates that VSM‟s nature is more deeply rooted than just comprising a simple autocratic tool. Instead, VSM is a model that intensely embodies theory. It constitutes a highly significant management device and includes sophisticated guidance concerning the complementary use of control and autonomy (Jackson, 1988).

Nonetheless, the possibility to apply VSM for good or evil exists, as for any other approach. It is my responsibility as a researcher to apply VSM in accordance with its intentions. This implies the necessity to base my decision to use VSM on a prior investigation of the extent to which the system tends to be autocratic (Jackson, 1988).

4.5 Relevance of VSM for the study

This section presents the significance of VSM and its features that informed my decision to apply VSM and to evaluate its merit in a sugarcane production and supply system.

Due to its general applicability, VSM seemed suitable for the study context. Its proficiency in complexity management appeared especially promising given the various complexities that challenge sugarcane production and supply systems. Successful VSM applications under comparable conditions further strengthened my choice to use VSM. Hoverstadt and Bowling (2005), for example, managed complex problems, composed of various interdependent stakeholders, who perceived the problem they were experiencing differently and favoured diverse solutions, by applying VSM.

The diagnostic competence of VSM constituted a core reason for its application, as I sought a comprehensive analysis of a sugarcane supply chain and the derivation of recommendations. VSM revealed fragmentation, missed collaboration opportunities, power issues, deficient feedback and causes of persistent operational failures, and investigated coordination and accountability matters (Harwood, 2009, Hoverstadt, 2004, Leonard, 1989, Watts, 2009). VSM‟s ability in raising awareness of these issues indicates its relevance for this study, because these issues seem to compromise the sugar industry, thus a better understanding of these issues is essential. Moreover, VSM explores systemic interactions and relationships and highlights where the research focus should be placed (Espinosa and Walker, 2006, Espejo and Gill, 2004). For diagnostic purposes, I particularly appreciated this potential of VSM.

Stafford Beer (1984) outlines four diagnostic points which are often indicative of a problem. This supports the evaluation of the viability of a system. These points are assessed by answering the following four questions:

- “Is the management presiding over a „viable system‟?...
- Does subsystem Five truly represent the entire system within the context of larger, more comprehensive and more powerful systems?...
- Do managers often fail to understand the need for subsystem Two and Four?...
- Do the Three, Four and Five subsystems need to form a Three-Four-Five subsystem to encourage „synergy‟ and interactivity?” Stafford Beer (1984, p.18)

The first question explores the presence and proper functioning of the essential and necessary VSM elements. The next question checks whether S5 appropriately represents the features and qualities of the system-in-focus to the next higher level of recursion. The adequacy of S2 and S4 is verified by the third question. Since a system requires an appropriate interaction between S3, S4 and S5, question four investigates the necessity for the creation of a specific S3-S4-S5 subsystem.

According to Brocklesby and Cummings (1996) and Cordoba and Farquharson (2008), VSM assists in the anticipation, planning and implementation of change, organisational restructuring and autonomy enhancement. These abilities describe another reason why VSM appeared relevant in my context, as anticipated changes at sugar industry level most likely require approaches that facilitate restructuring and autonomy enhancement.

In addition, VSM appeared appropriate, because it fosters the consideration of stakeholders‟ views and their integration in the decision-making process (Hoverstadt and Bowling, 2005), and I desired such a methodology. VSM facilitates this through its recursive nature. Espinosa and Walter (2006) even propose the benefit of a participatory VSM generation. This would support stakeholders‟ appreciation of the studied system and thereby facilitate the handling of detected shortcomings.

The reported ability of VSM to support cohesion, cooperation and communication (Leonard, 2007, Nystrom, 2006) seemed highly promising given the fragmentation in the sugar industry. The graphic illustration of the VSM and the outcome of its diagnosis is an appropriate metaphor to discuss viability issues and necessary changes without causing mutual blame and personal conflicts (Beer, 1979). Consequently, it promotes meaningful discussion about the reasons for malfunctions and potentially feasible interventions (Harwood, 2009, Devine, 2005). This might even facilitate the adoption of improvement suggestions, which are highly significant for the sugar industry context.

Instead of hierarchical management concepts, VSM provides a distinct framework for looking at organisations (Brocklesby and Cummings, 1996). This offered a further reason for my VSM usage, as I sought to consider the sugarcane supply and processing system from a different angle, rather than a traditional supply chain view. Also, the sugar industry is made up of many sub-systems rather than just being a single organisation and thus should be treated more as a system for which VSM‟s systemic perspective seems relevant. The intention to investigate power issues additionally substantiated the decision to apply VSM.

4.6 Concluding remarks

In this chapter VSM‟s core concepts, such as viability, variety engineering, recursion and autonomy were introduced, and the five functions and six channels that are vital for viability were highlighted. The chapter discussed some critical voices and provided a rationale for the application of VSM to this study.

The following chapter elaborates on the application of SSM and VSM by outlining the methodological approach that guided it.

CHAPTER FIVE: RESEARCH DESIGN

5.1 Introduction

This chapter outlines the research methodology of this study, which was framed by SSM, VSM and qualitative research tools. The chapter reasons the use of a qualitative approach and illustrates its combination with SSM and VSM. It describes the data collection, analysis and synthesis procedures used. In the Umfolozi milling area, the entire investigation was directed by the four-stage SSM process, which included three SSM-based workshops. In the Felixton milling area, VSM was applied to investigate the sugarcane production and supply system, thus data collection and analysis was shaped by my intention to conduct a VSM diagnosis.

Originally I intended to include small scale growers (SSG) and emerging growers in the study, since they are an integral part of sugarcane production and supply. Their issues, however, proved to be too specific and complex to be handled adequately in this study, which mainly focused on the large scale and commercial sector and sought a holistic understanding of the system as a whole rather than one specific group. In addition, a suitable examination of these issues would have warranted more time and dissertation space than was available to the researcher. Nevertheless, SSG related issues appear in some illustrations in Chapter 6, as they participated in the workshops based on my original intent to involve them, and because participants perceived SSG issues as important. However, except for presenting SSG issues on the charts created by workshop participants, they will not be further discussed.

The current research was embedded in the aforementioned larger project, which necessitated that most of the fieldwork was conducted in conjunction with another researcher applying SSM in the Felixton milling area and focusing on present soft issues. Nevertheless, I will refer to “I” or “me”, as this chapter presents my perspective and my role in the engagement.

5.2 Methodological approach

The methodological approach was qualitative in nature. It featured an intensive, rich and interactive stakeholder engagement, which sought a holistic understanding of the studied areas, but also sought to identify improvements. Qualitative research methods were combined with SSM and VSM in an interactive manner. The following aspects explain and justify this combination:

- Qualitative methods facilitate the comprehensive insight (Hannabuss, 1996), that is intended by VSM (Beer, 1973) and SSM (Fougner and Habib, 2008) and thus the combination of both seemed promising for the purpose of this study.
- VSM, SSM and qualitative methods pertain to an interpretive paradigm (Golafshani, 2003, Holwell, 1997, Schwaninger, 2004).
- SSM and qualitative methods intend to surface stakeholders‟ underlying perceptions and the less obvious aspects of a situation (Bartunek and Seo, 2002, Checkland, 2000a).
- A VSM diagnosis depends on obtaining a thorough insight into the studied system, which is provided by qualitative research methods and archival data (Watts, 2009, Harwood, 2009) and combining VSM and qualitative methods in an iterative and interactive manner seemed valuable (Hildbrand and Bodhanya, 2011).
- The combination of VSM with qualitative methods supported the investigation of topics, such as leadership, that might otherwise be neglected in VSM (Bryman et al., 1996).

A qualitative approach facilitates a comprehensive understanding of complex real-world phenomena (Attride-Stirling, 2001). It explores relevant issues within their contexts and surfaces individuals‟ diverse perspectives and the way individuals construct their reality (Bradley et al., 2007, Irvine and Gaffikin, 2006, Bartunek and Seo, 2002). This includes the disclosure of underlying perceptions, expectations and subjective experiences that gave rise to present circumstances. Consequently, a qualitative approach seemed highly suitable, as I was aiming at a holistic understanding of the studied milling areas and their issues. Moreover, I intended a rich stakeholder engagement for which a qualitative approach caters as well (Irvine and Gaffikin, 2006). The use of qualitative research tools and participatory tools, mainly from SSM, sought to ensure sufficient stakeholder involvement in the revelation of issues and the deliberation of their handling. Qualitative approaches apparently support change and improvements, which further justified their usage (Kvale, 1996).

The study featured an inductive and nonlinear approach. One interactive process guided the next and data collection and analysis proceeded iteratively, due to the impossibility to progress according to rigid plans in qualitative research (Bowen, 2008, Irvine and Gaffikin, 2006). This implied that methodological adjustments were made as the engagement advanced.

Qualitative research tends to be time-consuming and costly (Luna-Reyes and Andersen, 2003) and concerns regarding its validity and reliability, to which qualitative researchers refer as

trustworthiness, exist (Golafshani, 2003, Bowen, 2005). These circumstances were taken into consideration in the design of this study and the following measurements were meant to support trustworthiness. I adopted a critical stance towards interviewees‟ responses and observed their reactions as suggested by Luna-Reyes and Andersen (2003) and (Bryman, 2007). Triangulation and a process of continuously verifying my results further supported credibility (Kvale, 1996). Triangulation implies the consideration of various data sources (Bowen, 2005). In addition, as supported by Frost (2009), Irvine and Gaffikin (2006) and Bowen (2008) respectively, I did not impose my own views on participants, remained open to unexpected ideas and tried to consider all data diligently, before pronouncing judgment and closure. The fact that despite intensive effort, some stakeholders never committed to any engagement, constituted a difficulty for this research. It possibly limited the extent to which a change process could be initiated.

As indicated, the entire fieldwork in the Felixton milling area was conducted together with a fellow researcher. Stakeholders were jointly interviewed and their available time was divided between the two of us. We used two different questionnaires and alternated the leading role in the interviews, while both asked questions throughout. This process turned out to be supportive, as it improved observation and probing, and enriched the reflection on impressions gained during the interviews. The other researcher designed the workshops for the Felixton milling area, where I assisted as a facilitator.

SSM guided the empirical work in the Umfolozi milling area, while VSM directed it in Felixton. Consequent similarities and differences in the research design are indicated in the respective sub-sections of this chapter.

5.2.1 The SSM application in the Umfolozi milling area

For the Umfolozi milling area, the four-stage SSM learning cycle structured my research. This is depicted in Figure 5-1, which also outlines how qualitative methods assisted in the SSM usage. The qualitative approach particularly promoted Finding Out and Analysis Two and Three (Section 3.3.1). The qualitative analysis of conducted interviews revealed relevant issues and present perceptions about these issues. In addition, qualitative interviews facilitated a discussion of the social reality and power-related matters in the studied system.

As shown in Figure 5-1, Finding Out comprised an iterative interview process and the analysis of interview and workshop data. The first SSM-based workshop, in particular, was designed to

facilitate Finding Out. The resulting relevant issues are presented as themes, because thematic analysis facilitated their determination.

Model Generation implied that I generated purposeful activity models in collaboration with the fellow researcher for the preliminary findings that emerged from the first fieldwork phase.

The second and the third SSM-based workshops were designed to contribute to Stage 3 of the SSM process. The second workshop sought Comparison between created models and the perceived problem situation to facilitate a discussion about desirable and feasible changes and their Accommodation. The third workshop intended a Structured Debate on concrete improvement options that results in agreement on desirable and feasible changes and guides the way to Action To Improve. In addition, it was designed to facilitate a validation of my findings. Likewise, qualitative interviews and their analysis added to Stage 3, especially the final round of interviews (Section 5.3.3) which focused on improvement suggestions.

Action To Improve was not realised in this study, yet the improvement suggestions that resulted from this investigation are potential actions to improve. However, their feasibility could not be sufficiently assessed. Action to Improve was originally intended; however the nature of the engagement prevented the realisation of this intention. This is discussed further in Chapter 6 and Chapter 8.

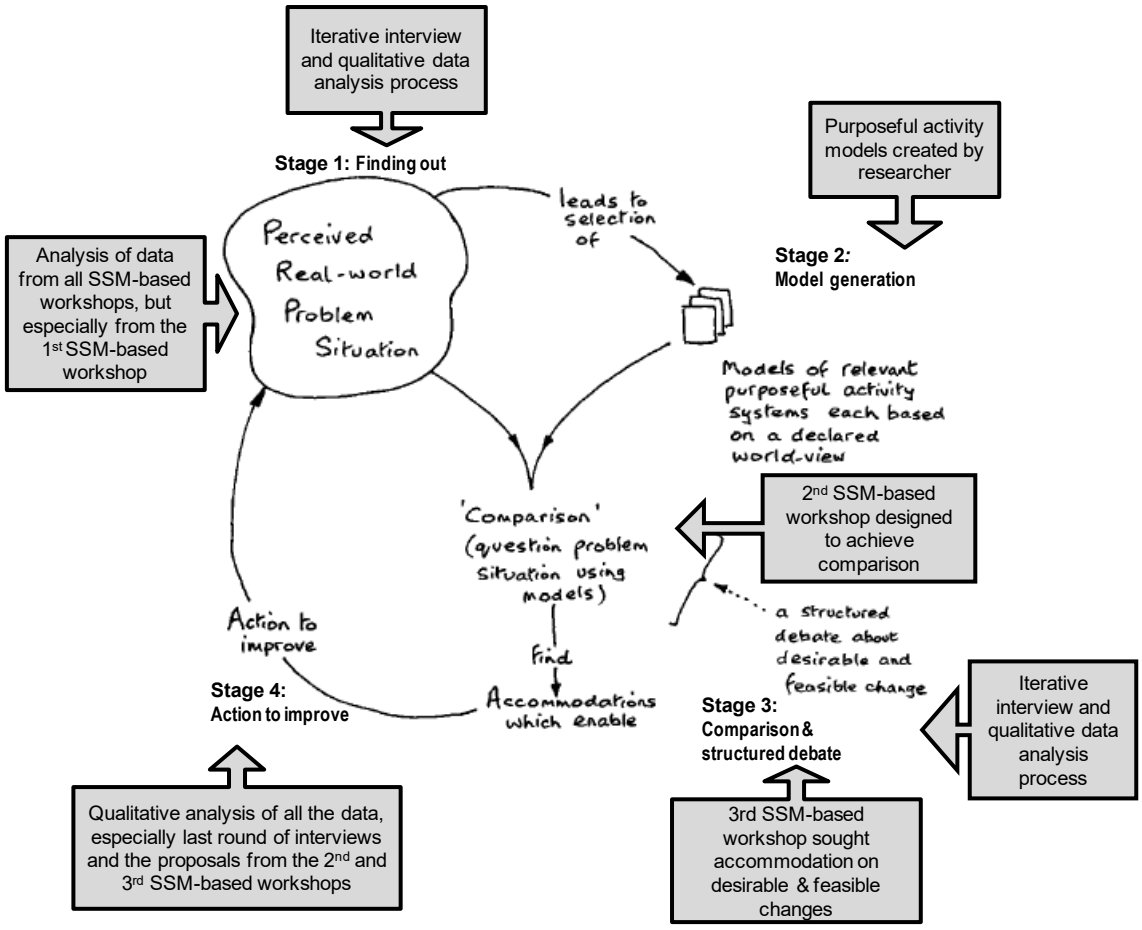

Figure 5-1: Overview of SSM usage based on the four-stage SSM process (adapted from Checkland, 2000b, p. 16)

5.2.2 The VSM application in the Felixton milling area

A VSM diagnosis assesses the viability of a system. It evaluates the presence and proper functioning of the five sub-systems and six channels and the system‟s compliance with the underlying principles of VSM (Beer, 1985). This requires the definition of the system-in-focus, its next lower, and next higher level of recursion, and the creation of a VSM of the studied system (Gregory, 2007). The generated VSM is compared with the generic VSM to reveal the actual functionality of present operations (Espejo, 1989, Beer, 1981). It discloses shortcomings in sub-systems or channels of the system (Espejo, 1989).

Interviews were the major data source for the generation of the Felixton specific VSM. In addition, I adopted a VSM perspective and noted anything of relevance for the VSM diagnosis during my involvement in the fieldwork and the SSM-based workshops of the other researcher. I generated the

Felixton specific VSM from the qualitative analysis of all data and its diagnosis disclosed present shortcomings.

5.3 Data collection

The respective Mill Group Board chair and mill managers approved this study as part of the larger project. Both milling areas provided the required contact details of various stakeholders. Ethical clearance was obtained from UKZN Ethical Clearance Committee prior to data collection (Appendix 6).

The fieldwork comprised three rounds of interviews and three half-day workshops which were conducted in both milling areas between July 2010 and March 2011. The study concluded with interviews with several sugar industry representatives in November 2011. Table 5-1 summarises the various field trips and performed activities. The dashed line indicates the different fieldwork phases to which I refer in this thesis.

Date	Place	Activity
13-16 July 2010	Felixton	12 Interviews with project team to gain 1st insights.
20-23 July 2010	Umfolozi	14 Interviews with project team to gain 1st insights.
26 Aug 2010	Durban	2 Interviews with Felixton role players (extension), unavailable when we were in the field.
22 Sep 2010	Felixton	1st SSM workshop – rich picture (1/2 day).
1 Oct 2010	Umfolozi	1st SSM workshop – rich picture (1/2 day).
25-29 Oct 2010	Umfolozi & Felixton	2nd SSM workshop – using constructed RDs & conceptual models to encourage discussion (1/2 day). Plus 9 interviews per area.
5 Nov 2010	Durban	1 Interview with Umfolozi grower, unavailable when we were in the field.
9 Nov 2010	Felixton	Introducing ourselves to key stakeholder in grower leadership, unavailable when we were in the field; 1 interview.
16 March 2011	Umfolozi	3rd SSM workshop – providing feedback on preliminary findings, discussing these findings and exploring possibilities to handle some of the issues which were perceived to be relevant.
15-17 March 2011	Umfolozi	15 interviews with various stakeholders.
22 March 2011	Felixton	3rd SSM workshop – providing feedback on preliminary findings, discussing it and exploring possibilities to handle.
22-24 March 2011	Felixton	14 interviews with various stakeholders.
3-17 November 2011	Durban	11 interviews with representatives from SASRI, SASA and CANEGROWERS.

Table 5-1: Overview of the fieldwork of this study

Two project members arranged the first fieldwork phase and the fellow researcher and I organised all later stakeholder engagements. We broadened the scope of interview and workshop invitations which were accompanied by a brief introduction of ourselves and our research projects. General e-mail invitations were followed up with several personal e-mails and phone calls to promote rich stakeholder participation. Data collection ended at the point when I gained no new insight despite considering new data and thus concluded that theoretical saturation had been reached (Bowen, 2008, Westbrook, 1994).

Data collection comprised interviews, observation, workshops and secondary data, which facilitated triangulation. Luna-Reyes and Andersen (2003) indicate the merit of interviews and workshops as

primary sources of data. Interview recordings and a field journal prevented the loss of valuable information. Notes were made immediately and completed as soon as possible after interviews or workshops. I noted any impressions, thoughts, linkages to earlier data, or ideas for possible themes and considered these notes as additional data.

Since individual perspectives differ, I considered a broad range of stakeholders to gain a comprehensive insight. The adequacy, accessibility and availability of stakeholders guided the purposive sampling (Kvale, 1996, Bowen, 2005). I interviewed large scale growers (LSG) because of their importance and diversity. Nonetheless, hauliers and mill employees were also involved in the study and several industry representatives were interviewed. Table 5-2 outlines the considered stakeholder groups.

Body	Representatives
STATUTORY	MGB chairman; MGB secretary; extension officer; representatives from the local grower associations, CTS, SASA, SASRI and CANEGROWERS.
MILL	Local mill management, including cane supply & cane procurement.
HAULIERS	Largest haulier; several medium hauliers; one small-scale haulier; tram operators.
GROWERS	Two exceptionally large scale growers, possessing 25% share in Umfolozi Sugar Mill; several large scale growers, few small scale growers, few emerging growers.
OTHERS	Contractors.

Table 5-2: Overview of stakeholder types that participated in the research

5.3.1 Observation

Observations facilitated a better awareness of the research area and validated and supplemented other data (Luna-Reyes and Andersen, 2003, Westbrook, 1994). Therefore, while I noticed side comments made by stakeholders and paid attention to their behaviour, such observations constituted only a minor aspect of my data collection.

5.3.2 Workshops

The workshops were based mainly on SSM and included several interactive group activities, as illustrated in Section 5.5. While facilitating the workshops, I noted information on discussed topics,

displayed perceptions, participants‟ behaviour and comments. Later I added my own reflections on the workshop process. All generated charts were labelled and became additional data. Participants were asked to complete evaluation forms after each workshop. This sought to improve the workshop process and to assess the virtue of the SSM-based workshops. The evaluation forms further provided opportunity to mention issues that participants did not wish to raise during the workshop. Project team members often attended the workshops, but refrained from intervening in the workshop process.

5.3.3 Interviews

Interviews were important for the SSM and VSM application, as they enabled the desired thorough investigation of both milling areas. They facilitated a sophisticated VSM generation and diagnosis and a comprehensive Finding Out. Interviews allowed me to clarify an issue and phrase new questions as the communication unfolded (Luna-Reyes and Andersen, 2003).

Introducing myself, the research project, and the purpose and procedure of the interview to follow established rapport with the participants. An informed consent form, which was signed by both parties, assured confidentiality, anonymity and voluntary participation. Interviews were recorded only where the interviewee agreed to it. Moreover, as the researcher, I attempted to be attentive, empathetic and supportive, and reassured confidentiality if needed. Interviewing stakeholders individually and mostly within their respective milling area sought to create a comfortable interview environment and encouraged stakeholders to be more responsive (Bowen, 2008).

The interview format was semi-structured and exploratory and was based on six open-ended question guides. Suggestions from Kvale (1996) and Hannabuss (1996) directed the interview process through the use of follow-up, probing and interpreting questions. „Innocent‟ or „devil‟s advocate‟ questions also assisted with exploring delicate issues. Leading and closed questions were avoided as much as possible. Silence encouraged the interviewee to disclose more.

The first round of interviews sought a general appreciation of the present situation in both milling areas. Therefore, only one broad question guide was used (Appendix 1A). This guide was directed by my research questions and explored soft issues and present goals. The interviews were conducted together with other project members who enquired input on hard technical issues for their network analysis. This meant that the available interview time was split between myself and the other interviewers.

After this introductory round of interviews, I generated different question guides for the two milling areas. The design of these guides was based on previous engagements to obtain more precise information on crucial topics. As questions changed, some stakeholders were interviewed more than once.

The questions guide (Appendix 1B) for the second round of interviews in Umfolozi was again governed by my research questions and SSM specific aspects, like Analysis Two and Three. In formulating the questions, I concentrated on general soft aspects and topics that surfaced during the first fieldwork phase. Since the analysis of hitherto available data resulted in a well-informed understanding of relevant issues, respective themes directed the final question guide (Appendix 1D). This guide focused on the clarification of extant ambiguities and especially the exploration of improvement suggestions for identified issues. It comprised two side-sections on small scale growers and internal mill issues, because I originally intended to obtain more insight on these matters. These questions were used only in interviews with stakeholders knowledgeable about those two topics.

The VSM structure formed the basis for the second Felixton question guide (Appendix 1C). This guide investigated the presence and proper functioning of the essential VSM elements as identified in the literature review. In phrasing the questions, I avoided jargon and unfamiliar language and I drew sketches to clarify some of my questions and to facilitate discussions. The third round of interviews focused on the completion of the VSM diagnosis and on stakeholders input for the handling of previously identified deficiencies. The questions (Appendix 1E) thus explored aspects of the Felixton VSM where I required clarification and improvement suggestions from the interviewees. The VSM literature seems silent regarding advice on how to arrive at recommendation for detected shortcomings. Therefore, the approach used in this study illustrates one possible option, whose merit was explored.

Table 5-3 to Table 5-5 outline the composition of interviewees from the Umfolozi and Felixton milling areas in each fieldwork phase. In the first round of interviews (Table 5-3), I interviewed twelve stakeholders in Felixton (13-16 July 2010), fourteen in Umfolozi (20-23 July 2010) and an additional two Felixton stakeholders at the SASTA congress in Durban (26 August 2010). In the second interview phase (Table 5-4) ten stakeholders were in total interviewed per milling area (25-29 October 2010 and in November 2010). The third interview phase (Table 5-5), comprised interviews with fifteen stakeholders in the Umfolozi milling area (15-17 March 2011) and fourteen stakeholders in the Felixton milling area (22-24 March 2011).

Stakeholder type	Number of stakeholders	
	Umfolozi	**Felixton**
LSG	5	5
Exceptionally LSG*	1	1
SSG / Emerging grower	-	-
Haulier	2**	1
Tram (UCOSP) representatives	1 and (1)***	-
Mill employees	3	3
Others****	2	2
Total	**14**	**12**

Comments:

* Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill

** One haulier, hauling for LSG, and one, hauling for SSGs only

*** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already

**** Extension officer, secretary, contractors, Cane Testing Service etc.

Table 5-3: Interviewed stakeholders in the first fieldwork phase

Stakeholder type	Number of stakeholders	
	Umfolozi	**Felixton**
LSG	6	4
Exceptionally LSG*	(1)**	1
SSG / Emerging grower	-	-
Haulier	-	-
Tram (UCOSP) representatives	(2)***	-
Mill employees	3	2
Others****	-	2
Total	**9**	**9**

Comments:

* Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill

** One haulier, hauling for LSG, and one, hauling for SSGs only

*** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already

**** Extension officer, secretary, contractors, Cane Testing Service etc.

Table 5-4: Interviewed stakeholders in the second fieldwork phase

Stakeholder type	Number of stakeholders	
	Umfolozi	Felixton
LSG	9	5
Exceptionally LSG*	-	-
SSG / Emerging grower	-	1
Haulier	-	-
Tram (UCOSP) representatives	(1)**	-
Mill employees	4	3
Others****	2	5
Total	**15**	**14**

Comments:

* Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill

** One haulier, hauling for LSG, and one, hauling for SSGs only

*** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already

**** Extension officer, secretary, contractors, Cane Testing Service etc.

Table 5-5: Interviewed stakeholders in the third fieldwork phase

The fieldwork concluded with eleven interviews of sugar industry representatives (Table 5-6) in November 2011. The sixth question guide (Appendix 1F) intended to investigate the industry‟s perspective on the studied milling areas, the future prospects and the impact of these trends on the local milling areas. Although these interviews were particularly relevant for the study of the fellow researcher, they enhanced my appreciation of the sugar industry, present industry matters, and the influence of these matters on the local mill areas, but proved to be less critical for my study, as I focused on the Felixton and Umfolozi milling areas.

Stakeholder type	Number of stakeholders
SASRI	2
SASA	2
SA CANEGROWERS	7
Total	**11**

Table 5-6: Interviewed sugar industry representatives

Interviews lasted approximately one hour and were conducted in English. Table 5-7 shows the total number of interviews across the different stakeholders.

Stakeholder type	Number of stakeholders	
	Umfolozi	**Felixton**
LSG	21	15
Exceptionally LSG*	3	(3)**
SSG / Emerging grower	-	1
Haulier	2	1
Tram (UCOSP) representatives	1 and (4)***	-
Mill employees	10	8
Others****	4	11
Total	**41**	**36**
Industry representatives°	11	
Total number of interviews	**88**	

Comments:

* Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill

** One haulier, hauling for LSG, and one, hauling for SSGs only

*** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already

**** Extension officer, secretary, contractors, Cane Testing Service etc.

°: SASA, SASRI, SA CANEGROWERS

Table 5-7: Overview of all stakeholders interviewed in this study

Interviews were recorded and usually transcribed which facilitated data accuracy. The first round of interviews in the Felixton milling area was not transcribed, as it did not focus on VSM specific topics and the taken notes seemed sufficient to inform the VSM analysis. I transcribed the first round of interviews conducted in the Umfolozi milling area and a third party transcribed the other interviews. A code was assigned to each interview for confidentiality purposes. For the interviews conducted with Umfolozi stakeholders I used code number U1 to U39 and for the interviews with Felixton stakeholder I used F1 to F25 as codes. These codes are applied in Chapter 6 and Chapter 7 for the purpose of quoting the actual words of respondent to substantiate my findings, while ensuring their confidentiality.

5.3.4 Secondary data

Secondary data comprised reports, internet documents, newsletters and newspaper articles about the sugar industry and the milling areas under study. It further contained minutes of meetings from the Umfolozi Mill Group Board and the Umfolozi Cane Growers‟ Association from July 2008 onwards, and from the Felixton Mill Group Board from November 2004 onwards. The minutes of meetings of the Felixton Canegrowers Association were not accessible. Secondary data revealed areas that required further probing and enabled cross-checks.

5.4 Data analysis

Data were analysed as I received them, as I followed an „analyse as you go‟ approach. This approach informed the research progress and revealed gaps that needed further clarification. The data analysis aimed at a deeper understanding of both milling areas, the determination of relevant issues as part of Finding Out in the Umfolozi milling area, and the creation and diagnosis of a Felixton specific VSM. Since "no standard methods, no via regia, to arrive at essential meanings and deeper implications of what is said in an interview" exists (Kvale, 1996, p. 180), I applied basic principles of qualitative analysis of the data from both milling areas. Nevertheless, the different guiding frameworks implied a slightly different analysis, as outlined below.

5.4.1 Data analysis of the Umfolozi milling area

For the Umfolozi data, I used thematic analysis, because *"*theme identification is one of the most fundamental tasks in qualitative research" (Ryan, 2003, p. 85). The thematic analysis surfaces relevant issues, underlying patterns, and present linkages (Attride-Stirling, 2001). In analysing the data, I applied an inductive and deductive approach. The former assisted me to infer themes directly from data and prevent premature closure (Bowen, 2008). The latter facilitated the consideration of my interview and research questions and supported the verification of preliminary themes. Furthermore, a deductive approach was applied to the workshop data, whereby I reviewed the presence of similar themes. In addition, I used the workshops to obtain confirmation of emerging themes.

The thematic analysis was guided mainly by the work of Attride-Stirling (2001) and Ryan (2003). I immersed myself in the data, which meant reading and rereading the transcripts and my notes. In so doing, I kept looking for prominent ideas, concepts or issues that emerged as possible basic themes. The relevant passage was underlined and labelled with a short note that stated the potential basic theme. This process increased clarity and assisted in the organisation of data. I revealed various

possible basic themes in the beginning, as I attempted to consider the data in its richness. Later, I specified, confined and condensed these themes (Glaser, 1965). This enabled me to group basic themes into organising themes or categories, which then facilitated the definition of global themes. These global themes holistically encapsulated the principal concept of a relevant issue. They developed throughout the study and were only eventually determined in the final version of the findings chapter. Writing, thus formed an essential part of the data analysis, as explained below.

The refinement and consolidation of themes suggested that I neglected less important issues. The reconsideration of text segments with similar labels enabled me to define basic themes and to detect the organising theme from these basic themes (Attride-Stirling, 2001). Constant comparison was essential to progress from basic to organising and then to global themes (Glaser, 1965). It required the continuous analysis of the data and their comparison with emerging ideas. Constant comparison disclosed linkages between themes (Scott and Howell, 2008). It indicated whether a new theme needed to be established based on a new data set, or if an old theme should be refined (Bowen, 2008). Accordingly, constant comparison facilitated theoretical saturation and contributed to the pinpointing of themes and thus promoted trustworthiness (Glaser, 1965, Bowen, 2005).

According to Attride-Stirling (2001, p. 392), the final themes needed to be "specific enough to be discrete and broad enough to encapsulate a set of ideas contained in numerous text segments". Looking for repetition, similarities, differences, shifts in content, gaps, causal relations, metaphors, and unfamiliar expressions assisted in the theme detection and determination (Ryan, 2003).

The iterative process of writing the section on themes in Chapter 6 further supported the progress from basic to organising to global themes. The analysis of data from the first two fieldwork phases led to an initial draft of Chapter 6, which was revised based on the outcome of the third fieldwork phase. I rephrased text segments and added new insights. This contributed to the specification of basic themes. The ensuing draft, however, was too detailed, lacked organising themes and featured insufficiently developed global themes. Therefore, I treated it as a set of intermediate data for further revision. I reconsidered the interview transcripts, workshop outcomes and this intermediate data by reapplying constant comparison. This eventually resulted in the consolidation of basic themes and the determination of organising and global themes, as illustrated in Section 6.2.

Analysis Two and Three were based on my reflection on the entirety of gathered data and contributed to Finding Out and theme specification. These analyses were guided by a more deductive framework, since I kept reflecting about the social reality, culture, history, and politics that characterise the Umfolozi system. As shown in Figure 5-2, for Analysis Two I asked myself

what are the roles, norms and values that underlie the situation and how do they impact on each other and influence the situation?

Figure 5-2: Analysis Two – reflection on the norms, values and roles characterising a situation (Checkland and Poulter, 2006, p. 35)

Analysis Three, shown in Figure 5-3, directed the investigation to politics and power-related issues. I explored the commodities that characterise power in a specific situation and investigated the processes by which they are obtained, used and distributed. Moreover, their relation to present roles, norms and values was considered.

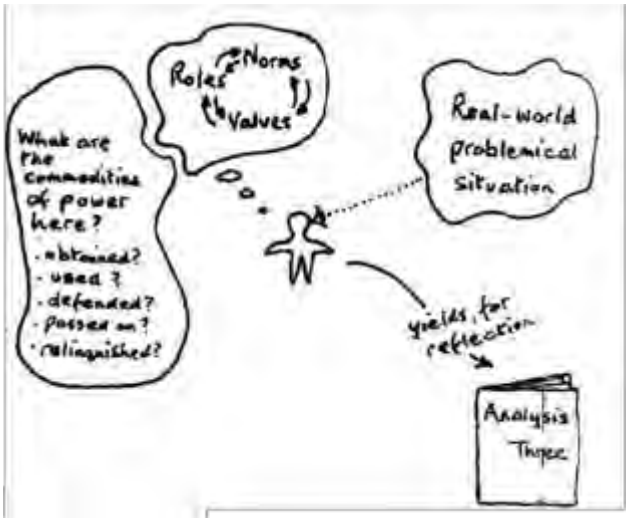

Figure 5-3: Analysis Three – reflection on the politics characterising a situation (Checkland and Poulter, 2006, p. 37)

The SSM-based workshop process was designed to contribute to Model Generation, Comparison and Accommodation, and the Action To Improve stage. The outcome of Model Generation, Comparison and Structured Debate, and Action To Improve led to the respective sections in Chapter 6, which includes a section that discusses challenges that were encountered in the SSM process and a brief section on improvement suggestions.

5.4.2 Data analysis of the Felixton milling area

Likewise, data analysis for the Felixton milling area study was iterative and involved various revisions of Chapter 7. Although I equally read, reread, underlined and labelled the data, I used a more deductive approach, because I focused predominantly on information required for model creation. The essential elements and general concepts of VSM guided the data analysis, whereby I extracted any relevant detail. I analysed available transcripts and my workshop notes and reconciled the results with my notes from the first round of interviews and secondary data. This process led to the Felixton specific VSM and enabled its diagnosis.

The transcripts were thoroughly analysed, although they contained parts that were largely relevant for study of the fellow researcher. From these parts, supplementary themes, which are not explicitly outlined, emerged. Although they had little significance for the VSM generation itself, they supported the VSM diagnosis.

The analysis of data from the first two fieldwork phases enabled me to build an initial version of the Felixton VSM and to conduct a preliminary diagnosis. I reviewed this based on the analysis of the third fieldwork phase. The eventual outcome of the VSM diagnosis and derived improvement suggestions are presented in Chapter 7. The second part exhibits improvement suggestions. Stakeholder proposals and the advantages and drawbacks of these proposals resulted in a first level of potential recommendations. I reflected on these preliminary recommendations. In doing so, I applied a VSM lens and considered the given situation in the Felixton milling area. This led to the final improvement suggestions.

As indicated, I combined qualitative methods and VSM in an iterative and interactive manner. The VSM structure guided the initial interview questions and the preliminary VSM diagnosis led to interview questions that particularly inquired improvement suggestions for disclosed deficiencies.

5.5 SSM-based workshops – Umfolozi milling area

The four-stage SSM learning cycle directed the design of the SSM-based workshops and I sought participation of representatives from all stakeholder groups. Table 5-8 to Table 5-10 illustrate the composition of participants in each workshop which were held in the Umfolozi clubhouse.

5.5.1 First SSM-based workshop – Finding Out

Workshop participation was less rich than intended (Table 5-8). This might have resulted from difficulties with the invitation procedure. Notifications that were sent out apparently featured insufficient information and failed to reach all stakeholders. Three participants (LSG, mill employee, other) largely led the group discussions. The contribution of three other participants (emerging grower, SSG, other) was sometimes overlooked and the remaining four participants hardly contributed. The unintentional high SSG participation created unforeseen language problems which compromised rich discussions and might have introduced bias towards SSG related issues and thus limited the outcome of finding out and the extent to which the data could be used in a change process.

Stakeholder type	Number of participants
	Umfolozi (01.10.2010)
LSG	1
Exceptionally LSG*	-
SSG / Emerging grower	6
Haulier	-
Tram (UCOSP) representatives	(1)**
Mill employees	1#
Others****	2
Total	10

Comments:

* Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill

** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already

*** Extension officer, secretary, contractors, Cane Testing Service etc.

Not actual mill employee, but current consultant

Table 5-8: Composition of participants in the first SSM-based workshop.

First, I sought to build credibility with an introductory section that presented this study, the characteristics and merit of SSM, and the purpose and procedure of the following workshop engagement.

Afterwards I explained the first group activity, namely the construction of a rich picture, and divided the participants into two groups. The groups were asked to draw a rich picture of their milling area that shows relevant stakeholders, issues and linkages. After initial hesitation, both groups developed a rich picture and presented it at the end of this exercise.

I recomposed the groups and described the knowledge café exercise, which aimed at surfacing relevant issues in the Umfolozi system. Each group received one of the rich pictures and a first set of questions (Appendix 2) together with the task to explore relevant issues by engaging with their rich picture and the questions. Core discussion points were recorded on flipcharts. After 15 minutes, the groups were remixed and received a new set of discussion questions (Appendix 2). The task remained the same.

Flipcharts that emerged from the knowledge café exercise served as basis for the following election, which aimed at the determination of critical issues for the next stage in the SSM process. I

requested participants to vote for those issues that they perceived as most relevant. Each participant had three votes, but SSGs did not vote. Participants filled in the evaluation forms and the workshop ended ahead of schedule.

5.5.2 Second SSM-based workshop – Comparison and Structured Debate

I created root definitions, CATWOEs and conceptual models for a set of preliminary findings that emerged after the first fieldwork phase in collaboration with the fellow researcher and illustrated them on flipcharts. These charts formed the basis for the second SSM-based workshop in the Umfolozi milling area. Moreover, the fellow researcher also used them in a workshop in the Felixton milling area.

Low workshop participation (Table 5-9) and time constraints compromised the workshop process. Nevertheless, the attendance of key role players (representatives from the Mill Group Board, the Umfolozi Cane Growers' Association and UCOSP) was beneficial.

Stakeholder type	**Number of participants**
	Umfolozi (26.10.2010)
LSG	4
Exceptionally LSG*	-
SSG / Emerging grower	-
Haulier	-
Tram (UCOSP) representatives	(1)**
Mill employees	1#
Others****	1
Total	**6**
Comments: * Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill ** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already *** Extension officer, secretary, contractors, Cane Testing Service etc. # Not actual mill employee, but current consultant	

Table 5-9: Composition of participants in the second SSM workshop

The workshop started with a presentation of preliminary findings and the clarification of some unfamiliar terms, such as root definitions, CATWOE and purposeful activity models. Participants

chose two topics for further discussion from the set of preliminary findings; namely mill efficiency and cane supply. The subsequent discussion unintentionally touched on two additional issues.

The presentation of the charts intended to inspire rich debates. I asked participants which activities of the purposeful activity model exist already, which are missing, what activities would be required to deal with the presented issue, and how they could be realised. These questions aimed at encouraging a Structured Debate on feasible and desirable changes. A stakeholder recorded the main discussion points on mill efficiency on a flipchart. Participants subsequently discussed cane supply in a similar manner. This led to a debate about SSG sustainability and the consistent delivery of quality. Again, one participant summarised the main discussion points on cane supply on a flipchart and participants filled in the evaluation forms.

5.5.3 Third SSM workshop –Structured Debate and Action To Improve

Findings from the first two fieldwork phases formed an important part of the last workshop. These findings were almost the same as the final themes (Section 6.2).

The composition of the workshop participants (Table 5-10) possibly introduced bias towards emerging growers and SSG issues. Mill representatives were equally concerned with SSG support and did not perceive themselves as mill management representatives. Therefore, once more, genuine participation from mill management was missing. LSG attendance was low, as only one typical LSG attended. The other LSG participated in his role as UCOSP representative.

Stakeholder type	Number of participants
	Umfolozi (16.03.2011)
LSG	2
Exceptionally LSG*	2
SSG / Emerging grower	4
Haulier	-
Tram (UCOSP) representatives	2 and (1)**
Mill employees	2
Others****	2
Total	**14**
Comments: * Deliver sugarcane to both mills, and have ownership in Umfolozi Sugar Mill ** Stakeholders in brackets play a role within UCOSP, but were indicated under another stakeholder type already *** Extension officer, secretary, contractors, Cane Testing Service etc.	

Table 5-10: Composition of participants in the third SSM workshop

In the beginning, I explicitly presented my findings and gave stakeholders the opportunity to question, discuss, approve or disapprove them. Since I intended to determine the issues that participants considered as most vital and thus were assumingly willing to develop precise improvement suggestions for their handling, I conducted an election exercise. Each stakeholder received four votes to indicate crucial findings and one veto to reject a finding. Themes which received a veto were briefly dealt with.

The two issues with the highest votes were selected and two groups automatically emerged, based on the stakeholders‟ interest. The groups were tasked to prepare concrete improvement recommendations which featured high ownership and high impact. While facilitating the group process, I emphasised the necessity to move away from a discussion of the issue per se, towards the development of specific suggestions. Tedious group discussions and time constraints meant that only these two issues could be approached.

Each group presented their suggestions at the end of the group discussions. The audience rated them on an impact-ownership matrix (Figure 5-4). High impact implied a suggestion‟s genuine potential

to improve the situation. Ownership referred to stakeholders‟ readiness and power to implement the recommendation. An exact determination of the execution of these suggestions exceeded the scope of this workshop.

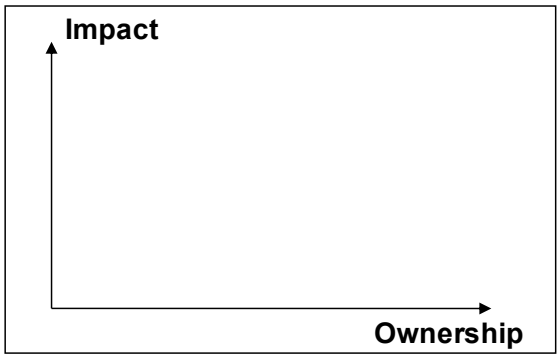

Figure 5-4: Presentation of the impact-ownership matrix

I ended the workshop with the request to complete evaluation forms. In addition, I showed my willingness to work on any of the presented issues together with stakeholders should they wish to do so. However, this offer was not subsequently taken up.

5.6 Concluding remarks

The findings that emerged from this study are subjective and partially dependent on my judgement as researcher, since in qualitative research there is no absolute truth: reality is based on perceptions and knowledge is constructed (Kvale, 1996). Moreover, nothing determines precisely which data belongs to which themes (Westbrook, 1994), or which theme has to be extracted from the data (Ryan, 2003, Frost, 2009). Nonetheless, the outlined methodological approach intended to ensure trustworthiness and defensible knowledge claims (Kvale, 1996, Bowen, 2005).

The following two chapters present the results that emerged from this research. The outcome of the SSM application in the Umfolozi milling areas is illustrated in Chapter 6, before the VSM diagnosis of the Felixton milling area is discussed in Chapter 7. Both chapters comprise suggestions for system improvement.

CHAPTER SIX: APPLICATION OF SSM IN THE UMFOLOZI MILLING AREA

6.1 Introduction

This chapter presents the outcome of the SSM application in the Umfolozi milling area. It is largely structured in accordance with the four-stage SSM process. Figure 6-1 summarises the structure of this chapter.

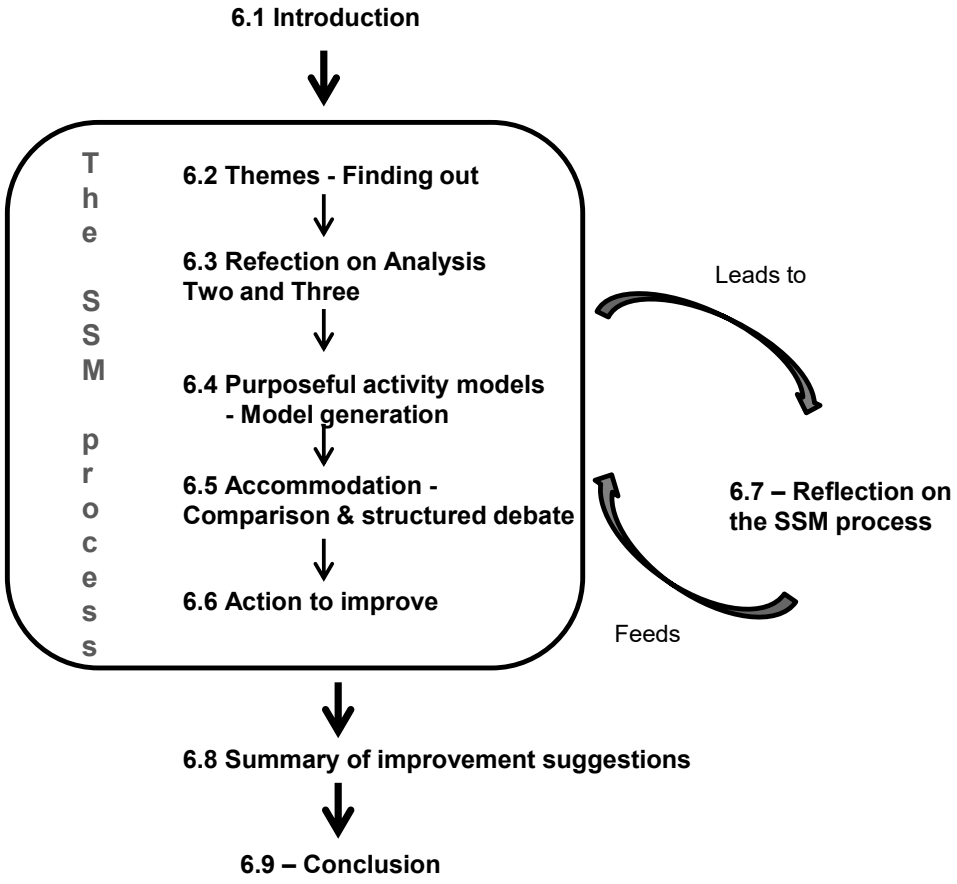

Figure 6-1: Chapter outline based on the four-stage SSM process

The first section comprises the outcome of the repetitive Finding Out; namely the relevant issues. They are presented as themes, whereby I use the words „issue" and „theme" interchangeably. My reflection on Analysis Two and Three is described in the following section. Afterwards the outcome of Model Generation and of Comparison and Structured Debate is illustrated. The latter contains

proposals that might be relevant for taking Action To Improve, whose realisation is outlined in the subsequent section. This is followed by my reflection on the four-stage SSM process. The chapter concludes with a summary of improvement suggestions which are potentially desirable and feasible concerning Action To Improve.

6.2 Themes – Finding Out

Finding Out led to the identification of nine global themes, and the emergence of one overarching theme as being outstanding. This overarching theme is fragmentation. Fragmentation challenges the entire sugar industry and its presence at all levels is well recognised. The nine global themes that are explained in more detail in the following subsections contribute to fragmentation. Table 6-1 lists these themes and their corresponding organising themes. The lack of a common driver further adds to fragmentation, because it entails conflicts around, amongst others, "*the quality of the cane, the length of the milling season… mill breakdown"* (U1), and rateable cane supply. Present industry regulations might prevent common drivers and the industry structure equally adds to fragmentation, due to the inherent miller-grower separation.

> *Fighting at this stage was mainly about the quality of the cane, the length of the milling season – which is a big factor that affects us -, the amount of money they spend, mill breakdown* (U1).
>
> *They [millers and growers] do have very different interests to protect* (U37).
>
> *Legal definition [...] basically inhibits dialogue* (U15).

Regarding the themes, it needs to be clarified that the themes are interrelated, which causes some overlap in the following theme descriptions. Moreover, not all issues that were revealed during the interview and workshop process are represented in this chapter. Their inclusion depends on the persistence with which they were mentioned and their suitability to the scope of this study, which is the Umfolozi milling area. Some of these issues are just briefly mentioned in Section 6.2.9.

Overarching theme	
Fragmentation	
Global theme	**Organising theme**
1. Becoming a real shareholder – a transition process	• Miller-grower stigma •Shareholding advantages •Transition a contentious issue: needed and neglected •Transition efforts
2. Insular view & deficient systemic commitment	•Origin and causes •Systemic impacts •Need for improvements
3. Grower relations	•Type of grower relationships •Causes and impacts of grower relations
4. Comfort zone & resistance to change	•Area specific advantages •Impacts of comfort zone •Resistance towards change
5. Cane supply – quality, quantity & consistency	•Cane quality • Impacts of deficient quality • Motivation and reasons for poor quality • Quality improvement efforts and challenges •Cane quantity • Urgency of cane supply increase • Reasons for decreasing supply • Possibilities for supply increase •Consistency • Reasons for inconsistency • Responsibilities for needed consistency
6. UCOSP's central position in the system	•UCOSP's operation • Core-functions and grower relation • Non-core-functions • Overhead structure • Transparency and information provision •UCOSP versus UCGA - a perceived power imbalance
7. Mill related issues	•Performance and efficiency •Managerial and operational soft issues
8. Trust & Communication	•Trust •Communication
9. Non–core issues	•UCOSP-mill interaction •Road cane •Sugarcane payment •Environmental issues

Table 6-1: Overview of relevant themes

Before continuing, I briefly introduce the three key roles, *viz*. practitioner, issue owner and the client, as part of Analysis One (Section 3.3.1).

Growers (LSGs, SSGs, and emerging growers), the board of directors and the management of the Umfolozi Sugar Mill (USM), UCOSP and the UCOSP board members, and road hauliers are the key stakeholder groups in the Umfolozi milling area. They act as issue owners, since they are connected with the outlined themes. Depending on the issue, they additionally can become a client or practitioner[1]. For instance, the directors of the Umfolozi Sugar Mill have to approve any mill intervention and thus constitute clients. The implementation of a system that promotes sugarcane quality improvements requires growers‟ approval; hence growers become clients. The group that drives the realisation of such a system acts as practitioner. The South African Sugar Research Institute and its extension officers, the Cane Testing Service and the Government are further crucial role players, who need to be recognised as issue owners, clients or practitioners regarding some of the themes. The iSimangaliso Wetland Park, a mining company and the Mtubatuba Municipality also influence the Umfolozi system, but they are outside the focus of this study. Table 6-2 outlines the issue owners, clients and practitioner that are relevant for my SSM application, whereby the study itself is seen as the intervention.

Role	Relevant stakeholders
Issue Owners	•Grower (LSG, SSG, emerging growers), miller, UCOSP, road hauliers, SASRI and its extension officer, CTS.
Clients	•SASRI (funding). •CEO of USM, MGB chairman (permission for study).
Practitioner	•Myself as researcher.

Table 6-2: Overview of the issue owners, clients and practitioner in this study

[1] In this section I apply a 'looser' concept of these roles. I relate to the client in more general terms, namely as the group of people that engenders the intervention and can stop it, and perceive the practitioner as the stakeholders carrying out the intervention.

6.2.1 Becoming a real shareholder – a transition process

Despite the fact that most LSGs are directly or indirectly shareholders of the Umfolozi Sugar Mill, many growers failed to consider themselves as being growers and millers. Disagreement about the mill‟s purpose indicates that some growers have accepted genuine mill ownership, while others reject it. The latter perceive the mill simply as a place to deliver cane, whereas the former are strongly committed to improve the mill performance, maximise the farming and milling profits, and to realise the miller-grower partnership. Even previously, when the mill was grower owned, growers never adopted full mill ownership. Therefore, becoming a real shareholder describes a transition process that requires more time than expected. Stakeholders need to unlearn their old roles, embrace their new identity and nurture confidence in each other. This is reflected in the responses of some of the interviewees:

They own it but they haven't taken ownership (U19).

Still growing into it (U4).

Although some stakeholders argued that millers and growers are *"on the same page"* (U27) already, the continued existence of the deeply rooted miller-grower conflict was broadly confirmed. This conflict results from the historical perception that only one wins at the cost of the other, the current industry structure, and the lack of a common driver. It implies distrust between millers and growers and hence discourages growers from taking real mill ownership. The absence of a real mill ownership is further shown by the presence of an insular view and deficient systemic commitment (Section 6.2.2), and the fact that miller and grower representatives do not jointly discuss their different ideas concerning a improvement strategy for the mill.

They seem to be insisting on the old traditional grower-miller relationship (U23).

Since these realities compromise the Umfolozi system, growers‟ acceptance of real mill ownership would assumingly improve the system‟s efficiency. Stakeholders suppose, for example, that this acceptance promotes the delivery of appropriate sugarcane quality and enables other systemic improvements. Therefore, the transition process needs to be completed, which requires a mindset shift among both, growers and millers.

You pretty have to be together […] It is one of this huge losers or huge gainers (U4).

They will deliver sub-quality cane to their mill (U35).

The transition process, however, also causes tension. Some growers completely refuse to engage it, because they argue that it is detrimental for their farming operations since it incurs more costs than benefits. In addition, they felt compelled to buy the mill back while being excluded from the negotiation. This refusal causes frustration among the other stakeholders and challenges endeavours towards becoming one entity.

We were pretty well forced into buying (U5).

Although the feasibility of the transition is doubted, first signs of its realisation have been indicated. Workshop participants mentioned that present miller-grower conflicts are less severe than previously. The benefits that arise from a mainly grower-owned mill, such as improved communication, mutual appreciation, better mill approachability, an anticipated dividend pay-out, and more grower influence, also promote the transition. However, alleged efforts of mill management, such as operating in a trustworthy manner, and emphasising the new identity, seem to lack the desired effect. A few interviewees proposed that the area leadership does not support the transition process sufficiently, as evidenced by comments like "*‚don't talk to us about the mill, we are growers'"*' (U19). A lack of communication among the board members of the Umfolozi Sugar Mill apparently further hampers taking real ownership.

Going to always have a sort of an ‚us" and ‚them"(27).

6.2.2 Insular view and deficient systemic commitment

The behaviour of several stakeholders is guided by an insular view and a lack of commitment to the system. An insular view refers to the fact that stakeholders fail to consider the Umfolozi system in a holistic manner. Deficient systemic commitment means that they might regard it holistically, but do not care about interdependencies and interactions. Both aspects imply that stakeholders focus only on their own operations, without taking responsibility for the system. The lack of systemic commitment was even revealed as the present culture.

As long as my farm is doing alright […] everything is fine (U34).

An insular view implies a partially poor understanding of the interrelationships within the system. This limits growers‟ consideration of how their activities affect the mill, the system and thus

themselves, as shown in Figure 6-2. Growers with an insular view fail to see the negative effects of poor quality or un-rateable supply, whereas growers who lack commitment neglect these matters. The latter apparently are not concerned about the detrimental impact of their actions on the mill, such as delivering consignments that contain rocks.

Fundamental lack of understanding on how it all fits together (U7).

I'm not interested in your problems (U26).

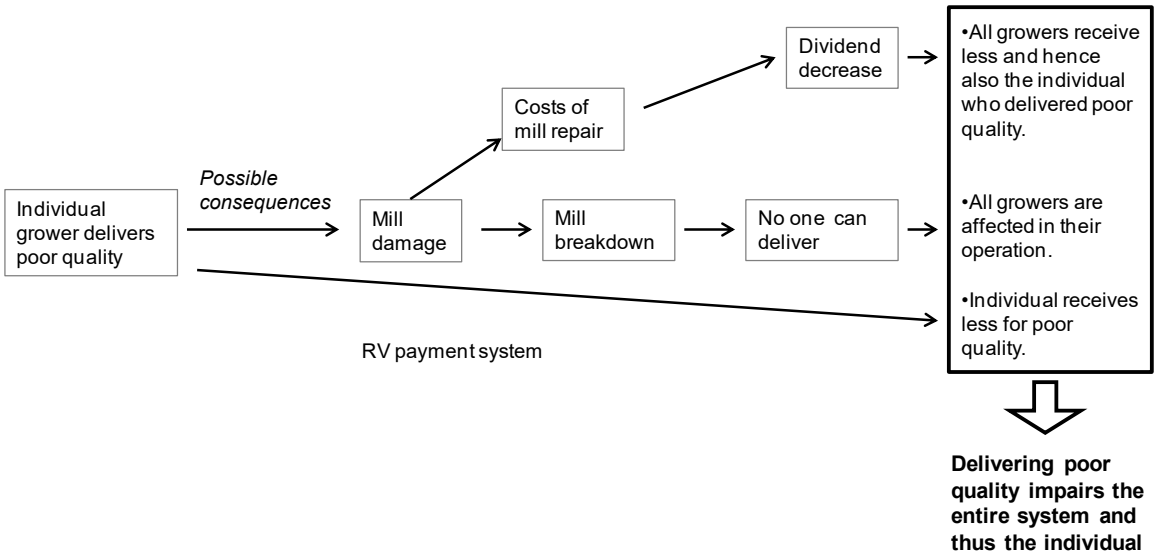

Figure 6-2: Illustration of a possible interdependency that is disregarded by the individual grower, who delivers poor sugarcane quality cane based on an insular view or deficient systemic commitment.

Some impacts of insular view and deficient systemic commitment are outlined in Figure 6-3. They compromise the system‟s efficiency and cause frustration. The bringing about of a holistic perspective and systemic commitment, amongst others, certainly requires a mindset change.

You need a change in the mindset of the growers (U8).

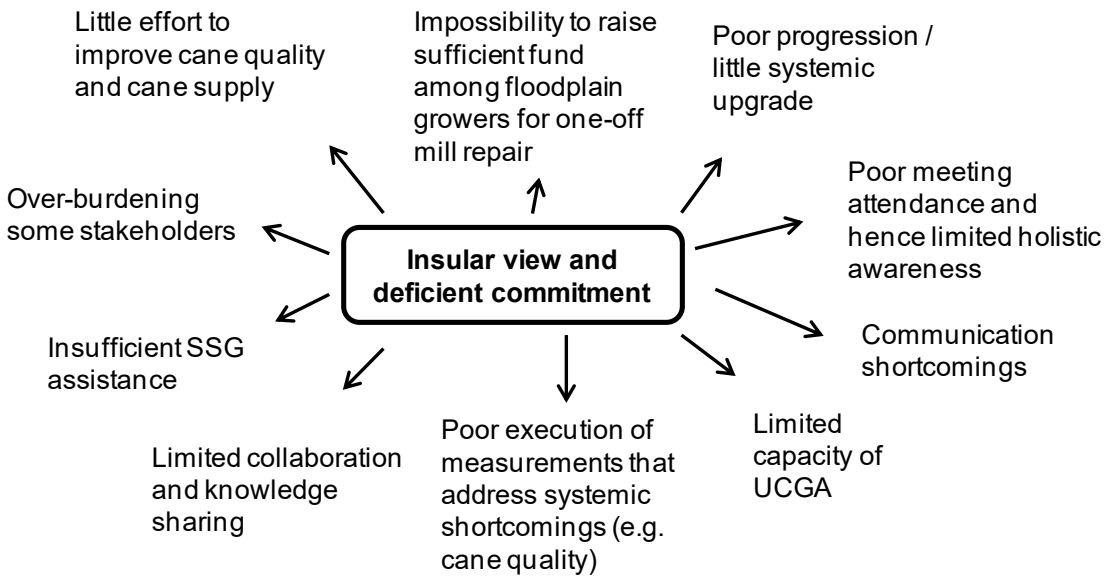

Figure 6-3: Consequences of an insular view and deficient systemic commitment

Similar reasons that led to difficulties with adopting real mill ownership (Section 6.2.1) added to an insular view and deficient commitment. The lack of commitment additionally results from living in a comfort zone (Section 6.2.4), the pro-activeness of UCOSP (Section 6.2.6), which frees growers from getting involved and being committed, and the decreasing grower numbers that results in a higher strain on remaining growers.

6.2.3 Grower relations

Grower relations encompass a wide range of interactions, from being characterised by mutual support and collaboration to bad relationships. They are often transmitted over generations, and thus are deeply rooted. Bad grower relationships are characterised by jealousy, competition, and friction within the grower body. This adds to deficient systemic commitment. These relationships partially result from living in a comfort-zone, which implies that growers are independent of each other and hence there is no necessity for good relationships. Although some stakeholders deny the relevance of this issue, poor relationships apparently constrain the system and other stakeholders seek a more collaborative culture, which unlocks systemic improvement options. Better grower collaboration could, for instance, entail collective farming operations which would improve the systems efficiency, due to the benefits of economy of scale.

Huge division in that community (U17).

You've got so much money… you don't have to be proper friends (U36).

6.2.4 Comfort zone and resistance to change

Many LSGs live in a comfort zone because area specific advantages allow for a comfortable way of living and satisfaction with the status quo. This leads to a *"resistance to change"* (U6). Figure 6-4 outlines the area specific advantages that lead to a comfortable and prosperous Umfolozi system.

Umfolozi growers … make a lot of money (U14).

It's a comfort zone (U20).

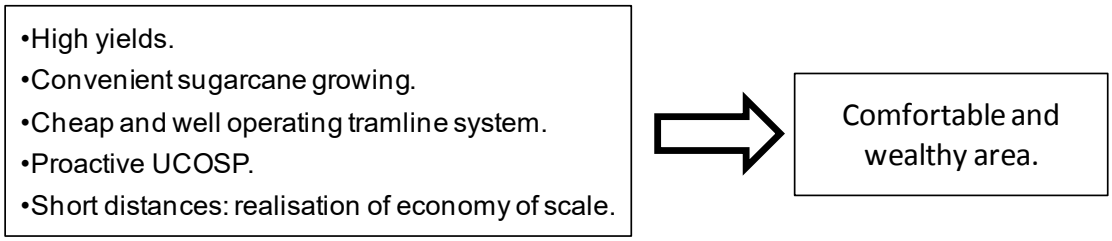

Figure 6-4: Area specific advantages and their consequences

Some floodplain growers perceive sugarcane growing as convenient, describing it as *"an easy business, if you like to farm"* (U11) and the well-organised transport system adds to this convenience. As indicated in Section 6.2.2, UCOSP"s pro-activeness offers additional comforts, as it liberates growers from becoming active themselves.

UCOSP does a lot of work….. Guys get a lot of things taken off their hands (U20).

It [Umfolozi system] is incredibly unique and it works well (U13).

Living in a comfort zone limits stakeholders" motivation to change and causes several efficiency deficits. Stakeholders mentioned that it encourages apathy, minimal effort and deficient systemic commitment. It further limits improvements, such as cane quality advancements, because the progressive business spirit that would drive these improvements seems missing due to the level of prosperity. As a result, convenience rather than progressiveness becomes the core priority.

They really don't want to put any more effort into it at all (U19).

People are just not interested (U3).

Living in a comfort zone limits the mindset change that according to some stakeholder is urgently needed. The fear of losing something, such as influence, and the fact that conservative stakeholders hold influential positions possibly increase the resistance to change.

We are very traditional and people don't want to change (U9).

Doing the old stuff rather than put some really dynamic people out there (U23).

6.2.5 Cane supply – quality, quantity and consistency

Adequate cane supply, in this study, refers to the consistent and sufficient supply of fresh, mature, and clean sugarcane of high quality.

6.2.5.1 Sugarcane quality

The reality that some growers deliver poor quality sugarcane, *viz*. consignments with high ash and fibre contents, low purity, and possibly containing foreign matter, was disclosed as a serious concern, as it impedes the performance of the entire system. In particular, given the fact that compared to other mills, the Umfolozi mill struggles to process unclean cane, which can even cause mill breakdowns. Other growers acknowledged the disadvantages of poor quality, such as lower remuneration, and sought to deliver appropriate quality. Some growers argued that the delivery of poor quality sugarcane is not an issue and insisted that the mill stops blaming the growers.

It's costing the mill money on maintenance (U20).

It is quite important that we send good quality. It affects milling performance…and obviously profitability …which triggers back to us (U5).

Figure 6-5 outlines some of the reasons that cause the delivery of inappropriate cane quality.

Figure 6-5: Direct and indirect factors that contribute to quality shortcomings and partially limit the effectiveness of quality improvement efforts

The clean cane campaign was initiated to improve sugarcane quality. It comprises various activities namely:

- Education about the importance of appropriate quality,
- Ensuring growers‟ awareness about the quality they delivered,
- Conducting farm visits and
- Providing advice.

Some stakeholders perceive this initiative as beneficial and advocate its continuity, while others see it as an inappropriate interference. Several factors that were outlined in Figure 6-5 constitute reasons for the rejection of this initiative. This rejection causes frustration among stakeholders who seek quality advancements. By implication, further quality improvement attempts need to be conducted with great care to avoid the emergence of a similar offensive attitude that causes the rejection of desired outcomes. A mindset change most likely supports quality improvements, because it deals with some of the reasons for poor quality delivery. In addition, the area leadership must increase its efforts to resolve quality shortcomings, because their current behaviour is partially seen as unfavourable.

You can't just always come out with a big stick, if you want to be effective (U15).

It's definitely a process of changing mind-sets (U20).

6.2.5.2 Sugarcane quantity

Inconsistent views about the necessity for an increase in sugarcane supply exist. Some stakeholders mentioned a concerning supply decline that compromises the profitability of the system and explains the necessity for supply increase. Alternative crop production, sugarcane migration to other mills, possible crop destruction through floods and poor productivity of SSGs and land reform farms reduce the cane supply. On the other hand, interviewees argued that the current crushing capability of the mill also limits a successful supply expansion, because there is already sufficient supply for the present mill capacity. Some interviewees questioned the appropriateness of the aim to increase the sugarcane supply and the mill capacity and instead proposed that an improved efficiency of the current operation forms a superior strategic approach. Likewise, the perspectives concerning the feasibility of supply increase differ. Some mention difficulties with supply enhancement, while other claim that additional supply can be easily acquired.

Need to increase our cane supply (U32).

We've got more cane than we know what to do with (U30).

Overall, supply increase is viewed as strategically important and stakeholders indicated various options for vertical and horizontal expansion. The former refers to an increased productivity of existing supply areas and the latter to the acquisition of new supply areas. Dividend pay-out and fibre reimbursement are assumed to boost vertical expansion. Since previously discussed issues, such as living in a comfort zone, insular view and deficient systemic commitment, contributed to the cane supply decrease, their handling should automatically increase the supply. Growers with a holistic view discern the direct benefits of supply increase, namely a higher remuneration based on higher tonnage, and its necessity for the viability of the mill and hence the system and their own operation. This should prompt growers to apply best agricultural practice and augment their production. Nevertheless, some interviewees still questioned the feasibility of vertical and horizontal expansion on the flood plain and the possibility to realise the potential in the SSG sector.

If there is vacant land that we can develop we need to develop those lands (U31).

6.2.5.3 Consistency

The system depends on consistency. The mill requires sugarcane consistently and growers desire a steady running mill. However, inconsistencies in grower deliveries, the cane haulage and the mill exist, and millers and growers blame each other for such inconsistencies.

Consistency would help all, miller and grower (U8).

We require our trams 7 days a week; we are not getting rateable cane (U2).

The reasons for these inconsistencies are summarised in Table 6-3.

Area of inconsistency	Reason for inconsistency
Growers: inconsistent delivery of DRD	• Adverse environmental conditions (e.g. rain, run-away fire). • Insular view which implies not perceiving the relevance of consistency . • Living in a comfort zone, lack of taking mill ownership and deficient systemic commitment, which entails not caring about the adverse effects of inconsistency.
Inconsistent haulage	• Poor scheduling systems. • Long haulage distances.
Mill	• Technical shortcomings cause mill breakdowns. • Managerial and operational deficiencies cause fluctuations.

Table 6-3: Areas and reasons for inconsistencies in the system

Based on the need for consistency, all stakeholders are equally obliged to seek stability. The mill management needs to ensure a steady mill running. Likewise, growers need to supply sugarcane in accordance with the DRD-system, which is explained in detail in (Section 7.4). At its core, the consistency issue entails the question of who will pay for the prevention of mill stops that arise from the lack of cane supply. Growers consider it as the mill‟s responsibility and the mill regards it as a growers‟ responsibility. This causes conflict and indicates the presence of an insular view. It further suggests that the current rules, which regulate the miller-grower interplay, might be flawed.

If we have zero NO cane stops, the supply chain has been optimized (U7).

6.2.6 UCOSP's central position in the system

6.2.6.1 UCOSP‟s operations

Stakeholders are predominately satisfied with UCOSP, based on its achievements in its two core functions, sugarcane transportation and flood protection. UCOSP provides the cheapest and most adequate transport system for the flood plain. Many interviewees trust UCOSP‟s decisions and described it as collaborative, transparent and approachable.

> *UCOSP are doing a brilliant job* (U24).

However, other voices contested this perspective. UCOSP‟s accomplishment of non-core-functions, such as the operation of a quarry, a timber plantation, and sugarcane growing in particular cause severe discontent. Concerning these functions, some UCOSP members feel insufficiently involved in decision-making, and criticise UCOSP‟s poor transparency and its ineffective management. The latter apparently leads to suboptimal results that fall back on USCOP members, because inefficiencies engender higher transport costs on the tramline system.

> *Those non-core operations are not good businesses* (U17).
>
> *It was not transparent enough* (U33).

Various stakeholders disclosed further points of general dissatisfaction with UCOSP‟s operations; *viz.*, poor transparency and approachability, inadequate management, inappropriate handling of members‟ queries, and serving members unsatisfactorily. These points are elaborated on in Table 6-4.

Areas of discontent	Reasons for discontent
Transparency and approachability	•No financial transparency. •Poor information provision .
Management shortcomings	•Deficient investment in the tramline system (e.g. additional wagons, replacements, repairs). •Oversized and expensive overhead structures. •Payment of UCOSP's directors: unjustified and problematic. •Leadership and leadership style hardly changes .
Dealing with its members	•Ignoring members' request pertaining regular and detailed information about UCOSP's operations. •Defensive set-up at UCOSP meetings silences stakeholders and compromises the opportunity to raise issues. •Offensive leadership that rejects criticism or suggestions .

Table 6-4: Areas and reasons raised by some stakeholders for their discontent with UCOSP's operations

The UCOSP management claims that it is transparent. It informs its members at the AGM and provides the opportunity for members to raise issues at the weekly director meetings. Non-transparency is dismissed as mere perception. The re-election of UCOSP"s management indicates the satisfaction of the majority of stakeholders with UCOSP, despite mentioned shortcomings. However, the points outlined under „dealing with its members" in Table 6-4, clearly indicates a shortcoming concerning UCOSP"s supposed transparency. The re-election of the current management might also result from living in a comfort zone and deficient systemic commitment.

The biggest stumbling block for UCOSP is the lack of transparency (19).

6.2.6.2 UCOSP versus UCGA

Compared to UCOSP, the Umfolozi Cane Growers Association (UCGA) constitutes a relatively weak grower body. An element of power imbalance and competition was disclosed, because the activities of these two bodies partly overlap and both groupings perceive themselves as grower representatives. Some stakeholders argue that UCOSP weakens the UCGA, but others contest this statement.

They are very much over shadowed by the co-operative (U21).

The majority [...] are happier with UCOSP being the stronger body (U28).

The good reputation of UCOSP, its superior basis and pro-activeness, the attitude of growers, and historical circumstances strengthen UCOSP's position and thereby indirectly debilitate UCGA. Table 6-5 provides more detail on these factors. They imply that powerful stakeholders rather become involved in UCOSP than in UCGA. This draws capacity away from UCGA and undermines its significance and implicates that UCOSP is influential and powerful.

Factor	Implication of factor
UCOSP's superior basis	• Higher resource availability compared to UCGA. • Paying UCOSP board members, while UCGA involvement voluntary. • Charismatic, influential and pro-active board members who form a strong team.
UCOSP's esteem	• UCOSP is the prestigious body and carries authority. • High meeting attendance from growers. • Easiness of recruiting board members. • Becoming a UCOSP board member is preferred over contributing to other committees.
UCOSP's pro-activeness	• Conducts crucial activities (e.g. transport and flood protection). • Conducts activities that should be in UCGA's area of responsibility (e.g. dealing with the iSimangaliso Wetland Park). • Was involved in the mill repurchase and holds the share of floodplain growers. • Taking over the scheduling of USM's entire sugarcane supply. • Perceives itself as the spokesperson of the floodplain growers. • Advocates the necessity to be influential.
Grower attitude	• Satisfied with UCOSP's activities, trust UCOSP's decisions and delegate them decision-making power. • Not caring about UCGA's weak position. • Not challenging UCOSP due to living in a comfort zone and deficient systemic commitment .
History	• The mill was originally grower owned, which implied the irrelevance of a strong UCGA. • UCOSP managed the mill originally, which created a powerful position.

Table 6-5: Factors that strengthen UCOSP and weaken UCGA

Some stakeholders question UCOSP's capability as a change driver, because they perceive change as contradictory with its own interests of remaining influential and powerful. Subsequently, they doubt UCOSP's willingness to address the issues that were outlined in Section 6.2.1 to 6.2.4.

> *UCOSP aren't going to be the people that change that perspective because it suits them quite nicely* (U24).

When I presented the UCOSP issues in the final workshop, a UCOSP representative rejected their validity. However, several interviewees repeatedly re-affirmed their accuracy. Although, overall the satisfaction about UCOSP seems to outweigh concerns and dissatisfaction, there is merit in addressing these issues, because there *"is a good section that is not happy with the way they [UCOSP] run things"* (U17). Nonetheless, these issues might be less significant than they appear due to some interviewees, who might have been disgruntled about a personal experience with UCOSP.

> *There have been a lot of complaints of discontent but… they do a great job in a lot of ways* (U29).

6.2.7 Mill related issues

Technical, managerial and operational mill shortcomings currently limit mill performance. These shortcomings should be addressed because they compromise the system as a whole, since all stakeholders require an efficient mill operation. Technical deficiencies, which cause mill breakdowns, particularly impair the system.

> *It is an old mill […] everything seems to break* (U16).
>
> *Not getting too upset because they are trying their best* (U18).

Although most growers bear with these technical shortcomings, the mill needs to demonstrate its crushing ability and reliability. This is important to create the required stability, regain growers‟ confidence and overcome present frustration. The management of the Umfolozi Sugar Mill has developed a repair strategy and reinvests revenues to remedy technical shortcomings. Later stakeholder engagements revealed that this strategy has already made an impact in improved performance.

> *Need to make sure that this mill crushes consistently* (U38).

Financial capabilities and time-constraints of the off-crop season restrict the repair strategy. Many growers would desire a faster remedy of technical deficiencies. The fact that mill management constantly seems to blame the bad mill state and poor cane quality as reasons for mill breakdowns, instead of investigating the mill‟s operational and managerial deficiencies, creates frustration

among growers and leads to a „blame" culture. Figure 6-6 summarises present management problems which were mentioned by a few interviewees. Nonetheless, overall satisfaction with the mill management prevails.

So soft issues are actually key (U15).

It's a lack of maintenance, lack of management (U22).

- Monitoring systems insufficiently indicate performance reduction.
- Training deficit concerning the technical peculiarities of the Umfolozi Sugar Mill.
- It was proposed that mill staff would benefit from increased supervision and support.
- The present incentive system unintentionally encourages a concealing of mistakes.
- Some interviewees suggested that poor morale, motivation, collaboration, lack of team spirit and trust exists.
- A few interviewees indicated that the workload and expectations are sometimes inappropriate which causes frustration .
- Leadership deficiencies in top management, which cause silo operation and add to a poor team spirit, were suggested by a few interviewees.

Figure 6-6: Managerial and operational mill deficiencies that compromise mill efficiency

Mill management is aware of most of these deficiencies and aims at their improvement. Nevertheless, overcoming present shortcomings constitutes a challenging endeavour, especially as some result from the fact that top management reportedly is *"not a unified management team"* (U25), which implies insufficient guidance, supervision and transmission of a team spirit. In addition to repairing the mill, some stakeholders indicated the present intention "*to invest in the mill to bring it to its design capacity"* (U15). This requires the consideration of associated challenges.

6.2.8 Trust and communication

Trust and communication are mutually interdependent and interrelated to all previously mentioned issues (Section 6.2.1 to 6.2.7). Trust and communication can either promote improvements in these issues, or be restrained by deficiencies in these issues. Figure 6-7 provides an example of the interrelationship.

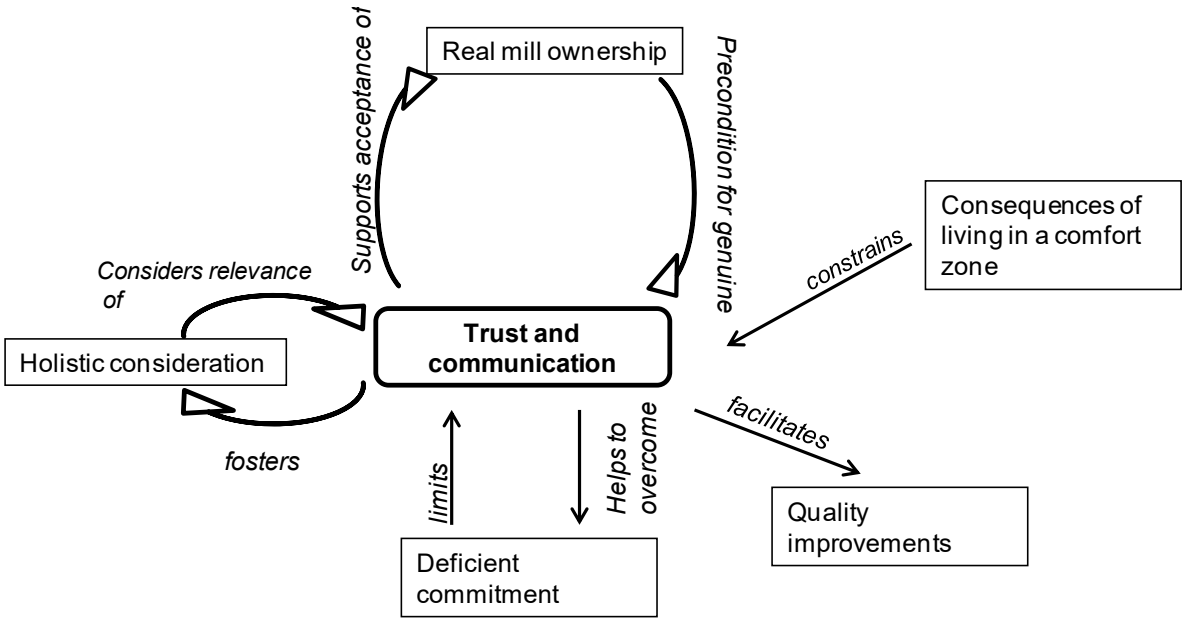

Figure 6-7: Interconnectivity of trust and communication with other relevant themes

Stakeholders perceive mutual trust as crucial for a prosperous operation of the system. Trust has already improved significantly because the mill is predominately grower owned, runs more reliably and mill management has increased its communication with growers. Nonetheless, vast potential for improvement still exists. There is still an element of miller-grower mistrust. As shown in Figure 6-7, an increased trust level would encourage other systemic improvements and the handling of some deficiencies.

> *Trust is a key element to make it work* (U7).
>
> *Mistrust from the millers"side, and … mistrust from the growers"side* (U24).
>
> *Can't say there is mistrust ... because there is fairly good communication* (U10).

Likewise, the systemic importance of adequate communication is acknowledged. Although stakeholders seem satisfied with the existing communication and information provision, room for improvement was revealed. For instance, some stakeholders neither knew of the impossibility of a one-off mill repair, nor the repair strategy that is used instead. This resulted in dissatisfaction with the mill management and added to miller-grower tension. Likewise, communication shortcomings contribute to an insular view, because stakeholders lack awareness about relevant matters. Mill management desires an increased two-way communication to improve the miller-grower interaction

and to receive feedback concerning deviation from the DRD-system (Section 7.4). This would facilitate coordination, better adaptation to supply outages, and mutual appreciation. Moreover, communication with long distance hauliers should increase and a proper communication culture needs to be established.

It is very important to communicate (U12).
The lines of communication could be better (U8).

6.2.9 Non–core issues

In addition to the above core issues, the issues listed below are considered as non-core issues. Non-core issues refer to issues that influence the system, but either to a lesser extent, or fewer stakeholders perceive these issues as important, or sufficient ways of addressing them were revealed. Alternatively, non-core issues also relate to issues that are outside the scope of this study, because their adequate handling would require the inclusion of stakeholders beyond the Umfolozi system. The non-core issues are briefly introduced in Table 6-6.

Issue	Description of the issue
UCOSP – mill interaction	• Disagreement between UCOSP and mill management concerning the capacity of the tramline system and the cane supply scheduling. • The mill argues that UCOSP runs below capacity and should acquire more wagons, while UCOSP rejects this assertion. • The mill perceives itself at the receiving end concerning the way UCOSP deliveries sugarcane, while UCOSP argues that the mill 'dictates' how UCOSP can operate, as UCOSP depends on a smooth mill running. • It was decided that UCOSP take over the entire cane scheduling, which is expected to improve the UCOSP-mill interaction.
Road cane	• Road transporters feel disadvantaged in comparison to the tramline system and experience long turnaround times. • A system that coordinates tramline and road deliveries better is going to be implemented. • UCOSP coordinating the entire supply is expected to optimise the road tramline interaction. • Good relationship between road and tramline operators .
Sugarcane – payment	• Dissatisfaction with the current division of proceeds adds to conflict and discontent. • Issues seems to be appropriately discussed at industry level. • Growers are confident that should local agreements be required, they are easy achievable due to shareholding.
Environmental issues	• Conflicts between the milling area and the iSimangaliso Wetland Park, and between the milling area and the mine about the Umfolozi River exist, yet they ere not perceived as severe. • Inconsistency in the water flow of the Umfolozi river and catchment degradation are a concern.

Table 6-6: Brief overview of non-core issues

6.2.10 Reflection on themes

Although fragmentation is the overarching theme, there seems to be a strong and mutually reinforcing relationship between fragmentation and some of the global themes. Fragmentation and the first two global themes as depicted in Table 6-1 are notably interdependent and intensify one another. In addition, the adverse consequences of living in a comfort zone seem to boost the other three themes and fragmentation, as stakeholders are satisfied with the status quo and perceive no need to intervene. Living in a comfort zone itself, is not fortified by any of the other issues, as it results from the peculiarities of the Umfolozi milling area. The interactions between the themes are shown in Figure 6-8. An insular view, for instance, contributes to fragmentation, deficient systemic

commitment and not becoming a real shareholder. Likewise, not becoming a real shareholder adds to fragmentation and limits a holistic view and systemic commitment.

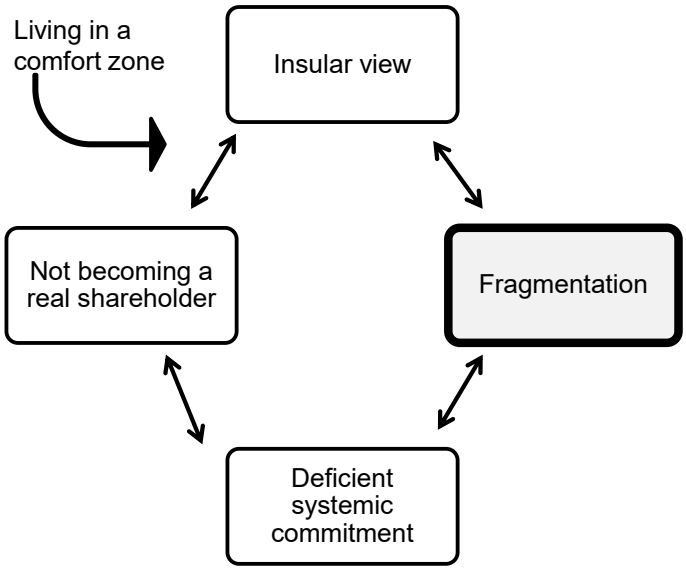

Figure 6-8: Connectivity and correlation between themes

The first two global themes and fragmentation, contribute to deficiencies regarding sugarcane quality, quantity, and consistency, trust and communication, and UCOSP‟s central position. This is indicated in Figure 6-9. These themes either imply that the necessity to handle the other issues is not seen or neglected, or that the motivation to address these other issues is limited. Consequently, fragmentation and the first four global themes seem central and capable of unlocking a tremendous potential.

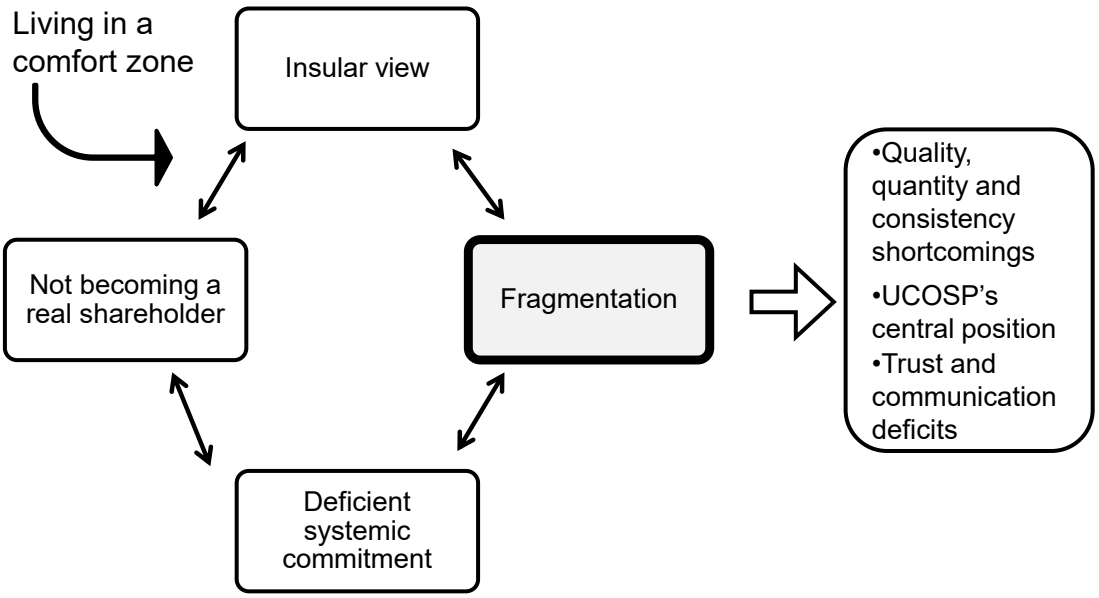

Figure 6-9: Interrelation between fragmentation and some global themes

6.3 Refection on Analysis Two and Three

This section summarises the outcome of Analysis Two and Three. All themes are, at least to some extent, influenced by culture or power issues. Not becoming a real shareholder, deficient systemic commitment, insular view, fragmentation, living in a comfort zone, and UCOSP‟s central position clearly describe characteristics of the present culture.

6.3.1 Analysis Two

Umfolozi growers embrace at least one of the following three different roles: powerful, active, or apathetic. Powerful growers are influential growers. They are expected to direct the system and the grower body. They should embrace a holistic view, have grasped the concept of mill ownership and be committed to the system as a whole, yet they do not necessarily follow this norm. Their main characteristic is their influence. Some stakeholders felt that these growers fail to meet their responsibilities; *viz*., having the system‟s interest at heart and this causes discontent. The group of powerful growers comprises mainly members of UCOSP‟s board of directors. Action To Improve requires the approval of this group to be culturally feasible because their disapproval limits the realisation of proposed changes.

Active growers show commitment to the system by attending meetings, embracing a holistic view, and trying their best to improve their own and the system‟s prosperity. This describes the behaviour

a grower should embrace based on the value system of active growers. However, growers in this role might not be influential enough to lead the system and spread the adoption of these norms. Nonetheless, this group is the most responsive grower group to initiate change and improvements. These growers could play a leading role for the development and realisation of culturally feasible change.

The values and norms of the final, apathetic group result from living in a comfort zone. Growers in this group are characterised by deficient systemic commitment and an insular view (Section 6.2.2). They embrace a poor business spirit and strive for a comfortable lifestyle rather than realising the optimum. This promotes a „convenience" culture instead of a „commitment" culture. This culture partially underlies the first four global themes and adds to cane supply issues (Section 6.2.5). Apathetic growers inadvertently strengthen the position of the powerful growers, since they do not challenge them.

The convenience culture compromises the implementation of improvement possibilities and the realisation of the system's full potential. It prevents, for example, a change in the tramline operation to a 24-hour loading and transport system, possibly impairs cane quality and quantity improvements, and engenders resistance towards change. Growers do not realise economy of scale, because collaboration is perceived as less convenient for the individual. The convenience culture inhibits the collaborative culture that active growers desire. Culturally feasible changes require a reflection on whether these changes constrain stakeholders' convenient way of operating, and as such, causes their rejection.

The different grower roles lead to discrepancy in the grower body, especially between powerful and active growers, because of these implicit power difference. The fact that some growers were included in the arrangements concerning the mill repurchase, while others merely were spectators created further discontent within the grower body. Likewise, the behaviour of apathetic growers adds to frustration and friction, because it clashes with value system of active growers. These circumstances impair grower relations, limit knowledge sharing and cooperation, and cause a culture of jealousy and poor trust within the grower body.

Trust and communication essentially describe a cultural issue, because genuine trust and communication depend on present norms and values. These norms and values determine whether trust and communication are seen as critical and thus are aspired to, or not. The mill, for example, perceives trust and communication as vital to improve the miller-grower relationship. Therefore, it sought to increase its communication effort and to act in an open, honest and trustworthy manner.

For a culturally feasible advancement of trust and communication, growers and millers have to discern communication and trusting relationships as worthwhile. Stakeholders, who value mutual appreciation, a holistic view, becoming real shareholders and systemic commitment as a critical norm automatically add to communication and trust creation.

The following cultural issues constrain becoming a real shareholder. Present norms seem to feature a deeply embedded miller-grower conflict and fragmentation. Several growers do not perceive of themselves as in a position to act like mill owners and thus do not behave as such.

Some growers associated with the mill have the perception that it is merely „a place to dump" the sugarcane, rather than the growers' property. Thus attempts to improve the prosperity of such properties are perceived as being not worthwhile. They additionally perceive the mill as „always deficient". These perceptions together imply that ownership of mill properties is not desirable and this needs to be addressed in order to facilitate a culturally feasible acceptance of mill ownership.

The perception of the mills as „always deficient" also adds to mill internal shortcomings. Mill employees consequently fear another ownership change or even mill closure which compromises their motivation. The uncertainty about the norms and values of the new mill management creates a culture of insecurity and contributes to present managerial and operational deficiencies (Section 6.2.7).

The mill role of „crushing sugarcane" implies that stakeholders anticipate continuous sugarcane crushing and adequate sugar extraction. Since this requires the elimination of present mill shortcomings, the still occurring mill breakdowns engender frustration and a blame culture (Section 6.2.7). The blame culture limits efficiency and the taking of real mill ownership. Overcoming mill inefficiencies is thus culturally feasible and aspired to. This should be accompanied by the provision of a rationale for the taken approach.

Stakeholders expect that UCOSP adequately services the interests of growers and the mill, since they assigned UCOSP the role of „service provider". Therefore, poor tramline maintenance and capacity, deficient transparency and inappropriate handling of its members" requests causes discontent. This can only be addressed once UCOSP"s norms are clarified and clearly communicated.

6.3.2 Analysis Three

The mill holds a powerful position, because it is a crucial element in the system; decisions can be made rapidly and stakeholders view the mill as central and critical. Likewise, growers have a powerful position, premised on the industry setting and especially the shareholder setting in Umfolozi. For example, growers managed to persuade Umhlatuzi Valley Sugar Company Ltd to deliver sugarcane to the Umfolozi Sugar Mill, which neither of the previous mill owners achieved. This shows their scope of influence, especially when they join forces. By implication, the power status between the mill and the grower body seems equalised.

Mill management cannot enforce a grower behaviour that would be more suitable for its own purposes. For instance, growers have to approve stricter cane rejection rules. Accordingly, they need to be involved in the development of cane quality improvement measures to ensure the feasibility of these measures. Regardless of this, not all growers perceive themselves in a powerful position in their interactions with the mill and they seem to require improved negotiation skills to strengthen their bargaining power.

As indicated in Section 6.2.6, many of the UCOSP issues are related to its powerful position. Some interviewees argued that UCOSP is a closed entity which operates in a certain manner in order to maintain its power. UCOSP reportedly acts defensively and counteracts any activity that could reduce its power. UCOSP might even remain insufficiently transparent out of fear of losing influence. This behaviour impedes fruitful discussion about present concerns. Stakeholders mentioned that UCOSP leadership seems nepotistic, as members of the same family are repeatedly appointed to the board. Considering these circumstances, change depends partially on UCOSP‟s approval or support to be feasible.

Negotiations about the division of proceeds are essentially a power issue; *viz*. who has more power to acquire the bigger part of the pie for its stakeholder group. Since these negotiations add discontent throughout the industry, Umfolozi stakeholders requested the sugar industry bodies, like SASA, CANEGROWERS and the Sugar Millers‟ Association to intervene. These bodies deny their ability to dissipate local tensions. Interviewees opposed this view, because they felt powerless to deal with discrepancies that emerge from negotiations that are conducted at industry level. The power imbalance thus compels the industry to assist in the handling of local frictions. Although this friction is less severe in Umfolozi compared to other milling areas, interviewees welcomed the anticipated development of vertical slicing and the implied empowerment of local areas. They are confident about their ability to achieve local agreements in a changed industry setting, due to

growers‟ ownership of the Umfolozi mill. Consequently, the Umfolozi milling area appears to be better prepared for the expected industry changes. In other milling areas, the reported miller-grower power gap is concerning in light of these changes; especially since the industry might play a less dominant role in miller-grower negotiations. This would mean that CANEGROWERS cannot support the interest of its growers to the extent it currently does.

Government plays a powerful role, as its decisions are critical for the sustainability of the industry. It determines the industry framework, establishes the legislations that either promote or limit co-generation and ethanol production from sugarcane, and seeks access to the European sugar market. Nonetheless, the industry itself possesses lobby power, because it provides employment and rural development, which could possibly be even increased once downstream activities are enabled.

6.4 Purposeful activity models - Model Generation

The preliminary findings outlined in Figure 6-10 emerged from the analysis of all the data of the first fieldwork phase. This section briefly introduces the flip charts that were created for the preliminary findings and presented to stakeholders. The charts generated for the residual preliminary findings are illustrated in Appendix 3. Several of them are still relevant given the final outcome of Finding Out; *viz*., the charts that deal with stakeholders‟ mutual appreciation, the division of proceeds, the working relationships, communication and the consistent delivery of quality cane.

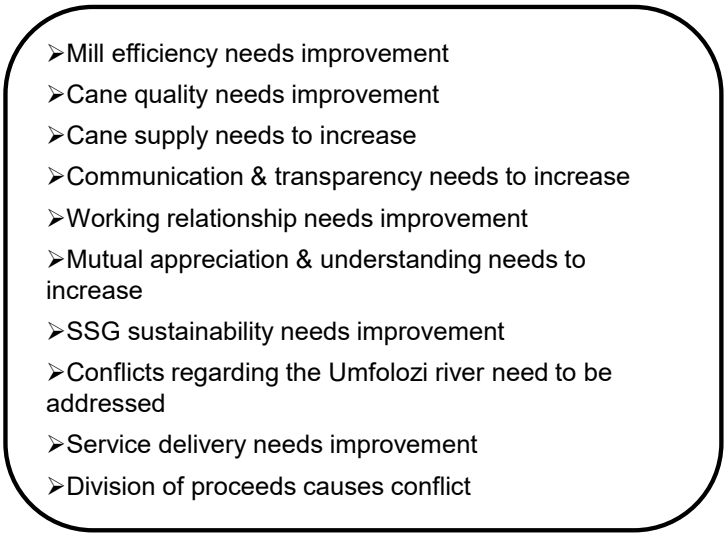

Figure 6-10: Preliminary findings which formed the basis for Model Generation.

The Root Definition (RD), CATWOE and conceptual model of a system that seeks mill efficiencies improvements is outlined in Figure 6-11. A proper repair and maintenance strategy will increase mill efficiency and reduce times of slow crushing and mill breakdowns. Shareholders and mill management, as owners of this system, need to approve this strategy. Its realisation could be limited by financial constraints. Growers, millers and hauliers would benefit from the implementation of this system and the conceptual model identifies the required activities for its realisation. These activities need to be accomplished primarily by mill staff and engineers. Later fieldwork revealed that several activities resonate with the approach taken by the mill management.

Mill efficiency improvement

Root Definition:

A mill management and shareholder owned system, operated by engineers and mill staff to improve mill efficiency by ensuring proper maintenance in order to reduce slow crush and mill stops, within the constraints of what is financially feasible.

CATWOE:

C	Growers, mill management, mill staff, mill shareholders, hauliers
A	Engineers, mill staff
T	Inefficient mill to efficient mill
W	Ensuring mill maintenance improves mill efficiency / Improved mill efficiency reduces slow crush and mill stops
O	Mill management and shareholders
E	Finances

Activity model:

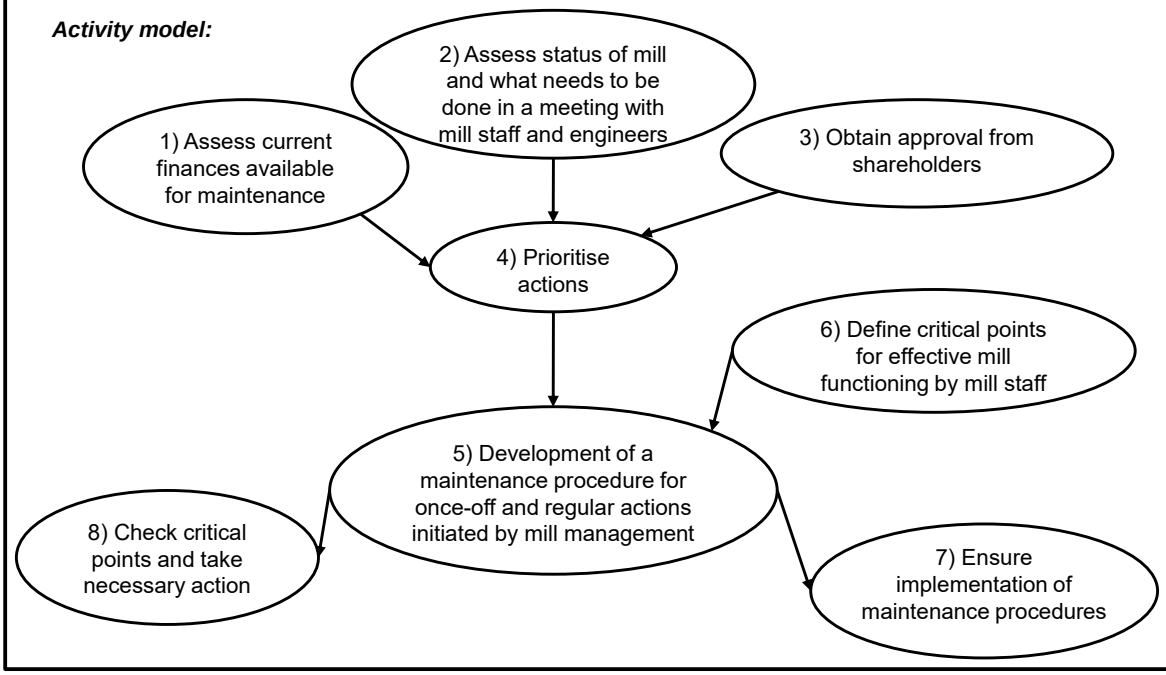

Figure 6-11: Root Definition, CATWOE and activity model of a system to improve mill efficiency

The Root Definition and conceptual model in Figure 6-12 describes one possible system to increase cane supply from which growers, hauliers and the mill would benefit. Supply increase would result from the cultivation of spare land, SSG and emerging grower support and a general productivity increase among growers. The latter is facilitated by the implementation of a yield-increase-incentive-system and the development of growers with a high potential for yield increase. Figure 6-12 provides more detail on the realisation of this system, assigned responsibilities and possible constrains.

Cane supply increase

Root Definition:

A grower owned system, operated by growers and mill, to increase cane supply by evaluating yield increase potential and spare land potential, by supporting SSG and emerging growers and by implementing a yield increase incentive system in order to make local sugar production area more sustainable, within the constraints of weather, soil fertility, land, and the availability of input resources.

CATWOE:

C	Growers, hauliers, mill management and shareholders
A	Growers, mill management
T	Lack of cane supply to increase cane supply
W	Increase cane supply makes the local sugar production area more sustainable / Supporting SSG and emerging growers and implement a yield increase incentive system increases cane supply
O	Growers
E	Weather, soil fertility, land, availability of input resources

Activity model:

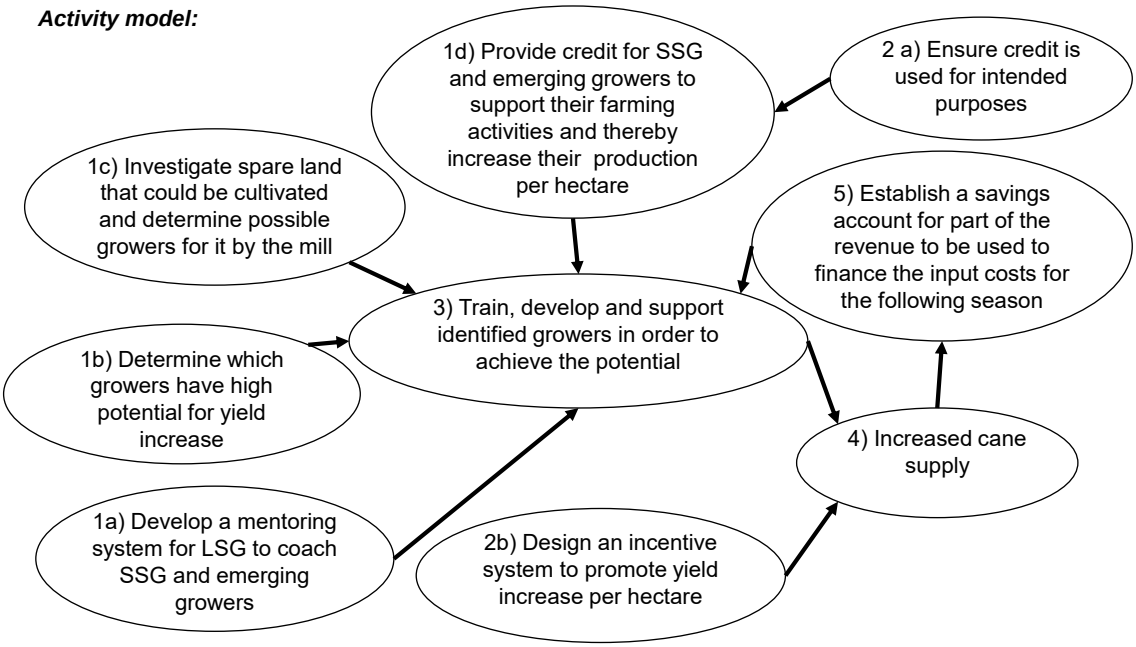

Figure 6-12: Root Definition, CATWOE and activity model of a system to increase cane supply

6.5 Accommodation – Comparison and Structured Debate

The presentation of the above outlined figures promoted rich debates and Comparison between the models and the real world issues. This should have led to agreement on desirable and feasible changes. Although, no real Comparison was achieved, the discussion confirmed themes, provided

additional insight, and resulted in some improvement suggestions. Figure 6-13 illustrates the main proposition for mill efficiency improvement; namely investigating the possibility of a one-off repair. The generated chart includes the respective responsibilities, preconditions and possible constraints. It confirms the desirability of some of the activities that were outlined in the conceptual model in Figure 6-11.

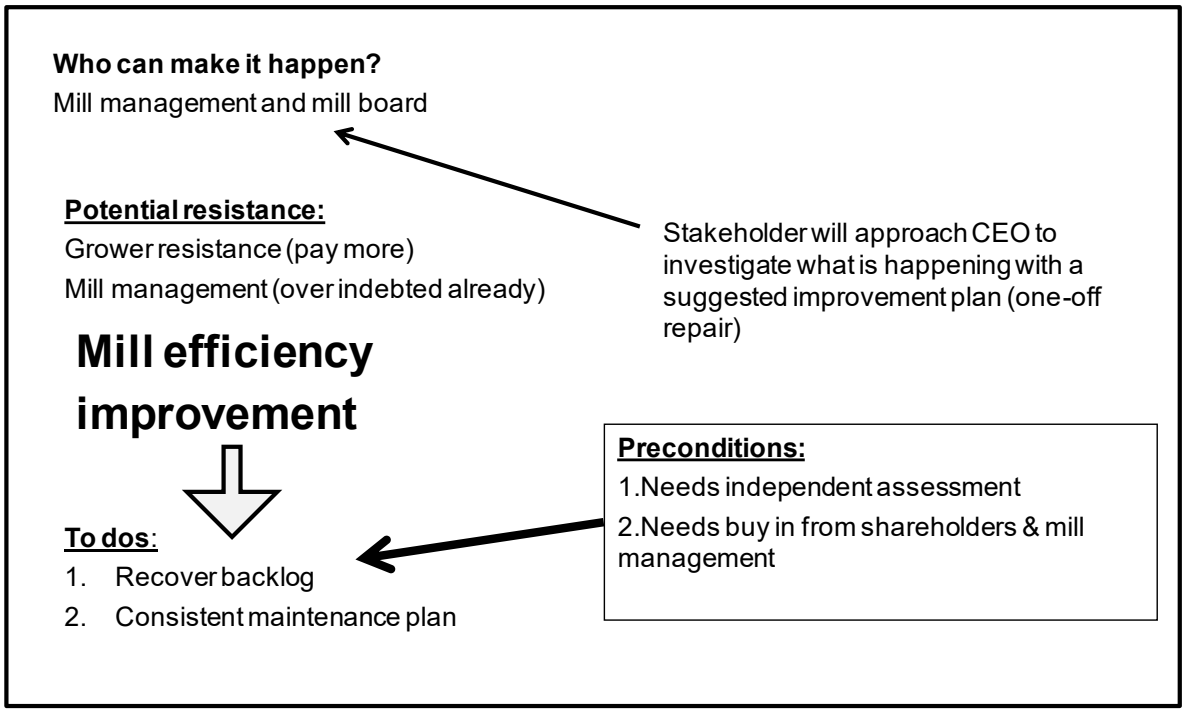

Figure 6-13: Chart on mill efficiency improvement generated by a participant in the second SSM-based workshop

The discussion also surfaced various options for cane supply increase and quality improvements, which are summarised in Table 6-7. Figure 6-14 outlines the proposition participants perceived as most suitable to achieve supply increase.

Theme – relevant issue	Improvement suggestions
Cane supply	•Improve grower relationship. •Assess genuine potential for horizontal and vertical expansion. •Make strategic decision to either focus on horizontal or vertical expansion. •Utilise potential for horizontal expansion in SSG sector via adequately managed projects. •Obtain supply from other milling areas. •Implement best management practice and a respective benchmark system.
Sugarcane quality	•Improve grower relationship. •Training on adequate farming practices. •Implement best management practice and a benchmarking system •Apply 'name and shame'. •Mill to follow-up with quality offenders. •Consider options for financial incentives.

Table 6-7: Suggestions for supply increase and quality improvement derived from participant discussion in the second SSM-based workshop

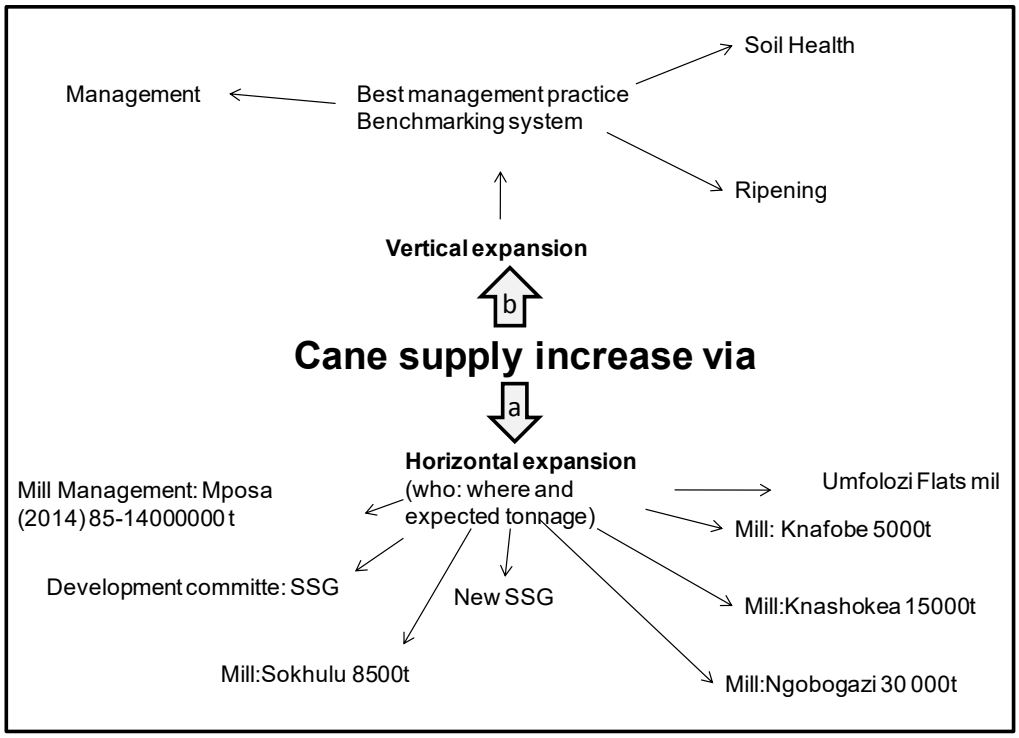

Figure 6-14: Chart on cane supply increase generated by a participant in the second SSM-based workshop

Although these stakeholder propositions can be seen as some kind of Accommodation, this Accommodation lacks assertiveness and concreteness. Stakeholders neither approved certain actions, nor specified activities that were to be pursued. This shortcoming is further discussed in Section 6.7 and 8.1.1.

The third SSM-based workshop led to further proposals for the handling of two topics, namely sugarcane quality and SSG issues. Table 6-8 summarises the proposals to improve cane quality and Table 6-9 outlines the created proposals for advancing SSG sustainability.

Proposal name	Proposal detail
Change cane rejection rules	•Increase practicality and strictness of the MGB rules for cane rejection .
Change cane testing procedure	•Test poor appearing consignment before it goes into the mill & can cause damage . •Reject consignment that proves to be poor.
Financial incentive or penalty system	•Financially incentivise the supply of good sugarcane quality or penalise the supply of poor sugarcane quality. •Precondition: overcome potential constraints against this initiative.
Smiley faces	•Allocate a smiley face on a notice board to growers delivering good quality and a sad face to growers supplying poor quality. • Quality advancement is stimulated by the creation of peer pressure resulting in an intrinsic motivation for improvement (similar principle as by 'name and shame').

Table 6-8: Recommendations to improve cane quality derived from participant discussion in the third SSM-based workshop

Proposal name	Proposal detail
Credit accessibility	•Enable access to credits for input factors. •Prevent misuse of funding.
Infrastructure	•Government: improve infrastructure to facilitate a better accessibility of SSGs' growing area.
Irrigation scheme	•Possibility to obtain grants for irrigation scheme exists. •But, there is uncertainty about water availability in the respective area.
Better contractor system	•Development of better contractor system currently in progress. •Improved contractor system: more reliable and more effective transport of SSGs' sugarcane.
Extension staff: mill or government	•Training is crucial. •Provide more extension staff: mill or government.
Property rights / farm size	•Adequate farm size is precondition for sustainability. •Farm extension limited by impossibility to obtain land rights. •Create enabling regulations and install a secure land tenure system.
Labour	•Improve labour supply.

Table 6-9: Recommendations to improve SSG sustainability derived from participant discussion in the third SSM-based workshop

Although generated proposals were less specific than intended, the accompanying debates enhanced participants‟ understanding of the issues. Ranking the proposals on the impact-ownership matrix facilitated insight into their feasibility and desirability. High impact and high ownership indicates that the corresponding suggestion is highly desirable and possibly feasible. The classification is shown in Figure 6-15 and helped to uncover worthwhile proposals.

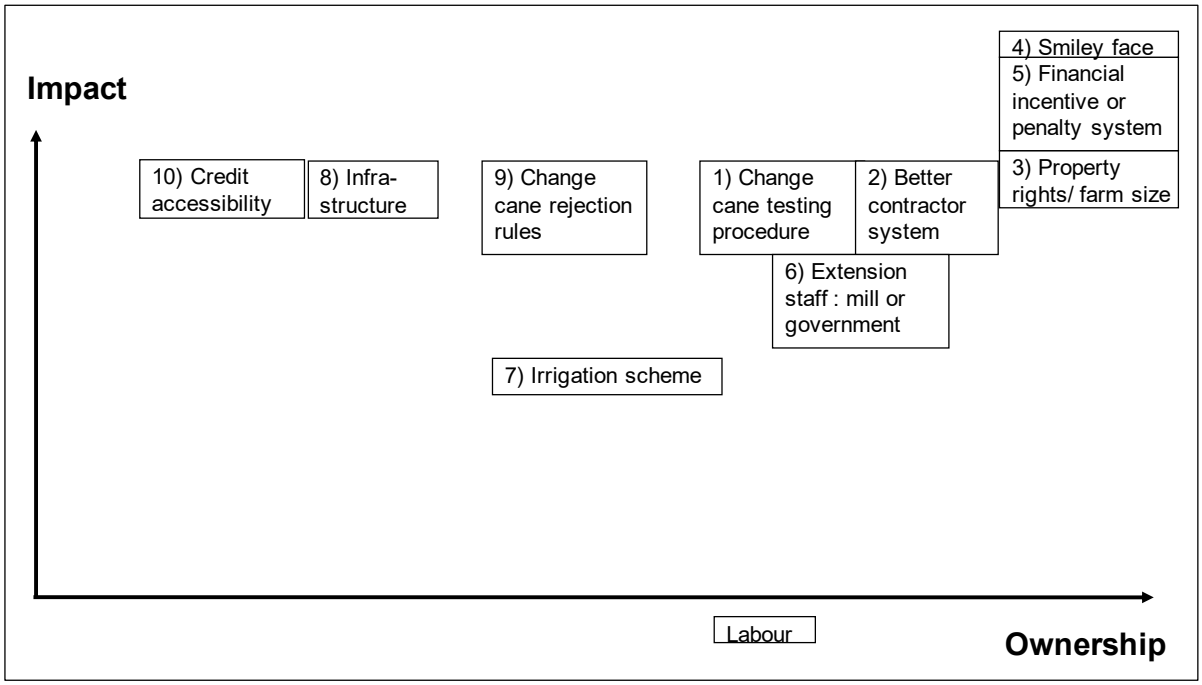

Figure 6-15: Recommendations on impact-ownership-matrix (Number 3, 4 and 5 are on the same position)

Based on this matrix, the introduction of a financial incentive or penalty system, or a system that assigns smiley faces, appears most promising to advance sugarcane quality. The realisation of these systems requires the approval of the Mill Group Board, which seems to be the appropriate body for following up these proposals. A change in the sugarcane testing procedure describes another seemingly worthwhile proposal. Changing the sugarcane rejection rules constitutes the least promising option, based on lower ownership, which indicates anticipated grower resistance. For the first three suggestions, Accommodation concerning their appropriateness was reached, but this did not imply Accommodation on their realisation.

6.6 Action To Improve

Despite my best intentions, the realisation of this stage could not be achieved. Although some proposals from the third workshop seemed likely to lead to Action To Improve, they remained in their preliminary stage. Pursuing the realisation of these proposals was outside the capabilities of this study, as it would have needed more support from stakeholders within the Umfolozi system, which was not given. The following section elaborates on the prevailing circumstances and their impacts on the SSM process.

6.7 Reflection on the SSM process

The process of Finding Out was unintentionally predominant in this study. The themes (Section 6.2) emerged primarily from the interview data, yet all workshops added to the Finding Out. The rich pictures (Appendix 4), charts generated from the knowledge café exercise (Appendix 5), and the conducted election exercises supported the theme identification. The second and the third SSM-based workshops inadvertently enriched Finding Out and the third workshop approved the overall integrity of the themes.

Workshop outcomes were less rich than interview data and featured a different focus, most likely due to the characteristics of workshop participation and maybe some facilitation deficits. The workshops were sensitive towards current events such as poor service delivery, concentrated on hard issues such as mill efficiency or cane quality improvements, and partly disregarded soft issues such as communication, living in a comfort zone and insular view. Hard issues generally achieved much higher results in the voting compared to soft issues. Participants never chose to discuss improvements possibilities concerning any of the presented soft issues, although they indirectly validated their relevance. For instance, participants mentioned that living in a comfort zone added to cane quality shortcomings, since stakeholders were not prepared to do their very best. This indicated that soft issues underlie hard issues. Since interviews, in contrast, surfaced soft issues and their significance, I propose that the workshops were insufficient for an in-depth Finding Out. Given similar circumstances, an interview process seems essential for comprehensive theme identification and Analysis Two and Three.

The negligence of soft issues indirectly confirms the presences of an insular view because participants fail to appreciate the system holistically. Growers‟ poor workshop attendance substantiates the validity of the following themes: comfort zone, deficient systemic commitment, insular view and becoming a real shareholder – a transition process. The reality that soft issues were hardly acknowledged could indicate difficulties concerning their handling. However, the challenges in dealing with soft issues and a generally lower sensitivity towards soft issues, might also explain why they were not chosen for further discussions.

Comparison and taking Action To Improve proved to be a difficult part of the process. Participants did not really engage with the conceptual models presented, although I encouraged them by asking questions like which of the illustrated activities exist already and which might be required (Section 5.5.2). The development of concrete improvement proposals was problematic. Participants preferred to elaborate their views about an issue and battled to move from discussing the issue per se to

generating specific recommendations and pining down changes, despite my emphasis on determining concrete suggestions. Although this might indicate a shortcoming in my facilitation skills, I propose that this situation arose from the fact that participants felt overwhelmed by issues and unable to address them.

Also, the workshop conditions especially regarding the lack of stakeholder participation largely contributed to encountered difficulties (Section 8.2.1). These shortcomings might have resulted from not knowing about the study, a low interest in this study, being tied up and unable to prioritise an engagement in the study, the lack of commitment to the system, a generally low motivation to engage in group processes or meetings or from living in a comfort zone and thus being complacent and not prepared to make any additional effort.

Furthermore, there seems to be a tendency within the sugar industry that issues are debated over and over again, rather than agreeing on specific activities to address them. Consequently, encountered difficulties might be a part of the industry culture.

Essentially, the SSM application resulted in ideas about feasible and desirable changes, but not in their realisation and learning was probably limited. The fact that only a few stakeholders participated in the workshops and that all different stakeholder groups were never present certainly compromised the learning effect. Yet, the few stakeholders who participated in the process indicated its value.

Three areas of concern regarding the SSM workshop process emerged from this discourse; *viz.,* participation, workshop focus, and Comparison and taking Action To Improve. Table 6-10 summarises the respective challenges.

Area of concern	Challenges
Participation	•Low participation. •Lack of representation from all different stakeholder groups. •Poor attendance of influential and important stakeholder (leadership). •Participants composition introduced bias.
Workshop focus	•Different focus in comparisons with interview process. •Focus on tangible issues. •Neglect of 'softer' issues.
Comparisons & taking action to improve	•Challenging to develop concrete proposals for action to improve and to move beyond merely discussing issues. •No real accommodation since no agreement on specific changes was achievable. •Debating the issue and potential suggestions rather than performing a real comparison, as suggested in Stage 3.

Table 6-10: Challenges encountered in the SSM-based workshops

6.8 Summary of improvement recommendations

This section presents desirable and feasible changes as identified by the preceding processes. The improvement suggestions constitute a consolidation of my reflection on the totality of improvement proposals, which included consideration about their feasibility and systemic desirability.

Table 6-11 to Table 6-14 summarises my improvement suggestions. Concerning cane supply increase and cane quality improvement the suggestions raised in Section 7.10 apply for the Umfolozi milling area as well.

Suggestions to address the various issues	
Issue	**Suggestion for improvement**
Becoming a real shareholder – a transition process: Embracing real mill ownership requires a *mindset shift* towards being a miller and a grower; hence any initiative that assists in performing this *mindset change* should be pursued.	• Area leadership (mill, grower, UCOSP) needs to show unity among themselves and conduct a leading role in driving this mindset change. • Mill needs to remain accessible, informative and trustworthy to foster ownership. • Growers having accomplished a mindset shift should encourage their peers to do the same. • Continuously emphasise the necessity and benefits of becoming a real shareholder. • Increase attractiveness of mill ownership. • Mill management needs to acknowledge growers' interests in their decision making. • Work jointly (miller and grower) on specific issues (e.g. cane supply, quality).

Fragmentation:
Overcoming fragmentation is critical to unlock improvement potential, but requires a *mindset change* towards seeing each other as partners; thus measures to induce this changed perspective need to be conducted.
	• Precondition: willingness to embrace a new perspective.
	• Leadership needs to
	  • Remedy the fragmentation between the different leadership groups themselves.
	  • Consider the entire system in their decision making.
	• Clearly communicate the reasons for decisions that apparently compromise one stakeholder group and ensure that this group is compensated.
	• Understand diverse driving factors and align them better.

Insular view & deficient systemic commitment : To overcome an insular & deficient systemic commitment a *new mindset* that looks at the system holistically and acknowledges the imperative to contribute to it is required.	• Leadership needs to emphasise the importance and benefits of a holistic consideration and systemic commitment. • Education about an holistic view and systemic commitment and their necessity. • Compensate growers for activities that compromise their own profit for the benefit of the system and clearly communicate this approach . • Incentivise system conducive and committed behaviour. • Conduct fewer regular meetings and create task groups. • Prove mill reliability and profitability to induce commitment. • Identify and deal with conflict points.

Table 6-11: Improvement suggestions regarding becoming a real shareholder, fragmentation, insular view and deficient systemic commitment

Suggestions to address the various issues	
Issue	**Suggestion for improvement**
Growers relation: To overcome poor grower relationships, growers need to appreciates the relevance of good grower relationships.	• Emphasise necessity and benefits adequate grower relations. • Awareness creation about reciprocal contributions to the Identify and deal with conflict points.
Comfort zone & resistance to change: The current *mindset*, largely resulting from living in a comfort zone and implying resistance to change, needs to be shifted towards a more holistic, committed and pro-active mindset that supports a common culture, to induce improvements in other issues.	• Adequate milling performance will facilitate the development of a common culture. • Area leadership needs to facilitate the mindset change in a participative manner. • Stakeholders, already having adopted a changed mindset, need to support the mindset change process. • Emphasising the relevance of a new mindset and the uniqueness of a grower owned mill. • External threat would induce a change, but not desirable.
Trust & communication: To increase trust & communication, respective measures need to be taken, which also need to facilitate a *mindset shift* towards discerning trust & communication as critical and being prepared to act accordingly.	• Area leadership needs to lead by example. • Create space for discussing contentious issues and install mechanisms that facilitate reconciliation. • Reassess and improve current communication mechanisms. • Act in a open, fair, honest, reliable and righteous manner. • Make an effort to communicate and to appreciate each other.

Table 6-12: Improvement suggestions concerning grower relations, comfort zone and resistance to change, trust and communication

Suggestions to address the various issues	
Issue	**Suggestion for improvement**
<u>Cane supply – quality, quantity & consistency :</u>	Cane supply improvements should be jointly pursued by millers and individual growers and area leadership needs to determine and implement respective approaches.
Cane quality improvement measurements need to appreciate factors potentially constraining their realisation, be flexible, and involve all affected stakeholder groups in their development.	• Any means of addressing deficiencies in the first four areas will facilitate quality improvements. • Grower and UCOSP leadership needs to become better and more committed quality driver. • Training and education regarding quality matters. • Showing the importance & advantages of delivering adequate quality. • Approach quality offenders. • Reconsider adequacy of MGB rules pertaining quality. • Investigate feasibility of a financial incentive system . • Implement ‘name and shame’. • Pre-test poor appearing consignments that might cause mill damage. • Improve mill performance and its ability to deal with poorer quality. • Mill profitability and dividend pay-out.
Necessity for cane quantity enhancements needs to be assessed and respective measurements installed.	• Demonstrate mill efficiency and profitability. • Awareness raising concerning the importance of supply increase • Realise means of horizontal and vertical expansion (e.g. bulk-buying of input factors, knowledge sharing, overtaking sub-optimal managed farms, developing vacant land, obtaining supply from other milling areas, implement irrigation scheme).
Millers and growers need to increase the consistency in their operations.	• Improve the compensation capability of the sugarcane scheduling system . • Consider the adaptation of the mill running speed. • Improve reciprocal communication to enable better adaptation.

Table 6-13: Improvement suggestions regarding cane supply

Suggestions to address the various issues	
Issue	**Suggestion for improvement**
UCOSP's central position in the system: Improving present displeasure and frustration concerning UCOSP, will improve the systems effectiveness, based on creating a better atmosphere and advanced relationships. However, the feasibility of most suggestions depends on the willingness of the UCOSP leadership's to progress accordingly, except when growers strongly start demanding their realisation.	• UCOSP leadership needs to adopt a more positive attitude towards its members. • UCOSP needs to increase its approachability regarding growers' concerns. • UCOSP needs to augment its transparency and information provision . • UCOSP should reconsider the accomplishment of none-core businesses. • Should non-core functions remain, UCOSP needs to demonstrate their significance and improve information provision about them . • Reconsider UCOSP board's accountability towards their members and the timeframe each board member can remain on the UCOSP board. • Linkages and collaboration between UCOSP & UCGA needs to be fostered. • Reconsider the payment of stakeholders serving on the UCOSP board or on the UCGA executive committee. • Consider the employment of staff to assist the UCGA leadership.
Mill related issues: To overcome mill deficiencies, which restrain the system's effectiveness, technical shortcomings, mill internal soft, operational and managerial weaknesses need to be addressed by the mill management.	• Concerns and perceptions regarding technical mill shortcomings need to be addressed by adequate information provision. • Assess mill's ability to cater for intended higher cane supply. • Top mill management needs to augment its interaction with lower managerial levels . • Top mill management needs to conduct an on-going effort to re-establish USM's credibility to increase employees motivation and stakeholders commitment . • To improve the mill internal culture, top management should define and exert USM's culture and identity and contribute to the Mtubatuba community. • Overcome fragmentation within mill leadership by creating awareness about it and facilitating team building.
Future prospect:	Since positivity concerning Umfolozi's future viability persists, it is not a theme in the findings. Nevertheless, some critical improvement suggestions and future plans are currently discussed and crucial issues need to be addressed to ensure the system's future sustainability. •Other relevant issues (themes) need to be mastered. •Reconsider mill capacity and sugarcane supply increase. •Consider the serious and permanent risk of another destructive flood. •Implement better sugar sales strategies.

Table 6-14: Improvement suggestions concerning UCOSP's central position in the system, mill related issues and future prospect

Many recommendations suggest increasing stakeholder awareness about issues and about the necessity and benefits of the handling of these issues. This emphasises the need for education and communication. The rationale that underlies these recommendations is elaborated in Section 7.10 in the following chapter. The area leadership should perform a pioneering role concerning the implementation of these recommendations, as a committed leadership seems essential for systemic enhancements.

As highlighted in Section 6.2.10 fragmentation and the first two global themes are interlinked and central. The handling of any of these themes facilitates the overcoming of shortcomings in other themes. For example, growers with a holistic view are more likely to embrace systemic commitment and mill ownership, and to leave the negative consequences of living in a comfort zone behind, once they perceive the benefits of this changed behaviour. This will in all probability result in improved two-way communication, as well as improved cane supply, sugarcane quality and consistency. These changes would encourage the reduction of fragmentation.

By implication, a mindset change that either induces an increased holistic consideration, improved systemic commitment, becoming a real shareholder, or ceasing living in a comfort zone, unlocks a vast potential. This mindset change initiates the self-enhancing loop in Figure 6-16, which assumingly engenders improvements in all global themes. Therefore, I propose the merit of pursuing a mindset change. Although the SSM process generally facilitates learning and thus a mindset change, the difficulties encountered in this study, such as problems with workshop participation prevented this (see also Section 6.7 and Section 8.2.1). Possibilities to promote this mindset change are discussed in Section 8.5.2.

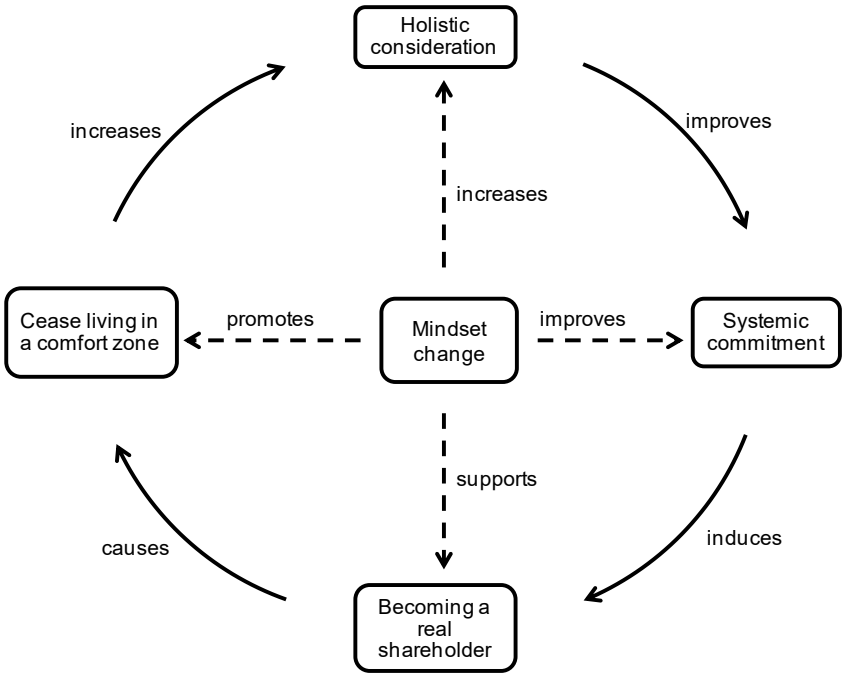

Figure 6-16: Self-enhancing benefits of mindset change

As indicated in Table 6-13 and Table 6-14, shortcomings concerning hard issues as for instance cane supply, can be addressed by other means such as improved coordination, or better farm management rather than a mindset change. Although these technical measures are relevant, I still propose the importance of handling soft issues. Soft issues seem to be the underlying reason for shortcomings in hard issues, and either contribute to them, or prohibit their elimination. Measures that concentrate on hard issues only might result in interim solutions, according to the system archetype „fixes that fail" (Braun, 2002) in the long-term.

6.9 Concluding remarks

This chapter presented the core issues that currently confront the Umfolozi milling area. It described the SSM application and the encountered challenges. SSM was highly suitable to facilitate the Finding Out, but weak in change implementation. Although Action To Improve did not occur, I outlined potentially desirable and feasible improvements. I further suggested that a mindset change offers the potential to facilitate advancements concerning several issues. However, for this mindset change to happen, some structural changes which allow for holistic consideration, systemic

commitment, and becoming a real shareholder, are required. This is further discussed in Chapter 8. The outcome of the VSM application in the Felixton milling area is presented and discussed in the following chapter.

CHAPTER SEVEN: APPLICATION OF VSM IN THE FELIXTON MILLING AREA

7.1 Introduction

This chapter presents the outcome of the VSM diagnosis of the Felixton sugarcane production and supply system. First, the outcome of the VSM diagnosis is described. Afterwards suggestions concerning the handling of identified deficiencies are made.

Figure 7-1 outlines the recursive fragmentation of the Felixton system and the sugar industry, which defines the scope of the Felixton system.

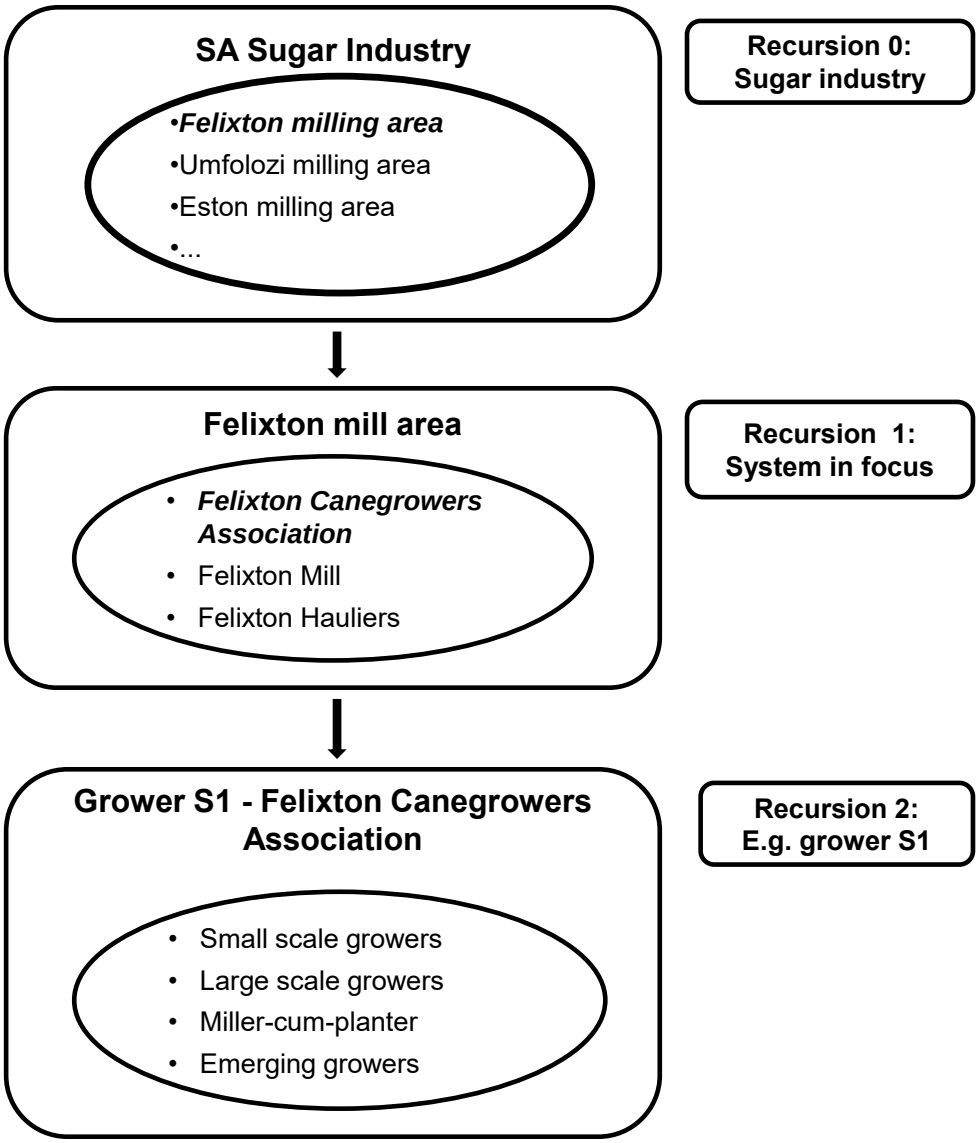

Figure 7-1: Recursive unfolding of the study context showing the position of the Felixton system and its embedded sub-systems

7.2 Operational units – S1

Figure 7-2 outlines the operational units of the Felixton system; *viz.*, grower S1, haulier S1, and mill S1.

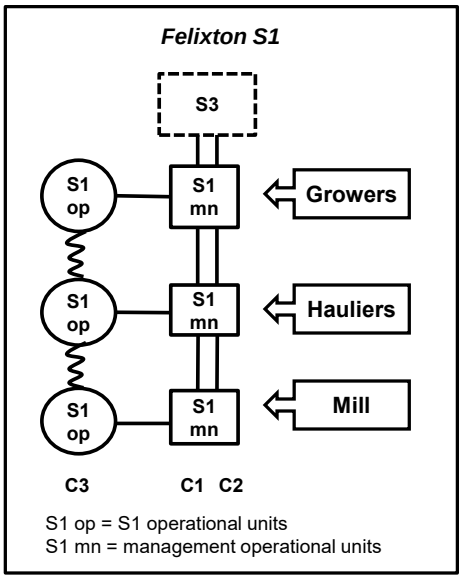

Figure 7-2: Overview of Felixton's operational units

The mill S1 is owned and operated by Tongaat Hulett Sugar Limited (THS). Despite diversity amongst growers regarding their aims, operations, challenges, and needs, I consolidated them in a single grower S1 for the purpose of the VSM analysis. Interviews substantiated the necessity to consider growers as one body. Large scale growers (LSG), emerging growers, growers-cum-planters and small scale growers (SSG) form the operational units of the grower S1. The haulier S1 includes all hauliers that deliver sugarcane to the Felixton mill.

Stakeholders emphasised the increasing importance of contractors which suggested their consideration as a separate S1. However, I allocated contractors to the environment, because they are service providers who primarily accomplish tasks that fall in the growers‟ scope of responsibility. Only an increase of contractors who perform a distinct supply chain task, such as harvesting, would warrant the creation of an additional contractor S1.

7.2.1 Mill S1

The mill S1 is tasked to continuously crush the delivered sugarcane, extract as much sucrose as possible and deal with all associated matters. In exchange for its services, it requires the consistent delivery of good quality sugarcane that is free of foreign matter. This request is transmitted via C1, C2 and directly via C3, the Squiggly Line in Figure 7-2. The local mill management oversees and manages the mill operations and carries responsibilities in other sub-systems in its mill S3 function

(Section 7.5.1.3). Internal mill challenges, apart from those that affect the entire system, are not presented since my focus is on the entire milling area.

Insufficient transparency, openness and communication with other operational units constitute a mill S1 shortcoming. This deficiency compromises other functions, such as C3, C2, S3 and S5. It contributes to fragmentation, insecurity, displeasure, mistrust, a deficient miller-grower relationship and poor mill credibility. Inadequate transparency results partly from an unawareness of THS‟s future plans at the local level and partly from the prohibition to share these plans. Despite the indication of slight improvements regarding these shortcomings in later stakeholder engagements, the necessity to further address them persists.

> *There isn't any transparency* (F4).
>
> *Mill manager…doesn't know anything from a strategic company point of view. If he does, he is not allowed to divulge it* (F1).

Perceived deficiencies are strengthened by an unsatisfactory transmission of information obtained from the mill within the grower body. This indicates a weakness in grower S1‟s communication channels, rather than a deficient mill transparency, and shows the importance of adequate information transmission.

> *The leadership knows … 100% where we are, whether that gets down to growers too …I have no idea* (F13).

Moreover, local mill management is discerned as powerless and missing the essential scope of action, which indicates a lack of local autonomy. This describes a serious mill S1 weakness. It constrains the ability of mill S1 to engage with other S1s and to deal with "*contentious issues …directly"* (F3). It further prevents the adequate contribution to S3 by mill management, which requires sufficient local autonomy. Mill S1 shortcomings thus lead to mill S3 deficiencies (Section 7.5.3.1).

> *Decisions aren't made at a local level; this is not just a perception but reality* (F21).

However, some stakeholders denied the validity of these statements. They discounted them as a remnants from the past, and promoted by growers who fail to attend meetings which outlined the mill‟s real scope of action. These stakeholders further emphasised mill management‟s ability to

make decisions locally, its pro-activeness concerning grower assistance and its ability to accomplish its mill S3 function adequately. Figure 7-3 summarises the reasons for perceiving the mill S1 as sufficient, although, altogether the vital necessity to strengthen its autonomy was confirmed. Nonetheless, restoring the mill‟s autonomy might be easier to achieve, than originally expected.

Decisions get made here (F18).

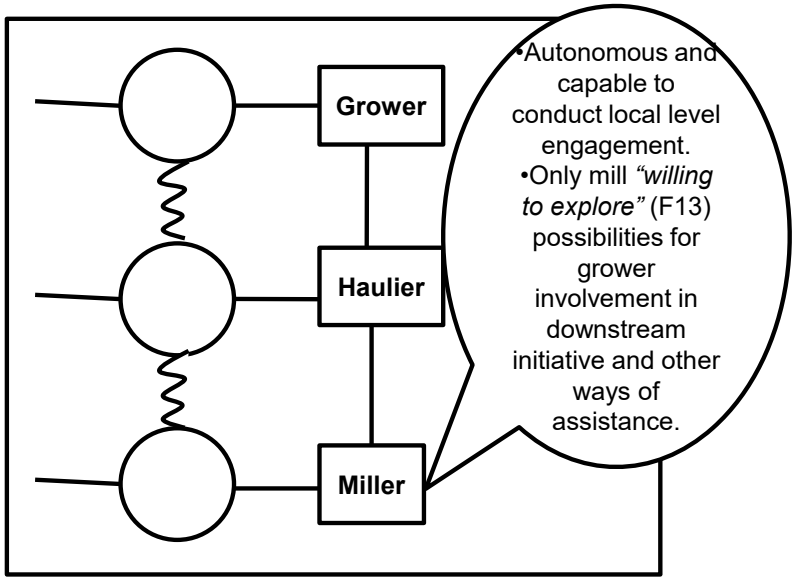

Figure 7-3: Presentation of some stakeholders' view of the mill S1

Furthermore, the mill S1 is challenged by insufficient cane supply and hence underperforms. This threatens the mill‟s viability and impairs the managerial capacity and effectiveness as well as the profitability and continuity of the entire system.

7.2.2 Grower S1

The grower S1 is represented by the Felixton Canegrowers Association (FCGA). A strong leadership that supports growers and *"more unity [among growers]… than ever before"* (F6) promotes the viability of the grower S1. The grower S1 is obliged to supply adequate sugarcane consistently and is responsible for the transport of sugarcane to the mill. Shortcomings in the accomplishment of these obligations surfaced.

Despite its overall strength, the viability and efficiency of the grower S1 is challenged. Growers fail to speak "*with one voice"* (F16). However, other stakeholders dismissed this perspective as negligible, based on the impossibility to "*get all to agree"* (F21). A commitment difference that contributes to discontent within the grower S1 exists. Some growers are dedicated, embrace a community spirit and strive towards progression, while others are apathetic or selfishly "*don't think further than themselves really"* (F15). Growers" resistance towards collaboration restrains them from a *"massive saving that [would be] available*" (F22) as a result of a better realisation of economies of scale.

The poor profitability of some growers and the financial hardships they face describe a further concern. Poor profitability effects the affordability and the realisation of best agricultural practice, such as replanting or adequate fertiliser application. A progression of this trend might cause a reduction in farming operations and thus in cane supply, which could further jeopardise the viability of the entire system. This trend, however, might as well encourage efficient growers to absorb the farms of under-performing growers. By implication, the profitability of remaining growers would increase, which would strengthen the grower S1. Although outlined difficulties need to be addressed, they do not thus far truly endanger the sustainability of the grower S1.

Compared to the mill, many growers perceive a power gap and experience themselves at the receiving-end of the relationship. The financial hardships of growers reinforces the feeling of being exploited by the mill.

> *It is very difficult to respect the mill when they are stabbing a knife into your back.* (F11).

The larger mill circle in Figure 7-4 indicates this grower perception which adversely affects the miler-grower relationship.

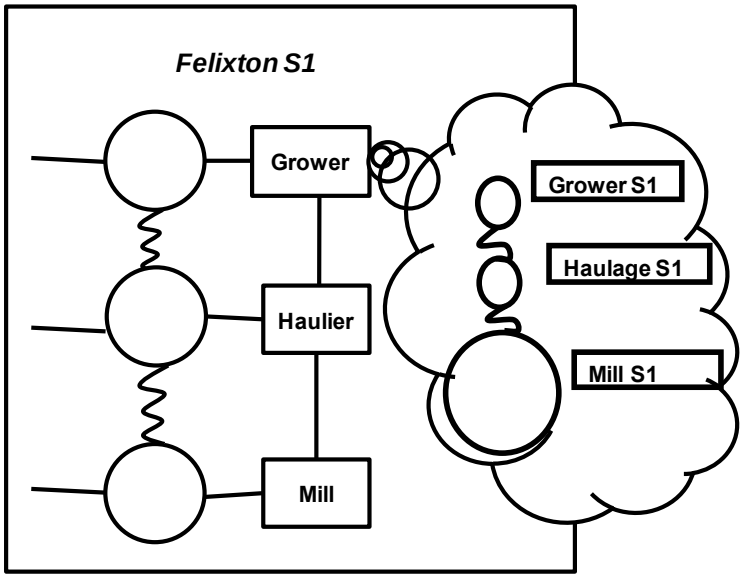

Figure 7-4: The distribution of power in the system from the perspective of some growers

Mill management contests the grower perception with regard to power and some growers request their peers to acknowledge the mill‟s mandate to *"maximize their profit"* (F16). In addition, some interviewees argued that growers should stop "*living beyond their means"* (F19), but rather focus on their farming operation which would enable them to survive harder times.

7.2.3 Haulage S1

Hauliers form an indispensable part of the sugarcane supply chain. This explains the importance of the haulage S1. However, the haulage S1 is constrained by the following conditions. Some interviewees perceived hauliers merely as service providers, rather than as integral parts of the system. Since hauliers are not involved in S3 or S4, their impact on the system is insufficiently considered. The interaction of haulage S1 with other operational units is thus impeded, and the system has only a limited capacity to monitor hauliers. These circumstances lead to inefficiencies and from a VSM perspective, even threaten the viability of the haulage S1. This suggests that improved integration of hauliers into the system is needed.

They are the step children of this family, because they live on the outside (F7).

7.2.4 Major cane supplier

The mill requires sugarcane from one particular grower for its continuous operation. The separate and oversized circle in Figure 7-5 illustrates the resultant one-sided dependency, which compromises the system by limiting S3‟s ability to enforce the implementation of crucial regulations. The sugarcane supply of this grower cannot, for example, be suspended to penalise inadequate cane supply, as this could force a temporary mill closure. Mill closure means that other growers also cannot deliver their sugarcane to the detriment of the entire system. The transport subsidy that the mill pays this supplier is another source of discontent. This is intensified by the grower perception that the mill could have sourced sufficient sugarcane locally, instead of becoming dependent on this major supplier.

It is him who is keeping this mill going (F8).

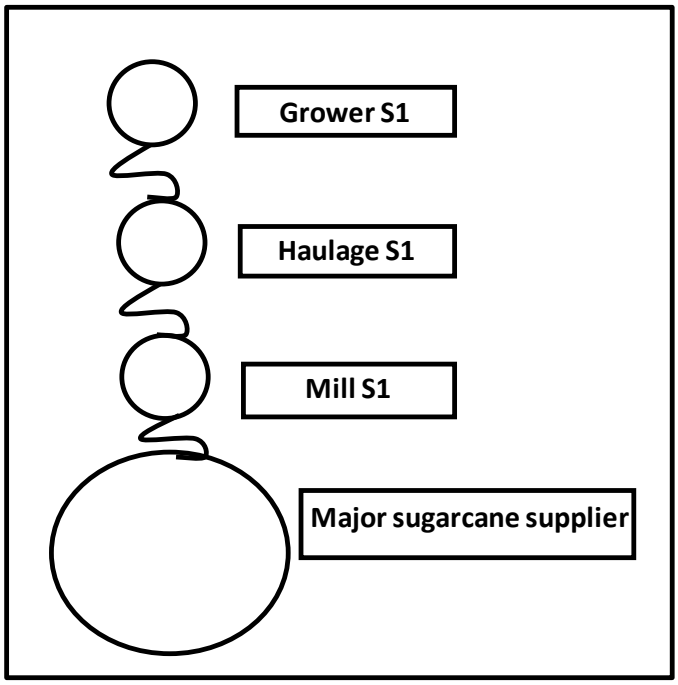

Figure 7-5: One-sided dependency on one supplier

7.3 Squiggly line – C3: operational linkages and relationships

The interaction and relationship between operational units was diversely described as well-functioning to poor. The former perception results from a supposedly improved

approachability and information provision from mill side regarding operational matters. An understanding of the basic operations of the system further eases interaction. This indicates *"pretty good"* (F7) working relationships and adequate communication mechanisms.

They communicate with each other quite often (F18).

Nonetheless, C3 enhancements are indispensable. Present C3 deficiencies such as fragmentation, low transparency, inadequate two-way communication and poor interactions impair the system. They result primarily from deficient trust, mutual appreciation and miller-grower relationships. The presence of these issues additionally indicates a S5 weakness. Interviewees propose that "c*ommunication has always been an on-going issue"* (F9), but the following C3 matter should be particularly considered.

The mill still provides insufficient information about technical mill shortcomings that impinge on the system. Growers thus "*believe that the mill is always hiding something from them"* (F5). This inhibits a trusting and appreciative miller-grower relationship. Disclosed improvements in this regard most likely arose from the fact that the grower S1 constantly approached the mill and pressurised it through such mechanism as the North Coast Forum. Nevertheless, THS"s confirmation of its commitment to Felixton promoted C3 improvement.

Very little trust between growers and millers, mainly because there's not enough openness (F4).

In the last 12 months...better sort of relationship forming (F22).

Growers likewise contribute to C3 shortcomings by "*not taking the initiative to communicate"* (F18) and hauliers equally insufficiently report to the mill report. Since this inadequate two-way communication constrains the mill operations, all stakeholders need to *"open up with each other"* (F6). Communication and feedback mechanisms should be advanced. The poor communication of the rail transport operator Spoornet further compromises the system"s performance as growers who are not informed about transport problems continue to cut and load their cane on railway waggons, which then remains at the loading zone. This causes no-cane mill stops and the consequent cane deterioration results in a loss for the individual grower.

The large number of different hauling operators causes more Squiggly Lines than the mill can adequately handle. The multitude of lines on the left side in Figure 7-6 illustrates this reality and

seriously challenges C3. It means that each single haulage operator would have to be contacted to ensure appropriate communication, information transmission and interaction. Adequate coordination (S2) requires a knowledge of the current position, delivery quantity and delivery time of each single haulier, which is impossible under the prevailing circumstances. The use of fewer hauling companies to manage the interplay of operational units, would improve their interaction and coordination. The thick line in Figure 7-6 shows this preferred state.

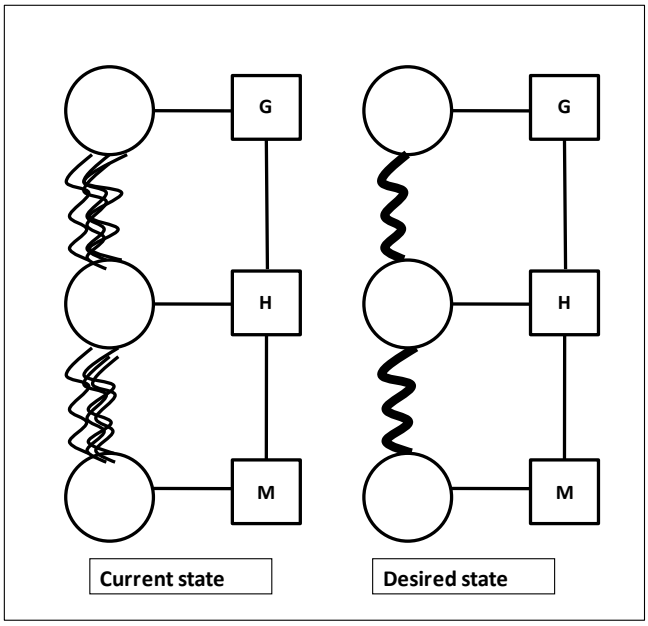

Figure 7-6: Illustration of the current and desired state concerning the interaction with hauliers

7.4 Coordination – S2

Although present coordination efforts and mechanisms are in theory sufficient, "s*ome people are way ahead, some are way behind"* (F7) regarding the amount of sugarcane they should have delivered at a certain point. This shortcoming and supply irregularities, such as times of oversupply and undersupply at the mill indicate a coordination shortcoming.

The daily rateable delivery (DRD) determines how much sugarcane each grower is supposed to deliver every day. The DRD constitutes the central coordination mechanism. Compliance with the DRD-system facilitates a smooth operation and ensures that the mill receives a constant supply of sugarcane. The cane supply department in the mill performs a S2 function, because it coordinates and monitors the DRD. It informs growers of one-off DRD adjustments due to unexpected problems

in the system, and follows up with growers who are behind their expected DRD. It also seeks to counterbalance supply outages. Stakeholders suggested that this coordination *"is as good as it can get"* (F1). The Mill Group Board liaison officer, who also approaches non-rateable growers, supports the cane supply department in its undertakings. A light scheduling system that either indicates that arriving hauliers are allowed to enter the mill yard or not, controls access to the mill and thereby facilitates coordination from a technical side.

Despite this, coordination deficiencies exist. Fragmentation, diverse hauling operators, an unwillingness to deliver throughout the day and unreliable rail transport impede coordination. The domino effect caused by unforeseen mill breakdowns and the system‟s inability to compensate supply outages because of insufficient capacity and flexibility, further constrain coordination.

The fact that coordination measures, which would work in theory, cannot be realised in this specific case, particularly limits coordination. These measures depend on stakeholders‟ willingness to obey them. Neither compliance with the DRD system nor adequate two-way communication can be ensured. Poor two-way communication indicates that an unawareness of the effect of reduced deliveries exists, and prevents an otherwise possible compensation for supply outages.

> *Not high on the list to tell them that you are not delivering* (F11).

S2 deficits partly arise from S3 shortcomings, because S3 needs to ensure compliance with present regulations. Operational units partially counterbalance coordination weaknesses. For example, the mill speeds up or slows down to adjust itself to available cane supply.

7.5 Daily management and control — S3 & S3*

Various committees contribute to the management of operational units. They establish guidelines and regulations, monitor their fulfilment and provide resources. The Mill Group Board (MGB), the Felixton Canegrowers Association (FCGA) and the local mill management in its S3 function (mill S3) are examples of the prime S3 groups. The following committees also accomplish some S3 functions, but compared to the former groups, their contribution to S3 is small:

- Pest and Disease Committee,
- Seed Cane Scheme**,**
- Felixton Grower Consortium,
- Transport Committee,

- Mill Cane Committee,
- Outreach Committee,
- Mill Extension Services,
- South African Sugar Research Institute (SASRI) through its extension officer,
- Cane Testing Service (CTS) and
- North Coast Forum.

Although some bodies only assist growers, I still perceive them as an S3 function, especially because the grower S1 is vital to the system. The industry organisations SASA, SASRI and CANEGROWERS also contribute to the Felixton S3, because they perform initiatives that promote local operational units.

The Pest and Disease Committee and the Seed Cane Scheme oversee the physical condition of farms, determine permitted sugarcane varieties and can impose the removal of infected sugarcane. The Felixton Grower Consortium facilitates the purchase of cheaper farming input factors such as fertiliser and the Mill Cane Committee, Outreach Committee and the mill extension service are concerned with SSG support. The Cane Testing Service examines the sugarcane quality and the sucrose extraction and contributes to miller-grower conflict resolution. The South African Sugar Research Institute, through its extension officers, assists growers via general information and scientific advice. The Transport Committee was re-established during our engagement and seeks improved efficiency of the current transport system. Its success would entail synergies, financial benefits, and crucial S2 advancements.

The North Coast Forum was recently established to strengthen the bargaining position of growers in negotiations with THS in matters such as insurance deals, loans or bulk-buying. It has already improved the miller-grower discussions. Nevertheless, from a VSM perspective, these miller-grower resource-bargaining interactions should occur in local forums.

7.5.1 Core S3 groups

7.5.1.1 The Mill Group Board

The MGB accomplishes essential S3 functions. It handles the day-to-day activities and constitutes the miller-grower interface. It is concerned with all cane supply related matters, consistent mill running and determines the length of the milling season. It sets the operational parameters, controls

compliance with existing rules and in theory possesses the power to sanction the noncompliance with these parameters and rules.

7.5.1.2 The Felixton Canegrowers Association

The FCGA assists growers, represents their interests and interacts with the mill and the MGB concerning miller-grower issues. Its Executive Committee engages in agricultural topics and grower concerns, such as problems with the rail transport. It seeks to source cheap input factors and informs growers about relevant local and industry matters. It also aims to enhance the system‟s efficiency by dealing with cane quality issues and non-compliance with the DRD-system. It monitors growers‟ performance and approaches those who underperform in these aspects. In principle, it "*can dictate"* (F9) certain behaviours, yet its *"power to sanction"* (F19) is queried.

The necessity to align growers‟ interests to facilitate an effective interaction with other S3 groups challenges the FCGA. The shrinking grower number and the time constraints under which they operate, lead to difficulties in finding volunteers for the Executive Committee of the FCGA. In addition, some interviewees feared that growers might lack the essential skills to accomplish FCGA functions, such as negotiations with the mill S3, successfully.

7.5.1.3 The Mill S3

Local mill management is another key S3 component. Besides dealing with cane supply matters, it partially engages with other S3 bodies, which includes resource-bargaining with growers and grower assistance. It further manages all issues regarding an adequate mill operation in its mill S1 function.

7.5.2 Central S3 matters

Cane quality, sugarcane allocation, resource-bargaining, resource provision and SSG and emerging grower assistance form the primary S3 affairs.

7.5.2.1 Cane quality

The MGB defines local quality parameters and cane rejection rules, based on "a*n industry guideline, which advises what is an accepted quality cane"* (F5). Cane rejection rules enable the mill to reject unsatisfactory sugarcane after consultation with a MGB representative.

CTS checks *"roughly 60-67 %"* (F12) of the supplied consignments. The ensuing reports inform growers about their cane quality and expose quality offenders. The MGB and its liaison officer can access these reports and thus should be knowledgeable about growers‟ quality status. The liaison

officer approaches growers whose cane quality is unsatisfactory, investigates the problem and offers guidance. He increases awareness about quality shortcomings and establishes certain procedures to address inadequate cane supply.

7.5.2.2 Sugarcane allocation

The DRD-system is compulsory and aims at ensuring consistency. The MGB determines and reviews each grower‟s DRD based on estimates and the duration of the milling season. It checks the accuracy of stated estimates, monitors growers‟ abidance to the DRD-system and deals with non-rateable growers. However, non-compliance to the DRD-system is generally not sanctioned.

7.5.2.3 Resource-bargaining and resource provision

Various resource-bargaining activities are conducted by various stakeholders. A consistent supply of adequate sugarcane is requested in return for continuous appropriate sugar extraction. Other miller-grower negotiations describe further resource-bargaining examples. Several bodies provide resources, mainly in the form of information, guidance or the bulk-buying of input factors. The mill S3, for instance, partially supports growers through fertiliser, ripener, loans or seed cane.

7.5.3 S3 deficiencies

7.5.3.1 Mill S3

According to some interviewees the mill S3 lacks approachability and engagement with other S3 groups, for example, the grower leadership. This view was, however, discounted as mere perception by other stakeholders who stated improved miller-grower interaction. Nonetheless, mill S3 shortcomings impede daily management and control and cause dissatisfaction within the grower body. This further impinges on S5.

> *Clear signs of Tongaat-Hulett not communicating anything* (F7).
>
> *Had quite a lot more contact this season with the mill* (F15).

The lack of local mill autonomy prevents the mill S3 from an adequate handling of operational matters, appropriate grower assistance and proper resource-bargaining (C2). The latter is prohibited because the *“players that are influential… aren't normally part of discussion”* (F3). However, some stakeholders denied these shortcomings (Section 7.2.1). They propose that the resource-bargaining is only hampered by a poor cash flow situation. They further suggest that growers

themselves contribute to resource-bargaining shortcomings, since they fail to pursue one common aim. The grower leadership denied this assertion.

The recurring confirmation of poor mill accessibility, openness, and autonomy and inadequate resource-bargaining clearly confirm a present mill S3 weakness. This was substantiated by stakeholders who argued that the presence of an influential role-player incorrectly indicated the adequacy of mill S3. Although the mill S3 in all probability is less deficient than originally assumed, remaining shortcomings need to be addressed, as they limit the efficiency of the system.

7.5.3.2 C2 deficiency

Resource-bargaining activities in general need to increase to better equip growers with resources. Thus far, C2 is insufficiently used for respective discussions, especially in the area of bulk-buying.

Dissatisfaction with the current sugarcane payment system is another resource-bargaining issue. Growers reject the current system, as they *"only get paid for the sugar"* (F17), but not for any additional value of sugarcane by-products, such as fibre. The respective resource-bargaining is accomplished at the next higher recursive level, because changes in the sugarcane payment system are determined at industry level. Nevertheless, the outcome of these negotiations influences the Felixton milling area. Dissatisfaction with the fibre and molasses reimbursements adds to local displeasure and miller-grower conflict. The non-remuneration for bagasse, which is sold to a neighbouring paper mill in particular results in frustration and is a missed local resource-bargaining opportunity.

The involvement of growers in other downstream activities and downstream payment is equally decided at industry level. However, should the industry develop towards vertical slicing, all these negotiations become part of the local resource-bargaining. Some interviewees doubted growers‟ readiness to engage in these negotiations with their miller at a local level, because they reportedly lack the required skills, capacities and resources. Mill management, in contrast, has sufficient resources to get all the essential support in the form of economic or legal advice.

7.5.3.3 Sugarcane quality and allocation – C1 deficiency

Despite poor quality, sugarcane is seldom rejected. Some stakeholders perceive the DRD-system as *"efficient enough to co-ordinate the cane supply"* (F2), while others revealed its insufficiency. The supply of poor quality sugarcane and the presence of foreign matter in the consignment (e.g. stones) together with the non-compliance with the DRD-system unveil a serious S3 shortcoming, as S3 is responsible for ensuring the rateable supply of appropriate sugarcane. These deficiencies

compromise other sub-systems, and thus the efficiency of the Felixton system. For example, stones in the consignment cause damage to the mill and the consequent mill stops affect all stakeholders, as *"nobody gets their cane crushed"* (F22). S3"s inability to facilitate compliance with the DRD-system and two-way communication impairs S2 and C3.

The following circumstances explain the ineffectiveness of what are, in theory, appropriate approaches. Available regulations are either simply not applied, or cannot be realised, as their adherence could disrupt the entire system. Previously successful regulations, like the *"ash scheme"* (F7) or the rock penalty system, were abandoned. The establishment of necessary penalty systems, or an increased enforcement of present regulations to prevent a behaviour that is detrimental to the system, seems impossible. Likewise, the intervention of the liaison officer has insufficient impact.

The implementation and tightening of present procedures is largely impaired by the poor miller-grower relationship. This indicates that S5 shortcomings impede a proper S3 function, because they imply the rejection of in principle adequate mechanisms. The reality that the mill operates at *"spare capacity"* (F11) and thus requires *"every stick of cane"* (F5) and depends on one major supplier explains why, in theory, pertinent procedures are not enforceable. This situation allows for greater leeway concerning consistency and quality shortcomings. Moreover, growers *"are very reluctant"* (F24) about penalising their peers, which further restrains the feasibility and tightening of given regulation. S3"s deficient capability to enforce compliance with existing regulations lies in its inability to exert C1, corporate intervention. Furthermore, shortcomings concerning rateable supply and cane quality are "*not followed up"* (F17) enough. The liaison officer"s capacity is limited and FCGA representatives rarely approach concerned growers despite their mandate.

> *We"ve done away with it, because of a fight with Tongaat* (F15).
>
> *The fact is, there is no stick to make sure that all the farmers stick to the daily rate.* (F11).

The poor financial condition of growers further impedes the production of good quality sugarcane, as it restricts an optimal input factor application. Some are of the opinion that quality shortcomings will resolve themselves, as some growers will realise that "*quality cane actually produces money"* (F17), whereas *"inefficient growers"* (F16) will succumb to financial pressure and drop out of the system. Nonetheless, cane quality deficiencies might compromise the system"s performance much longer than expected, because thus far no evidence of this development exists.

7.5.4 Audits-S3*

The MGB liaison officer, CTS, the Pest and Disease Committee, MGB and mill representatives conduct audits of the operational units. They monitor specified estimates, rateable supply, sugarcane quality, adequate sugar extraction, compliance with variety regulations, and the pests and diseases status of farms. They review reports, conduct farm visits, and check the consistency of the mill operation via the time account report.

However, S3* is insufficient. For instance, not enough farm visits are conducted, some stakeholders are completely unaware of these audits and haulage S1 is poorly monitored. These deficits are predominately a result of time and resource constraints.

7.6 S3–S4 balancing

Mill management handles daily matters and considers future aspects and thus conducts an appropriate S3 – S4 balancing. Several growers are largely concerned with short-term or medium to short-term matters, such as land claims or the implementation of minimum wages that might threaten their long-term sustainability. This compromises growers‟ long-term planning as they are focused on shorter term issues. Nevertheless, both groups acknowledge that the "*issues now govern the future"* (F21), which suggests an adequate S3-S4 balancing. Moreover, as soon as clarity about possible changes in the agricultural labour legislation and the accomplishment of the land reform exists, growers assumingly increase their long-term focus.

7.7 Outside and future – S4

The decrease in cane supply demands S4‟s prime attention. Millers and growers acknowledge the necessity to seek supply increase. Moreover, discussing opportunities to enhance the transport system which implies an improved sustainability also falls in S4‟s responsibility ambit.

At industry level, possibilities to engage in downstream activities and the development of vertical slicing are discussed. Although these discussions belong within the scope of the industry S4, their outcomes impact on the Felixton system. Therefore, the local S4 needs to consider these matters as well. The extent to which Felixton growers will be involved in downstream activities is uncertain. Many of them want to participate, but feel that their involvement depends on the mill‟s willingness to include them. Some growers are also worried about the requirements that accompany their involvement in downstream activities such as financial strains to build the required facilities. Generally, growers seem to be excited about the proposed vertical slicing, but are also slightly

concerned about the implied challenges, such as the need to increase their bargaining power for local negotiations with the miller. Mill management prefers a development towards vertical slicing and voiced their intention to get involved in co-generation with grower participation. Nonetheless, cane supply increase constitutes the mill‟s prime focus.

Various bodies accomplish S4 tasks. The mill deals with future matters and generates a "*4 year business plan"* (F5). The FCGA is likewise concerned with strategic issues. The North Coast Forum looks *"at the opportunities and threats"* (F12) and is perceived as the appropriate body for strategic discussion. SASRI‟s site-specific research also contributes to the local S4. Furthermore, sometimes "*a group of normally miller and grower"* (F22) engages jointly in strategic discussion and initiatives.

In summary, S4 activities occur predominantly within the different operational silos, rather than being collectively accomplished across stakeholder groups. The silo approach describes a S4 shortcoming. It fails to handle external and future matters such as the essential increase in cane supply adequately. This would benefit from a common effort of all stakeholders groups which apparently is limited by the mill‟s poor strategic openness. Some stakeholders‟ lack of awareness about future considerations further illustrates the necessity to strengthen S4.

7.8 Normative management – S5

Stakeholders suggested that industry regulations maintain the system and guide its direction. However, these guidelines seem insufficient as a genuine cohesive force as revealed in the several S5 shortcomings of the VSM diagnosis. Before discussing these shortcomings, circumstances that suggest that S5 exists and holds the system together are presented.

Sugarcane grows well in the Felixton milling area and sugarcane production is worthwhile. The profitability of the Felixton system seems to be the major cohesive force. It motivates stakeholders to remain in the system despite present displeasure. The cohesive force is fortified by positive future expectations such as the huge potential of the anticipated development in downstream activities.

> *It is all about money* (F9).

The incipient realisation that *"one is interdependent on the other one"* (F19) reinforces this cohesion with some stakeholders even stating that *"there is loyalty"* (F14) within the system. The present *"love-hate relationship" (F18)* between millers and growers, and an intention to make the

system work and benefit from implicit advantages can be seen as the culture that characterises and maintains the system.

The following advantages motivate growers to stay in the Felixton system. The close proximity of the Felixton mill affords the grower low-priced and convenient sugarcane transportation. The mill is the newest and biggest THS mill, the THS brand enjoys a high reputation and the sugar price is protected. These factors provide stability and security.

Some stakeholders stated that *"certain rules and parameters"* (F14) which are defined by the MGB hold the system together. The MGB apparently directs the system and is *"the nuts and bolts of most of the things"* (F17). The MGB, however, deals largely with S3 matters and thus appears to be of minor relevance for S5.

Nonetheless, the following circumstances indicate an insufficient common culture, identity, vision, direction and cohesion and thus clearly show the presence of S5 deficiencies. These circumstances contributed to the emergence of S5 shortcomings.

A feeling of solidarity, a team spirit and "*a proper vision"* (F24) is missing. The miller-grower relation features a lack of trust, conflict, and fragmentation. This is reflected in the statement that "*The mill is crushing the cane for the mill… [and] ….the grower is growing cane for himself"* (F14). Some growers have left the system already, while others deliberate about leaving it to set up their own mill. The perception that THS lacks transparency, accessibility and interest in occurrences on the ground, and favours a major supplier over local growers fortifies the miller-grower gap. Growers who are *"bitter with themselves"* (F16) presumably add to displeasure. An adequate S5 would create the intrinsic motivation that keeps the system together.

> *Guys next door bought into the mill there… so they left* (F13).
>
> *Growers and the millers they don't function together* (F19).

Inadequate cane supply and deficient two-way communication suggest that stakeholders fail to consider the system holistically and take responsibility for it, which points to a S5 deficit. The reality that hauliers are not "*an emotional part of"* (F11) the system verifies the insular view and an inadequate S5.

Some growers mentioned that they stay in the system solely due to a lack of choice. There is no viable cultivation alternative or another mill to be supplied with sugarcane and growers have signed cane supply agreements. This illustrates the absence of a genuine commitment to the system.

They [mill management] tied us up (F6).

Some local S5 weaknesses result from conflicts at industry level. Displeasure is transmitted downwards and constrains the Felixton system. This reality describes a disadvantage of the recursive connectivity between the system-in-focus and Recursion 0 (Figure 7-1). Nonetheless, present S5 weaknesses result primarily from local shortcomings.

The Industry there's big conflict (F13).

The present but weak S5 offers significant improvement potential. Existent S5 shortcomings cause deficient two-way communication and creditability issues and impair the functioning of other sub-systems, in particular S2, S3 and C3. They contribute to cane supply decrease and limit the joint handling of present challenges.

Nevertheless, mill management's comment *"we've got to get our growers up and viable"* (F13) suggests at least some acknowledgement of the importance of a holistic approach and the beginning of S5 improvements. This commencement is further supported by the following circumstances. THS increased its commitment to the system, by investing in the Felixton milling area, establishing grower assistance programmes, and expressing the intention to involve growers in possible downstream activities. An incipient improvement in miller-grower relationships was mentioned and stakeholders seem increasingly to recognise their interdependency and the necessity to operate holistically.

There is no doubt with regard to the continuity of the system. Present S5 deficiencies appear to be less severe than originally anticipated but they must be addressed due to their detrimental impact on the system.

7.8.1 Algedonic signal

The algedonic signal is an emergency alarm signal (Section 4.3.5) which alerts parts of the system. Examples include:

- Massive fires or serious droughts,
- Operational parameters defined by mill management,
- Severe decrease in cane supply and

- Threats that endanger the continuity of the whole system, such as massive drop in the sugar price.

Altogether, there is a lack of signals that get the attention of the entire system in cases where an occurrence endangers its viability. The reality that no specific stakeholders accomplish a S5 function might contribute to this situation. No signal seems to act as an algedonic signal and to induce the congregation of an emergency committee. This committee would ideally be composed of representatives from all stakeholder groups and collaboratively deal with noticed threats. It would report to the mill management and the grower leadership and could even approach the sugar industry if need be, as soon as a potential threat is detected. By implication, the algedonic signal mechanism is currently not sophisticated enough.

7.9 Environment

The environment of the Felixton system comprises a broad range of external factors, including the Felixton community.

Regulations of governmental bodies like the Department of Land Affairs, the Department of Trade and Industry, the Department of Labour, the Department of Environmental Affairs, the Department of Water Affairs, the Department of Agriculture and the local governments of the uThungulu and Umhlatuzi districts affect the system. For instance, the maximal payload of sugarcane trucks is determined and compliance with this is checked at the mill. This can cause delays and long queues at the mill and thus limit efficiency. Poor infrastructure in sugarcane growing areas, the Agricultural Union of KwaZulu-Natal and strikes further compromise the system, by for example constraining the sugarcane transport or resulting in short-term labour shortage. Government legislations like the Sugar Act (Act No. 9 of 1978) determine the system‟s scope of action (Legalb, n.d.).

The implementation of affirmative action is another political factor that impinges on the system and allegedly adds to a decrease in SSG cane supply, internal mill difficulties and problems with Spoornet. The implementation of land reforms affects the cane supply of the Felixton system and stakeholders whose land is under claim. The apparent lack of government support for SSGs and emerging growers is concerning because their poor productivity might endanger the system‟s viability.

When Affirmative Action came in, they put peanuts into the positions and we need people who know what's happening (F19).

The following external factors also influence the system:

- Environmental issues, like drought, pests or diseases,
- Petty crime,
- Contractors and the
- International sugar market and the world sugar price.

Petty crime implies that agricultural equipment, such as irrigation systems get stolen. Also, the performance of contractors reportedly is lower compared to the performance of growers.

7.10 Improvement recommendations

This section comprises suggestions for the handling of weaknesses that were surfaced during the VSM diagnosis and as a result of my reflection on stakeholders‟ recommendations (Chapter 5).

I frequently proposed to inform and educate stakeholders about the vital importance of a holistic view, a behaviour that considers its impact on the system, present interdependencies, adequate two-way communication, and appropriate cane supply.

Stakeholders might have been aware of some of this already, but their knowing seems to remain at a very superficial level. Had they truly grasped these aspects and their effects on their own operations, a consequent deeper understanding would have resulted in a changed behaviour. Therefore, I propose that only a deeper, emotional knowing, which I discern as the kind of knowing people internalise and act on, can induce change. The recommendations to inform, educate, and emphasise target this deeper level of knowing.

Communication and education have to demonstrate the impact of certain behaviours on individual stakeholders, as well as the system, explicitly. The illustration of feedback mechanisms and their importance for each stakeholder should create the desired deeper knowing. However, only if stakeholders perceive these feedbacks as relevant, will they change their current practice. The effects of stakeholder behaviours need to be shown in a way that is meaningful for them, in a „language‟ to which they respond. This is elaborated on in Chapter 8.

Communication and education should not be limited to a confrontational one-sided process that illustrates present feedbacks and tells stakeholders how to behave. Instead, the focus needs to be on stakeholder engagement and experiential learning (Le Roux and Steyn, 2007, Andrews et al., 2008, Haapasalo and Hyvönen, 2001). Experiential learning seems capable of engendering a deeper understanding and stakeholders‟ willingness to take ownership of their behaviour. It allows stakeholders to experience the effect of their behaviour in a „safe‟ and participatory manner. This is not perceived as confrontational and thus should support learning and a changed behaviour (Enciso, 2001). Experiential learning comprises diverse methods, emphasises stakeholder engagement, challenges present comprehensions and promotes an understanding of the bigger picture (Geurts et al., 2007).

Figure 7-7 summarises the above discourse and outlines that communication and adequate education entail a reinforcing process that leads to behavioural changes.

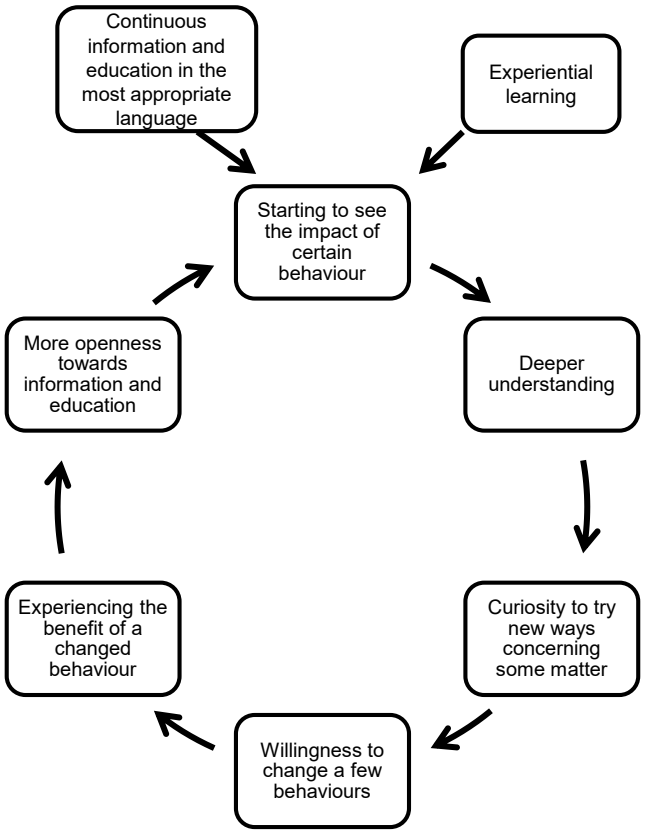

Figure 7-7: Inducing a deeper knowing that leads to behavioural change

7.10.1 S1 improvements

7.10.1.1 Grower S1

Outlining the importance of a holistic consideration and a behaviour that is beneficial to the entire system should encourage grower commitment to, and collaboration in, the system. Since the responsibilities of the FCGA became more demanding and time intensive, growers should consider employing professionals to support the FCGA and to master present difficulties. This would also free growers on the Executive Committee to concentrate on their sugarcane growing. However, this approach might be limited by financing problems and the reluctance of growers to give up control. Alternatively, growers should obtain additional support from CANEGROWERS.

7.10.1.2 Mill S1

The sugarcane supply urgently needs to be increased and the propositions outlined in Section 7.10.4 should be considered.

Mill management could disclose its local expenses and revenues to address the present grower perception of being exploited by the mill (Section 7.2.2). The importance of a profitable mill needs to be emphasised to the grower body.

The provision of adequate local autonomy and its utilisation is a critical approach given current mill S1 shortcomings that imply S3 deficits. Mill management has to increase its information transfer, its openness towards other operational units and its interaction with them. Essentially, it needs to assume its S1 and S3 responsibilities. Mill staff needs to experience local autonomy because they contribute to the conception of a poor mill S1. Likewise, the grower leadership should correct the false perception that mill management completely fails in its S1 and S3 responsibilities by informing its peers about conducted interactions with mill management and mill support. The outcome of miller-grower leadership discussions and an overview of information and assistance provided by the mill should be circulated within the grower body.

The realisation of these suggestions should facilitate resource-bargaining, C3, and S5 advancements, and possibly better miller-grower cooperation in S4.

7.10.1.3 Haulier S1

Means to better integrate the hauliers into the system have to be found urgently. The local leadership needs to promote the acknowledgement of hauliers as a crucial part of the system and should consider possibilities for their improved inclusion. The possibility to include hauliers in

meetings that address issues relevant for the entire system (e.g. MGB meeting) should be contemplated. Alternatively, the linkage between haulier representatives and the cane supply manager at the mill could be strengthened.

7.10.1.4 Major supplier

Due to the negative effects of one major cane supplier (Section 7.2.4) the mill should justify its strategy and equally support its local growers. This will diminish the present frustration among growers. In addition, measurements to ensure the adequate cane supply of this supplier without prejudicing the entire system need to be designed.

7.10.2 C3 improvements

All operational units need to enhance their communication and interaction with each other. This seems to require an adequate S5, because effective two-way communication follows once stakeholders perceive themselves as partners in an entity. Then again, any measurement that encourages C3 improvement, will add to relationship building and facilitate S5 advancement.

Experiential learning most likely facilitates a better understanding of present interdependencies, the importance of interaction and two-way communication, and thus supports C3 improvements. The mill should continue to lead by example by communicating operational information to all involved. Grower leadership should advise the mill concerning additional information that is needed to improve information provision and facilitate a better miller-grower interaction. The determination and use of the preferred communication medium should further support information exchange. However, compared to creating an adequate S5, this technical approach holds minor relevance.

7.10.3 S2 improvements

In principle, adequate coordination mechanisms (Section 7.4) should become functional as soon as S3 is able to ensure rateable supply and two-way communication. Anything that empowers S3 promotes S2 advancements. Likewise, the significance of two-way communication and compliance with the DRD-system should be emphasised.

The capacity of the cane supply department should be increased and a means to obtain additional supply from other wards should be established to improve the system‟s ability to compensate unexpected supply outages. This requires a creation of more flexible structures.

The presence of too many Squiggly Lines describes a C3 deficiency, which compromises S2 (Section 7.3). Less diverse hauling companies and a central body to manage them would improve C3, S2 and the overall efficiency of the system. It would result in reduced transport costs and a better integration of the haulier S1 into the system. Stakeholders should target and discuss corresponding changes in the transport system. In order to do this, they need to include representatives from all stakeholder groups and consider possible obstacles. This should facilitate a successful implementation of changes. The reestablishment of the transport committee seems promising with regard to the realisation of such a transport-project.

Present discussions concerning this transport project should continue. The central body that manages the haulier interplay has to be operated by a non-profit, miller-grower joint venture, as none of the groups is likely to accept sole responsibility. However, disagreement about the payment for the sugarcane transport and insufficient grower buy-in limit the immediate implementation of this transport project. Some growers prefer to continue with their own sugarcane transport, which they regard as more convenient and profitable. They also worry about possible negative effects of this project, such as a dependency on a single haulier or small haulier group, which might prove to be an expensive and unreliable haulage monopoly.

Despite these difficulties, stakeholders should try to handle the present challenges and concerns to further pursue this project. The strategies outlined in Figure 7-8 can assist in this. Furthermore, a local champion has to drive the project. Outside experts cannot implement changes in the transport system but they can support them with the needed expertise. Especially given their own time and capacity constraints, stakeholders should consider consulting an expert.

- Demonstrate the advantages of a changed transport system for the individual stakeholder.
- Consider present concerns and design ways to address them (e.g. growers should pay per loaded truck to prevent a poor loading performance).
- Growers who are reluctant to embrace a new system should be approached to understand their hesitancy and to address it.
- The new transport system has to be more cost-effective for the individual grower than the current system.
- It is impossible to convince all growers to enter a common transport system; thus means to incorporate their transport activities in the new system need to be designed.

Figure 7-8: Measures to overcome challenges in the implementation of a changed transport system

A centrally managed system would „enforce" rateable supply and appears the most appropriate to improve S2. This system would prevent the possibility for supplying less sugarcane one day and simply catching up the next day. This system daily assigns each grower a certain number of deliveries depending on their individual DRD. Not meeting these deliveries entails the loss of a part of the daily allocation.

In any case, stakeholders should consider the implementation of a scheduling system as it facilitates coordination. Its successful introduction, however, requires the approval of the majority of stakeholders.

As long as the presented possibilities are not realisable, stakeholders need to consider alternatives. To start with, the following three options could be discussed:

1. Designing a system in which growers enter their daily, proposed quantity delivered. The system is accessible to growers, hauliers and the cane supply department. Ideally, it alerts hauliers and the cane supply manager when a delivery deviates from the expected supply and thus enables adaptations.

2. Creating area-specific grower groups and compel growers to inform their area representative in the case of a deviation from the anticipated supply. Representatives inform the supply manager of the total deviation in their area. Alternatively, the supply manger contacts each representative to enquire about the area"s supply.

3. Employing additional staff who is tasked with making enquiries regarding the expected sugarcane supply and delivery time from growers or hauliers to assist the cane supply manager. However, this approach simply counterbalances coordination deficiencies, instead of being a real coordination tool and it involves added personnel costs.

The implementation of some kind of penalty scheme, such as payment deferral, could be considered to address Spoornet"s inefficiencies regarding reliable sugarcane transport. In this matter, THS and the industry also need to increase their pressure on Spoornet. Mill management needs to overcome operational mill problems to alleviate their tremendous knock-on effect on the system. An adequate S5 presumably further encourages S2 improvements, as it enables S2 to coordinate activities within one entity, instead of trying to coordinate fragmented units.

From a technical side, the establishment of a stockpile was suggested, but excessive cane deterioration negates this option. Also, a stockpile is an adaptation of the mill S1 to a deficient S2, rather than a genuine coordination mechanism.

7.10.4 S3 and S3* improvements

7.10.4.1 Sugarcane quality and rateable supply- C1 advancements

Increased cane supply will facilitate improvements concerning cane quality and rateable supply, as it empowers S3 to assert existing rules and to possibly even introduce stricter ones. Once the mill operates at capacity, lower supply on one day cannot be compensated by higher supply the next day; thus rateable delivery becomes imperative.

THS needs to continue the expansion of cultivable areas through replanting assistance and the rehabilitation of neglected or fallow farmland. Bulk-buying should boost growers‟ productivity, as the optimal input factor application becomes affordable. Likewise, the involvement of growers in revenues from downstream products should promote cane supply, because it makes sugarcane growing more profitable. Successful emerging grower and SSG assistance equally encourages cane supply increase. Stakeholders should additionally consider establishing an assistance scheme that offers practical help to dedicated growers who genuinely struggle.

The entire area leadership needs to become a driver for cane quality and rateable cane supply. This necessitates a better communication of the importance of these aspects. The leadership should emphasise the financial advantages of cane quality improvements and clarify the components of adequate quality. CTS should broaden its initiative of demonstrating to growers the effects of inadequate cane supply.

An improved presentation of the quality parameters of growers might be beneficial, as the current way of informing growers fails to induce quality improvement efforts. The new presentation should show grower‟s individual sugarcane quality and their position in relation to their peers. The grower ranking should be flexible, area specific and apply long-term averages. The disclosure of financial losses in comparison with peers who deliver adequate quality could prompt extra quality advancement. However, this approach may meet with resistance and needs to be handled with care because of its sensitivity.

The feasibility of MGB regulations has to be improved. Stakeholders should discuss options to modify and reinstate abandoned, but formerly effective, rules. This requires the correction of the

disadvantages of the regulations and growers‟ consent for their re-instatement. The rules need to be more flexible and applicable to all suppliers without constraining the system. Growers could be divided in different groups and group-specific measurements, such as cane rejection for LSGs and financial penalties for exceptionally large suppliers, could be applied. The use of adjustable benchmarks and flexible parameters, instead of fixed numbers should be considered. Applying the same set parameters to all growing areas and all growers appears inappropriate given the diversity of growing regions and of grower characteristics. Considering cane quality, area-specific quality parameters and percentages constitute a more equitable reference for cane rejection.

Stakeholders should additionally consider the establishment of a quality committee. This committee could execute improvement suggestions and further promote quality enhancements via the following activities:

- Contact growers who slip below a certain quality benchmark,
- Support the advancement of persistent quality offenders by means of a mentorship programme, whereby experienced growers advise inexperienced growers and
- Design area-specific guidelines for best management practice, based on its ten best growers.

Ideally, the committee receives support from SASRI and CANEGROWERS and is operated by the extension officer, MGB liaison officer and grower representatives, with the input from mill and MGB representatives. However, stakeholders might reject the idea of creating another committee, since several exist already and stakeholders become tired of committees. In this case, the temporary employment of a „cane quality pioneer“, who performs the outlined activities, might be more adequate.

Shortcomings regarding sugarcane quality and rateable supply require a better follow-up. Growers should be approached once they repeatedly perform below a benchmark to better understand these shortcomings and develop appropriate improvement actions. Affected growers should perceive this approach as a valuable, rather than as an imposed intervention. Therefore, a collegial approach that focuses on their needs in the development of pertinent corrective procedures is vital. The engagement with these growers should continue until they are stabilised above a set benchmark. The suggested quality committee seems most suited to execute the follow-up. Since the realisation of this approach exceeds the capacity of stakeholders who currently perform the follow-up, additional personnel need to be appointed. Difficulties in securing their remuneration could prevent the implementation of this approach.

The following factors further promote adequate sugarcane quality: growers‟ sufficient provision of production input factors, clean deliveries of sugarcane from areas not affected by rain and reduced cane deterioration through improved coordination.

Deficiencies in connection with rateable supply can be addressed by similar means as suggested for cane quality. A benchmarking system which reveals growers‟ compliance with the DRD-system could be created to pressurise deviant growers. The MGB could implement this system as it already monitors the adherence to the DRD-system. This system should be group-specific and flexible to cater for unforeseeable eventualities.

A holistic consideration that acknowledges the importance of behaving in a manner that is conducive to the system further encourages quality improvements and rateable supply. It assumingly prompts growers to operate in a system-compatible way, comply with its rules and approve needed regulation changes.

Since an adequate S5 induces commitment to the system and improves miller-grower relations, it advances the applicability of present regulations and thus empowers S3. It might even engender growers‟ effort to supply adequate sugarcane rateably.

7.10.4.2 Audits – S3*

Stakeholders need to contemplate opportunities to strengthen S3* and to increase its capacity. They should consider possibilities to include a haulier monitoring in S3*.

7.10.4.3 Mill S3 and resource-bargaining

The handling of mill S1 deficiencies (Section 7.10.1.2) by default implies mill S3 improvements. Should THS fail to enhance local autonomy, influential THS representatives have to attend discussions at S3 level. Provided sufficient local autonomy, mill S3 has to use this autonomy. The mill S3 needs to demonstrate its approachability and thus deal with grower requests, appreciate their perspectives and justify why certain support is unfeasible. Likewise, the impression that mill S3 entirely fails to accomplish its duties needs to be corrected (Section 7.10.1.2).

The determination of a priority list, over which local mill management possesses complete decision-making freedom, could support the resource-bargaining. In addition, growers need to speak with one voice and use appropriate channels. Their requests need to be pertinent, feasible, mutually beneficial and well-conceived.

Bulk-buying possibilities regarding the purchase of farming input factors need to be fully exploited. THS should increase its effort in this regard and stakeholders should consider other options to facilitate bulk-buying. The FCGA or the Felixton Grower Consortium might be able to conduct the entire bulk-buying programme. Alternatively, an extra S3 body, responsible for performing all bulk-buying, could be established.

7.10.5 S4 improvements

S4 activities should be jointly conducted by all stakeholders groups. They need to engage in strategic discussions and to collectively develop feasible future initiatives. This supports an adequate consideration of all perspectives, suggestions, and external factors, and thus promotes the suitability of intended future developments such as downstream involvement. The creation of a strategic forum would facilitate this approach. Haulier representatives need to be included in respective discussions, which should strengthen the haulier S1. Stakeholders could contemplate to what extent the MGB would be able to act as a strategic forum. Advocating for a joint S4, has however, no intention to discount the importance of the continuity of separate S4 activities within the specific stakeholder groups.

Grower and mill leadership, in particular, should deal jointly with the most pressing future matters, namely cane supply increase and the execution of the possible involvement in downstream activities. Mill management has to enhance its strategic communication and grower leadership needs to inform its peers about already occurring joint strategic discussions.

7.10.6 S5 improvements

S5 improvements have to be genuinely pursued, as an adequate S5 engenders advancements in other sub-systems and thus enables the system to realise its full potential. The following suggestions strive for cohesion and the development of a common identity and culture.

Millers and growers should explore possibilities to accommodate their diverse objectives, reduce tension, improve their relationship and create mutual appreciation and trust. The achievement of one aspect supports the others due to their interdependency. Honest and informal miller-grower interactions supposedly improve their relationship and thus trust and mutual appreciation. Grower days and informal gatherings might be one option to support this.

The opportunity to purchase THS shares at a reduced price, or growers‟ involvement in downstream activities, further advances the miller-grower relationship, as growers will feel that their interests

are being considered. Moreover, THS top management should occasionally visit the milling area to show interest in local occurrences. Likewise, more resource-bargaining interactions with growers encourage the view that millers and growers are partners in one entity.

The handling of mill S1 and mill S3 deficits (Section 7.10.1.2 and 7.10.4.3) should support the miller-grower relationship and is crucial because these deficits strongly compromise S5. Sufficient local mill autonomy should enable the mill management to contribute to the development of the identity, policy and direction of the system in collaboration with other operational units.

The area leadership has to champion a holistic consideration, which highlights the necessity to become system partners. The ensuing mindset change should facilitate the development of a proper S5. Stakeholders would discern the mill area as one system composed of millers, growers and hauliers, and behave in a system-compatible manner. The expected development towards vertical slicing might promote this development.

7.11 Reflection on the VSM usage

The study revealed the interdependencies between diverse sub-systems and channels. Weaknesses in one sub-system contributed to, or were caused, by deficiencies in another sub-system.

Mill S1 shortcomings, for example, engendered deficiencies in C2, C3, mill S3 and S5. Then again, S5 deficiencies implicated S3, S2 and C3 weaknesses, since the operational units lacked the intrinsic motivation to interact and to comply with S3‟s regulations. Likewise, a deficient C3 adds to S2 shortcomings and compromises mutual appreciation and thus S5. This circumstance indicates that improvement in one system or channel facilitates advancement in other systems or channels.

The allocation of certain activities to specific sub-systems or channels was partly challenging. The establishment of a separate haulier S1 (Section 7.2.3) was queried by stakeholders who insistently assigned hauliers to the environment. The assignment of contractors was equally ambiguous (Section 7.2). Likewise, the allocation of SASRI, SASA and CANEGROWERS appeared inconclusive. Stakeholders mentioned their contribution to the Felixton S3 and S4, yet these committees are particularly significant for the sugar industry, which is the next higher recursive level. Moreover, their consideration as external impact factors, suggests their assignment to the environment. This, however, lacks accuracy, because the Felixton system is embedded in the sugar industry. Since these three organisations primarily contribute to the sugar industry, I allocated them on the next higher recursion, but acknowledged their input to Felixton related systems.

Unexpectedly, S5 can be seen as a „choke point" in the system. Serious miller-grower conflicts, fragmentation, self-centred behaviour, poor transparency and deficient trust demonstrated S5 shortcomings. These deficiencies impair other sub-systems and thus the overall efficiency of the system. By implication, their handling constitutes a leverage point to improve S5 and the viability of the system.

The broader questionnaires of the fellow researcher and the SSM-based workshops supported the revelation and understanding of issues that challenge the viability of the system. This circumstance emerged from the project conditions, rather than being originally intended. It particularly assisted in a comprehensive appreciation of soft issues which contributed to deficiencies in the five sub-systems.

7.12 Concluding remarks

This chapter outlined the outcome of the VSM diagnosis of the Felixton systems. It highlighted the major shortcomings of the Felixton system and provided some suggestions concerning their improvement. The correction of identified deficiencies will further increase the efficiency and prosperity of the system and its individual stakeholders.

The chapter concluded with a brief contemplation on the VSM usage which is extended in the following chapter and reflects on the theory of VSM and SSM, the entirety of conducted empirical work and the research questions.

CHAPTER EIGHT: DISCUSSION

8.1 Introduction

This chapter outlines the contributions of this study from a theoretical and methodological perspective and regarding the investigated milling areas of Umfolozi and Felixton. The former is based on a review of the literature concerning SSM and VSM in the light of my experiences with applying these two methodologies. The latter is achieved by discussing my research questions. The chapter is thus composed of two parts. The first part discusses theoretical and methodological contributions, whereby one subsection concentrates on VSM, one on SSM and one on both methodologies with respect to the sugarcane supply chain context. The second part answers my research questions. The answering of my last research question presents a synthesis of both parts as it summarises the merits of SSM and VSM for this study.

8.2 SSM – theoretical and methodological considerations

8.2.1 Situation specific circumstances and lessons learned

The core intention of SSM is to facilitate a holistic understanding of a circumstance, and to facilitate learning and improvement. The realisation of these intentions implies the realisation of SSM‟s full potential. This section reflects on how the situation specific conditions in my study impacted on this.

As shown in Chapter 6, the application of SSM led to an in-depth understanding of the Umfolozi sugarcane production and supply system. However, agreement on desirable and feasible changes and improvement was not achieved and the learning probably was limited, and restricted to those few stakeholders who participated in the workshop process (Section 6.7). The study focused predominantly on Finding Out. I propose that this reality was caused by given circumstances, rather than a failing of SSM, or inadequate SSM usage. These circumstances are as follows:

- Inadequate stakeholder participation in the SSM workshops,
- Presence of certain soft issues,
- Characteristics of the sugar industry and
- Different value systems.

Inadequate stakeholder participation refers to low workshop participation, the constant absence of representatives from some stakeholder groups and the lack of influential stakeholders with decision-making power. The absence of the latter particularly impaired the SSM process, as they were essential to finalise and approve recommendations. It might have also led to the belief amongst other participants that this study was irrelevant and thereby intensified low participation. Moreover, it could indicate that influential stakeholders themselves lack commitment to change, which further compromises taking Action To Improve. Stakeholders whose input in the discussion of improvement is vital, and stakeholders who would execute the changes, were insufficiently represented. These circumstances added to a poor ownership of developed suggestions and a lack of change implementation.

Although SSM generally deals with soft issues, the presence of certain soft issues, such as living in a comfort zone, apathy, an unwillingness to change and to adopt a more holistic view, or deficient systemic commitment limited stakeholders‟ readiness to learn and move forward and thus directly impaired the SSM process. They also indirectly compromised the SSM process, as they added to inadequate workshop participation and hampered Accommodation.

The industry structure in all probability added to experienced difficulties. Dividing millers and growers in two separate silos impedes Accommodation on improvements and the implicit miller-grower conflicts inhibited adequate workshop participation. Accordingly, encountered difficulties could be perceived as an inherent feature or „fault‟ of the system, meaning that it is too complex to initiate change.

Stakeholders‟ different value systems most likely added another reason for the difficulties with change implementation. The value system determines the behaviour of stakeholders and the changes to which they are ready to aspire. Research, such as my study project, often aims at an increased efficiency, yet stakeholders might have other desired improvements or their value systems may conflict with each other. Some stakeholders might pursue the highest possible profitability, while for other stakeholders other things, like long-term sustainability, or spending time with their family, or things outside sugarcane production and supply are more critical. Although the latter certainly hampers Accommodation, I perceive the first two reasons as the main cause of the encountered difficulties.

Under comparable conditions and in particular where underlying soft issues cause resistance to change, SSM is unable to achieve its full potential. The realisation of the full potential seems to require the interplay of several factors, such as adequate stakeholder participation, stakeholders‟

willingness to learn, and a competent facilitation of the SSM process, as suggested by Callo and Packham (1999). Nonetheless, I advocate the merit of a SSM application, because it facilitated a comprehensive understanding of the studied system. It also served as a valuable sense-making tool, which is ~~as~~ a prerequisite for the handling of present issues and improvements. Since SSM highlights what should be changed, one can argue that it promotes change realisation, even though in this instance it in itself did not bring about such change. According to Holwell (1997) SSM‟s ability to show what needs to be changed is an advancement in itself. As a result, I state the appropriateness and suitability of SSM in similar contexts.

The presented difficulties enabled me to derive methodological lessons as encouraged by Checkland and Scholes (1990) and Connell (2001). These lessons resulted in the development of a facilitator guideline. The guideline, however, is not intended as a determinate procedure that the SSM user is obliged to follow, as this would contradict with Checkland‟s (2000b) emphasis on light-footedness and user-dependence. It rather seeks to encourage other SSM users to extend these methodological lessons and to assist inexperienced SSM users with its usage. Presented concepts shall eventually become internalised, in accordance with Mode 2 SSM usage.

The guideline is shown in detail in Table 8-1 and Table 8-2 and some key points are outlined below. Table 8-1 contains conditions that need to be met to realise certain SSM competencies. These conditions enable the SSM user to decide whether the characteristics of their situation allow the materialisation of the SSM competencies they intend to realise and whether or not SSM is the 'right' approach. Table 8-2 comprises general suggestions that promote the SSM application. In developing these guidelines I acknowledge the aspects mentioned by Kreher (1994), Connell (2001), Checkland (2000a), Callo and Packham (1999), Woog et al. (2006), Molineux and Haslett (2007), Reisman and Oral (2005), Winter (2000), Gregory and Midgley (2000), Kayaga (2008), Zhang (2010), Cordoba and Farquharson (2008), as outlined in Section 3.5.

Ability of SSM	Conditions for realising the respective ability
Holistic insight	• The SSM user will benefit from the ability of SSM to facilitate sense-making and a holistic insight. A rich interview process with a broad range of stakeholders is required. High workshop attendance and rich workshop process is not critical. • An increased insight among stakeholders requires their involvement in the SSM process and their participation in the SSM workshops.
Learning	• Stakeholders have to be willing, open and committed to learning. • Since an intensive interaction with, and among, stakeholders is critical for learning, they have to be involved in the SSM process, thus rich workshop participation is critical. • Since learning is time intensive, all involved and crucial parties need to have sufficient time available. • Ideally, the SSM user is part of the system and capable of facilitating sufficient stakeholder involvement and commitment to promote learning. • A perceived urgency for change boosts learning, as it engenders stakeholders' willingness to learn.
Change realisation	• Resistance to change will limit possible change implementations. • Change requires stakeholders' willingness to take responsibility for the system and for change. • A perceived necessity to perform change encourages change realisation. • Workshop attendance is essential, as change depends on jointly identifying and discussing change possibilities. • Influential stakeholders (power holders, decision-makers) have to participate in the SSM process, as they eventually determine the change that will be implemented. • Sufficient time availability of all involved parties is critical. • A SSM application that is driven by influential stakeholders from within the system promotes the SSM application and encourages change realisation. • The presence of shared urgency to address a certain issue, instead of an overwhelming mass of critical issues, supports change.

Table 8-1: Factors that are critical to achieve the value or declared goals of SSM

Criteria	Recommendation to meet criteria and promote SSM use	
Stakeholder participation	• Assess whether adequate stakeholder participation for the desired intention is achievable; if not additional methodologies need to be employed.	F
	• Evaluate stakeholders' relationships, as poor relationships limit stakeholders' willingness to partake in the SSM process.	F
	• Consider all relevant stakeholder groups in the SSM process.	F
	• Seek sufficient, genuine and committed participation of all affected stakeholders by repetitively and personally requesting their involvement.	F
	• Only apply SSM when an urgency to address an issue exists, as this boosts participation, alternatively the urgency has to be established.	S
	• Consider initially working with a small group of dedicated stakeholders to develop a pioneering group, which later drives the SSM process with the entire system.	F
	• Will be higher if the entire process is driven from within the community.	S
Driven from within	• Ideally, the SSM process is driven from within the community. Driven from within induces the required vested interest in the SSM process and thus encourages stakeholder participation and eases accommodation.	S
	• Either the SSM user is commissioned by influential stakeholders or is a powerful stakeholder himself.	S
	• Commitment and support from the leadership concerning the SSM process endorses it.	S
	• Receive a clear mandate, as such is important to support learning and Action To Improve.	S
	• Consider developing a pioneering group that drives the SSM process.	F
Adequate introduction	• Introduce SSM, including its aims, benefits, and the requirements for a successful usage, to all relevant stakeholders prior to its application. This should increase stakeholders' willingness to participate in the process.	F
	• An adequate introduction should encourage some responsibility which will foster the fulfilment of essential conditions.	F
Adequate transmission of progress	• A limited stakeholder participation especially requires the adequate dissemination of all outcomes of the SSM process.	S
	• Distribute a report which summarises the core discussion points and achieved agreements to all relevant stakeholders.	F
Critical supplements	• Interviews need to be included in the SSM process to facilitate the desired in-depth understanding that includes all issues and diverse perspectives.	F
	• Interviews are especially critical in case of poor workshop attendance or a reluctance to openly raise one's views.	F
	• The knowledge cafe exercise supports the derivation of relevant systems.	F
	• Ranking suggestions on an impact-ownership matrix facilitates their discussion and the accommodation on feasible and desirable changes.	F
Realisation of stage 2 and 3	• Seek the determination of feasible and desirable improvements.	F
	• The development of conceptual models to discuss improvement options is not essential, alternatively stakeholders can be tasked to develop concrete proposals for mastering certain critical issues.	F
	• Should alternative approaches for the determination of feasible and desirable improvements be chosen, the facilitator has to probe the assumptions that underlie these suggestions and effect debates on them.	F
Power issues	• Be conscious about the impact of power issues and power imbalances.	F
	• Encourage open and honest discussion that supports stakeholder communication competence, emphasises voluntary participation and elicits 'silent voices' and stakeholder willingness to consider new ways of dealing with issues.	F
Characteristics of good SSM facilitation	• Empathise with participants and establish rapport.	F
	• Consider and appreciate the diversity of perspectives and their linkages.	F
	• Ensure reflectivity and embrace flexibility.	F
	• Create a comfortable atmosphere which is conducive to open and honest discussions.	F
Comments: F indicates issues that relate to facilitation/facilitator S indicates issues that relate to the 'clients' system		

Table 8-2: Factors that support an SSM application

Being driven from within the studied system supports the SSM application and supports the realisation of SSM‟s full potential. It requires a closer collaboration between the stakeholders and the SSM user and the availability of local champions to boost the SSM process. In cases, where SSM is applied as an „imposed‟ research project, the likelihood of realising its full potential is lowered. Local championship could be developed by identifying, and then closely collaborating, with a group of committed stakeholders, like the „active‟ growers (Section 6.3.1) in this study. Regardless, permission of „powerful‟ stakeholders still needs to be given, as it is a precondition for change. The merit of a local championship concerning learning and change implementation and possibilities to develop it need to be explored further. Moreover, future research should extend presented methodological lessons.

8.2.2 Some critique in view of this study

A criticism queries the adequacy of SSM, as it apparently fails to engender change and improvements. Although I anticipated SSM‟s ability as a change driver based on the works of other authors (Checkland, 2010, Kalim et al., 2006, Winter, 2006, Wilson and van Haperen, 2010), my study confirmed the asserted shortcomings regarding change and improvement (Callo and Packham, 1999). It showed that SSM clearly revealed „what‟ needs to be changed, yet lacked competency in facilitating the implementation of this change, namely guiding the „how‟ (Kinloch et al., 2009, van de Water et al., 2007). This resulted largely from given conditions discussed in Section 8.2.1. Despite SSM‟s participatory nature (Kayaga, 2008, Checkland, 2000a, Molineux and Haslett, 2007, Brocklesby, 2007) and my endeavour to obtain rich stakeholder participation, the inadequate workshop attendance confirmed another criticism, *viz*. SSM‟s inability to guarantee adequate stakeholder participation. Such critique applies to other participatory methodologies as well.

Despite the validity of present critiques, I still advocate the adequacy, merit and suitability of SSM. Even critics appreciate SSM‟s ability as sense-making device (Bell and Warwick, 2007). I further suggest that the creation of the conditions proposed by the facilitator guideline assist in the realisation of change and improvement. Future research needs to investigate possibilities to strengthen the capacity of SSM to implement change. This should include research that explores the benefit of combing SSM with other approaches, as recommended by Sørensen et al. (2010), Reisman and Oral (2005), Zhang (2010), Bell and Warwick (2007), and van de Water et al. (2007).

Nonetheless, SSM most likely is not the most appropriate approach to induce change given strong resistance to change. It cannot, and does not intend to, impose change. Under such circumstances, a more autocratic approach might be required and critical systems thinking and in particular total

system intervention should be considered (Jackson, 2000). This reality, however, does not justify claiming that SSM, as a methodology, is inappropriate. It rather illustrates a case of poorly matching a problem situation with a methodology for its handling. By implication, it is vital to reflect on one‟s intention and prevailing circumstances prior to applying SSM. The absence of certain conditions (see Table 8-1) or the presence of circumstances comparable to this study (Section 8.2.1) certainly compromises the capabilities of SSM.

This study contributed to the elimination of the criticism that SSM research focuses only on the theoretical development of SSM, by applying SSM in a practical context, reflecting on encountered difficulties and deriving methodological lessons.

8.2.3 Criteria to justify SSM usage

Encountered challenges with change implementation led to a reflection on whether or not this study can still claim that SSM was applied.

Table 8-3 outlines my fulfilment of four elements that characterise any SSM application (Checkland, 2000a). The extent to which the core principles of SSM were achieved is shown in Table 8-4. Finally, I applied Checkland and Scholes‟ (1990) and Holwell‟s (1997) Constitutive Rules as evaluation criteria. My compliance with them is shown in Table 8-5 and Table 8-6. The term „fulfilled‟ means that by reflecting on a criteria and my SSM application, I came to the conclusion that the study sufficiently complied with the respective criteria.

Criteria	Satisfaction of Criteria
1) A perceived real-world problem situation	✓The real-world problem situation constitutes the complexity that characterises a milling area, such as the presence of various stakeholders with different and partially contradicting views, expectations and objectives; and the vast interconnectedness and interaction of its components. This complexity implies conflicts and inefficiency.
2) A process for tackling that situation in order to bring some kind of improvement	✓A holistic understanding of the present complexity to induce some improvements was intended. The process involved a rich stakeholder engagement, which comprised several rounds of interviews and various SSM-based workshops. Despite not achieving any obvious tangible improvement s, I still argue that the criteria is met. The advancement lies in the sense-making that leads to an enhanced understanding of the system, which according to Holwell (1997) is an improvement.
3) A group of people involved in this process and	✓Although participation was a concern in the SSM-based workshops, overall, the study featured comprehensive stakeholder engagement due to rich stakeholder participation in the interviews.
4) The combination of these three (intervention in the problem situation) as a whole with emergent properties	✓As shown in the research design and the Umfolozi findings chapter these three interacted in the study. The resulting emergent property constitutes my and partially stakeholders' improved appreciation of the complexity of the Umfolozi system, which enables the deduction of improvement suggestions.
Comments: ✓: criteria is fulfilled x: criteria is not fulfilled ✓/ x: justifiably not fully complying with the criteria	

Table 8-3: Compliance with four elements characterising SSM use (Checkland, 2000a, p.821)

Criteria	Satisfaction of Criteria
1) Real world is seen as complexity of interactions	✓ I investigated these interactions and interconnectedness in the studied system.
2) Models of purposeful activities comprise an explicit worldview	✓ Generated models contained an expressed worldview. Although only a few models were engaged, I reflected on the underlying perspectives that led to actions and approaches taken by stakeholders.
3) Models of purposeful activities are used to explore relationships and to structure a discussion about a situation, and not to model the real world	✓ Models were used to initiate a discussion about a situation, rather than an illustration of realty. ✓ Models were used to explore relationships and interactions. The subsequent discussion facilitated my better understanding of the studied system, but stakeholders insight was only increased to a limited extent, due to low stakeholder participation in the respective workshop.
4) Action to improve requires accommodation	✓/ x I acknowledged this reality and sought accommodation, yet given circumstances limited the extent to which it was achieved.
5) Theory and practice are strongly connected and integrated in each other; their interaction forms an on-going learning process	✓ I acknowledged this reality, but perceive it as predominately relevant for SSM's emergence . Regardless, using a inductive approach concerning the revelation and determination of Umfolozi's core issues, also caters for this principle.
6) SSM is adaptable to ensure suitability for specific circumstances	✓ Justifies my adaptations and warrants my claimed SSM usage, despite the impossibility to entirely comply with the constitutive rules and all criteria.
7) SSM itself constitutes a continual learning system, which facilitates and anticipates learning	✓ I strongly aspired to facilitate learning among partaking stakeholders, but experienced difficulties with its realisation. However, this is not based on not using SSM, but on given conditions.
8) SSM is most beneficial when used as a participatory approach, but is not limited to such	✓/ x Despite strongly seeking sufficient stakeholder participation, it was not achieved in the workshop process. However , such does not imply that my SSM application fails to be SSM.
Comments: ✓: criteria is fulfilled x: criteria is not fulfilled ✓/ x: justifiably not fully complying with the criteria	

Table 8-4: Compliance with SSM principles derived from Checkland and Haynes (1994, p. 195) and Checkland (2000b, p. 16)

Criteria	Satisfaction of criteria
SSM is a structured way of thinking, focusing on real-world problem situations and intending to bring about improvements	✓Using SSM guided my thinking about the complexity that characterises the Umfolozi system. ✓Inducing concrete improvements was intended, but especially a comprehensive understanding of various interlinked issues, contributing to present inefficiencies; this sense-making also constitutes an improvement.
The structured thinking is based on systems ideas and any usage claiming to be SSM needs to be expressible in terms of SSM's explicit epistemology	✓Systems ideas, such as looking at the whole and present interdependencies, rather than issues in isolation, characterised my study and present interrelations were frequently indicated. ✓In illustrating the outcome of applying SSM, SSM notions are used.
Claiming SSM use requires that: *1) there is no automatic assumption that the real world is systemic; taking parts of the world to engineer them as systems can only be done by conscious choice*	✓Assuming that the world is composed of systems was denied, instead the process of inquiry into the world was systemic and I consciously drew boundaries around defined systems or issues.
2) careful distinction is made between the engaging in the everyday world and the conscious systems thinking about it; the user iteratively and consciously moves between the two	✓I engaged with stakeholders during various field-work phases to disclose relevant issues, stakeholders' perspectives about them and their diverse worldviews; afterwards and especially during data analysis I consciously reflected about these engagements, revealed issues and the diverse and partly contradicting perceptions. ✓This process was conducted in an iterative manner.
3) holons, like `purposeful activity systems', are constructed, embodying the 4 basic ideas: emergent properties, layered structure, process of communication and control	✓Conceptual models were prepared and discussed with stakeholders. ✓/ x The models featured emergent properties and a layered structure, but lacked the monitoring and control aspect to ease their comprehensibility for stakeholders. This is justified by Checkland's allowance for situation specific adaptations.
4) holons are used to interrogate the real world to articulate a dialogue about desirable and feasible changes	✓Prepared models were used to induce a dialogue about feasible and desirable changes. This also facilitated a better insight, which constitutes one of SSM's intentions. x Only a few of the models formed the basis for this dialogue, and given conditions prevented the genuine determination of desirable and feasible changes in the respective workshop. ✓/ x Considering the entire stakeholder engagement, it was possible to derive some seemingly feasible and desirable changes. Consequently, the requirement was met, although not from of a participatory workshop process, which involves all stakeholder group to discuss feasible and desirable improvements, as requested by SSM's mode1 in. However, given circumstances and time constraints limited the practical validation of the desirability and feasibility of derived suggestions.
SSM's flexibility requires a conscious reflection about the adaptation to a particular situation	✓Encountered challenges and their impact on the SSM application are outlined.
Any SSM use will potentially lead to methodological lessons, which await extraction	✓Methodological lessons are derived from this SSM usage.
Comments: ✓: criteria is fulfilled x: criteria is not fulfilled ✓/ x: justifiably not fully complying with the criteria	

Table 8-5: Compliance with Checkland and Scholes' reviewed Constitutive Rules (1990, adapted from p.286-287)

Criteria	Satisfaction of criteria
Philosophical level:	
1) Social reality is continuously socially constructed	✓This perspective was embraced.
2) Use explicit intellectual devices consciously to explore, understand and act in the respective problem situation	✓Accomplishing, for instance, the logic- based and cultural- based stream of analysis facilitated a rich insight in the situation.
3) Include in the intellectual devices 'holons' in the form of systems models of purposeful activity built on the basis of declared worldviews	✓ Conceptual models were prepared on the basis of a declared worldview.
SSM process:	
•Uses activity models	✓Generated models were used in the 2nd SSM workshop.
•Entails an understanding of the history of the situation, the cultural, social and political dimensions of it	✓These aspects were considered by means of reflecting on Analysis Two and Three and exploring underlying issues throughout the whole process.
•Focuses on learning one's way to accommodations which either enables action to improve or sense making	✓SSM facilitated my sense-making about the situation. x Despite sincerely aiming to enable stakeholders to learn their way to sense making or improvements, given circumstances limited accommodation and the realisation of this intention.
•Applies discourse and debate for learning and achieving accommodation	✓ Discourse and debates occurred. x Given circumstances impaired learning, accommodation and thus improvement.
•Is necessarily cyclical and iterative	✓ Field-work and analysis phases alternated iteratively.
SSM techniques	
selection from RP, RD, CATWOE, Formal Systems Model, the what/ how distinction, or structures such as the PQR-formula is used, but not limited to this pool of techniques in the process	✓The following SSM techniques were explicitly used: RP, RD, CATWOE and conceptual models ,and the PQR formula helped in framing the RD.
Comments: ✓: criteria is fulfilled x: criteria is not fulfilled ✓/ x: justifiably not fully complying with the criteria	

Table 8-6: Compliance with Holwell's Constitutive Rules (1997, adapted from p. 401-402)

Despite my best intention to adhere to these criteria, their satisfaction was not fully achieved. For instance, I generated conceptual models with the aim of facilitating learning, accommodation and

improvements, yet this was not fully accomplished (Section 8.2.1). Nonetheless, I claim SSM usage for the following reasons:

- Table 8-3 to Table 8-6 showed that I fulfilled most of the criteria, regardless of encountered difficulties,
- I sought to comply with these criteria and the essence of SSM and
- Checkland (2000b) repetitively emphasises flexibility, situation specific adaptation and Mode 2 usage.

Since I claim SSM usage, despite weaknesses in entirely fulfilling all criteria, I propose that less strict criteria, in particular compared to Holwell‟s (1997) Constitutive Rules, might be required. This is supported by the reality that calling for the strict compliance of Holwell‟s rules, seems inconsistent with Checkland‟s (2000b) emphasis on light-footedness and his refusal to precisely define the „how‟ of the SSM process. Nevertheless, evaluation criteria have to include the interpretive paradigm of SSM as this prevents misconceptions and misuse of SSM (Holwell, 1997). Provided that compliance with this paradigm exists, looser parameters like Checkland‟s (2000a) four elements, or a genuine endeavour to comply with SSM‟s principles, and to strive for learning, a holistic understanding and improvement, appear sufficient as evaluation criteria.

Premised on this discourse, I suggest the criteria in Figure 8-1 as possible assessment criteria for a claim of SSM use. They intended to incorporate the repetitively emphasised light–footedness. In accordance with Checkland and Scholes (1990), I seek to facilitate a dialogue about SSM usage, rather than irrevocably set an SSM application. I encourage other researchers to explore the suitability of these criteria in the view of their SSM applications and to add to the discussion on SSM assessment criteria.

- Foundation: problematic perceived real world situation requiring some kind of improvement.
- Emphasis: learning, sense-making, holistic understanding, and/or improvement.
- Underlying theoretical and philosophical concepts needing to be accepted:
  - Interpretive framework.
  - Reality and the world is continuously socially constructed and interpreted and describes a complexity of interactions.
  - Sustainable improvements require accommodation resulting from genuine, honest and open discussions that enable all affected stakeholders to contribute.
  - Focus lies on stakeholder participation and the relevance of the human element in any situation.
  - Discussions are crucial for learning and accommodation.
- Process:
  - Structured way of thinking which is conscious about acting in the world or thinking about it.
  - Consciously uses intellectual devices to holistically interrogate and grasp a situation, to be explicit about their contained worldviews.
  - Holistically approaches a situation including its history, cultural, social and political dimensions.
  - Ideally iterative and on-going.
  - Applies SSM tools, like RP, RD, CATWOE, conceptual models, PQR -formula, but is not limited to this pool of techniques.

Figure 8-1: Possible criteria to assess a claim of SSM use (derived from my reflection on the study and the criteria provided by Checkland and Haynes, 1994, Checkland, 2000b, Checkland and Scholes, 1990, Holwell, 1997)

8.2.4 Worldview

By virtue of my being German, I observe that the explanation of the concept worldview accords with my German understanding of Weltanschauung, which is more comprehensive than its English counterpart. The concept was introduced in Chapter 3 and is repeated in Figure 8-2 for illustrative purpose. Checkland himself proposes that the term Weltanschauung is more appropriate for SSM purposes, because it comprises a variety of aspects and several notions (Checkland, 2000b). He emphasises the importance of this richness, by sometimes using the German word Weltanschauung, which incorporates one‟s ideology, world outlook and philosophy of life.

Worldview describes a person's individual understanding of the world. This means the way humans perceive and construct their world and make sense of it, which is always in a manner comfortable to them. The concept worldview includes our inherent images of the world and the things we take for granted. It implies the notion that humans have individual assumptions, values, perceptions, intentions, norms, beliefs, personalities, backgrounds and experiences, which shape and influence their respective worldview.

Figure 8-2: Exploration of the concept of 'worldview'

As shown in Figure 8-2, a broad range of matters such as assumptions, values, views, objectives, backgrounds, experiences and cultures, influences the worldview of an individual. A person‟s worldview is everything the person stands for. It is deeply embedded in their personal characteristics. The German word „Weltanschauung‟ comprises a philosophical or religious component, as one‟s worldview is completely internalised. The embraced worldview determines what someone perceives as right or wrong or as the truth, which then naturally influences one‟s behaviour. As a result, a person‟s worldview defines the way that person sees the world, makes judgments and consequently acts.

The concept worldview is very powerful, as it facilitates the adequate consideration of all the mentioned aspects. It helps to explain why an action appears logical to one person, based on their adopted worldview, while it is inexplicable to another person. Embracing a certain worldview might even imply the refusal of given facts. No one would voluntarily act in a way that contradicts with his worldview. Awareness that different people hold different worldviews, should facilitate the exploration and handling of conflicts, as the underlying sources can be investigated. Individuals who neglect the reality that diverse people hold diverse worldviews, are often hostile to other views and fail to understand the behaviour of others. Also, the opinion that „my worldview is the right one‟ is quite common and means that this worldview is strongly defended and consequently compromises change. For these reasons it is pivotal to appreciate the present worldviews in a studied system.

8.3 VSM – theoretical and methodological considerations

8.3.1 Importance of S5

The presence of soft issues, like miller-grower conflicts, self-centred behaviour, low transparency and poor trust, indicates a weak cohesion and the absence of a common culture, identity, vision and direction and points to a S5 shortcoming.

An adequate S5 would facilitate a joint culture and identity where stakeholders genuinely acknowledge that they are system partners and consequently have to realise the full potential of this system and serve its purpose collectively. This would support the elimination of conflicts and self-centred behaviours, promote trusting and appreciative relationships, and increase internal information exchange and communication and transparency. This discourse demonstrates the close linkage between S5 and soft issues. As outlined in Figure 8-3, an inadequate S5, among other factors, contributes to soft issues.

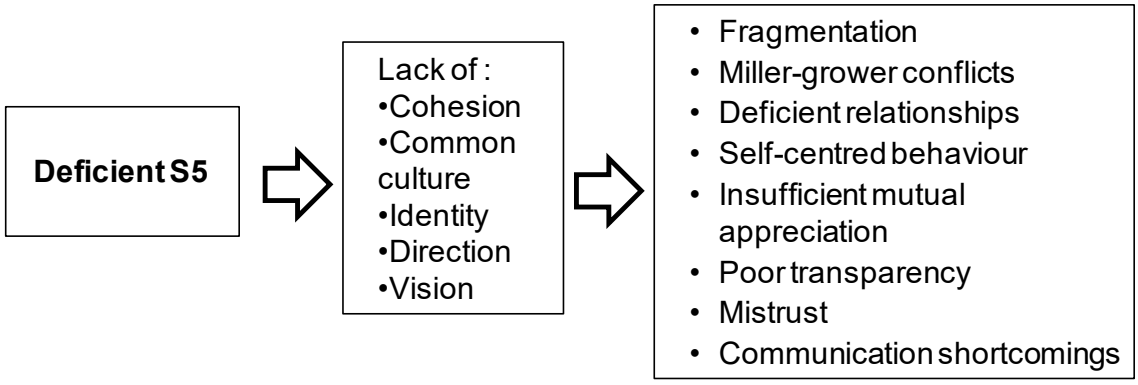

Figure 8-3: S5 shortcomings contribute to soft issues

Chapter 7 showed that these soft issues impaired the adequate functioning of several VSM sub-systems and channels. Their accurate operation, besides certain regulatory and managerial aspects, depends on the appropriate handling of „people issues". These issues can incapacitate properly working systems. For instance, adequate two-way communication is critical for proper coordination. This reality emphasises the importance of an adequate S5 which facilitates the handling of these soft issues.

The VSM literature, however, seems relatively silent about the importance of S5 and soft issues, regarding the viability of a system. Their significance and their connection either appears neglected or is at least not emphasised to the extent to which it became apparent in this study.

In sugarcane production and supply systems an adequate S5 turned out to be even more critical. Like any other system that is composed of structurally independent units without a compelling force holding them together and without any other mechanism creating an appropriate relationship between the subsystems, the systems lack coherence by default. S5 would need to facilitate the required relationship among them. Therefore, a stronger focus on S5 and present soft issues is required compared to when using VSM in a „normal" organisation. To my knowledge, this peculiarity is not mentioned in the literature. Future research should explore the relevance of S5 and possibilities to strengthen it. One option is the combination of VSM with more participatory methods that facilitate conflict management and the development of a shared culture. An adequate consideration of S5 also requires an investigation of soft issues and relational elements. Section 8.3.3 contains some suggestion to realise this.

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8.3.2 Connectivity and interrelation between systems and channels

The VSM application described in Chapter 7 showed that the interrelationships between systems and channels inhibit a clear attribution of causes or impacts to particular systems or channels. The interrelationship additionally hampered the drawing of clear boundaries and an unambiguous allocation of a group, activity, or function. The literature, however, is silent concerning these challenges. It rather suggests that performed functions are discrete and that the assignment of specific activities to definite sub-systems is obvious. Nonetheless, based on my experience, I

suggest that the VSM users have to be alert to these interrelationships, reflect on their view of the interrelationships, and consider how this view influences the allocation of causes and effects and of particular matters, groups, or activities to certain VSM elements. Another view on the relationship might lead to a different allocation.

These allocation difficulties add to another VSM characteristic that is inconsistently represented in the literature. I perceived the assignment of activities to systems as partly subjective and requiring a boundary judgment. For instance, I allocated some groups to S3, although they only assist growers, because I view any managerial function that supports and deals with an operational unit and therefore has to engage with other groups on S3 level as S3, rather than as an S1 management function of the respective operational unit. This shows that the VSM diagnosis of the Felixton system is premised on my subjective boundary judgments which are based on my understanding of VSM in relation to the Felixton system. Another researcher may have conducted a slightly different VSM diagnosis. Consequently, I advocate the interpretive nature of VSM and its allocation to the interpretive systems paradigm. This contradicts other authors, like Jackson (2000), who assign VSM to a functionalist hard systems paradigm and claim a straightforward and objective assignment. They seemingly neglect the continuous and thorough reflection required for the eventual allocation.

8.3.3 Importance of qualitative interviews and additional 'soft' questions

The study clearly highlighted the significance of the qualitative interview process for the VSM diagnosis. Interviews were crucial in acquiring the necessary information and sufficiently rich input for diagnostic purposes. A VSM diagnosis should always include interviews, especially when the researcher lacks familiarity with the studied system.

Moreover, I propose that a VSM diagnosis should place more emphasis on soft issues as this study demonstrated their relevance for the investigated system. The qualitative interview questions of the fellow researcher supported an adequate investigation of these issues. These questions promoted the disclosure of miller-grower power imbalances, insufficient autonomy of the local mill management and the powerful position of one single supplier. They ensured that the VSM diagnosis did not concentrate predominately on organisational structures, which was identified as a VSM shortcoming (Jackson, 1988). Furthermore, qualitative interview questions that explore soft issues describe one opportunity to support a more appropriate consideration of S5. Soft issues most likely surface in a pure VSM based process, but probably not in a comparable richness. This richness, albeit, enables a more sophisticated understanding of present shortcomings. By implication, I recommend that a VSM diagnosis always include qualitative interviews which also investigate soft

issues. VSM and qualitative methods should be combined in an iterative and interactive manner (Hildbrand and Bodhanya, 2011).

The interview questions could be guided by Analysis Two and Three of SSM which facilitates the consideration of political and soft issues. Besides SSM, other methodologies that focus on soft and relational aspects could be consulted to generate interview questions for the VSM diagnosis to enrich the diagnosis and the consideration of S5.

The use of these comprehensive interview questions, however, generated more data than was needed for the VSM diagnosis. This made it impossible to assign each discovered detail to a VSM component. I was, for example, unable to allocate THS‟s perceived differential treatment of growers to a specific aspect in VSM. The researcher needs to be aware of this difficulty and apply a VSM lens when analysing the interview data. Information that cannot be assigned serves as additional insight that improves the researchers understanding of the system and thus the model building, the VSM diagnosis and the deduction of recommendations. Although, this circumstance was confusing in the beginning, it eventually promoted the VSM generation and hence affirms the merit of a qualitative interview process.

Qualitative interviews were used to facilitate the deduction of recommendations for detected deficiencies (Chapter 5). Interviewing stakeholders regarding their opinions and suggestions for the handling of shortcomings was invaluable as interviewees‟ answers guided the eventual recommendations, which should contribute to their implementation. This assumption could not be investigated in this study, since stakeholders were neither exposed to the outcome of the VSM diagnosis nor the derived recommendations. The fact that another researcher also conducted fieldwork in the Felixton milling area meant that I used VSM as an analytical tool only, rather than to engage with stakeholders. Nevertheless, I propose that suggestions arising from interaction with stakeholders are more likely to be implemented, compared to recommendations that researchers derive from their VSM diagnosis without such input. Furthermore, I suggest that VSM is ideally applied as a genuine participatory approach where the outcome of the VSM diagnosis is presented and discussed, and recommendations are jointly developed with stakeholders to support their realisation. Further research needs to explore the merit of these propositions and should investigate general means that facilitate the deduction of improvement suggestions.

8.3.4 Power issues and change implementation

This study clearly showed VSM‟s ability to detect power issues and power imbalances (see for example Section 7.2.1, 7.2.2, and 7.5.3.1) and thus rejects the claim that VSM fails to reveal these aspects (Luckett and Grossenbacher, 2003). The VSM perspective indicated how disclosed power imbalances should be addressed. Its concept of local autonomy for example, proposed that the autonomy of mill S1 needs to be increased. Consequently, VSM guides the power distribution and handles power issues, opposed to what critics claim (Paucar-Caceres, 2009). The study could not validate the capacity of VSM to overcome disclosed power challenges and to engender a power distribution that complies with its concepts. This results largely from the reality that the outcome of the VSM diagnosis was not discussed. Regardless, I suggest the appropriateness of VSM for systems that are challenged by the question of centralised versus decentralised power distribution and the management of power-imbalances.

Despite exhibiting the diagnostic capacity of VSM, its ability to support the implementation of derived recommendations was not confirmed by this study. For instance, a common haulage system, whose merit was approved by stakeholders and from a VSM perspective, was not realised. VSM seems to lack mechanisms that translate recommendations into practice. This confirms the criticism that VSM fails to handle detected deficiencies (Nechansky, 2010), yet querying its suitability appears unreasonable due to its diagnostic strength. Instead, I propose that VSM should be combined with other, more participatory approaches that encourage change realisations, as suggested by Harwood (2009) and Schwaninger and Rios (2008). Future research should explore respective opportunities and should include the investigation of possibilities to derive recommendation from the VSM diagnosis in collaboration with stakeholders (Section 8.3.3).

Beer (1979) mentioned that VSM is applicable in a participatory manner, because the outcome of the VSM diagnosis can be presented in a way that is more abstract and allows stakeholders to discuss deficiency without getting enmeshed in recriminations. The study confirmed VSM competence in this regard, as it is for example possible to represent the powerful position of one single haulier via differently sized circles (see Figure 7-5). This should facilitate fruitful debates that lead to the determination and realisation of concrete improvement steps. However, prevailing circumstances prevented this kind of illustration and subsequent discussion with stakeholders (Section 8.3.3). These circumstances might also explain why this VSM application failed to show its ability to advance communication, cohesion and collaboration as proposed by VSM proponents (Leonard, 2007). Consequently, I propose that any VSM diagnosis should include an interactive discussion of its outcomes with the affected stakeholders.

Further research is needed to investigate opportunities to strengthen the handling of shortcomings that surface during the VSM diagnosis and the materialisation of the VSM concept of power distribution. This should comprise an investigation of the merit of applying VSM in a more participative way.

8.3.5 Consideration of the social capital

A VSM diagnosis shows what should be improved from a VSM perspective. This does not consider whether derived suggestions are appropriate from a social capital point of view. The social capital values the relations between people and argues that these relations induce some competitive advantage for the individual or the system, and thus enhance the productivity of the system (Burt, 2000, Coleman, 1988).

The VSM diagnosis revealed that one large supplier received more benefits in comparison with other suppliers in form of transport subsidies to guarantee the supply despite a long haulage distance. However, it did not show whether this differential treatment is appropriate, as it might increase the viability of the bigger whole and hence should be retained, or whether it is inappropriate and that measurements to rectify it should be taken. As long as the differential treatment increases the overall efficiency of the system, it seems valid for business and acceptable from a VSM perspective. Nevertheless, a seemingly appropriate differential treatment that implicates short-term gains might cause intense dissatisfaction and mistrust, which could impair the system‟s long-term efficacy. VSM overlooks these aspects as it fails to facilitate a reflection on the social capital. Although this also depends on the way VSM is applied, the need to consider the social capital is not explicit in the model. VSM consequently lacks the ability to direct decision-making concerning the continuity or the conclusion of the differential treatment.

Since the VSM users need to make the respective recommendations, they need to be aware of these VSM shortcomings and should consider social capital in their diagnosis. They should judge the recommendations that they derive from the VSM diagnosis from a social capital perspective. VSM could be beneficially enhanced via the consideration of the social capital and future research should explore opportunities to facilitate this. The already suggested integration of aspects from other methodologies, the use of a qualitative interview process and a more participatory VSM application, describe possible options.

8.4 SSM and VSM in the sugarcane supply chain context

To my knowledge and with the exception of Smajgl et al. (2006), neither VSM nor SSM have been previously applied to a sugarcane production and supply system anywhere in the world. The context of the study by Smajgl et al. (2006) differs significantly from this study. Since sugarcane supply chains are comparable with general supply chains, the outcome of this study also applies to other supply chains, especially in agriculture. While there were only a few studies utilising SSM, VSM had not been previously employed in the supply chain context (Gencoglu et al., 2002, Soares et al., 2008). My study thus adds to the body of knowledge on SSM and VSM usage in the sugar industry specifically and the supply chain context generally, especially with a focus on food and agriculture. This section outlines my experience with using these methodologies and their competences and relevance in this context.

I investigated the merit of SSM by critically reflecting on whether the SSM strengths that Gencoglu et al. (2002) propose as valuable for supply chain management could be realised in this study. Table 8-7 summarises the outcome of this reflection.

Suggested strengths of SSM in supply chain management	Their materialisation in this study
➢Improves understanding :	
•Acknowledges different ideas and perspectives	✓Ensured thorough investigation of all aspects and perceptions, especially through the interview process.
•Conceptual nature of the approach prompts questioning, thinking and critical analysis	✓ Ensured a holistic and critical consideration.
•Focuses on the purpose of the chain, systems, needs, outputs etc.	✓ Disclosed the relevant issues, especially through the interview process.
•Considers social and political environment, including social, political and cultural issues	✓ Revealed cultural and power issues impacting the system, especially thanks to the interview process.
•Adds structure to messiness by providing a disciplined formal way to proceed	✓ Facilitated sense-making and guided the inquiry.
➢Promotes creativity and builds confidence	✓ / x SSM workshops encouraged creativity, but most likely would have benefitted from richer participation. X Confidence building was not detected.
➢Allows for questioning of the current arrangements	✓ / x Questioned current settings, but required the facilitator to probe accordingly.
➢Participative and collaborative nature	✓ Focused on stakeholder participation. x Failed to achieve sufficient workshop attendance.
➢Iterative nature allows for on-going improvement	x On-going improvements were not be realised in the study, most likely due to given workshop conditions.
➢Practical	✓ Relatively easy to apply, many practical tools.
Comments: ✓: criteria is fulfilled x: criteria is not fulfilled ✓/ x: justifiably not fully complying with the criteria	

Table 8-7: Materialisation of SSM strengths relevant for supply chain management (Gencoglu et al. 2002, adapted from p. 54 & 55)

SSM facilitated a holistic understanding of supply chain issues and revealed why seemingly appropriate measurements lack effectiveness. Stakeholders commented that being involved in the SSM process was valuable as it broadened their scope of consideration and renewed their awareness about issues that are theoretically known, but often neglected. The fact that some workshop

participants would have liked to engage in issues in this manner further, explicitly shows the virtue of SSM in this context.

Involvement in the SSM workshops has encouraged creativity as stakeholders were exposed to different ways of engaging in present issues. To what extent creativity was increased, however, cannot be evaluated. The SSM application, to my knowledge, did not lead to new ways of addressing an issue. Although the study displayed the ability of SSM to foster creativity, its capability to build confidence could not be confirmed.

The focus of SSM on stakeholder participation and its relevance in the supply chain context, which requires a participatory approach that accommodates diverse goals and perspectives, was demonstrated by this study. However, challenges that were experienced (Section 8.2.1) need to be addressed to benefit from the full potential of SSM. These challenges also explain experienced deficiencies concerning on-going improvements (Table 8-7) and shortcomings regarding the ability of SSM to deal with conflicts and fragmentation in the supply chain context (Gencoglu et al., 2002). Consequently, an inability of SSM in this matter cannot be concluded. Instead, I assume, that the full potential of SSM is achievable, especially if more conducive conditions for this methodology are provided (Table 8-1).

Besides most of the benefits, the study confirmed the difficulties that Gencoglu et al. (2002) indicate; *viz.,* drawing rich pictures and reaching Accommodation. Means to handle these challenges need to be found.

In conclusion, I argue for the significance and suitability of SSM to the sugar industry and the supply chain context. This needs to be verified by further research, which should explore possibilities to handle encountered challenges.

The VSM application provided the desired holistic understanding of the investigated sugarcane production and supply system and revealed present weaknesses. This points to the suitability of VSM in the sugar industry and the general supply chain context. Further research needs to explore the significance of VSM in this field.

The following discourse indicates the particular relevance of VSM for the sugar industry. At present the industry is seen and treated as a coherent organisation, yet it differs from a conventional simple organisational set-up. This consideration needs to be replaced by a new way of looking at the industry. Since the systemic perspective of VSM provides a different framework, the VSM approach appears to be highly promising and the study showed the appropriateness of VSM in

providing this different view. The VSM synthesised coherently with the Felixton milling area, which is one of the operational units of the sugar industry.

Given the anticipated development towards vertical slicing, new approaches for managing the industry are urgently needed. The changes may result in a loss of influence for current industry bodies. Milling areas require certain freedom, while at the same time maintaining the industry‟s cohesion. VSM can assist in this matter through its concept of local autonomy that facilitates decentralisation and localised decision-making, whilst maintaining systemic coherence. The vertical slices would become the operational units of the industry. They would be autonomous to such an extent that the industry still remains cohesive. This is just one example that indicates the possible merit of VSM in pointing the way towards a realisation of expected changes. The exact design of the structural and managerial industry setting from a VSM perspective requires further research.

The reality that the sugar industry and a general supply chain are composed of structurally independent units impacts on the VSM application. The VSM diagnosis might detect shortcomings in the operational units, yet the system-in-focus cannot address them, because the operational units are not only managed by the S3 of the system-in-focus, but also by their own S3. For instance, the VSM diagnosis disclosed shortcomings in the mill S1, but the S3 of the Felixton system was unable to handle these deficiencies, as this was outside its sphere of influence. Only THS top management, which is not part of the system-in-focus, but the S3 of the mill S1, can handle this issue. In the context of vertical slicing, this circumstance, becomes negligible. The top management of the milling company will supposedly be part of the slice and thus of the S3 of the system-in-focus. Nonetheless, similar peculiarities that emerge from using VSM in these kinds of „looser“ systems need to be acknowledged and further explored.

Revealed S5 shortcomings also result from the peculiarities of these „looser“ systems. An overall structure that determines the culture, identity or direction of the system seemed to be missing. Despite some unifying force, there was no personalised S5 and no stakeholder group appeared to perform a S5 function. The study highlighted that under these circumstances the establishment of an appropriate S5 is even more important (Section 8.3.1). The development of a personalised S5 might facilitate S5 improvements, as local champions promote cohesion. Vertical slicing might support the deployment of a more personalised S5, as either the MGB could embrace more S5 responsibility or an additional committee that considers the slice as a whole could be created.

8.5 Research questions

This section answers my research questions.

8.5.1 What are the leadership and management challenges within the sugarcane supply and processing chain in the investigated milling areas?

Fragmentation at local and industry level is the core leadership and management challenge identified by this study. Millers and growers perceive each other as opponents, rather than as partners. Soft issues contributed to this fragmentation which now leads to their continuity. The study showed that fragmentation and other soft issues translate into technical and operational shortcomings and a poor realisation of improvement opportunities. They consequently compromise the efficiency of the studied milling areas. Becoming real partners will unlock the system‟s potential, as this supports the rectification of fragmentation and other soft, managerial or behavioural issues. However, this requires a mindset change on the part of both growers and millers (Section 8.5.2.6).

One might assume that fragmentation in the Umfolozi milling area is less severe than in the Felixton milling area, because growers hold mill ownership in the former. This, however, turned out to be untrue. On paper, miller and growers are partners, but in their mindset the perception of „millers-against-growers‟ persists. Although several stakeholders indicated the desire to become genuine partners, they lack the ability to realise it. Not knowing how to overcome fragmentation, insufficient incentives to becoming real partners and established structures explain the continuity of the status quo. This shows the deep rooted nature of this leadership challenge.

The industry structures and industry regulations also contribute to fragmentation. They divide millers and growers in two separate entities and determine the core procedures for the milling areas. This limits opportunities for local miller-grower interaction, localised agreements and mill area specific decision-making, and the establishment of common drivers. The lack of a common driver in itself adds to fragmentation (Section 8.5.3). By implication, the expected development towards vertical slicing might support the handling of fragmentation. This, however, depends on the extent to which the new setup allows for local negotiation leeway, equips local stakeholders to engage in respective discussions, and especially empowers growers in this matter. Nonetheless, structural changes alone are insufficient, as evidenced by the fragmentation in Umfolozi.

The imperative to ensure the sustainability of the respective milling area depicts another core leadership challenge. The leadership needs to engage in strategic issues and industry matters.

8.5.2 What are the critical soft, managerial, behavioural, strategic, and leadership issues, and how can they be addressed?

To begin with, it needs to be clarified that critical in this context refers to crucial. This means that a critical issue compromises the system, but does not necessarily determine its viability. Figure 8-4 defines my understanding of critical soft, managerial, behavioural, strategic, and leadership issues to ease the comprehensibility of the following issue allocation.

Figure 8-4: Illustration of my understanding of soft, managerial, behavioural, strategic, and leadership issues and their interdependencies

The fact that these issue categories and the issues themselves are interrelated complicates a clear determination of cause and effect and a specific allocation of an issue to one category. As a result issues may belong to more than one category and intensify each other. Table 8-8 summarises my issue attribution concerning the two studied milling areas.

Revealed issues	Issue category				
	Soft	**Managerial**	**Behavioural**	**Strategic**	**Leadership**
Fragmentation & not becoming real partners	X	Adds to managerial issues	Manifests in a certain behaviour	X	X
Insular view	X	Adds to managerial issues	Manifests in a certain behaviour	X	Facilitate its handling
Deficient systemic commitment	X	Adds to managerial issues	Manifests in a certain behaviour	X	Facilitate its handling
Grower relationships	x	-	Manifests in a certain behaviour	(X)	Facilitate its handling
Comfort zone & resistance towards change	X	Adds to managerial issues	Manifests in a certain behaviour	X	Facilitate its handling
Communication	X	Adds to managerial issues	Manifests in poor 2-way communication	(X)	Facilitate its handling
Trust	X	Adds to managerial issues	Manifests in certain behaviour	(X)	Facilitate its handling
Quality	Add to deficiencies	X	Certain behaviour causes shortcomings	(X)	Facilitate its handling
Quantity	Add to deficiencies	X	Certain behaviour causes shortcomings	X	Facilitate its handling
Coordination: Consistency & ratability	Add to deficiencies	X	Certain behaviour causes shortcomings	(X)	Facilitate its handling
Milling	-	X	-	(X)	Approve its handling
Mill autonomy & resource bargaining	Adds to soft issues	X	-	(X)	X
Expected sugar industry changes	Can imply soft issues	-	-	X	X
Transparency & information provision	Adds to soft issues	X	-	-	Approve its handling
UCOSP's central position	X	(X)	(X)	-	X

Comments:

X: issue in the respective category

-: issue does not belong to this category

(X): important issues but not critical issues in this category

Table 8-8: Summary illustration of present soft, managerial, behavioural, strategic, and leadership issues.

8.5.2.1 Soft issues

The study clearly revealed the significance of soft issues in the sugarcane supply chain context. Most soft issues simultaneously constituted managerial, behavioural, strategic, or leadership issues, and reinforced each other (Section 6.2.10). For instance, deficient systemic commitment amplified fragmentation and an insular view which then reinforced deficient systemic commitment. Soft issues manifested in certain behaviours that either caused managerial shortcomings or restricted the implementation of managerial procedures and improvements, such as the realisation of a vehicle scheduling system or 24-hour loading. Consequently, soft issues often form the underlying cause of many managerial deficiencies and compromise the efficiency and prosperity of sugarcane production and supply systems.

Besides being a core leadership and management challenge, fragmentation described a major soft issue and implied miller-grower conflicts, a poor miller-grower relationship and deficient mutual appreciation. The behaviour resulting from fragmentation amplified managerial deficiencies, because stakeholders acted in a self-centred manner and refused to consider the system as a whole and to perceive each other as partners. This prevented essential changes in the MGB rules to improve cane quality and facilitate rateable supply. Consequently, fragmentation is a managerial and behavioural issue as well.

Insular view and deficient systemic commitment were other soft issues that reinforced behavioural and managerial shortcomings, as stakeholders either failed to perceive or care about the impact of their own conduct on the overall system. An insular view or deficient systemic commitment prevented stakeholders for instance from engaging in sufficient two-way communication, which compromised the coordination of sugarcane supply and thus prevented efficient operation.

Trust and communication constituted further soft issues, and shortcomings in these areas intensified other soft issues such as fragmentation, deficient systemic commitment and an insular view. They additionally caused managerial shortcomings. Poor trust impaired improvements in managerial measurements, such as the implementation of more appropriate cane rejection rules, as respective stakeholders feared that these were to their disadvantage. Deficient two-way communication limited a smooth operation and reinforced trust deficits.

Living in a comfort zone and resistance towards changes depicted an additional soft issue where the resulting behaviour limited improvements and implicated managerial deficiencies. Stakeholders who live in a comfort zone lack progressiveness and are not concerned about the efficiency of the system, since there is no financial pressure to worry about it. The influential position of UCOSP

revolved around power and thus equally is a soft issue. Likewise, partially poor grower relationships can be allocated to soft issues. They compromise possible efficiency improvements, since they limit collaboration among growers and thus benefit from the economies of scale.

8.5.2.2 Managerial issues

Deficient autonomy of local mill management and challenges concerning sugarcane quality, consistency, and coordination were core managerial issues as were insufficient cane supply and weaknesses in the mill operations. The lack of transparency and information provision described another managerial issue, as it is the responsibility of the system‟s management to inform the member and to establish the needed communication structures. Since these issues often engendered conflicts and displeasure, they contributed to the emergence of soft issues. This reality shows the interdependency between categories and between issues.

8.5.2.3 Behavioural issues

As indicated, present soft issues manifested in certain behaviours and constituted behavioural issues. The main behavioural issues are as follows:

- Insufficient two-way communications,
- Deficient information provision,
- Self-centred behaviour and poor commitment to the system,
- Poor stakeholder interaction and collaboration,
- Lack of progression,
- Unsatisfactory compliance with present procedures (e.g. quality, DRD) and
- Resistance towards change.

Some behavioural issues could be allocated to other categories as well, such as technical shortcomings or personal incompetency, and do not necessarily represent a deliberate action, but in this study they certainly also reflected a behavioural issue.

8.5.2.4 Strategic issues

The lack of sugarcane and the intention to increase cane supply constituted core strategic issues. The necessity to handle soft issues also described a strategic issue, because these soft issues could at worst, impair the sustainability of the investigated systems. To this end, fragmentation, insular

view, deficient systemic commitment, and resistance towards change seemed especially critical. The anticipated structural change at industry level certainly is a strategic issue, whose realisation might be challenged by present soft issues.

8.5.2.5 Leadership issues

The aforementioned Table 8-8 shows that all issues comprised some leadership aspect. Present soft issues depicted a leadership challenge, as the leadership seemed responsible for their handling. Likewise, the leadership either needs to support or approve the rectification of more tangible issues. However, the leaders apparently added to deficiencies in these matters, as they were negligent regarding, for instance, cane quality, rateable supply or mutual appreciation, instead of leading by example. Insufficient local mill autonomy and poor resource-bargaining were further leadership issues. Their presence indicated a partially autocratic leadership. Moreover, future considerations and strategic discussion, such as the move towards vertical slicing, constitutes a leadership responsibility. The UCOSP leadership contributed to the establishment of UCOSP‟s central position and hence this issue formed a leadership issue.

8.5.2.6 Dealing with critical issues

Although measures which focus on one specific issue, such as coordination shortcomings, are relevant for the handling of present issues, I propose a more overarching approach that focuses on the handling of soft issues. The significance of this approach arises from the interdependency between issues and the reality that soft issues often underlie managerial, operational or strategic challenges, as indicated in Section 6.8. This approach features a mindset shift that engenders real miller-grower partnership.

As shown in Figure 8-5, the mindset shift leads to the reduction of fragmentation and the handling of other crucial soft issues. The direct benefits of this mindset change are indicated in the middle circle in Figure 8-5. The handling of any one of these soft issues promotes improvements concerning other soft issues. Moreover, the mindset change and the implicit elimination of these soft issues engender the positive impacts illustrated in the outermost circle. This mindset change should even ease the anticipated changes at sugar industry level, as it should enable miller and grower representatives to overcome their contention and determine the new arrangements.

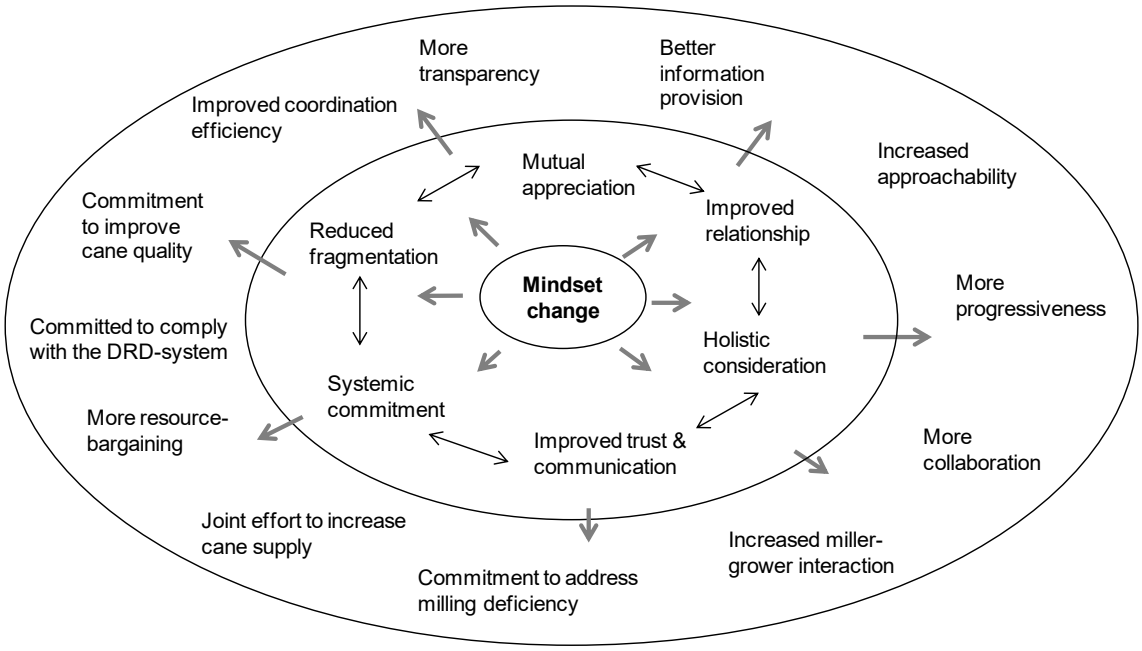

Figure 8-5: Inducing mindset change that supports improvements in many issues

The following discourse comprises possibilities that would boost the desired mindset change and other researchers are encouraged to extend it.

A mindset change cannot be directly induced. However, I propose that any means that fosters the handling of the soft issues in the middle circle of Figure 8-5 encourages a genuine miller-grower partnership and thus promotes the needed mindset change. Local and industry leaders need to play an important role in facilitating respective changes. They either should lead by example, or at least approve and support the handling of present issues. By implication, the leaders need to execute a mutually appreciative leadership style and collaborate across the boundaries of stakeholder groups. They should consider facilitating a process in which stakeholders jointly develop the identity, culture and vision of their milling areas. This will promote trust, mutual appreciation, improved relationships, internal communication and systemic commitment.

Figure 8-5 can also be read from the outside inwards due to the interrelationships between the issues. Therefore, the implementation of the benefits in the outermost circle should assist in the handling of soft issues and thus promote the required mindset shift. For instance, better information provision and increased approachability, resource-bargaining and miller-grower interaction should contribute to, for example, improved mutual appreciation, trust, relationships and commitment, and thus a mindset shift.

The leadership can support the realisation of the aspects in the middle circle of Figure 8-5 through the following strategies. It needs to act in a trustworthy, approachable and caring manner, and create the space for miller-grower collaboration and interaction. It has to emphasise the necessity of holistic consideration and systemic commitment by illustrating present interdependencies and feedback mechanisms. As indicated in Section 7.10, the communication and education in this matter has to highlight the impacts of certain behaviours and specifically the benefits of a changed behaviour for the individual. This has to be communicated in the „right" language to entail a deeper emotional knowing, and thus, the desired behavioural changes.

The communication, illustrations, feedbacks and implemented measures need to resonate with stakeholder value systems to prompt a changed behaviour. For stakeholders who speak a business language, the feedbacks should be shown in monetary terms. Stakeholders who are concerned about long-term sustainability, rather than maximum current profits, should be exposed to the consequences of certain behaviours on this sustainability. Non-compliance with these value systems causes the continuity of the current behaviour. Although Analysis Two (Section 6.3.1) partly explored stakeholder value systems, my study did not place a main focus on them. Further research should therefore explore these value systems and focus on culturally feasible changes.

Communication and education should be supported by experiential learning (Section 7.10). Experiential learning facilitates the essential deeper knowing, desired mindset shift, and implicit behavioural changes. Experiential learning exercises should involve miller and grower representatives. This promotes miller-grower collaboration because they jointly work on certain issues and share an experience. Local and industry leadership should thus consider enquiring the assistance of facilitators who are trained in conducting experiential learning, participatory conflict mediation and the discussion of controversial issues.

At industry level, these facilitators would assist in dispute resolution regarding the division of proceeds, or the shaping of the reviewed industry framework. Wynne (2009) confirmed the need for conflict resolution mechanisms. In the milling areas, they would support the handling of conflicts that emerge from day to day operations. They could further facilitate local miller-grower negotiations that become more relevant in the changed industry setup. In this regard, SASRI"s concept of extension could be expanded onto other areas. As each milling area has its extension officers for agricultural matters, stakeholders should consider employing people skilled in softer aspects, like conflict management, communication support or negotiation assistance.

Local leadership should consider the implementation of additional feedback mechanisms. The behaviour of some stakeholders have a negative impact on the system, yet this impact is not named and quantified and the perpetrators are not sanctioned. Growers could be compensated for a behaviour that is beneficial to the system, yet possibly unfavourable for their own operations. For instance, additional expenses that emerge from the production of specifically good sugarcane quality could be compensated by a respective incentive system. Again, these feedback mechanisms need to be designed in a manner that matches with stakeholders‟ value systems.

A better alignment of stakeholder drivers should support real miller-grower partnership and the implicit mindset shift (Section 8.5.1 and 8.5.3). Le Gal et al. (2008) confirms the necessity to match individual interests. Working towards the same goals reduces miller-grower conflicts and thus fragmentation. The adequate alignment of drivers, however, requires the consideration of stakeholders value systems. Further research needs to explore these value systems and stakeholders‟ true drivers and the options to adjust them appropriately. Experiential learning could assist in the alignment and the handling of present conflicts. Again, the consultation of external facilitators might be worthwhile. However, the alignment might also require changes in the industry structure.

The establishment of a place where representatives from different stakeholder groups can meet and discuss relevant issues should be contemplated (Beer, 1985). The local leadership should make a habit of regularly meeting in such a place to promote mutual appreciation and collaboration and thus a mindset shift.

Sufficient information provision, adequate communication, openness towards present inquiries and concerns, and acting in an honest and trustworthy manner describe further measurements that encourage the mindset change. For this to work, all stakeholders are obliged to take responsibility.

However, a potential resistance to change, which is human and generally related to soft issues, needs to be taken into consideration (Chroust, 2002). It might limit the effectiveness of outlined suggestions. Resistance to change arises from different views regarding an issue and the necessity of change, the lack of ambition, not knowing how to change and letting go of the used way of behaviour and especially from deeply embedded values (Pardo del Val and Fuentes, 2003, Alas and Sharifi, 2002).

Consequently, as long as stakeholders fail to perceive present soft issues as critical and to discern a changed behaviour as beneficial or necessary, a process that seeks the handling of soft issues and the outlined mindset shift will not be initiated. The experienced resistance to change largely results from living in a comfort zone in a protected industry setting, but probably also from stakeholders‟

deeply rooted values systems. The situation might only alter when the industry is confronted by a serious challenge that threatens its viability and demands that stakeholders work together. However, although resistance to change might limit the successfulness of made recommendations, many of these recommendations, such as having a pioneer leading by example, communicating adequately or involving the affected stakeholders themselves, promotes the overcoming of this resistance (Chroust, 2002). Moreover, certain leadership qualities such as assigning responsibility, giving feedback, being approachable or providing ownership, reduces resistance to change and in this regard, all stakeholders are encouraged to lead (Geller, 2003).

I propose one „harder" strategy for the handling of a tangible issue, namely coordination, in addition to suggestions already outlined in Chapter 6 and Chapter 7. In VSM, coordination is facilitated by a corporate regulatory centre for the system-in-focus and divisional regulatory centres for each operational unit (Beer, 1981). The cane supply department in the mill, which adds to the corporate regulatory centre due to its coordinative significance for the system, is currently the only divisional regulatory centre. Therefore, the establishment of divisional centres in the grower and haulier body should be considered. This could simply mean the determination of area representatives who interact with the cane supply manager and engage with the hauliers or growers in their area. This would create mutual awareness about derivations from expected deliveries, transport problems, and milling deficiencies and enable respective adaptation in all operational units. The area representatives could further promote communication and transparency by facilitating adequate information transmission and highlighting aspects where more information is required. Furthermore, the establishment of divisional regulatory centres would encourage quality improvements, as the respective channels to communicate and educate stakeholders in this regard would be in place.

8.5.3 What are the high level goals between the various stakeholder groups, and to what extent are they compatible?

The establishment of profitable and sustainable ventures describes a common goal, yet stakeholders have to pursue different strategies to achieve this aim. This reality contributes to fragmentation. The diverse objectives of the different stakeholder groups are outlined below. Moreover, some stakeholders might aspire to aspects that cannot be valued in monetary terms, such as more free time. This may be in conflict with the intention to enhance the financial profitability of the individual and the system.

The miller seeks mill efficiency, profitability and sustainability. This includes satisfying mill shareholders with adequate dividend payments. Several growers assume that these dividends are paid at their expense.

For profitability purposes, the miller needs to maximise its yield and minimise its costs, which entails the following objectives:

- Technical mill efficiency and sustainability at low costs,
- Sufficient cane supply for an efficient mill operation,
- Continuous cane supply for consistent mill running,
- Clean sugarcane of high quality for high sugar extraction and no mill damages,
- Purchase of sugarcane at low prices and
- Exploitation of milling outputs (e.g. sugar sale on retail market, high molasses price, usage of by-products of the sugar production, such as bagasse).

The miller intends involvement in downstream development and thus advocates respective legislative changes that support co-generation and ethanol production from sugarcane.

Growers aim at the profitability and long-term sustainability of their farming operations. They consequently aim at high yields, high quality and improved farming operations, while keeping the input and transport costs at a minimum. Growers calculate the trade-off between additional costs for further quality improvements and the remuneration they will receive from these improvements. They request a better recoverable value (RV) and molasses price and the reimbursement on the entire cane, rather than just its sugar content. This means involvement in the profits from the sale of by-products. Some growers inquire the financial assistance of the mill for input factors. Many growers seek a development of downstream activities as they anticipate an improved profitability. Adequate replanting and farm expansion supports growers‟ long-term sustainability and profitability.

Although profitability is a critical driver, it is not the only one. Once a comfortable living is possible, other things may become more important to the individual. Some growers may prefer to have more leisure time, than to get the most out of their farming operation and to strive for optimum quality.

Hauliers aim at profits from sugarcane transport. To realise this objective, trucks need to be loaded to the maximum transport load and the waiting periods at the mill have to be kept to a minimum.

The sugar industry targets its continuity and prosperity and aims at a favourable legislative framework. It consequently lobbies for legislative changes that enable downstream development. Industry representatives often intend to retain their own and the industry‟s influential position. At present, the sugar industry and its representatives have a lot of influence on the different milling areas, as they set the regulatory framework. This is welcomed by many growers, because they perceive present industry structure as crucial for the support of their interests. However, some millers would prefer more flexibility and a less powerful industry to have more leeway.

The Government equally has an interest in the prosperous continuity of the sugar industry, since this provides employment and contributes to the South African economy. In addition, government is committed to rural development and land redistribution to which the industry contributes.

The Mill Group Board is concerned with the establishment of all milling area specific regulations that enable a smooth operation. To this end, it strives for effective stakeholder collaboration and miller-grower conflict resolution concerning operational matters. This can be challenging as the MGB members generally champion the objectives of their own stakeholder group.

Table 8-9 summarises the above discourse and illustrates the goals of the different stakeholder groups. It indicates to which extent they are compatible or competing.

Goal	Miller	Grower	Haulier	Industry	Govern-ment	MGB
Profitability & sustainability	X	X	X	X	X	X
Dividend payment	X	≠	-	-	-	-
Mill efficiency	X	X	X	X	X	X
Consistency (cane supply & milling)	X	X	X	X	-	X
High cane quality without foreign matter	X	X / -	-	X	-	X
Low-priced cane supply	X	≠	-	≠ [1]	-	-
Involvement in down-stream activities	X	X	-	X	-	-
Low-priced farming input and transport	-	x	≠	-	-	-
Improved remuneration (entire sugarcane stick & better molasses pay)	≠	X	-	≠ [1]	-	-
More mill assistance	≠	X	-	-	-	-
Best agricultural practice (replanting, ripening etc.)	X	X / -	-	X	-	X
Other motives, e.g. convenience[4]	≠[2]	X / -	≠[2]	≠[2]	-	≠[2]
Maximal transport load	-	-	X	X	-	-
Remaining of industry influence	≠[3]	X	-	X	-	X
Employment & rural development	-	-	-	-	X	-
Land reform[5]	-	- / ≠	-	X	X	-
Smooth running & effective collaboration	-	-	-	X	-	X

X: Goal of stakeholder group,
-: Not a goal, but also not contradicting, with the goals of this stakeholder group , thus neutral towards this goal
≠: Contradicts with a goal of this stakeholder group
x / **-** **:** Goal of some stakeholders in this group, but not of entire group
-/≠: Goal contradicts with the objectives of some stakeholders in this group
1: Remuneration of sugarcane is the core miller-grower conflict point at industry level , but implies local conflicts
2: Can contradict depending on the respective motive
3: Some would prefer a looser regulation
4: Applies above a certain profitability; these additional drivers need to be detected and considered
5: All stakeholder should seek the successful realisation of land reform, due to its importance for the industry's profitability and continuity, yet they pursue it to a different extent

Table 8-9: Overview of competing and compatible goals

As shown in Table 8-9, many goals are either compatible (since several stakeholder groups pursue them) or at least not contradictory (because the stakeholders who are not pursuing them adopt a neutral position towards their achievement). Nevertheless, wherever „≠" appears the objective of one stakeholder group contradicts with the objective of another. This indicates a deficient compatibility in the drivers, because only one group can completely achieve its objectives to the detriment of another group. This lack of a common driver that aligns stakeholders" diverse interest causes tension, conflicts and inefficiencies. The current industry setup contributes to this deficiency (Section 8.5.1).

Sugarcane remuneration describes a core miller-grower conflict point. Growers and millers both intend to maximise their profitability. However, the miller needs to reduce his input costs, and thus targets an as low as possible sugarcane payment. This is in conflict with growers‟ objective to increase the sugarcane reimbursement and to obtain the miller‟s financial assistance for farming inputs. Both intentions are understandable and serve the common goal of continued prosperity, yet they are not compatible.

The continuity of the sugar industry requires the profitability of both stakeholder groups. The failure of one group implies the decay of the other. Although stakeholders grasped this reality, their understanding seems to remain at superficial level, as it has failed to result in a behaviour that truly seeks to increase the profitability of both groups. I acknowledge that this shortcoming partly also results from the difficulties in bringing about a changed behaviour, which are probably intensified by the present industry setup. The suggestions outlined in Section 8.5.2.6 should support the essential deeper knowing and implicit behavioural changes.

Experiential learning, adequate communication of the necessity to become genuine partners and the alignment of stakeholders‟ drivers are particularly relevant. Experiential learning should engender the deeper understanding that the division of proceeds needs to be defined in a manner that millers and growers can genuinely approve without feeling compromised. Although current efforts to increase „the pie‟ that millers and grower share might ease the negotiations about the division of proceeds, the indicated deeper knowing still appears to be still crucial. Discussions, pertaining how best to share this „bigger pie‟, need to be effectively facilitated.

An idea regarding a possible, more acceptable division of proceeds is outlined, which intends to initiate discussions, rather than being a set recommendation. In a scenario where all the farms are owned and managed by the mill, conflicts regarding the division of revenues from sugarcane production and processing would not exist. Sugarcane production would merely be one input factor and its costs would be reduced from the overall revenue. Although this is impossible in the current industry setup, it suggests a possibility for a changed payment system. Each farm could be considered as a production site and the mill would pay its production costs; *viz.,* the expenses for farming input factors, labour and sugarcane transport. The farm owner would receive a fixed salary and benefits depending on the farm‟s performance. Growers should directly benefit from the milling profits in a way that promotes systemic commitment and behaviour conducive for the system to function effectively. However, considerations also need to take into account that growers are not driven by financial incentives only.

Means that facilitate the better alignment of millers‟ and growers‟ drivers and their remuneration urgently need to be found, because a core conflict that leads to fragmentation and inefficiencies revolves around the questions „who gets the bigger part of the pie‟.

8.5.4 To what extent can Soft Systems Methodology and the Viable System Model be applied to address the leadership and management challenges within the sugarcane supply and processing chain?

As highlighted in Section 8.2.1 and Section 8.4, I claim the merit and suitability of SSM and VSM in the sugarcane supply chain context, although present leadership and management challenges were not mastered.

The study showed the relevance of both methodologies for diagnostic purposes. The implicit thorough understanding of these challenges is critical for their handling. Both methodologies enabled the deduction of improvement recommendations, whose realisation is impeded by present conditions, rather than an incompetence of the methodologies (Section 8.2.1, 8.3.3, and 8.3.4). More favourable circumstances, such as adequate stakeholder participation, local champions, or the use of VSM in a more participatory manner, would have facilitated the handling of management and leadership challenges. I propose that provided such favourable conditions can be established (see Table 8-1 for detail), a methodology, like SSM, that focuses on achieving Accommodation despite different stakeholders‟ interests is particularly relevant given a main leadership and management challenge, *viz*. the presence of fragmentation.

Furthermore, to counterbalance some of the difficulties that were encountered in this study, I suggested the advantage of combining SSM and VSM with other approaches. Both methodologies would benefit from a combination with methods that support change implementation. VSM could even be combined with SSM to use VSM in a more participatory manner.

VSM might provide the necessary new framework for looking at the sugar industry and guiding the expected development towards vertical slicing (Section 8.4). Its concept of cohesion (S5) and long-term sustainability (S4) could assist in the handling of fragmentation and support the future prosperity of the industry. VSM thus seems highly promising in the light of present leadership and management challenges.

Based on this discourse, I propose the virtue of systemic approaches to surface and possibly handle the challenges that confront sugarcane production and supply systems. Further research should explore their significance.

8.6 Concluding remarks

This chapter presented my reflections on the application of SSM and VSM to sugarcane production and supply systems and outlined my contributions to the body of knowledge on SSM and VSM usage. The chapter showed that I applied SSM, despite experiencing difficulties in the realisation of its full potential. The lessons that arose from the SSM and VSM application seek to assist future SSM and VSM users.

The chapter discussed some criticism in the view of my experience and elaborated on the notion of „worldview". In addition, it highlighted areas that have been neglected in the VSM literature, such as the importance of S5 and qualitative interviews. The chapter further demonstrated the merit and suitability of SSM and VSM in the supply chain context and in answering my research questions.

The following chapter draws some conclusions from these reflections and highlights recommendations concerning future research opportunities.

CHAPTER NINE: CONCLUSION AND RECOMMENDATION

This chapter is composed of four components. First, the core conclusions that I drew from this study are highlighted. Thereafter, limitations of this research are indicated followed by a section that outlines recommendation for future research in a detailed manner. It seeks to illustrate all the points where future research could add value and where procedures could be improved provided a similar study is conducted. Finally, this chapter brings the thesis to a close with some concluding remarks that provide a condensed overview of the entire study.

9.1 Conclusion

Integrated sugarcane production and processing systems are highly complex. Not only is the system exposed to a wide range of environmental factors, but the chain of command, ownership of the system as a whole and vast range of values among literally hundreds of stakeholders are vague and potentially contradicting. This warranted the methodological approaches followed in this study.

While other fields increasingly appreciate the benefit of systemic approaches, these approaches have hardly been used in the sugar industry context. Neither the Soft Systems Methodology (SSM) nor the Viable System Model (VSM) have been applied to investigate and tackle the complexity of a sugarcane production and supply system, and only SSM has been used in a few studies in a supply chain context. The SSM literature revealed a need to reflect on SSM applications, which should include the deduction of methodological lessons. Although some practical advisors guide the potential SSM user in their SSM usage, a coherent framework that brings them all together is lacking. Likewise, while SSM critics mentioned difficulties with change implementation, there is little guidance on how to facilitate improvements.

Concerning VSM, the literature is silent regarding the challenges implied in making a clear boundary judgment and in deciding to which VSM sub-system or channel a certain activity or group should be allocated. The importance of an adequate normative management (S5) that ensures the system‟s coherence, identity and direction is underemphasised. Little has been written about how the essential information for a VSM diagnosis should be obtained, how the VSM diagnosis should be conducted, how improvement recommendations should be deduced from the VSM diagnosis and how the implementation of these recommendations can be facilitated.

The presence of miller-grower fragmentation was confirmed by VSM and SSM in both milling areas as a crucial soft issue that impairs the sugar industry and its milling areas. Fragmentation prevents a synergetic partnership. The following soft issues contribute to fragmentation:

- Deeply rooted miller-grower conflicts over operational matters, such as cane quality, rateable supply and milling deficits, and especially about the division of proceeds,
- An insular view,
- Deficient systemic commitment and
- Insufficient transparency, trust and communication.

This study claimed that in order to reduce fragmentation, there needs to be a mindset change at a deeper emotional level that encourages stakeholders to become genuine system partners. As outlined in Figure 9-1, this mindset change would induce improvements in present soft issues, as indicated in the middle circle, and entail more tangible benefits illustrated in the outermost circle. This study proposed that the handling of any of these soft issues promotes the needed mindset change due to their interrelatedness. The necessity of a holistic consideration, systemic commitment and becoming real partners needs to be communicated more and in a manner that causes a deeper emotional knowing which results in behavioural change.

The respective communication needs to show the benefits of these behavioural changes for the individual stakeholder and the system. Tools from experiential learning could be applied to support this communication. The implementation of additional feedback so that stakeholders experience the effects of their behaviour on the system should be considered. The communication, feedbacks and illustrations have to resonate with stakeholders‟ underlying value systems in order to be effective. In addition, I have suggested that the realisation of the aspects in the outermost circle in Figure 9-1 facilitates advancement in the softs issues in the middle circle, thereby engendering a mindset change and the implicit reduction of fragmentation. However, living in a comfort zone, namely a lucrative and much protected sugar industry, compromises approaches that seek a mindset change and the handling of fragmentation, because stakeholders do not perceive a necessity to change. Thus, the status quo remains.

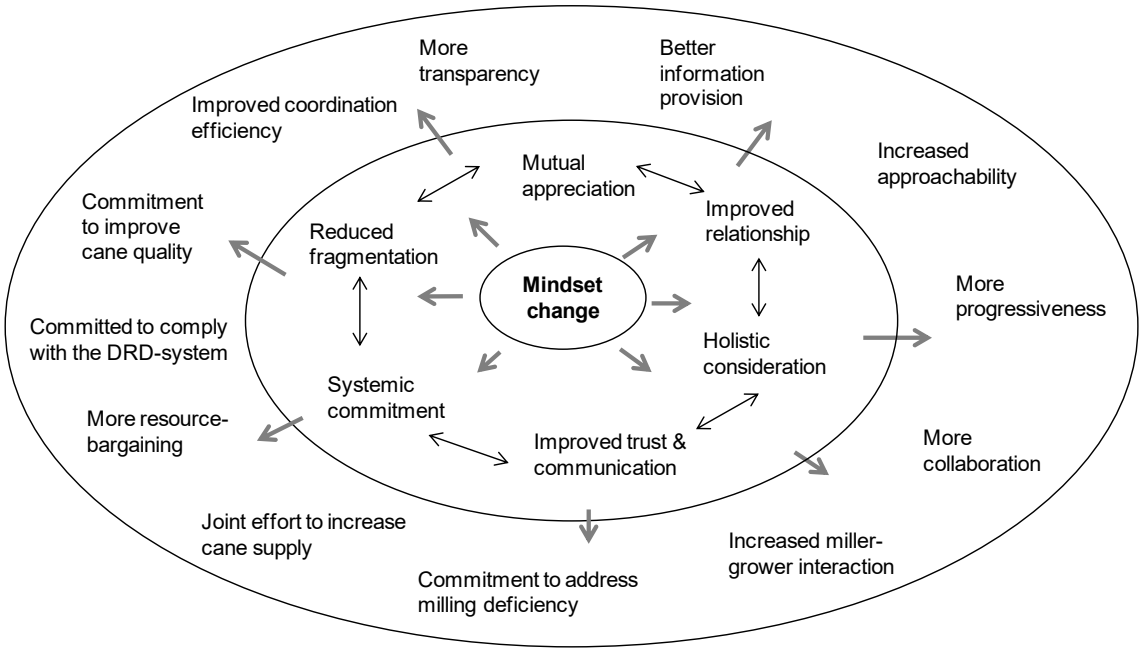

Figure 9-1: Inducing a mindset change that support improvements in many issues (redrawn from Chapter 8)

Apart from soft issues, the study indicated that the structure and regulations of the sugar industry contribute to fragmentation (Section 8.5.1). A changed industry setup which supports the alignment of stakeholder objectives is desirable. The expected development towards vertical slicing offers promise in this regard. I propose, that the success of this development concerning the handling of fragmentation depends on the extent to which it facilitates adequate local interaction and decision-making. Furthermore, structural changes alone are insufficient to deal with fragmentation, because otherwise fragmentation would not have been an issue in Umfolozi. This substantiates the importance of a mindset change.

Besides soft issues, the study also showed that both milling areas are challenged by cane quality shortcomings, consistency deficits and the intention to increase cane supply. Although the implementation of more tangible measures, such as a better coordination mechanism, is important for the handling of these „hard" aspects, the study showed that soft issues likewise need to be considered in this regard. Soft issues underlie hard aspects and either contribute to deficiencies in these aspects or detract from their resolution.

This holistic investigation provided a comprehensive understanding of the complexity that characterises sugarcane production and supply systems. It revealed underlying soft issues, interactions, interdependencies and the multidimensionality of the studied milling areas. I thus

advocate the necessity for more holistic studies in the sugar industry which necessarily needs to include the consideration and handling of soft issues, since the application of VSM and SSM demonstrated that soft issues contribute to inefficiencies at the Umfolozi and Felixton milling areas.

The employment or consultation of facilitators who are skilled in the handling of controversial issues and who can promote progress towards a genuine partnership seems beneficial to support the handling of soft issues and the better alignment of stakeholders‟ drivers.

SSM and VSM enabled the desired holistic insight into two different mill areas. The study indicated the benefit and suitability of systemic approaches to sugarcane production and supply systems. By implication, I propose the merit of these approaches and recommend their future use.

However, both methodologies were unable to address surfaced issues or to bring about change and improvement to the extent that was envisaged. As argued in Chapter 8, this shortcoming largely results from circumstances, rather than an inability of the methodologies. The outcome of the VSM diagnosis could not be presented and discussed in a participatory manner (Section 8.3.3) and the SSM workshops featured insufficient stakeholder participation, including the lack of appropriate level stakeholders with decision-making power (Section 8.2.1). The aforementioned soft issues intensified the lack of adequate stakeholder participation and resulted in a resistance to change. Under comparable circumstances, SSM and VSM applications are limited to bringing about a holistic understanding. This confirms the critique that SSM fails to facilitate change. Nevertheless, I am still convinced of the suitability of both methodologies for the sugar industry.

The circumstances of the current study led to the deduction of some methodological lessons on VSM (Sections 8.3.3and 8.3.4) and on SSM (Section 8.2.1). These methodological lessons may assist other researchers with their SSM and VSM applications and enhance the use and appreciation of both methodologies in practice. The core methodological lessons to support SSM and VSM applications that I derived from this study are as follows:

- Improvements and change requires adequate stakeholder participation and stakeholder willingness and commitment to engage in this change process,
- Both methodologies should be driven from within the system, which includes an intensive engagement between the SSM or VSM user and the stakeholders,
- The outcome of the VSM diagnosis should be discussed with stakeholders in a participatory manner to develop and agree on improvement activities and

- SSM and VSM should be combined with qualitative methods in an interactive way to support a holistic insight.

Adequate stakeholder participation means the involvement of all relevant stakeholder groups and especially power holders. I further propose that without a local champion or a direct demand from a milling area to conduct a study, neither SSM nor VSM should be applied, except if an increased understanding is aspired to.

VSM appeared to be a particularly relevant approach for the sugar industry context. It enables stakeholders to perceive the industry from a systemic perspective, rather than as an organisation, and could provide the desired framework for looking at the industry. Furthermore, its concept of local autonomy, whilst facilitating systemic cohesion, could guide the expected changes in the industry structure (Section 8.4).

The study further highlighted the importance of an adequate normative management (S5) that facilitates a common culture and identity and ensures coherence. The establishment of an appropriate S5 assists in the handling of present soft issues. Although a proper S5 is important for any organisation or system, it appeared to be particularly relevant in cases where a mandatory overarching structure that binds the diverse subsystems together is missing.

The study contributed to the body of knowledge on sugar industry related matters, since it highlighted that*:*

- Fragmentation exists at all levels and compromises the industry and its milling areas,
- Soft issues have a crucial impact on sugarcane production and supply systems and thus need to be acknowledged and addressed,
- A mindset change and a structural change seem crucial to deal with fragmentation and present soft issues and
- Sugarcane production and supply systems require a holistic consideration, which is facilitated by a systemic approach.

It further added to the body of knowledge on SSM and VSM, by:

- Showing the merit of SSM and VSM in inducing a holistic understanding of two milling areas, a context where neither methodologies have been applied before,
- Proposing the merit of VSM and SSM for the general supply chain context,

- Outlining the impact of situation specific characteristics on the SSM and VSM application, which in this study, constrained change and improvement,
- Deriving methodological lessons that support VSM and SSM usage,
- Highlighting that VSM appears to be a particularly promising approach for the sugar industry,
- Indicating that the allocation of certain stakeholders or activities to a certain sub-system can be challenging,
- Suggesting that a VSM diagnosis should also consider the social capital of a system,
- Showing that an adequate normative management (S5) is especially important in the context of systems that lack a mandatory overarching structure,
- Adding to the discourse pertaining criteria to assess the adequacy of a claim of SSM and
- Enriching the concept of worldview.

9.2 Limitations

The embedding of the current study within the pilot project impacted on the scope and conduct of the study. The Felixton SSM-based workshops were, for example, determined by another project member. Time and resource constraints implied that this study was conducted in two milling areas only and that the intensity of the stakeholder engagement was limited. The SSM or VSM application in other milling areas or a more intense cooperation with stakeholders could lead to different results. Therefore, the general validity of my study outcomes, especially concerning the suitability of SSM and VSM and systemic approaches for sugarcane production and supply systems, is limited. Furthermore, SSG and emerging grower issues were excluded from this study, despite their crucial relevance in the investigated milling areas and the importance of these issues for the sugar industry.

9.3 Recommendations for future research

This study leads to several recommendations for future research, which are outlined below. They revolve around issues related to systemic approaches in the sugar industry context, VSM, SSM and the sugar industry. The items are not necessarily related and are simply listed below in a bulleted list for practical purposes.

9.3.1 Systemic approaches in the sugar industry context

Based on the findings and limitations of the current study, future research should:

- Validate the claim that systemic approaches are valuable and suitable for the sugar industry context,
    - Explore the merit of other systemic approaches in the sugarcane supply chain context, e.g. Critical Systems Heuristics (Ulrich and Reynolds, 2010) or Critical Systems Thinking (Jackson, 2000),
- Apply SSM and VSM to other sugarcane production and supply systems to further explore their significance and validate their suitability for the sugar industry context and
- Investigate whether VSM can be the new framework for looking at the sugar industry and whether it can guide the anticipated development towards vertical slicing; e.g. explore the managerial and structural setup of a changed industry from a VSM perspective.

9.3.2 VSM related issues

The study highlighted that further research on VSM related issues should:

- Examine the merit of VSM for other supply chains and investigate the peculiarities that arise from using VSM in this context,
- Investigate opportunities to strengthen the VSM diagnosis by means that support the handling of identified deficiencies,
    - Explore opportunities that facilitate the deduction of improvement suggestions from the VSM diagnosis in a manner, which facilitates stakeholder buy-in and the implementation of these suggestions,
    - Consider combining VSM with other approaches that support the implementation of derived improvement suggestions,
- Validate the merit of a qualitative interview process for the VSM diagnosis and the resultant improvement suggestions,
- Examine the merit of applying VSM in a more participatory manner,
    - Investigate the merit of presenting the outcome of the VSM diagnosis to affected stakeholders and of developing improvement suggestions for detected shortcomings in collaboration with them,
    - Investigate opportunities to build the VSM of a system in collaboration with the stakeholders of this system and explore the benefit of this,
- Explore opportunities that support the detection of S5 shortcomings and possibilities to strengthen S5,

- Investigate whether it is possible that S5 is executed by specific stakeholders in the sugarcane production and supply chain context and explore the benefit thereof,
- Explore opportunities to enrich a VSM by consideration of the social capital and investigate the impact and merit thereof,
- Investigate how best the information required for the VSM diagnosis should be obtained,
- Investigate possibilities that assist the VSM user in the allocation of stakeholders, issues or activities to sub-systems or channels and
- Investigate possibilities that enable VSM to not only detect power issues and make recommendations for their handling, but to address them as well.

9.3.3 SSM related issues

Concerning SSM, the study proposed that future research should:

- Further investigate the merit of SSM in the general supply chain context,
- Seek means that strengthen SSM‟s ability in bringing about Accommodation, change and improvement such as a combination with other approaches that support change implementation,
- Investigate SSM‟s change capacity under conditions that are more conducive for a SSM application,
    - Explore to what extent adequate stakeholder participation, stakeholders willingness to engage in a change process and the presence of local champions to drive the SSM process assist in change implementation,
    - Explore possibilities to develop local champions to drive the SSM process,
- Validate and extend the facilitator guideline that emerged from this study,
- Enrich the discourse on adequate criteria to claim SSM use and
- Explore possibilities to overcome initial barriers with the rich picture drawing.

9.3.4 Sugar industry related issues

Future research in the sugar industry context should:

- Conduct studies that focus specifically on present soft issues within the different milling areas and their handling,
- Take soft issues into account even if it aims at optimisation on hard technical aspect, in order to support technology adoption,

- Seek a close collaboration with stakeholders in the respective milling area and concentrate on local „solutions" rather than applicability in the entire industry,
- Apply a holistic perspective and perform studies that examine sugarcane production and supply chain holistically,
- Explore possibilities that support a mindset change and the reduction of fragmentation,
    - Investigate how stakeholder drivers can be better aligned given present industry regulations and how these regulations would need to be changed to assist in this alignment,
    - Explore how the necessity to become partners could be adequately communicated and what kind of additional feedback mechanisms to support systemic commitment should be implemented,
    - Investigate the merit of experiential learning in supporting a process of becoming real partners,
    - Investigate possibilities to extend the concept of extension to other aspects, e.g. dealing with soft issues, conflict resolution and communication support,
- Continue to explore stakeholders" underlying value systems, namely their drivers and motives,
    - What kind of change do stakeholders desire?
    - How could present regulations be adapted to better resonate with stakeholders" value system?
    - What is the appropriate language for the communication and implementation of feedback mechanisms?
- Investigate possibilities to improve the coordination within the sugarcane supply chain and thus reduce inconsistencies,
    - Explore possibilities to improve two-way communication and
    - Examine opportunities that enable the cane supply managers to better counterbalance supply outages from certain regions.

9.4 Concluding remarks

This study sought to explore the appropriateness of systemic approaches to the sugarcane production and supply chain context, including their ability to bring about improvements. From the range of systems methodologies, I chose Soft Systems Methodology (SSM) and the Viable System

Model (VSM). Both methodologies had not previously been used in this context and studies holistically investigating the sugarcane production and supply system, and its underlying soft and leadership issues, were rare.

The study clearly indicated the merit of systemic approaches in facilitating a holistic understanding of the investigated systems. The SSM application and the VSM diagnosis revealed crucial issues and shortcomings in the sugarcane production and supply systems of the Umfolozi and Felixton milling areas respectively. They also facilitated a greater appreciation of existing soft and leadership challenges. The study demonstrated the importance of considering such challenges in future investigations of the industry, as they exert a significant influence on the sugarcane production and supply process.

A core issue that surfaced in this study was the presence of fragmentation. The study proposed that in order to reduce fragmentation stakeholders need to effect a mindset change. It further suggested that this mindset change can be supported by the effective handling of soft issues and adequate changes in the structure and regulation of the sugar industry. However, presented recommendations with regard to fragmentation are far from complete and will hopefully serve as a point of departure for further research.

Additional research should focus on overcoming the challenges of this study, as well as enhancing the merit of the methodological propositions posited by the researcher. The efficacy of the VSM and SSM approaches in understanding the sugarcane production and supply systems in this study points to the benefit of utilising such systemic approaches to explore similar contexts in the future.

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APPENDIX 1: INTERVIEW QUESTION GUIDES

Appendix 1A: Question guide for first round of interviews in Umfolozi and Felixton

Main questions:

- What are the various goals of the growers, haulers and millers and do you consider them to be compatible with each other or are they competitive? And why do you think so?
    - How do you feel specifically regarding communication and trust between the stakeholders?
    - How do you currently deal with those issues and do you consider this as appropriate? What would you recommend?
- How influential is your own position and that of your stakeholder group both towards the overall success?

Additional questions:[2]

- What does the interviewee think can be done to improve overall system efficiency? and would he/she run things differently if it were one company (miller, haulier and grower)?
- What major issues you have been confronted with in last 6 months? (beginning)
- If you were one company how would you resolve it? (end/middle)
- What have we missed/should we have been asking you? (end)

Appendix 1B: Question guide for the second round of interviews in Umfolozi

- How do you feel in general about soft issues in your milling area?
    - Particularly around leadership and power relations?
- How would you describe the working relationship between the different stakeholders?
    - Can you explain whether they appreciate and understand each other? Describe?
    - How is your working relationship influenced by soft issues, i.e. communication, trust, value, norms and behaviours?

[2] This were only sometimes used

- How would you describe the transparency of the interactions between the different stakeholders happening in your mill area?
    - How is it influenced by issues around power relations?
    - How would you describe the behaviour of your colleagues and other stakeholders in this respect?
    - Which kind of communication would be required to address issues of transparency?
- What are the soft issues around cane quality and cane supply?
    - How is it influenced by existing values, norms and roles or behaviour?
    - How would you describe issues around leadership and management in this respect?
    - What can be done by individuals to ensure the long-term sustainability?
- Tell us about the payment system; is it equitable, how do you experience it?
    - What can be done by the various stakeholders to enable the development of a fairer payment system?
- Tell us your thoughts on mill efficiency and how it affects the system and what are the soft aspects around it.
- What are management and behavioural actions that can be done by you or other stakeholders in order to address the issue of SSG sustainability?
- How would you describe the existing norms, values, roles and power relations in your milling area?
- How would you describe the long-term sustainability of the Umfolozi milling area, and what are the strategic issues that need to be considered with regards to long-term sustainability?
- What are the soft issues around the Umfolozi river water conflicts?
    - What are leadership and management challenges in this respect?
    - What can be done by individuals to ensure the long-term sustainability, and what strategic steps can be taken?

These questions guided the interview process, however, I did not always ask all of them, but instead let the course of the interview direct the discussion.

Appendix 1C: Question guide for the second round of interviews in Felixton

While asking these questions, I focused on further probing and the system as a whole, rather than the details of the operation. I applied a *‚tell me more…"* approach. The question guide was structured around 6 themes; *viz.*, the 5 sub-systems and the squiggly line (channel 3). I concentrated on deriving information for these themes, instead of rigidly asking every question that appears in this guide.

- What are the main operations of the Felixton system?
  - E.g. Growing, hauling, milling – are there any others?
  - How dependent are you as a grower/haulier/miller on the Felixton System?
- How do they relate and work together?
  - How are the relationships between the different operations?
  - Does it work well or not? Why? Tell me more….
    - How does what you do influence what others do and how much is your operation influenced by other operations? How do you experience the connection and interaction between the different operations in the Felixton system?
      - What is happening between the operations?
- If you look at the operations you mentioned, what mechanisms do you have here in Felixton that allows things to run smoothly?
  - How do you coordinate those operations?
  - Do you experience situations in the system that come and then go away and come again and what do you do about it?
    - Traffic example: e.g. every morning there was a long queue at a special intersection and cars waited over half an hour. Then they built a traffic light, cars still wait, but less.
- What are the important committees and other structures that enhance good operation of Felixton as a whole?
  - To what extent do they influence you, what do they determine?

- If you look at the Felixton system as a whole, who do you think is managing it and through what mechanisms?
- For the Felixton milling area where do the instructions come from in relation to the three groups and how? Who is the "boss" (e.g. company)
    - Who give instructions for what needs to happen across this 3 players and how? What is determined? What is expected from you?
    - Or if there is conflict between the 3 main players how do you work with it?
    - Where does the MGB fit in?
- What resources do you get (from the system as a whole/from your "boss")?
    - What resources does the MGB provide? (e.g. Money, material, information)
- What is expected from you in exchange for the resources?
- How do you or the others check that you deliver what is expected? (e.g car company – if engines not delivered then reclamation of construction department)
    - And if you don"t focus on your group what are those mechanisms/ "bosses"/ requirements for the system as a whole?

o Who is looking at the environment and who investigates what impact external factors have on the system in the long-term?

- Where do you see the Felixton milling area in 5 years?
- Which future trends are likely to have an impact on the system and how do you plan to deal with them?

o Why do you exist in Felixton milling area as collective together? Please describe to me in one sentence why the system does exist!

- Why can"t you just farm and do your own business?
- Yes I know it would be more expensive to deliver somewhere else….but what binds you all together as Felixton System?

Appendix 1D: Question guide for the third round of interviews in Umfolozi

- The data shows that stakeholders perceive the mill not as efficient as it should be– what concrete steps could be done about it?
- What are the obstacles that prevent growers from taking actions to ensure that the mill is successful?
- And in relation to this "lack of ownership" – what do you propose to overcome it?
- What is required to ensure that growers become more committed to the success of the whole mill area?
    - Which concrete suggestion can you make that enhance growers" commitment?
- Can you specify what actions mill leadership, UCOSP and the grower body needs to put in place to make growers more committed?
- Cane quality is an issue. Everyone talks about it and a general agreement about the importance of good cane quality exists. However, some growers seem to either perceive their quality as sufficient, or they are eager to improve their quality, but not at their cost and both hinders quality improvement. Which concrete steps can the industry as a whole take to deal with this tensions and what concrete proposal do you have for the stakeholders here in this area?
- Can you specify what concrete actions need to be put in place to increase cane supply and by whom this should be driven?
- The statement, UCOSP is too powerful in this area and weakens the grower body which is becoming a step child and UCOSP contributes to growers lacking responsibility for the whole milling area, was made. Do you agree with it, if so how can this be addressed?
- And how do you feel in regards to UCOPS"s transparency and communication, because it was mentioned that they lack transparency in regards to decision making and performance especially considering their non-core functions and financial transparency. What do you suggest to resolve this?
- It has been suggested that the grower body is made up of some growers having more decision making powers and some having less which causes jealousy and friction. To what extent can this be addressed? What do you suggested to improve the situation?

Questions for mill employees[3]:

- The data shows that stakeholders perceive the mill not as efficient as it should be – what concrete steps could be done about it?
- What are the soft and managerial issues within the mill – can you please name the top 5 and how you describe the working atmosphere?
- It was mentioned that decisions are made by a relatively small group and that there is a lack of a more comprehensive structure to prevent one sided decisions. How do you perceive the decision making by senior management?
- Low morale, commitment and motivation of mill staff and cultural and interpersonal issues among them were mentioned – could you elaborate on that. And what concrete steps can be taken to improve morale and motivation and resolve interpersonal and cultural issues?
- How do you feel about the statement the mill lacks supportive leadership and appropriate staff management? What would you suggest to address this?

SSG specific questions[4]

- It was mentioned that SSG struggle to work together. However, one suggested core approach to improve their sustainability is grouping – what can the industry as a whole do to deal with this tension and which specific actions could the Umfolozi milling area take?
- Is there a central or overarching scheme for SSG support because at the moment to me it looks like there is the mill, then there is this local office supported by cane growers then there is the development committee…Or can you give me an overview what each body does for the SSG?
- Why is it so split and what would you propose to unify them more?
- What are the obstacles that prevent those huge ranges of SSG activities making a real contribution to SSG sustainability? And what specific actions are required to move forward and make a real difference to SSG sustainability – industry level and locally?
- And what is this mill cane committee? How does that support SSG?

[3] These questions were only used in the few interviews with mill employees

[4] These questions were only used in interviews with stakeholders having a special focus on the SSG sector

Appendix 1E: Question guide for the third round of interviews in Felixton

In the last round of interviews in Felixton I, again, used a *„tell me more..."* approach, whereby I specifically focused on receiving clarity on S3 deficiencies, S3*, the squiggly line, S2 improvements, and the presences of S4, S5, the algedonic signal and the S3-S4 balancing.

- Can you tell me more about measurements in regards to ensuring
  - Rateable delivery and
  - Delivering appropriate quality and no foreign matters.
    - Who determines, monitors and implements it?
    - Are they followed? Ash penalty?
    - If not what would be appropriate measurements to achieve that?
- Can you tell me more about the issue of the lack of two way communication.
  - Info is sent out and growers don"t report back.
  - Spoornet doesn"t inform if there is a problem.
    - What would be needed to make it happen?
- Are there any sporadic controls where someone from those committees or bodies comes to your farm / mill / haulage and checks for something?
- Can you tell me more about the working relationship between the different stakeholder groups because we were told it is good and a consideration of how my operations impacts on others exist and then we were also told that everyone has its own agenda and there is no understanding and appreciation of each other.
- How could the coordination of the different activities in the system (cane growing, harvesting, transport and milling) be improved? What would it need?
- I was told that within the Felixton cane grower body a transport pilot project was conducted and I heard that growers might come together and build their own mill.
  - Is there a group that initiates projects or special initiatives to improve the system and adapt better to the future? In what ways?

- Who defines and implements the strategy for the whole? (subcommittee of the FCGA or another body)

- Who is looking at the risk of decreasing cane supply or other future developments?

- Is there a common grower and miller body investigating it?
- How should this issue be addressed?

- How does SASA or CANEGROWERS or SASRI contribute on a local level for Felixton to adapt to future changes and to look at the environment?

- What do you consider as the environment?

- And when I asked what binds the system together I was told the MG.

- How? What are your thoughts on that?
- What makes the Felixton system the system it is?
- Who sets the parameters that determine the functioning of the system as a whole?

- Or if you look at the system like a company – a company has a mission statement or a culture that holds it together and gives it its identity, what is the culture or vision of the Felixton system? (e.g. contribute to research and "produce" educated and responsible student, e.g. world leader in car production)

- Many told me they would leave the system if there would be alternatives…or growers don"t care about the quality because it is the mills problem…or why should we bother communicating back to the mill…or don"t come to the meetings…and that there is no appreciation or understanding of each other….but if I look at this I wonder why doesn"t the Felixton system fall apart and the mill will just shut down – so there must be something that keeps the system together, what would that be?

- If there is a change in the environment that would risk all the livelihoods and the existence of all who would deal with it? And in what ways?

- To what extent does the Felixton System focus on the future and to what extent on the operational level?

Appendix 1F: Question guide for interviews with industry representatives

Sugar Act &Vertical Slicing

- What triggered the need for changes to the Sugar Act?
- Who is involved in bringing about the changes? / Who is driving the changes?
- What is the current status of negotiations and when will the Act be finalised?
- What are the proposed changes? And what are stakeholder‟s perceptions about them?
- How is vertical slicing defined?
- How will local mill areas be affected by the changes? And what are the different stakeholder groups‟ position / view towards this development?

Division of Proceeds

- Can you provide information about how pricing in the industry currently works? (Calculation of it) And about how it possibly will be conducted in the future. Will growers get reimbursed for the „whole‟ stick? Will there be a way of involving growers in the benefits of possible downstream product? How?
- Issues have been raised at mill area level concerning the division of proceeds and fibre, and it has been mentioned that industry matters severely impact the local relations, particularly creating tension between miller and growers, leaving a feeling of powerlessness. How do you feel about this? Provide your perspective about the division of proceeds and fibre, and future of co-gen, and how industry can intervene?

General disclosed issues / Issues at the milling areas

- Cane supply was also mentioned as critical to the survival of the industry, and local mill areas. What are your suggestions on how industry can intervene?
- What suggestions do you have to facilitate relations between miller and growers?
- It has been mentioned that the sugar industry is a very difficult industry to bring about change? How do you feel about this? How can change be brought about?
- Do you have any specific thoughts on the Felixton and Umfolozi mill areas? What is your perspective pertaining to issues or problems and what works well and what doesn‟t? How can

the industry intervene to improve the sustainability of the areas? (just put your intervention question at the end)

CANEGROWER

- How is CANEGROWERS linked to the local level and how to the industry level?
- How does CANEGROWERS support the growers in the respective milling areas?

APPENDIX 2: QUESTIONS FOR THE KNOWLEDGE CAFÉ EXERCISE

Round 1

What do you see in the picture?

Which concerns stand out for you?

What are the fundamental issues?

What are the problems in this picture? And how are they dealt with?

What linkages can you see in the RP and why are they linked?

How is one thing related to another? What Impact does x have on y?

Round 2

What can you see about the working situation in your milling area in this picture?

What are the key challenges that need to be addressed?

Can you see why it is so difficult to change the situation?

Who or which organizations or groups should be involved if you want to change something about the situation? Why?

Who is affected by the situation?

APPENDIX 3: ROOT DEFINITION, CATWOE & PURPOSEFUL ACTIVITY MODEL

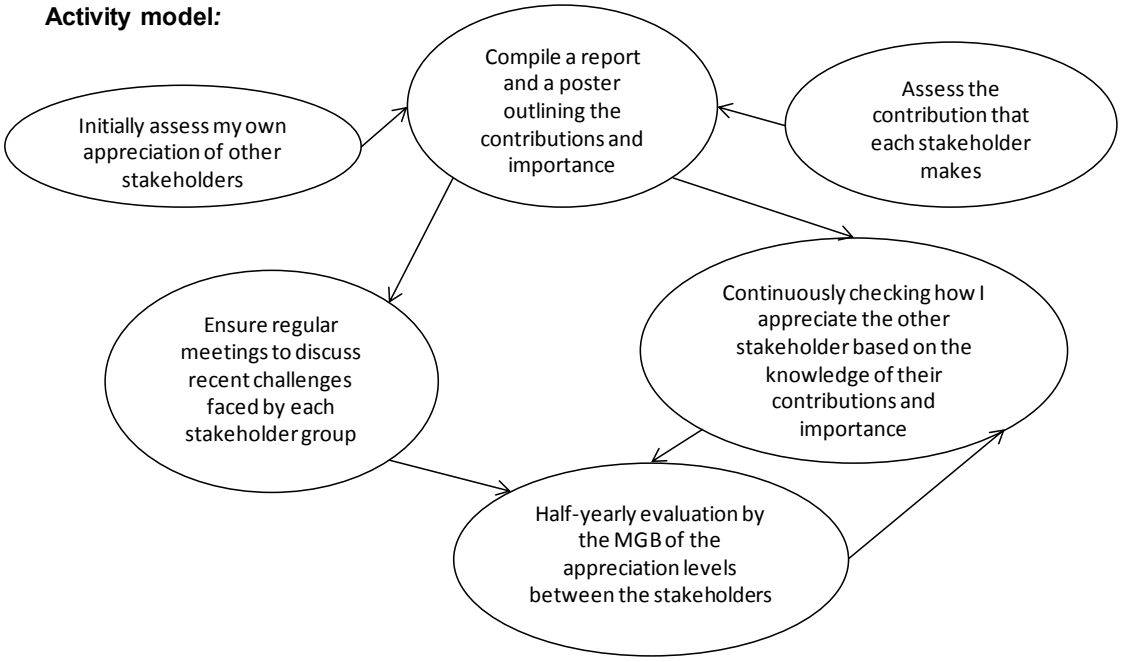
Appreciation of the different stakeholders

Root Definition:

A system jointly owned and operated by growers, hauliers, miller and MGB to improve appreciation of the different stakeholders by indicating their importance and contributions to the system, in order to improve the overall efficiency of the system, within the constraints of stakeholders who are not willing to be appreciative of the other stakeholders.

C	Growers, hauliers, mill
A	Growers, hauliers, miller, MGB
T	Improve appreciation of the different stakeholders
W	Indicating stakeholders' importance and contribution helps to improve appreciation of the different stakeholders / ? or Improve appreciation of the different stakeholders improves the overall efficiency of the system
O	Growers, hauliers, miller
E	Stakeholders who are not willing to be appreciative of the other stakeholders

Activity model:



Improve SSG sustainability

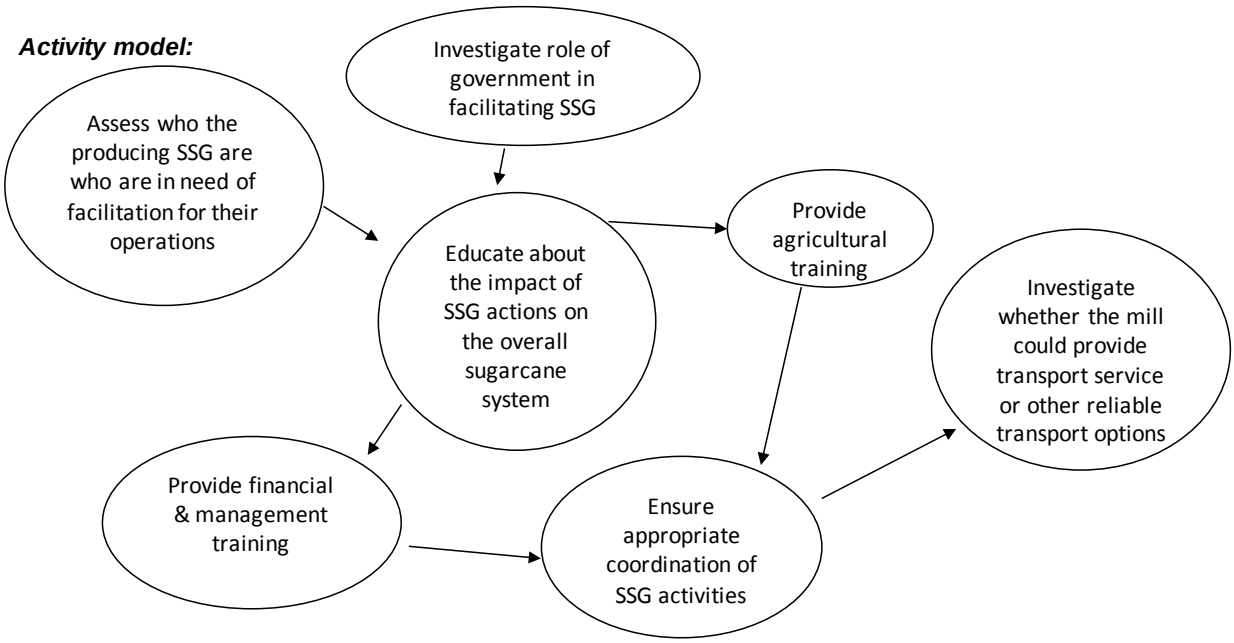
Root Definition:

A SSG and transporters owned system operated by SSG and transporters, but facilitated by millers and government, to improve the SSG sustainability and operations by addressing their deficiencies in order to increase cane supply, within the constraints of weather, infrastructure, lack of knowledge and finances. .

CATWOE:

C	SSG, mill
A	SSG, facilitated by mill and / or government, reliable transporters
T	Improve the SSG sustainability and operations
W	SSG sustainability will increase cane-supply / Addressing their deficiencies improves the SSG sustainability and operations
O	SSG, reliable transporters
E	Weather, infrastructure, lack of knowledge and finances

Activity model:



Consistent delivery of quality cane

Root Definition:

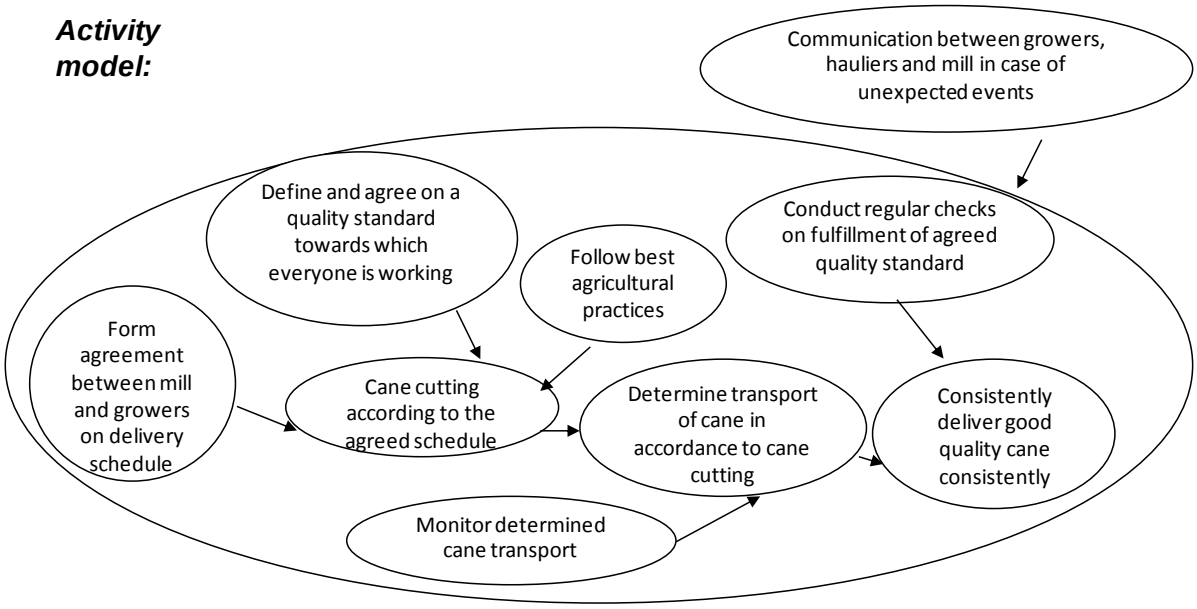
A grower and haulier owned system, and operated by hauliers, growers, mill, to enable consistent delivery of quality cane according to the defined ratable daily deliverables, by following good agricultural practices and ensuring efficient transport to the mill in order to improve the sugarcane production and processing system, within the constraints of the availability of input resources and weather.

CATWOE:

.

C	Mill, growers
A	Hauliers, growers, mill
T	Enable consistent delivery of quality cane according to the defined ratable daily deliverables
W	Following good agricultural practices and ensuring efficient transport to the mill enables consistent delivery of quality cane / Enable consistent delivery of quality cane improves the sugarcane production and processing system
O	Growers, hauliers
E	Available input resources, weather

Activity model:



Improvement of communication

Root Definition:

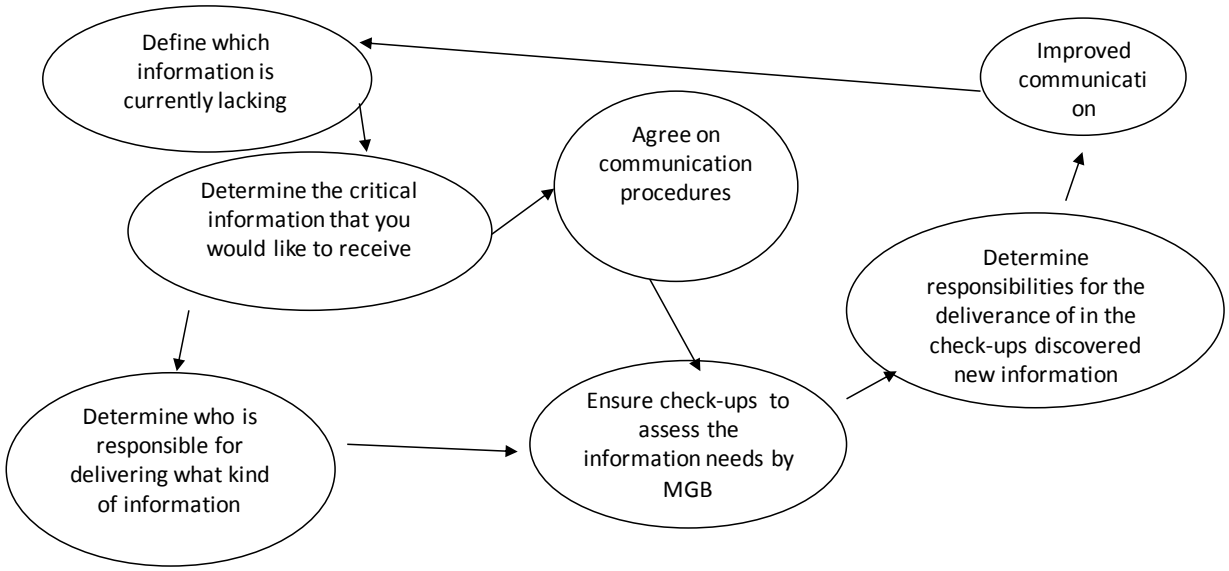
A system to improve communication between the three main stakeholder groups by defining the information needs and communication responsibilities and procedures in order to increase transparency in operations in the sugarcane production and processing system.

CATWOE:

.

C	Mill, growers, hauliers
A	Mill, growers, hauliers
T	Improve communication between the three main stakeholder groups
W	Improve communication between the three main stakeholder groups increases transparency in operations in the sugarcane production and processing system / Defining the information needs and communication responsibilities and procedures improves communication between the three main stakeholder groups
O	Growers, hauliers, mill
E	Access to communication modes, behaviours of withholding information, lacking the ability to see the benefits of improved communication

Activity model:



The Umfolozi river water conflict

Root Definition:

A system owned by water users, and operated by coal mine, growers, ISimangaliso Wetland Park, and the mill, to deal with the conflicting goals posed by the multiple users of the Umfolozi river water by bringing about an accommodation of the different interests, within the constraints of all relevant legislation around water use and protected areas.

CATWOE:

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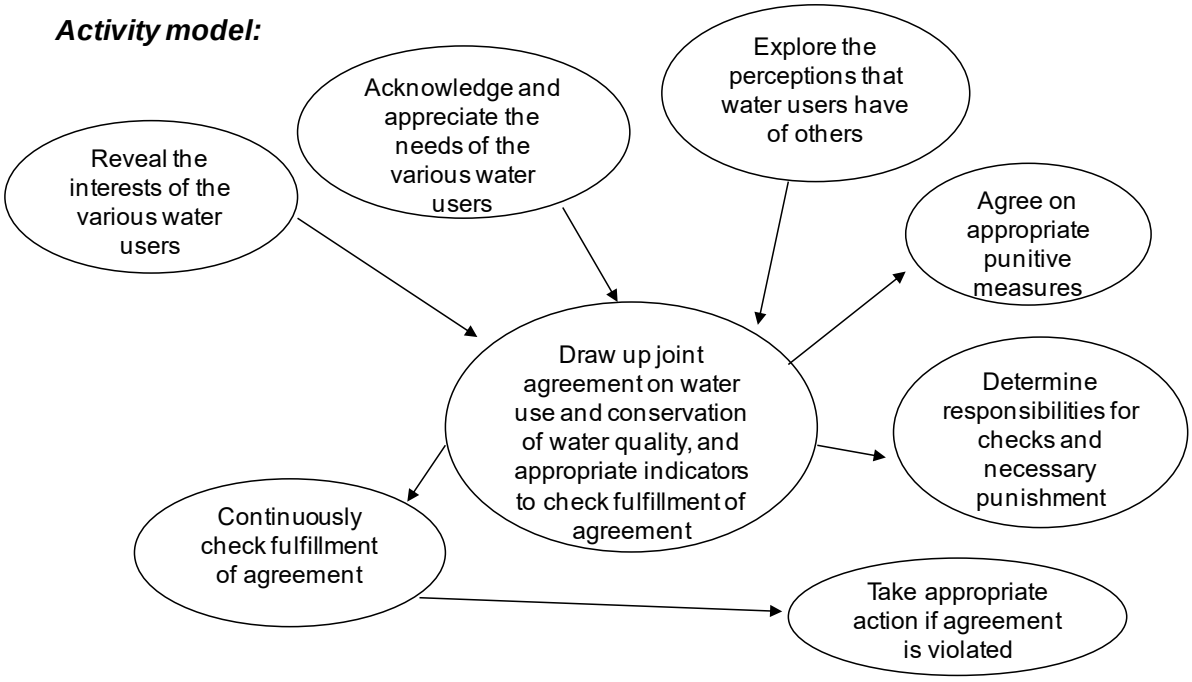
C	Coal mine, growers, iSimangaliso Wetland Park, Umfolozi community, mill
A	Coal mine, growers, iSimangaliso Wetland Park, mill
T	To deal with the conflicting goals posed by the multiple users
W	Bringing about an accommodation of the different interests deals with the conflicting goals posed by the multiple users of the Umfolozi river water
O	Water users
E	All relevant legislation around water use and protected areas

Activity model:



Better division of proceeds

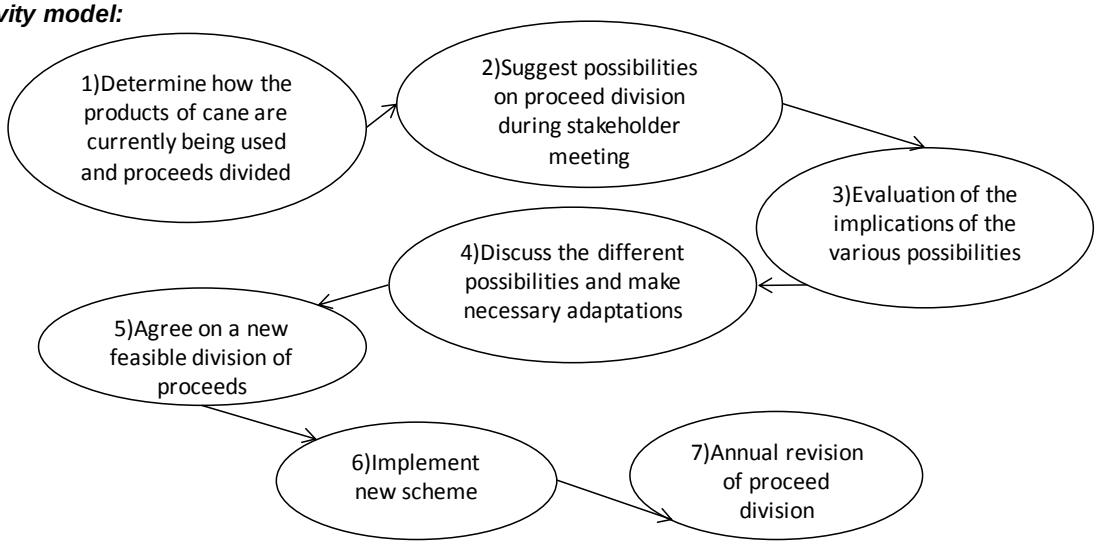
Root Definition:

A mill shareholder owned system, operated by mill management enabled by shareholders and growers, to design a fairer payment scheme by enhancing discussions about the division of proceeds that arise from the various products from cane, and investigations into the possibilities of better division of proceeds, in order to improve the miller-grower relationship, within the constraints of the Sugar Act, an entrenched way of doing things, and a potential unwillingness from mill shareholders to lose part of their profits

CATWOE:

C	Growers, miller
A	Mill management enabled by shareholders, growers
T	To design a fairer payment scheme
W	Designing a fairer payment scheme improves the miller-grower relationship / enhancing discussions about the division of proceeds that arise from the various products from cane, and investigations into the possibilities of better division of proceeds helps to design a fairer payment scheme
O	Mill shareholders
E	Sugar Act, entrenched way of doing things, a potential unwillingness from mill shareholders to lose part of their profits

Activity model:



Improvement of service delivery

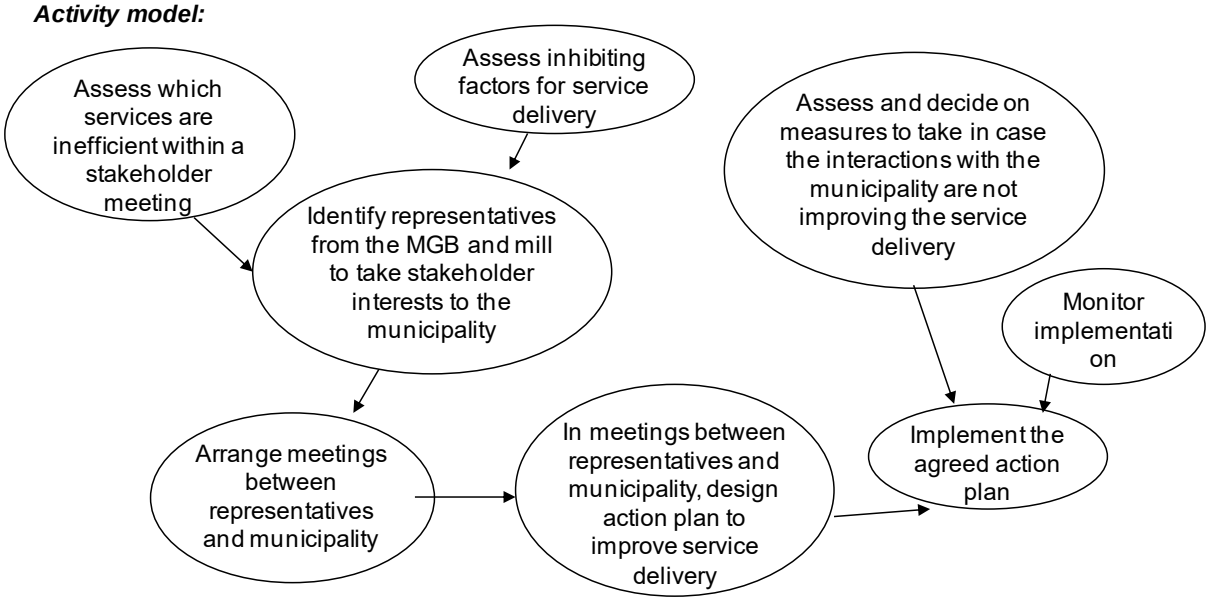
Root Definition:

A municipality owned and operated system to improve service delivery by having the MGB and mill representatives interact with the municipality in order to make the local sugarcane production and processing system run more smoothly, within the constraints of bad management of rates and lack of finances.

CATWOE:

C	Haulier, community, mill, grower
A	Municipality, MGB and mill representatives
T	Improve service delivery
W	Improve service delivery makes the local sugarcane production and processing system running smoothly / interaction with municipality improves service delivery
O	Municipality
E	Bad management of rates, lack of finances

Activity model:



Improve working relationships

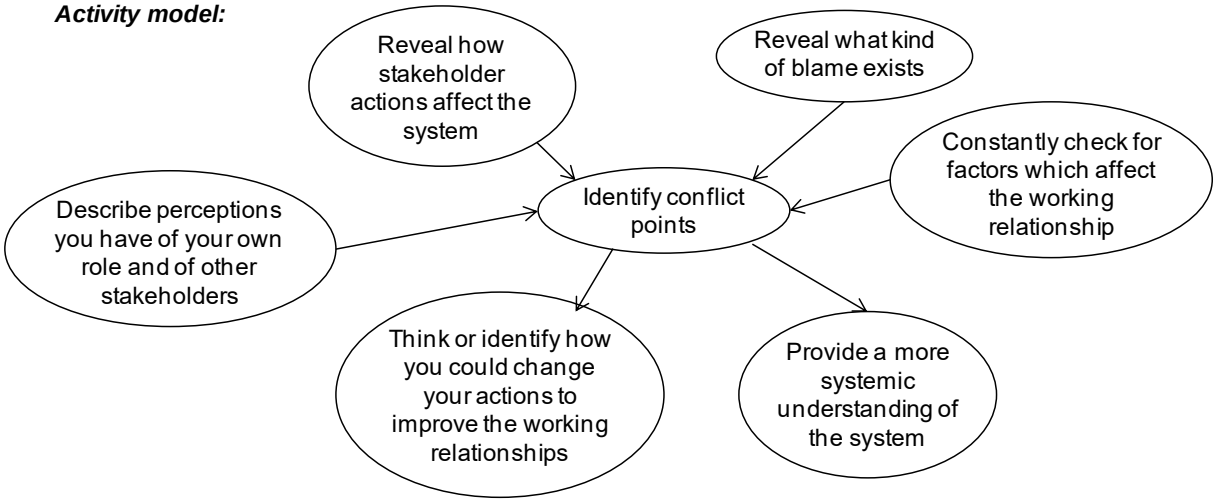
Root Definition:

A mill, grower and haulier owned and operated system, to improve the working relationship between the various stakeholders by identifying the sources of conflict and blame, revealing existing perceptions and providing a more systemic perspective in order to bring about a mindset change through an understanding of how stakeholders' actions affect the whole system, within the constraints of history, an entrenched way of doing things, a lack of a holistic system view, and egoism.

CATWOE:

C	Millers, growers, hauliers
A	Millers, growers, hauliers
T	Improve the working relationship between the various stakeholders / Bring about a mindset change through an understanding of how stakeholders' actions affect the whole system
W	Identifying the sources of conflict and blame, revealing existing perceptions and providing a more systemic perspective brings about a mindset change through an understanding of how stakeholders' actions affects the whole system and improves the working relationship between the various stakeholders
O	Millers, growers, hauliers
E	History, entrenched way of doing things, lack of a holistic system view, egoism

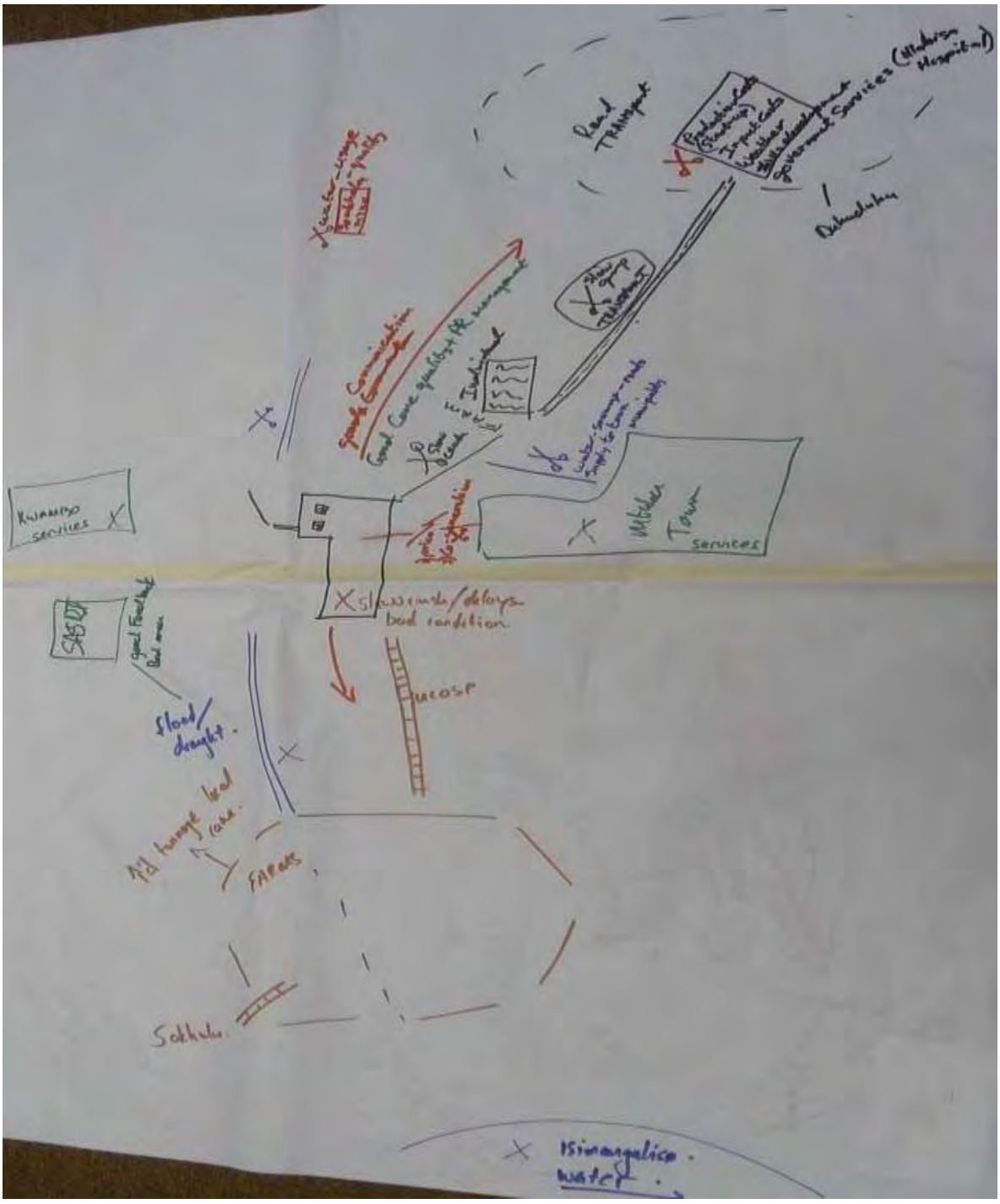
Activity model:



APPENDIX 4: RICH PICTURES UMFOLOZI

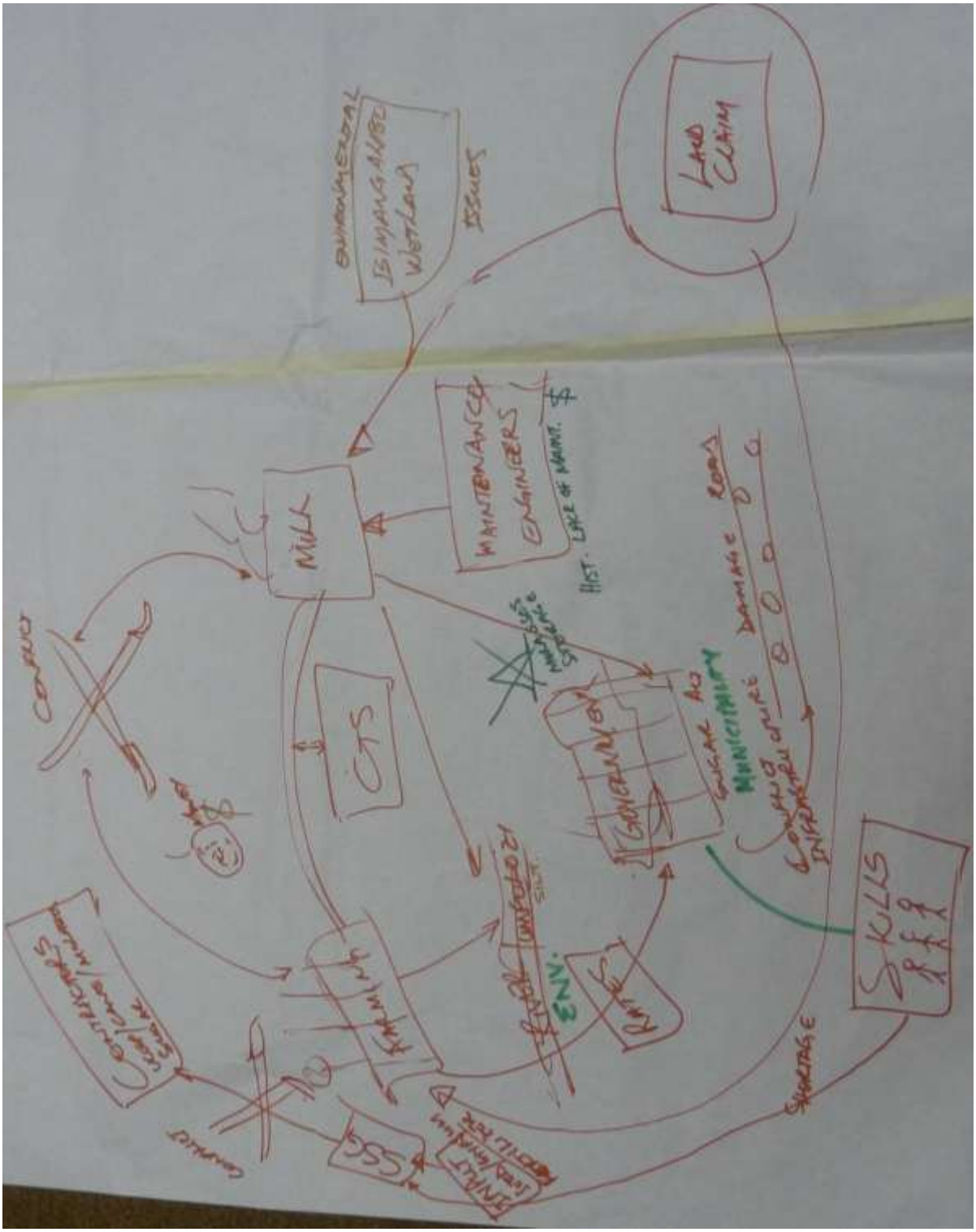
Rich picture: group one

This rich picture was created by one large scale grower, two small scale growers, one emerging grower and an Extension Officer.



Rich picture: group two

This rich picture was created by one CTS representative, one mill employee, one emerging grower and two small scale growers.



APPENDIX 5: KNOWLEDGE CAFÉ EXERCISE

Appendix 5 illustrates the charts that participants created during the knowledge café exercise in the first SSM-based workshop. These charts comprise the issue owners and the topics that workshop participants perceived as most relevant.

Outcome of the first round of the knowledge café exercise

Flip-chart generated by group one

- Conflicts:
  - shortage of water, environmental, transporting of cane (reliability), mill production (reliability), government services, contamination of water by mine
- Infrastructure
  - Socio-economic up-liftment through system
- Mill
- Growers, government services (municipality)
- SASRI – lack of input for Umfolozi region
- Municipality hindering development
- Weather – rain – no cane delivery to the mill

Flip-chart generated by group two

- Conflict – miller versus grower
- Transport – SSG – field to zone, zone to mill
- Slow crushing of mill
- SSG (start-up capital, salaries at the beginning, skills)
- Municipality (service delivery affects everybody)
- Water
- Inter-dependency (miller/grower/town)
- Maintenance

Outcome of the second round of the knowledge café exercise

Flip-chart generated by group one

- Mill not working well: old, requires more maintenance; sugarcane shortage
- Better or improved communication between mill and growers
- Transport also an issue
- Poor cane quality (stones, soil,
- People need to be better educated (growers) about cane quality
- Mill, government (Agriculture), SASRI

Flip-chart generated by group two

- Good working system
- Government services (mindset)/ mill (consistency in crushing, lack of foresight)
- Municipality (government services) - ineffective
- The mill – industry revolves around sugar mill
- Skilled engineers / financial for maintenance
- Stakeholders (Beneficiaries)
    - Skilled engineers, financials for maintenance

Brief reflection on the outcome of this exercise

This exercise was compromised by several shortcomings; viz., (a) the only attending large scale grower had to leave, implying a reduced diversity of perspectives, and (b) participants struggled to engage in the task, perceived it of little value, and were preoccupied with discussing poor service delivery. As a result, the debates were less rich than anticipated. This impeded the elaboration on relevant issues or systems for the next stage in the SSM process. Moreover, I felt participants intended to transfer the impression that everything works well, rather than disclosing difficulties.

APPENDIX 6: ETHICAL CLEARANCE

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15 SEPTEMBER 2010

Ms. S Hildbrand (210554921)
Leadership Centre

Dear Ms. Hildbrand

PROTOCOL REFERENCE NUMBER: HSS/0954/010D
PROJECT TITLE: Systemic Approaches to improvement in Sugarcane Production and Supply: Umfolozi & Felixton Mill Areas

NEED FOR ETHICAL APPROVAL WAIVED

I wish to inform you that the need for ethical review has been waived because this protocol forms part of the broader research protocol which has already received ethical clearance (HSS/0204/010).

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.
PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Professor Steven Collings (Chair)
HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

cc. Supervisor – Dr. S Bodhanya
cc. Mrs. C Haddon