DESIGN AND MANAGE LOCAL ORGANIC FOOD SUPPLY CHAINS: BENEFITS OF USING SOFT SYSTEMS METHODOLOGY

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ABSTRACT

Local organic food supply chain partners face uncertainties such as poor collaboration, communication and information sharing that cannot be reduced through the application of traditional, quantitative supply chain design and management techniques. Such techniques are known to improve supply chain coordination and efficiency, but they do not adequately consider major aspects of local organic food supply chains such as ethics, sustainability and human values that influence decision making and thus, supply chain activities. Supply chain design and management approaches suitable to small-scale, local organic food enterprises are lacking and need to be developed.

The aim of this paper is to suggest Soft Systems Methodology (SSM) as a new and suitable approach to design and manage local organic food supply chains. We illustrate how SSM can be used to reduce uncertainties within local organic food supply chains based on a German case study within the organic cereal sector. This illustration serves to identify benefits of using SSM compared with ad hoc, pragmatic and less structured approaches. Organisation of thought, intervention and change, as well as action-oriented, meaningful and participatory decision making are the major benefits. SSM is a promising alternative to traditional supply chain design and management techniques, and an approach to enable long term collaboration, coordination and communication along local organic food supply chains.

Keywords: Soft Systems Methodology; organic food; supply chain design; supply chain management

INTRODUCTION

Local organic food supply chain (LOFSC) partners face uncertainties such as poor collaboration, communication and information sharing (Kottila *et al*., 2005; Strauch and Schaer, 2005, p. 21; Stolze *et al*., 2007; Hindborg, 2008, p. 347; Kledal and Meldgaard, 2008, p. 309-315) that make their chains complex to design and manage. Such complexity cannot be reduced through traditional, quantitative supply chain design and management techniques. Traditional techniques are recognized to improve supply chain coordination and efficiency, but they are inadequate for considering central aspects of LOFSCs such as ethics, sustainability and human values (Milestad *et al*., 2010) that influence decision making and supply chain activities. LOFSCs are mainly composed of

small-scale enterprises (Milestad *et al*., 2010) that face limitations to implement complex mathematical models and sophisticated software used in traditional supply chain design and management (Dutta and Evrard, 1999; Sørensen *et al*., 2004; Celuch *et al*., 2007; Ahumada and Villalobos, 2009). Viable and well established approaches to reduce the inherent uncertainty, design and manage LOFSCs are lacking and need to be developed (Marsden *et al*., 2000; Kledal and Meldgaard, 2008, p. 309-315).
In practice, LOFSC partners mainly manage their relationships ad hoc, through personal communication and reach agreement through hand-shaking (Marsden *et al*., 2000; Morgan and Murdoch, 2000; Sage, 2003; Stevenson, 2009, p. 7). Organised and facilitated approaches such as workshops and information meetings, however, have been found to be more successful, especially in a long-term perspective (Marsden *et al*., 2000; Bahrdt *et al*., 2002, p. 61-62; Strauch and Schaer, 2005; Hindborg, 2008, p. 345-350). Some successful implementations of facilitated approaches are documented, but there is still a need to develop and explore systemic, structured, and practically 'softer' approaches to design and manage LOFSCs.
In this paper we suggest Soft Systems Methodology (SSM) (Checkland, 1981; Checkland and Scholes, 1990) as an approach to design and manage LOFSCs. SSM may help reduce uncertainties, support supply chain coordination and enhance supply chain efficiency. SSM is a participatory approach to intervene in problematic situations and enhance collaboration, communication and information sharing within multi-organisational settings (Huxham, 1991; White and Taket, 1997; Gregory and Midgley, 2000; Ingram, 2000; Taket and White, 2000; Franco, 2008, 2009). Besides, SSM enables problem solving through dialogue and qualitative methods, and it explicitly considers aspects such as ethics, sustainability and human values (Wilson and Morren, 1990, p. 73-106; Kunsch *et al*., 2009; Mingers, 2011). We discuss SSM as a promising alternative to traditional, quantitative techniques and illustrate how SSM can be used to improve problematic supply chain management situations. This illustration is based on a case study within the German organic cereal sector (Bahrdt *et al*., 2002), and serves to highlight benefits of using SSM compared with ad hoc, pragmatic and less structured approaches.
The main conclusion is that using SSM would have supported case study participants by providing better structure and organisation of ideas, as well as enabling higher motivation and incentive to take decisions and act for change.

Local organic food supply chains – problem situation

Local organic food supply chains are mainly composed of small-scale enterprises that aim at maintaining short distances between each other and to end-consumers. Enterprises are diverse and dynamic; they focus on holistic production practices, and often sell their products through alternative food purchasing venues (e.g. farmers' markets and box schemes). Supply chain partners and end-consumers are committed to sustainable, ethical food production, distribution, and consumption, they appreciate trust, respect and values (Hinrichs, 2000; Marsden *et al.,* 2000; Sage, 2003; King, 2008; Björklund *et al.,* 2009; Milestad *et al*., 2010).
Agri-food supply chains – the umbrella term for conventional and organic food supply chains – are more complex to design and manage than other supply chains (Ahumada and

Villalobos, 2009). Uncertainties such as limited shelf life, perish ability, weather variability, risk of infestation, rigid food quality and safety requirements, demand and price variability (Widodo *et al*. 2006; van der Vorst *et al*., 2007; Trienekens and Zuurbier, 2008; Verdouw *et al*., 2010) contribute to complexity and are often difficult to control and reduce. These uncertainties, however, need to be controlled and reduced in order to design and manage supply chains, to ensure supply chain coordination, reach competitiveness and customer service (Stadtler, 2005; van der Vorst *et al*., 2007).

LOFSC partners face additional uncertainties that can be categorised into factors related to: (a) relationships between supply chain partners; (b) communication between supply chain partners; (c) cooperation between supply chain partners; and (d) economic circumstances (Table 1).

Table 1: Local organic food supply chains – uncertainties

Category	Uncertainty
(a) Relationships	Difficulties in the right choice of supply chain partners (Kledal and Meldgaard, 2008, p. 309- 315)
	Difficulties to find skilled (with specific knowledge concerning organic food production and processing, also, management and economics) supply chain partners (Middendorf, 2007; Kledal and Meldgaard, 2008, p. 309-315)
(b) Communication	Inefficient and lacking information sharing between supply chain partners (Kottila *et al*., 2005; Strauch and Schaer, 2005, p. 21; Stolze *et al*., 2007; Naspetti *et al*., 2009)
	Difficulties to communicate differences between organic and conventional products to end-consumers (Kledal and Meldgaard, 2008, p. 309-315)
(c) Cooperation	Lacking agreement and cooperation among supply chain partners (Stolze *et al*., 2007; Kledal and Meldgaard, 2008, p. 309-315; Naspetti *et al*., 2009)
	Barriers to small-scale enterprises to access supermarkets (Bahrdt *et al*., 2002, p. 28)
(d) Economic circumstances	High operating, distribution and transportation costs due to small product quantities (Stolze *et al*., 2007; Kledal and Meldgaard, 2008, p. 309-315; Naspetti *et al*., 2009)
	Difficulties to allocate costs and returns to supply chain partners (Stolze *et al*., 2007; Naspetti *et al*., 2009)

The next section defines supply chain design and management and reviews how uncertainties are traditionally controlled and reduced.

Supply chain design and management

Supply chains are networks of organisations that are connected with each other with the aim of processing and selling products to end-consumers. Supply chains include suppliers, producers, customers, and end-consumers, also, transporters, warehouses, and retailers, depending on the specific supply chain configuration. Agri-food supply chains

are networks of organisations that produce and sell fresh or processed products from vegetables, crops or animals (van der Vorst *et al*., 2007). In order to ensure materials, information and financial flows between supply chain partners, supply chains must be dynamic and flexible, built on cooperation, coordination, control, and trust (van der Vorst *et al*., 2007; Naspetti *et al*., 2009; Verdouw *et al*., 2010). Supply chain design (SCD) is a process to build supply chains. It consists in: (a) the choice of supply chain partners; (b) the identification of customer segments; (c) the location of production and distribution facilities; and (d) the identification of facility capacity and transportation means (Stadtler, 2005). Stadtler (2005, p. 576), moreover, presents SCD as the basis for supply chain management (SCM), which is "…the task of integrating organisational units along a supply chain and coordinating materials, information and financial flows in order to fulfill (ultimate) customer demands with the aim of improving competitiveness of the supply chain as a whole".

Supply chain design and management techniques

Traditional supply chain design and management rely on quantitative techniques to control and reduce uncertainties and to enable optimal decisions. Ahumada and Villalobos (2009) review the use of quantitative techniques to deal with uncertainties along agri-food supply chains; other researchers have suggested quantitative techniques to design and re-design supply chains (Beamon, 1998; Reiner and Trcka, 2004; Santoso *et al*., 2005; Wang and Shu, 2007; Thanh *et al*., 2008; Hammami *et al*., 2009). Supply chain contracts (Cachon, 2003; Simchi-Levi *et al*., 2008, p. 125-138) and inventory management (Axsäter, 2003; Graves and Willems, 2003) have been discussed as approaches to manage relationships between supply chain partners and to coordinate materials, information and financial flows. Supply chain management through supply chain contracts and inventory management can only be optimised after quantitative analysis of possible types of contracts and of different supply chain configurations (Cachon, 2003, p. 5; Axsäter, 2003).

Traditional, quantitative supply chain design and management techniques do not adequately consider LOFSC partners´ capabilities or needs. Such techniques require the application of complex mathematical models and advanced software. Not only large amounts of precise data that are difficult to collect and tabulate (Simchi-Levi *et al*., 2008, p. 90; 130-131), but also financial assets, sophisticated strategies, specific skills and knowledge are necessary. Such resources are lacking within small-scale enterprises, thus, limiting the introduction of complex mathematical models and advanced software (Dutta and Evrard, 1999; Sørensen *et al*., 2004; Celuch *et al*., 2007; Ahumada and Villalobos, 2009). Quantitative techniques do not include variables which address the major uncertainties within LOFSCs such as food quality and safety requirements, and lack of agreement, collaboration, communication and information sharing. Besides, decision making to reduce uncertainties, design and manage LOFSCs depends also on ethical, moral and sustainability aspects that are not considered by quantitative techniques.

Considering the above mentioned nature of LOFSCs, new and adequate supply chain design and management approaches need to address: (i) development and support of

relationships between supply chain partners; (ii) consideration of financial and intellectual capabilities; and (iii) focus on ethical, moral, and sustainability, as well as on satisficing goals. As LOFSC partners lack information about markets and supply chain activities and face limitations to adopt complex mathematical models it may be appropriate to focus decision making on satisficing – acceptable and rational goals (Douma and Schreuder, 2008, p. 125-126) instead of optimisation as is done within traditional SCD and SCM.

Soft Systems Thinking

Street (1990) and van der Vorst (2000) describe supply chains as systems that include relations between different elements and as subsystems of some wider system – their environment. Systems Thinking (ST), also defined as the inquiry into systems, is a useful conceptual framework to understand supply chains and intervene in supply chain design and management problem situations. The main purpose of ST is to understand settings as a whole and how different elements in a system or problem situation influence each other (Wilson, 1988). Systems are seen as composed of interrelated elements and framed by boundaries. The boundaries of systems define them as subsystems of some wider system, which again influences and may change the system (Ackoff, 1971; Ackoff and Emery, 1972).

Systems Thinking includes two complementary traditions – hard and soft ST (Checkland and Scholes, 1990, p. 25). Hard ST relies on quantitative, mathematical methods. It is based on the idea that the world is systematic (Checkland and Scholes, 1990, p. 25), and that problems can be adjusted to fit optimisation models in order to solve them (Wilson and Morren, 1990, p. 109; Munro and Mingers, 2002). The above mentioned traditional supply chain design and management techniques can be classified as hard ST methods. Soft ST, on the other hand, aims at making sense of problematic situations, understanding, improving and changing them (Checkland and Holwell, 1998, p. 48). Goals of inquiry are considered to change constantly and be conflicting (Wilson and Morren, 1990, p. 111), thus problem situations need to be grasped from different points of view (Checkland and Holwell, 1998, p. 48). Soft ST relies on qualitative approaches and human activity systems models that comprise human perceptions, behavior, values, ethics and sustainability (Wilson and Morren, 1990, p. 73-106; Kunsch *et al*., 2009; White and Lee, 2009; Mingers, 2011), and it is based on facilitated processes of inquiry within a group of stakeholders (Checkland and Scholes, 1990, p. 25; Munro and Mingers, 2002). Facilitated processes enable participatory problem definition, structuring and solving in complex situations of common interest (Rosenhead, 1996; Taket and White, 2000; Rosenhead and Mingers, 2001). Such processes have not only been applied to business redesign, strategic development, strategic change and innovation (Ormerod, 1999) within individual organisations (Rosenhead, 1996), but also within multi-organisational settings to develop and support inter-organisational cooperation, communication, negotiation and agreement (Huxham, 1991; White and Taket, 1997; Gregory and Midgley, 2000; Ingram, 2000; Taket and White, 2000; Franco, 2008, 2009).

The suite of facilitated processes covers a range of methodologies (Rosenhead, 1996) such as Soft Systems Methodology (SSM) (Checkland, 1981; Checkland and Scholes, 1990), which we suggest to design and manage LOFSCs.

Soft Systems Methodology

The main reason for suggesting SSM lies in the ability of users to define problems logically and in detail and to systematically take action for improvement (Checkland, 1981; Georgiou, 2008). Application of SSM to improve performance of organisations, improve performance and problem-solving skills of managers, support organisational design, for strategic planning and the configuration of business processes, indicates the feasibility of SSM as an approach to design and manage LOFSCs. SSM particularly addresses the three requirements to new approaches to design and manage LOFSCs listed above. SSM addresses the requirement (i) to develop and support relationships between LOFSC partners as it enables stakeholders´ participation and group decision making, moreover, enhances inter-organisational cooperation, communication, negotiation and agreement. Concerning requirement (ii) SSM is a learning process that is not only a facilitator's skill, but that can also be taught to stakeholders involved (Checkland, 2001, p. 88) in order to reach self-facilitation within groups (Franco and Montibeller, 2010). Stakeholders already know the simple language to develop conceptual models: activities necessary to improve problem situations are namely formulated as verbs, as activities known from daily life (Checkland, 2001, p. 77). Checkland (1981, p. 214) writes: "…the methodology is not outlandish", because the components of SSM "perceiving, predicating, comparing, and deciding…are all everyday mental acts…" Facilitators may also adapt SSM to stakeholders' needs and capabilities, in such a way, that all feel comfortable and can make their way through intervention (Checkland and Scholes, 1990, p. 302). SSM fulfills requirement (iii) to focus on ethical, moral and sustainability, as well as satisficing goals, because it is based on soft ST, and may also include hard methods if appropriate and necessary (Checkland and Scholes, 1990, p. 25; Wilson and Morren, 1990, p. 107, 110).

Soft Systems Methodology - an illustration

In the following section we suggest a version of SSM adapted to design and manage LOFSCs. Additionally, we illustrate a possible application to local organic food supply chain management based on a German case study within the organic cereal sector (Bahrdt *et al*., 2002). The case study serves to demonstrate how SSM can be used to intervene in problem situations and deal with uncertainties within organic FSCs mainly composed of small-scale enterprises. Boxes 1 and 2 provide an overview of the project setting and the German organic cereal sector.

An advisory company completed a project with the aim of describing the organic cereal sector in Germany and identifying challenges, barriers and uncertainties within related supply chains. Literature studies, expert interviews and telephone surveys with stakeholders were carried out to describe the organic cereal sector and identify problem situations. In addition, workshops were organised with stakeholders to discuss the problem situations and find possible solutions to improve.

Box 1: A German case study (Bahrdt *et al*., 2002) – overview of the project setting

The German organic cereal sector is unstructured and includes supply chains that are mainly based on small-scale enterprises. The case study participants have identified three major problem situations: (1) poor communication between supply chain partners and end-consumers, and poor communication and collaboration among supply chain partners; (2) lacking access to information about markets, supply chain partners and supply chain activities; and (3) complexity of traceability and food safety requirements. The problem situations lead to challenges such as low end-consumers´ demand, buying frequency and expenditures for organic food; low raw-material quantities and variation in product quality; decision making under uncertainty and isolation of enterprises; high food safety and quality risk and slow and expensive market processes. The case study report provides a detailed description of the problem situations and related uncertainties.

Box 2: A German case study (Bahrdt *et al*., 2002) – overview of the organic cereal sector

The process of SSM is a framework for facilitators to guide groups of stakeholders during intervention in problem situations. Intervention is here supposed to be initiated by food supply chain partners within the German case study.

Stage 1 — Rich picture

The process of SSM starts with the composition of a rich picture to describe – ideally pictorially – the situation, which is found to be problematic (Checkland and Scholes, 1990, p. 45). The major aims are to understand the problem situation from different perspectives, emphasise structures, processes, relationships, conflicts and uncertainties (Checkland, 1990, p. A16-A19; Wilson and Morren, 1990, p. 106, 119-120), furthermore, to get a feeling of the situation. Stakeholders get a feeling of the situation, because they express concerns, judgments and values, and visualise abstract aspects through symbols (Checkland and Scholes, 1990, p. 45).

The next stages of SSM are illustrated based on problem situation (1) (Box 2) – poor communication between supply chain partners and end-consumers, and poor communication and collaboration among supply chain partners.

Stage 2 — Cultural analysis

Cultural analysis looks at the intervention itself as problematic and identifies: (a) the structure of the intervention and its roles – Analysis 1 (Box 3), (b) connections between roles, values and norms – Analysis 2 (Box 4), and (c) political dimensions – Analysis 3 (Box 5) (Checkland and Scholes, 1990, p. 45-51).

a) *Client*: food producers and/or suppliers; supply chain partners
b) *Client´s aspiration*: improve communication and collaboration between supply chain partners, and to end-consumers
c) *Problem solvers*: involved facilitator(s), advisory company, (facilitators´ names) and supply chain partners
d) *Resources available*: SSM; supply chain partners; information, knowledge and material available; duration of the project
e) *Constraints*: time; knowledge and information about LOFSCs; cultural environment
f) *Problem owners*: food producers and/or suppliers, involved supply chain partners, end-consumers, control authorities
g) *Implications of problem owner chosen*: the results of intervention must especially be useful to supply chain partners and end-consumers, thus information regarding supply chain partners, as well as end-consumers must be available. Involvement of end-consumers in a representative way is complex to achieve, therefore existing empirical data about end-consumers should be analysed
h) *Reasons for regarding the problem as a problem*: loss in market opportunities; lacking product quality, supply chain coordination and efficiency
i) *Value to the problem owner*: improved communication and collaboration between supply chain partners, and to end-consumers may increase supply chain coordination, efficiency and profit, furthermore support end-consumers' trust and decision making

Box 3: Analysis 1

Socio-cultural behaviour among supply chain partners and end-consumers:
- Tension
- Low team spirit
- Disorganised
- Reluctance
- Desire to communicate, collaborate and improve
- Desire to meet customer demand

Box 4: Analysis 2

Supply chain partners have:
- Power to change
- Power to hinder collaboration and communication (e.g. lacking information and knowledge, isolation and different opinions)
- Low power in bigger markets (barriers and competitors)

Consumers have:
- Power to change buying behaviour
- Power to impact supply chain profit (low demand, buying frequency and expenditures, different preferences and lacking information)
- Power to impose demand (e.g. for information and prices)

Box 5: Analysis 3

In case of supply chain design, we suggest Analyses 1, 2, and 3 as an approach to carry out the first stage of LOFSC design. Within Analyses 1 and 2 local organic food producers and/or suppliers discuss the need to find and integrate further supply chain partners, besides may select and involve them in the process of intervention. Within

Analysis 3 the identified and cooperating supply chain partners discuss and decide who should be in charge of chain leadership, thus should obtain responsibility for coordinating supply chain decisions.

Stage 3 — Definition of relevant systems

Relevant systems, also called root definitions describe in one or two sentences transformation processes of some entity into a new form of the same entity (Checkland and Scholes, 1990, p. 33). What goes into transformations also needs to come out, but in a new form. Root definitions describe the system to realise transformations, enhance change and improvement. First, stakeholders identify transformations to reduce uncertainties (Box 6); second, define details of transformations through the CATWOE mnemonic (Box 7); and third, formulate root definitions (Box 8) (Georgiou, 2008).

Uncertainty 1 - example:
Difficulties to implement marketing activities
T1: Poor marketing activities → marketing activities met

Uncertainty 2 - example:
Poor knowledge, information and expertise sharing between supply chain partners
T2: Poor knowledge, information and expertise sharing → knowledge, information and expertise sharing met

The same exercise is to be done for each uncertainty identified within the rich picture.

Box 6: Formulation of transformations (T)

C (customers – victims or beneficiaries): supply chain partners
A (actors who undertake T): supply chain partners
T: Poor knowledge, information and expertise sharing → knowledge, information and expertise sharing met
W (Weltanschauung – meaningful perspective): Knowledge, information and expertise sharing between supply chain partners supports collaboration, joint distribution, marketing and strategic planning, and improves supply chain coordination. Openness benefits everybody and leads to larger financial returns
O (owners who might stop T): supply chain partners
E (environmental constraints): capabilities, culture, attitude, access to information

Box 7: CATWOE based on T2 (Box 6)

A supply chain internal system that establishes and improves knowledge, information and expertise sharing between supply chain partners, in accordance with supply chain partners' needs and wishes, in order to support collaboration, joint distribution, marketing and strategic planning, and improve supply chain coordination, in an environment where supply chain partners have different capabilities, cultures, attitude and limited access to information.

Box 8: Root definition

Stage 4 — Modelling relevant systems

Relevant systems are modeled as conceptual models (Fig. 1), also known as purposeful human activity systems (HAS) that show inter-linked human activities necessary to realise transformations. Human activities are formulated as verbs that depend on and influence each other, thus build a structured plan to take action (Checkland and Scholes, 1990, p. 35-36).

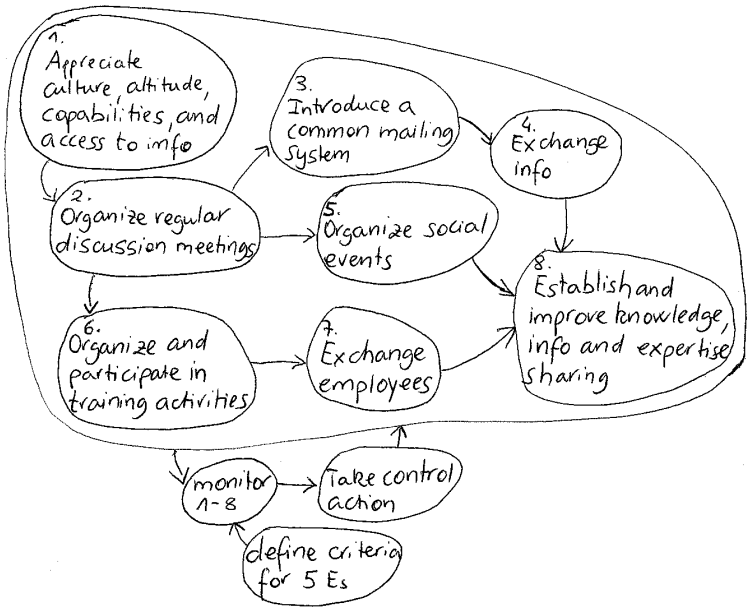

Figure 1: Human activity system based on T2 (Box 6)

At this stage stakeholders can choose between qualitative and quantitative models depending on the uncertainty and the supply chain activity of concern. In line with Checkland and Scholes (1990, p. 25, 31-32) and Wilson and Morren (1990, p. 107, 110) conceptual models can be completed or replaced by quantitative models. For both conceptual and quantitative models we suggest formulating root definitions and CATWOEs in order to define T in detail, moreover to discuss and agree upon which models are appropriate to realise T.
In case of SCD, supply chain partners design at this stage the second part of supply chains (resulting from stage 2), i.e. identify the location of production sites and facilities, facility capacity and transportation means.

Stage 5 — Comparison of conceptual models with the real world
Stakeholders compare conceptual models with the real world by answering questions such as "Does the activity in the model exist in the real world? How is it done? By what criteria is it judged?" (Checkland, 2001, p. 83-86) (Table 2).

Table 2: Comparison of conceptual models with the real world

Activity in model	Exists?	How?	Who?	Good or bad?	Alternatives?
Regular discussion meetings	No, not regularly	Discussion between individual SC partners takes place	Supply chain partners	Bad	No alternative Regular discussion along the entire SC

Stage 6 — Formulation of changes
As a result of stage 5, stakeholders formulate changes that are systematically desirable and culturally feasible; changes that are relevant, meaningful and that meet stakeholders' needs and wishes (Checkland, 2001, p. 85-86) (Table 3).

Table 3: Formulation of changes

How	Desirable?	Feasible?	Possible action
Organise monthly discussion meetings	Yes	Yes	Find location; select an organising committee; select discussion topics
Exchange employees	Yes	Yes	Describe employees´ profiles; exchange profiles; set up a plan

Stage 7 — Take action
Stakeholders take action to implement change and improve the problem situation through recycles of SSM (Checkland, 2001, p. 86).

Methodological reflections and conclusion

Researchers have discussed the benefits of using systemic, structured and facilitated approaches for problem solving and decision making. Systemic and structured approaches enable stakeholders to enter problem situations from a complete, wide ranging perspective, to gain clarity in thought, will and deed, moreover not only to structure the process of intervention and the complex problem situation, but also to structure the process of thinking and change (Mingers and Taylor, 1992). Systemic and structured approaches, besides help facilitators guide stakeholders during exploration with focus on the problem situation towards progress (Ackermann, 1996). Facilitators guide stakeholders in a constructive direction (Phillips and Phillips, 1993), refresh them with energy and motivation to act effectively "in the here-and-now" (Phillips and Phillips, 1993, p. 545). Facilitators deal with different personal interests and dominating personalities (Ackermann, 1996; Rosenhead, 1996), they do not only manage complexity of problem situations, but also of human relations manifested during intervention (Rosenhead, 1996). The aim is to understand group life (Phillips and Phillips, 1993, p. 541), ensure stakeholders´ free contribution and equal participation (Ackermann, 1996). Free contribution and equal participation increase stakeholders´ motivation, ownership and commitment to decisions and actions for change (Ackermann, 1996; Gregory and Midgley, 2000). The aim of this paper was to discuss SSM as a suitable approach to design and manage LOFSCs. Based on theory and the illustration of a German case study, the paper has shown how SSM can be used to control and reduce uncertainties within organic FSCs mainly based on small-scale enterprises. In order to identify the benefits of using SSM we shall look at what it might have evoked, if applied to the German case study. The case study mainly reports uncertainties that need to be approached through dialogue and consensus. Case study participants express a need for change, improvement, and innovative approaches to deal with difficulties to, e.g. communicate, agree, learn and understand. The research approach used within the case

study enables participants to better understand the problem situations and uncertainties. The case study report, however does not mention any increase in communication and agreement as a result of the research approach. Participants come up with innovative ideas about how to change and improve problem situations, but these are only formulated as suggestions (Bahrdt, *et al.,* 2002, p. 67-69), and not as agreed and intended actions part of a plan.

Soft Systems Methodology is a structured learning process that enables stakeholders to work themselves through understanding towards improving problem situations, evolving strengths, developing action plans based on agreement, engaging for intended change and innovating processes and structures (Checkland and Scholes, 1990, p. 3). The process of SSM is just about any purposeful, every-day thinking, but it provides better organisation and structure than thinking would without SSM. Stakeholders formulate ideas explicitly, follow a path towards results, furthermore share, trace and may recall ideas at any time (Checkland and Scholes, 1990, p. 300-302). The case study report is rather a detailed description of the German organic cereal sector than a plan to take action, but it can be seen as an input for future activities. From our point of view SSM and the identification of who is going to do what and how would have added an action-oriented perspective to the suggestions to improve problem situations. Thus, SSM might have helped participants continue to take action after hours spent on finding appropriate suggestions for change. The suggestions were, besides formulated as "could" or "should" actions, whereas SSM would have provided feasible and desirable changes formulated as active verbs. Through SSM, stakeholders get ready to act for change and improvement, because Analysis 1, CATWOE, root definitions and conceptual models clarify who does *what*, *how*, *under which constraints*, *with which resources* and *why*. Especially knowing why, clarifying the meaning and value of ideas motivates stakeholders to decide, take purposeful action and fight for improvement (Checkland, 1990, p. A39). The use of SSM implies further benefits: rich pictures and Analyses 1, 2, and 3 extract valuable and tacit knowledge from stakeholders, moreover establish a basis to identify and define problems and validate suggestions to improve problem situations (Jackson, 2000, p. 256; Georgiou, 2008). Within Analysis 2 stakeholders identify and discuss the atmosphere of intervention and abstract aspects that *a priori* might not be obvious. Stakeholders become aware of emotional relations between each other that not only help explain and structure uncertainties, but also enhance motivation and action towards improvement. Analysis 3 supports stakeholders to identify their power and competences. Awareness of being able to change problem situations, but also to hinder change – what might not be obvious to all stakeholders – may enhance further engagement and motivation.

Checkland (1990, p. A14) points out, that formulation of ideas is not enough to enable action, but that "debate structured by questioning perceptions of the real situation by means of purposeful activity models" enables action. Human activity models include activities necessary to reduce uncertainties and provide structured action plans to implement change. Comparison of models with the real world enhances discussion about which activities do already exist, which activities need to be expanded and which need to be introduced. Comparison, additionally identifies different stakeholders' attitudes

towards actions and aims at reaching conciliation between conflicting stakeholders (Checkland, 1985). Conciliation leads stakeholders to agree upon how to act, formulate and implement changes that are systematically desirable and culturally feasible. Change to improve actual problem situations, innovate structures and processes need to be desirable and feasible, because supply chain partners will only engage in, be able to implement and benefit from change that meets their needs and wishes.
Further research should from our point of view answer the question whether we can be sure that SSM will trigger better results in practice. Answering this question implies, on the one hand the consideration of possible pitfalls and challenges of using SSM. On the other, research and practice should also investigate the possibility of combining different methodologies, especially from different paradigms. Theory about multimethodology describes how to combine hard and soft approaches to improve problem situations that include hard and soft aspects. The use of multimethodology enhances a richer understanding of the problem situation, flexibility and responsiveness during intervention and a more holistic decision making (Midgley, 1997, p. 249; Mingers, 1997, p. 6-13). Supply chain design and management problem situations include hard, e.g. economic and soft, e.g. human aspects, therefore the potential use of multimethodology should be explored taking account of its philosophical, cultural and psychological feasibility (Mingers, 1997, p. 13-16).

This paper has shown how SSM can be used to design and manage LOFSCs. It has, furthermore attempted to identify benefits of using SSM compared with ad hoc, pragmatic and less structured approaches. SSM is a promising approach to reduce uncertainties within LOFSCs, support coordination and enhance efficiency.

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