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On systems thinking in logistics management - A critical perspective

Magnus Lindskog



Linköpings universitet

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Department of Science and Technology
Linköpings universitet, SE-581 83 Linköping, Sweden

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Magnus

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Abstract

Systems thinking. Systems theory. The systems approach. All these concepts have in various guises been claimed as central to logistics management, since its dawning in the mid twentieth century. Such claims are the starting point of this dissertation, the purpose of which is *to contribute to an increased understanding of systems thinking in logistics management research, both present and for future advances*. The primary unit of analysis in this dissertation is thus logistics management research.

The purpose is pursued through a strategy of triangulation of research approaches, via two research objectives:

- To describe the nature of systems thinking in logistics management research.
- To explore the merits for logistics management research of an interpretive approach to actors' systems thinking.

The term *systems thinking* in this dissertation denotes any somewhat 'organised' bodies of thought with aspirations to be 'holistic' in the sense of aiming for comprehensiveness. This part relates mostly to the *systems* part of the term. With regard to the other part, systems thinking is also regarded as a term that encompasses *thinking* about, and in terms of, systems; either that of researchers or that of actors in logistics practices.

Systems thinking can sometimes be theorised on in such a way that it seems fair to label it as *systems theory*. Another term that is also frequently employed is *systems approach*. This denotes any approach to intervene in and/or conduct research on enterprises, with a holistic ambition. Such approaches can or cannot be informed by systems theory. By *approach* is meant the fundamental assumptions of the effort, such as ontological and epistemological positions, views on human nature, and methodologies.

This dissertation employs an approach informed by a strand of systems theory labelled *Critical Systems Thinking (CST)*. This builds on a pluralist strategy, which entails an awareness of the strengths and weaknesses of all types of systems approaches, and

thus strives towards putting them to work under such circumstances in which they are best suited.

The first objective is pursued by means of a combined inductive-deductive approach presented mainly through two peer-reviewed, published journal articles. The first is an extensive literature review of academic publications in logistics management; the second is a survey of logistics management academics. Results show that the systems thinking within the discipline most often is not informed by systems theory, and is oriented towards a narrow section of the available systems approaches. This is an approach that builds on an objective world-view (realist ontology), and which seeks knowledge in terms of different kinds of law-like regularities. There are variations to the kinds of knowledge that are sought, in the sense that some search for deeper, underlying generative mechanisms (structuralist epistemology), some seek causal relationships among observable phenomena (positivist epistemology). The common view on human nature is determinist, and methodologies are often quantitative. It is concluded that logistics management employs a *functionalist* systems approach, which implicitly assumes homogeneity in actors' systems thinking in mutual contexts (i.e. shared logistics practices).

The second objective is pursued by adopting an interpretive systems approach, thus embracing a nominalist ontology and interpretivist epistemology, in order to explore what benefits such a perspective can lend to logistics management. Informed by the pluralist commitment of CST, theoretical constructs and methods grounded in cognitive psychology are employed to study logistics management practitioners' systems thinking through cognitive mapping. If this reveals heterogeneities in systems thinking among actors of a mutual context, in which a high degree of homogeneity can be expected, the rationale is that the dominant homogeneity assumption is insufficient. The study, presented through an unpublished working paper, concludes that actors' systems thinking can differ in ways that render the assumptions of the functionalist systems approach inadequate. More thought, debate, and research on an interpretive systems approach within logistics management is called for.

With constant expansions in the scope of ambition for logistics management in mind – towards larger enterprise systems in the spirit of supply chain management, towards more goals for enterprises than the traditional financial ones, and towards new application areas (e.g. healthcare) – it is recognised that more and more actors become

stakeholders in the practices that logistics management research seeks to incorporate within its domain of normative ambitions. This leads to an expanding scope of voices that ought to be heard in order to legitimise efforts to improve logistics management practices. This in turn motivates that we should seek to accommodate not only interpretive systems approaches, but also emancipatory, in order to ensure normative prescriptions that are legitimate from the perspectives of as many stakeholders as possible, not only from the common a priori efficiency perspectives of functionalist logistics management research.

Har vi fastnat i 60-talet?

Tänk dig en värld helt utan människor. Eller åtminstone där människor helt saknar fri vilja. En värld där varje mänsklig handling aldrig är en förutsägbar respons på händelser i omgivningen. Ändra på omgivningen så styr du människornas agerande. Låter det konstigt? För de flesta av oss gör det nog det. Men för en stor del av världens logistikforskare är det precis så som världen ter sig.

Logistik handlar om att skapa flöden av varor, människor, information, och tjänster. Som forskningsområde började logistik växa fram under 50- och 60-talen och var då främst riktat mot industri och handel. Från början handlade det mest om att samordna transporter och lager för att sänka företagets kostnader för att distribuera färdiga varor. Det var då som den obefolkade världsbilden etablerades inom logistikforskningen. Med tiden har logistik kommit att omfatta fler och större områden, såväl inom företag, som inom andra områden. Idag talas det om att logistik är en av de främsta konkurrensfaktorerna. Det forskas på hur logistik påverkar inte bara lönsamheten utan även hur det kan bidra till ett hållbart samhälle. Intresset för logistik har även vaknat inom nya tillämpningsområden, till exempel inom sjukvården¹. Som forskningsområde har alltså logistik hittills varit i ständig utveckling, åtminstone vad gäller de områden som inkluderas under dess paraply.

Logistik sägs ofta innebära ett *systemsynsätt*, dvs. att man inom logistik ser till helheten; hur hela systemet fungerar och hur hela systemet påverkas av en viss förändring. Därför talas det ofta om *logistiksystem*, vilka betraktas som något som kan utformas baserat på ingenjörsmässiga principer och för att uppnå vissa förutbestämda mål. De traditionella målen för logistiksystem brukar tas för givna och kan enkelt uttryckas som *kostnadseffektiva flöden som uppfyller kundernas önskemål*. Logistiksystemen kan liknas vid maskiner som kan konstrueras och byggas enligt vissa utvalda ”logistikingenjörers” uppfattningar, för att uppnå dessa mål.

¹ Se t.ex. <http://www.liu.se/forskning/forskningsnyheter/1.325357>

I denna avhandling ifrågasätts om man verkligen kan betrakta världen som helt oberoende av människor. Kan man verkligen förutsätta att alla människor alltid arbetar mot de förutbestämda målen? Kan man verkligen utgå ifrån att alla människor har samma världsbild och att de kommer att agera efter logistikingenjörernas ritningar? Dvs. kan man inom logistiken verkligen utgå ifrån den världsbild som man de senaste 50 åren tycks ha tagit för given?

I avhandlingen studeras forskning inom ett område som kan kallas för *systemtänkande*, dvs. forskning som handlar om olika synsätt avseende system och sätt att tänka om och kring system. Detta område har sin början ungefär samtidigt som logistiken, någon gång runt 50- och 60-talen. Till en början var det själva systemen som sådana som fokuserades. Liksom logistiken har detta område utvecklats sedan dess, dock i en något annorlunda riktning. Forskningen har alltmer kommit att omfatta inte bara själva systemen i samhället, utan även människorna som utgör dem. Man kan enkelt uttryckt säga att man tagit fasta även på *tänkandet* inom systemtänkandet, inte bara på själva *systemen*.

Genom att tillämpa teori från detta område visas i avhandlingen att den mekanistiska världsbilden som dominerat logistikforskningen inte är tillräcklig för att fånga upp alla relevanta aspekter. Logistiksystem är ofrånkomligen beroende av de människor som arbetar inom de berörda verksamheterna och hur de tolkar och värderar sin omgivning. Dvs. hur de *tänker* om och kring sitt logistiksystem. Allt som händer inom logistiksystemet är en följd av människors beslut och handlingar. Vi kan inte vara säkra på att alla har samma världsbild eller arbetar mot samma förutbestämda mål.

Avhandlingen visar att logistikforskningen har mycket att vinna på att utvidga sin världsbild så att människors subjektiva perspektiv och tänkande synliggörs. En strikt mekanistisk syn på mänskliga verksamheter kommer aldrig att kunna synliggöra alla aspekter som är av vikt och riskerar därigenom att leda till rekommendationer som inte leder till de bästa resultaten. Vår forskning syftar ofrånkomligen till att förändra människors agerande och för att kunna göra det behöver vi förutom själva systemen också börja se till *systemtänkandet*.

Till

Mirja

Hedda

Soja

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1 Introduction

This dissertation is concerned with *systems thinking* in *logistics management*, and aims to contribute to the latter by means of the former. It aims primarily to advance logistics management *research*, not logistics management *practice*. Being an applied discipline, however, a longer-term ambition is that advances in how we conduct research hopefully will contribute to even better support for those logistics management practices which we aim to improve.

1.1 Logistics management

Logistics management research is in this dissertation primarily regarded as any research initiative with an ambition to contribute to understanding, and as mentioned above, in the longer run managerial practice, on issues related to planning, design, implementation, improvement, and control of flows and storage of goods, services, and related information. This viewpoint thus draws on the widespread definition offered by CSCMP¹ (Appendix 1), but is somewhat less distinct. It is an attempt to capture the essence of the discipline in much the same way as Arlbjörn & Halldórsson (2002)², i.e. stating that the unit of analysis is ‘the flow’, but at the same time being slightly more concrete.

The use of *management* is intended to bring to the fore a viewpoint that anything that takes place in logistics practices, apart from unanticipated events such as accidents, are the effect of decisions and actions by actors – i.e. individual human beings – alone or in interaction with other actors. Decisions in logistics practices can span a wide range, from decisions of strategic dignity, to more operative levels; examples of the former being localisation of facilities or alliances with third party service operators, examples of the latter being lot sizing or call-off ordering. Any such decisions can be regarded as part of, or relevant for, the management of logistics practices. Actions in logistics

¹ Council of Supply Chain Management Professionals.

² The authors formulate a hard core of logistics as “... directed toward the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to; coordinate the flows and is based on; system thinking (a holistic view), where; the unit of analysis essentially is the flow.” (p. 25).

practices are the execution of such decisions, including but not limited to any physical and non-physical tasks that are necessary for the flows to function. Being the effectuation of decisions, all such actions can be seen as part of, or at least relevant to, the management of logistics practices. Although I strive to be consequent in using the term logistics management, much of what I find relevant for this is in literature by other authors named e.g. *logistics*, *integrated logistics* or *business logistics*, perhaps due to “...*strategic discipline title re-engineering*.” (New & Payne, 1995, p. 60). Therefore some inconsistencies might be experienced throughout this dissertation.

The position that is assumed here, which from a traditional point of view might seem non-rigorous, is entirely deliberate, and due to my own world-view. Contrary to the common viewpoint within logistics management (as will be discussed a little further on) that the world is entirely objective, or at least objectively accessible, I am inclined towards viewing the world as not entirely objective. I am convinced that certain aspects of pertinence to logistics management cannot be grasped and understood objectively. As will be argued later, I believe there is reason to embrace the possibility of disparate perceptions of the world, be it ‘real’ or not. Adhering to this perspective, I argue that a ‘firmer’ definition of what is meant by logistics management would stand the risk of disqualifying viewpoints of pertinence for such practices which our discipline might aim to support. Apart from contradicting my own world-view which, if anything, would be a real cause of concern, it would also risk alienation of such practitioners to which this work might appeal. With this I have declared one of the presuppositions which I bring with me into this undertaking.

Consequently, following the logic above, I believe that I cannot construct a definition of what counts as part of logistics management and what does not, which accommodates for the possible world-views of every potential reader. Possessing such a priori knowledge simply is not possible. In fact, as will be contended later, the practice of going about studying the world on the basis of such definitions of scope and aims, as e.g. in the one offered by CSCMP, is one aspect of our discipline that has been critiqued, and I believe rightly so.

My standpoint is that the value of my work for logistics management research ultimately must be subjectively evaluated by any reader who according her- or himself is part of the logistics management discipline, as (s)he perceives it. I will therefore be content with roughly sketching the contours of an area in which I believe my work has potential to contribute.

It is in this context necessary to relate to *supply chain management* (SCM). Pinpointing exactly what SCM is, is not an easy undertaking, and for the same reasons as above would not be a worthwhile effort. Some regard SCM as the same thing as logistics management, others view it as something else, and more still see it as partly the same, partly something different. For a few discussions on this, please refer to e.g. Mentzer *et al* (2001) Larson & Halldórsson (2002, 2004), Halldórsson *et al* (2007), or Sandberg (2007). This dissertation does not intend to bring any further clarity into these issues. Nevertheless, it is a notion that is frequently discussed in what I perceive as logistics management literature, and therefore relevant.

1.1.1 Evolution of logistics management

Some authors have produced historical overviews of the field, in which different eras, phases, or stages of the evolution of the discipline are outlined chronologically and/or sequentially. A review of these adds to the understanding of the discipline to which this dissertation is intended to contribute, by presenting a background to how we have arrived at where we stand today.

La Londe (1994) states that, although a military concept dating back to the days of Napoleon³, the roots of what we today know as logistics management lie in the 1950s-60s, in what was then called *physical distribution*. During this period enterprises focused on integrating activities related to finished goods such as warehousing, transportation, customer service; i.e. all that was part of getting the product to the customer. The goal was to strike a balance between on the one hand costs and on the other customer service, by trade-offs mainly between inventory management and other activities. *Physical distribution* is the first of three stages of evolution identified by La Londe, see Figure 1. The dominating North American professional association, since 2004 known as CSCMP, was formed in 1963 under the name of CPDM⁴.

The second stage, *Internal linkages*, meant that firms attempted to cover two or all three of the internal material flow loops illustrated in Figure 1, in order to reach even

³ One viewpoint regarding the history of the term of *logistics* is that the officer responsible for quartering troops, feeding the horses etc. was titled *Logistique*. Regarding etymology, a phrase that is widely reiterated across the WWW is: “The term *logistics* comes from the Greek *logos* (λόγος), meaning “speech, reason, ratio, rationality, language, phrase”, and more specifically from the Greek word *logistiki* (λογιστική), meaning accounting and financial organization.” (<http://en.wikipedia.org/wiki/Logistics>, Wikipedia entry for “Logistics” accessed March 24th 2012).

⁴ Council of Physical Distribution Management.

better management of inventories. Apart from the cost issues, the speed with which inventory flow through the enterprise was added to the goals, as this was connected to the capital levels within the business. This stage started at about 1985, when at the time CPDM changed its name to CLM⁵.

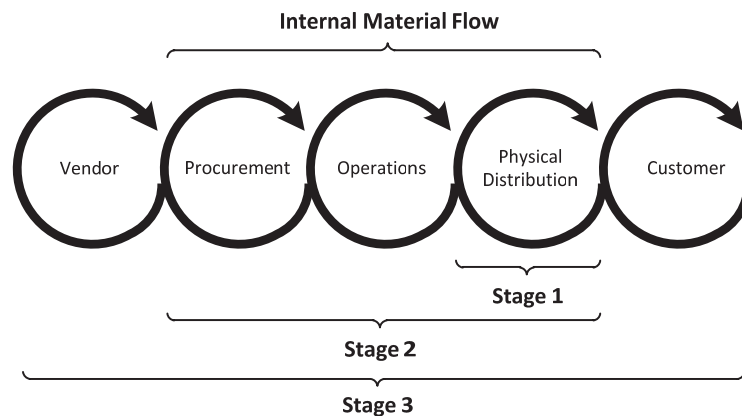


Figure 1. Evolution of the integrated *logistics* concept (La Londe, 1994, p. 9).

The third and last stage in La Londe's (1994) portrait of the evolution is *External linkages*. Companies started to look outside their own boundaries, and sought efficiencies in their relationships with suppliers, customers, and third parties. Concepts such as JIT, EDI, and DRP started to appear⁶ in the vocabulary of authors and managers.

In the same volume, Masters & Pohlen (1994) discuss the evolution of the profession of logistics executives, from the origin of the antecedents to the logistics concept to what at the time was labelled *Business logistics*. The authors identify roughly the same three phases: *Functional management*, *Internal integration*, and *External integration*. Before the first phase, the activities related to distribution were by company executives regarded as unskilled work, and much was done without regard to anything else in a fragmented manner.

A 1956 study on air freight (Lewis *et al*, 1956) introduced the notion of *total cost*. This sparked an interest in trade-offs between costs for transportation and inventory, which marks the beginning of the first phase, which lasted during the 1960s - 70s. The

⁵ Council of Logistics Management.

⁶ Just-in-Time, Electronic Data Interchange, and Distribution Requirements Planning

functions of *materials management*, responsible for inbound flow of materials to production, and *physical distribution*, responsible for outbound flow from production to customers, began to take shape in companies. Focus was on cost reduction in order to improve profits. The second phase took place during the 1980s, and saw a shift towards integrating the two prior separate functions. The third, during which the integration effort expanded its scope to encompass other companies, initiated in the early 1990s.

In a rather recent publication, Jahre & Persson (2008) present an overview of the evolution of logistics in the Nordic countries. Their findings are summarised in Table 1, in which the foci of the decades since the beginning in the 1960s are summarised.

Table 1. Evolution of the Nordic approach to logistics (Jahre & Persson, 2008, pp. 41-42). Original caption: "Business logistics: Change of focus over time"

1960s	1970s	1980s	1990s	2000s
Total cost concept	Delivery service	Tied-up capital	Value chains	Shareholder value and supply chains or networks
Cost efficiency	Focus on logistics systems Systems theory	Focus on flexibility	Create a competitive advantage based on the logistics processes Time-based management and process orientation	Focus on inter-organisational collaboration networks and relationships
Operations research Minimising logistics costs	Organisation and coordination of logistics activities	Order production JIT-philosophy	Responsiveness, quality, and productivity in the logistics processes	Positioning and operational excellence Managing supply and logistics networks

Other authors offer similar overviews of the historical development of logistics management. I have in Figure 2 sampled some of these and condensed the identified main phases, if any such are named by the authors, and the major issues and goals of each, along a time axis beginning in the 1950s and ending in the present.

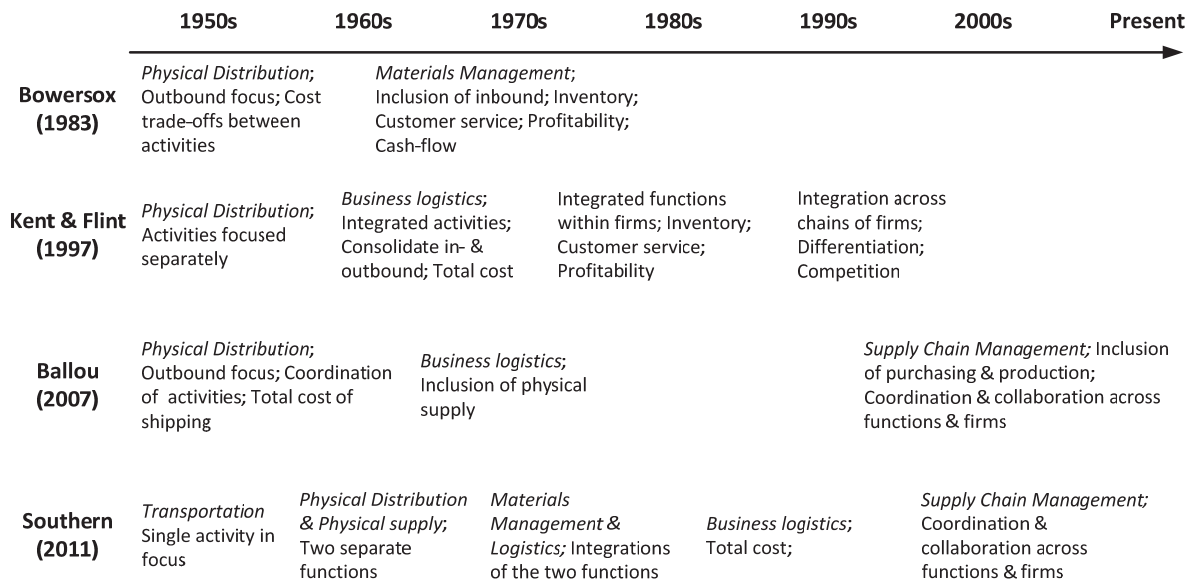


Figure 2. Timeline of phases and major concerns of logistics management.

Although the exact timing of different phases in the views on the evolution of logistics management differ, and are not exactly reproduced in Figure 2, there are great likenesses between all the accounts reviewed here.

The inception dates back to the post-World War II economy of the 1950s-60s, and at that time it was mainly the physical distribution of finished products, and cost trade-offs that were in focus. With regards to publications, besides the Lewis *et al* (1956) study, articles by Magee (1960), Drucker (1962), Heskett (1962), Flaks (1963), and LeKashman *et al* (1965) are often pointed out as having contributed to spurring the early interest. Examples of early textbooks are Smykay *et al* (1961) and Heskett *et al* (1964).

Since then, the scope has widened in two main ways: the extent of what within enterprises that is included as unit of analysis, and the extent of what is regarded as the goals. Regarding the former, there has been a gradual ‘sweeping in’ of first more

activities, later functions, and eventually entire companies, into the scope for the logistics management effort, from operating within one single function in the individual company, to spanning what is today referred to as *supply chains*. Regarding the latter, from the early cost focus, more aspects have been added, including but not limited to capital, customer service, and competitive advantage.

A reflection on these historical overviews is that, with few exceptions, the presentations of the evolution of logistics management do not distinguish between the evolution of the academic subject, and actual business practices. For instance, when it is claimed that main goals started shifting towards including not only costs but also revenue creation through customer service, it is unclear whether this relates to goals that companies pursued, goals that logistics researchers thought should be in the scope of logistics, or both. I.e. it is not explicitly stated whether or not the noted shifts are based on empirical observations. Perhaps this is due to the applied nature of the subject.

1.2 Systems thinking. And theory, approaches, methodologies...

The distinction between systems terms is not always easy nor clear-cut (see e.g. Gammelgaard, 1997); systems thinking, systems approach, and systems theory can be found in literature, bearing sometimes not so clear meanings. The term *systems thinking* is in this dissertation treated as the general term. It denotes any somewhat ‘organised’ bodies of thought with aspirations to support interventions in, and/or research on, organised enterprises, with an ambition to be ‘holistic’ in the sense of aiming for comprehensiveness. This part relates mostly to the *systems* part of the term.

With regard to the other part, systems thinking is also regarded as a term that encompasses *thinking* about, and in terms of, systems. This thinking can be either that of researchers, or that of other actors. Actors might perceive themselves to be part of, or interact with systems, and therefore relate to their ‘world’ in terms of systems or in systemic terms. This is of importance when seen in relation to the viewpoint stated

above, that logistics practices are dependent on actors' decisions and actions; these being, quite reasonably, intimately linked to thinking.

Systems thinking can sometimes be theorised on in such a way that it seems fair to attach the label *systems theory* to it. Another term that is used frequently is that of *systems approach*. By this is meant any approach to intervene in, and/or conduct research on, such enterprises discussed above. Such approaches can or cannot be informed by systems theory. By *approach* is meant the fundamental assumptions of the research or intervention effort. As will become evident in a subsequent chapter, several different systems approaches have developed over time, which are founded on different assumptions, such as ontological and epistemological positions.

Systems approaches can also underlie more or less articulated *systems methodologies*. Although a somewhat 'slippery' term, *methodology* should not be confused with *method*, and needs to be related to *approach*. As pointed out by Vafidis (2007), "*Methodology is a profoundly philosophical concept, concerned with a worldview, and is the starting point of scientific enquiry. Methods are technical approaches and tools, such as statistical methods or structured interview methods used for data collection and analysis.*" (p. 24). In one of the central publications on which this dissertation draws, the relationship between methodology and method is presented in the following manner: "*Methodology concerns itself with the study of the principles of method use, in the sense that it sets out to describe and question the methods that might be employed in some activity. Methodology is, therefore, a higher-order term than methods...*" (Jackson, 2000, p. 11). In a similar fashion, Arbnor & Bjerke (1997) write: "*Methodology is the understanding of how methods are constructed, that is, how an operative paradigm is developed. An operative paradigm relates a methodological approach to a specific area of study.*" (p. 16). Here, the authors utilise the term *methodological approach*, which conveys an image that *approach* and *methodology* are intimately related. In the systems theoretical literature that I have studied, the term *systems methodology* appears to be regarded as equally closely related to *systems approach*; the former being somewhat more specified manifestations of the latter. Whereas *method* is the concretisation of an intervention or research in terms of the tools, techniques, models etc., that are applied to conduct the research. The choice and application thereof should be informed by the applied approach.

To summarise, I have tried to use systems *thinking* as the general term, since the dissertation focuses the thinking of, in, and about systems, be it that of theorists or practitioners. Sometimes systems *theory* will be used to denote theorising on systems thinking, as discussed above, or for that part theorising on systems *approaches* and/or systems *methodologies*. The term systems *approach* will be used to denote efforts to study or intervene in a systemic manner, informed or not by systems *theory*. Sometimes such approaches will be manifested in a way which will be labelled systems *methodology*, although the distinction between *approach* and *methodology* is perhaps the blurriest one. Despite these intentions, some confusion of terms might nevertheless occur throughout the dissertation. Hopefully this will not obscure the important contours of the picture I have attempted to sketch.

1.3 A note on the critical perspective

The subtitle of this dissertation asserts that it employs a *critical perspective*. It might lie close at hand to interpret the critical stance I have assumed as one of ‘negative criticism’, i.e. pointing at the work done by others and exclaiming ‘hey, that’s no good!’ – for instance when studying how some selected statements are scrutinised below. Such treatment can perhaps be interpreted as ‘shooting the messenger’. That is however not the point. The role played by such intradisciplinary quotations is that of illustrative examples of some of the dominant messages of the discipline at large, as perceived by me. I have chosen these because they are useful as clear examples, albeit my intention is nothing but to be critical towards the message, rather than the messengers as individuals.

The idea, which hopefully will become clear through the pages of this dissertation, is to reflect on some assumptions which, probably much due to the influence of tradition, I think might be taken for granted within much of the research that is carried out within the discipline. In applying a critical perspective I thus adhere to a position inspired by the following: “*To be critical means reflecting on the presuppositions that enter into both the search for knowledge and the pursuit of rational action.*” (Jackson, 2003, p. 215). And, in doing so, being sorely aware that my world-view is limited, as is anybody else’s.

1.4 On paradigms, ‘-ologies’ and ‘-isms’

An important aspect of any approach or methodology underlying an intervention or a research effort, are a number of aspects all of which can be labelled with some really fancy words. I have opted to discuss this in a separate section here, as it is important for the discussions to come.

One pervasive term is that of *paradigm*, a term that in science is commonly associated to the works of Kuhn (see 1962). Arbnor & Bjerke (1997) defines a paradigm as “... *any set of general and ultimate ideas about the constitution of reality, the structure of science, scientific ideals, and the like.*” (p.26). A paradigm thus encompasses both *ontological* and *epistemological* positions, as well as other aspects of what is considered ‘good science’.

Burrell & Morgan (1979) distinguish four paradigms of social science along two dimensions, assumptions about the nature of social science, and assumptions about the nature of society⁷. The first of these dimensions concerns the *philosophy of science*, which in essence is what this section is about. A distinction is made between *subjectivism* and *objectivism*. The underlying philosophy can be characterised along four distinct assumptions of the nature of social science *ontology*, *epistemology*, *human nature*, and *methodology*.

The first term, *ontology*, is “... *assumptions which concern the very essence of the phenomena under investigation.*” (Burrell & Morgan, 1979, p. 1), i.e. how one regards the nature of the surrounding world. One can distinguish between two extremes, or ideal views. On the one hand reality is seen as something ‘out there’, independent of the observer, objective and ‘real’. Such a position is often labelled *realism*. On the other is the fundamental assumption that reality is a product of the observer’s mind, a position often labelled *nominalism* (Burrell & Morgan, 1979) or *relativism* (Guba & Lincoln, 1989). The latter note that, with regard to *realism* this is often manifested in the form of *critical realism* which maintains that reality can only be partially discovered within the frames of particular disciplinary perspectives. Nevertheless, as

⁷ The latter is not relevant for the distinctions being made in this section and is therefore not presented.

put by the authors “... *even the critical realist view does at bottom rest on a belief in substantial reality; its view is like the blind men discovering the elephant, for there really is an elephant.*” (p. 85, emphasis in original).

Intimately connected to how one regards the world is how one assumes to be able to get to know things about the world, the “...*assumptions about the grounds of knowledge – about how one might begin to understand the world and communicate this as knowledge to fellow human beings.*” (Burrell & Morgan, 1979, p. 1). This is called epistemology. Closely related to the realist ontology is positivism, an epistemological position according to which one is interested in explaining and predicting, thereby searching for regularities and causal relationships. This is synonymous to what Arbnor & Bjerke (1997) label explanaticism, and it has its roots in the natural sciences. The other position is by Burrell & Morgan (1979) labelled anti-positivism, and the authors maintain that such may take on many various forms. It is however common that the epistemology of such a position is labelled hermeneuticism which is used by e.g. Arbnor & Bjerke (1997) or interpretivism (e.g. Denzin & Lincoln, 2011). According to this position, one seeks not to predict, but rather to understand from the subjective viewpoint of the social actor.

Informed by Keat & Urry (1975) and Craib (1992), Jackson (2000) maintains that there actually is another epistemological position related to the realist ontology, namely that of *structuralism*. According to this view there are underlying mechanisms which cause the observable phenomena that positivists seek to discover, and that it is rather these hidden patterns and regularities which should be uncovered. It puts emphasis on “*relationships, rather than on the nature of the elements themselves...*” (Jackson, 2000, p. 25).

Regarding the aspect of human nature, Burrell & Morgan (1979) relate to the objectivist position a view that human behaviour is a response to the surrounding environment and events therein, this is labelled *determinist* view on actors. The opposing position is that of *voluntarism*, meaning that humans are regarded as actors with free will, values, and beliefs, who can act to create their environment.

The last aspect is that of methodology, which according to Burrell & Morgan (1979) is *nomothetic* if the researcher adheres to the objectivist position, meaning that the kind of knowledge that is sought is that of law-like regularities that govern what is observed. The researcher is seen as detached from the objects of study, in a sense standing on the outside looking in. The subjectivist position instead attempts to ‘get inside’ and seeks to understand how actors interpret their environment and create meaning of their interpretations.

It should be noted that literature offers generous opportunities for confusion with regard to terminology in the area of philosophy of science. Although not explicitly utilising the term *ontology*, Arbnor & Bjerke (1997) identify two extreme ontological positions that correspond to *realism* and *nominalism*, but label these *objectivist-rationalistic* and *subjectivist-relativistic* respectively, i.e. utilising some of the terms Burrell & Morgan (1979) use to describe a higher order characteristic than ontology. The corresponding epistemological positions have also by other authors been labelled *objectivism* (equal to *positivism*) and *relativism* (see e.g. Polkinghorne, 1989). The interpretive position has also been called *constructionism* or *constructivism* (Flick, 2009). The term *relativism* has, as seen above, also been used to denote an ontological position (Guba & Lincoln, 1989). Lincoln *et al* (2011) instead use *positivism* as the label for one paradigm, which thus encompasses ontological and epistemological positions. Healy and Perry (2000) use the term *realism* to denote what in their view is a paradigm.

In this dissertation I adhere as close as possible to the terminology of Burrell & Morgan (1979), however with the exception of *anti-positivism*. This epistemological position will instead be referred to as *interpretive*. This terminology is consistent with that used in the main theoretical frame of reference, and will therefore hopefully minimise confusion of terms within the dissertation. At occasions, the terminology of referred literature might be different. In such instances I will attempt to relate this to the terminology adopted here.

1.5 A glance at the role of systems thinking in logistics management

After this exercise in academic terminology, let us now establish the grounds for this interest in systems thinking in logistics management. On my personal behalf this interest has grown gradually ever since initiating undergraduate studies in logistics management some fifteen years ago, at the same university where this dissertation is now defended. Back then, students were taught that ‘logistics entails a systems approach’. It was more or less mandatory in thesis work to describe ‘the studied system’ with reference to a specific part⁸ of the book *The Systems Approach* (Churchman, 1968). And I know that the same basic message regarding systems thinking is still being sent, since I myself for many years now have been teaching undergraduates in the subject, at that same department, sending precisely that message.

Such statements regarding the centrality of systems thinking for logistics management are by no means unique for this specific institution. Similar postulations are reiterated every now and then, both verbally and in literature⁹. Variations of the same basic message are put forth in conference papers, journal articles, textbooks, and dissertations. Table 2 lists a number of such assertions, in chronological order.

⁸ This is the part in which Churchman in a short list outlines five basic considerations that a systems analyst must bear in mind when considering systems, see Churchman (1968), pp. 29-30.

⁹ We see for instance in Table 1 that Jahre & Persson (2008) identify systems theory as an important factor during the 1970s, however, what is meant by this is not elaborated in that publication.

Table 2. A selection of statements pertaining to the role of systems thinking in logistics management.

Quotation	Source
<i>The systems approach was and remains the cornerstone of the integrated logistical concept.</i>	Bowersox (1978), p. 11
<i>Integrated physical distribution, which is based on a total system approach...</i>	Lambert & Mentzer (1980), p. 18
<i>Knowledge of systems theory has enabled logistics theoreticians to rigorously examine the nature of logistics systems. ... the total systems approach is basic to logistics research...</i>	Gomes & Mentzer (1988), p. 77
<i>The systems approach ... is one underlying premise in the conceptual framework of logistics management.</i>	Novack et al (1992), p. 237
<i>The development of an idea of the supply chain owes much to the emergence from the 1950s onwards of systems theory, and the associated notion of holism.</i>	New (1997), p. 16
<i>The underpinning philosophy mentioned most often in the SCM process literature is systems thinking.</i>	Bechtel & Jayaram (1997), p. 21
<i>This systems approach within the firm has been the underlying premises of much of current logistics management, thought, and practice.</i>	Stock et al (1999), p. 45
<i>The systems approach is a critical concept in logistics.</i>	Stock & Lambert (2001), p. 4
<i>... the hard core may be formulated as follows: directed toward the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to; coordinate the flows and is based on; system thinking (a holistic view)..."</i>	Arlbjörn & Halldórsson (2002), p. 25
<i>We believe that Systems Theory is the core pillar of modern logistics management...</i>	Naim et al (2003), p. 7
<i>... systems thinking, which is the dominating ontological and epistemological position within the field of SCM today.</i>	Johannessen (2005), p. 60
<i>Dominating in logistics research is the systems approach...</i>	Kihlén (2007), p. 16
<i>Supply chain management is based on the systems theory of the firm.</i>	Randall & Farris (2009), p. 671

Taken together, this produces an image that a common belief within the discipline is that systems thinking is a foundation that has influenced logistics management from the early days in the 1950s-60s, and has continued to do so until today. This relationship is generically depicted in Figure 3:

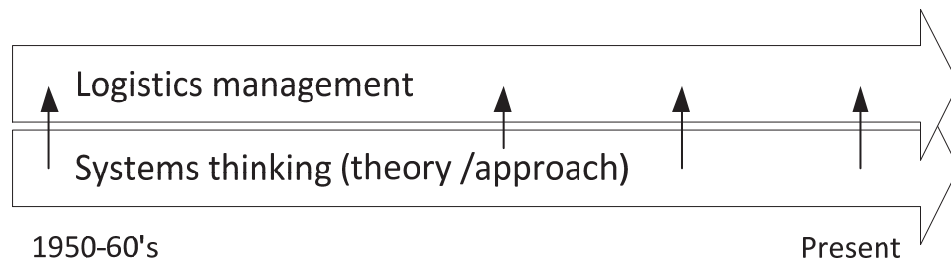


Figure 3. A generic depiction of common claims regarding the relationship between logistics management and systems thinking.

This figure illustrates the domain of this dissertation. i.e. the relationship between systems thinking and logistics management. Especially, focus lies on the connections that are generically denoted by the vertical arrows in Figure 3. We shall return to this in the following section.

Apart from such claims as presented in Table 2 above, there exists some criticism of vague references regarding the role of systems thinking within logistics management research and its claimed application: *“Logisticians often claim to use systems thinking when managing the flow of goods and information from the point of origin to end customers, but few authors explain why or how the concept is used”* (Holmberg, 2000, p. 853), or as reflected upon by Aronsson: *“A literature review of all articles published in major logistics journals (Stock, 1997) there are only three references developing systems theory, all from the 70s, indicating a lack of discussion or development of systems theory within logistics. The approach is however widely used in published articles.”* (2000, p. 45).

Another pervasive feature of such statements as in Table 2 above is the use of singular definite form: it is, as can be seen, quite common to make claims regarding the role of ‘*the systems approach*’. This signals, however implicitly, that there is one determined

systems approach to logistics research. One that is different from one or more other research approaches of non-systemic character.

Some authors outside of our field however claim that there are more than one systems approach available to research: “...a systems approach in science may take on quite different forms depending on the circumstances...” (Olsson & Sjöstedt, 2004, p. 3), or “The field of systems science, the objects of systems research, and the interpretations of the term ‘systems thinking’ are both broad and diverse.” (Lane & Jackson, 1995, p. 217). If so, is there perchance more than one type of systems thinking which could be relevant for and applied to logistics management research?

Returning to Holmbergs (2000) statement above regarding the absence of explicitness about the systems thinking that is applied, there are exceptions, i.e. instances in which there are explicit statements regarding the nature of the systems thinking. For example, in two recent doctoral dissertations from this same university one can read: “The methodological approach applied in this dissertation is that of a case study approach. ... With regards to case studies being of a holistic nature, this relates to an important feature in much logistics research today, namely that of the application of a systems approach. ... in generic terms, it implies that reality is viewed as objectively accessible...” (Kohn, 2008, p. 16). Another similar statement reads: “My research philosophy is based on a systems approach. A systems approach presumes an objective reality which can be (more or less) “discovered”. ... As the name suggests, the systems approach means that the world can be thought of, and divided into, different systems. ... A systems approach also normally removes, or at least diminishes, the importance of people from the studied systems.” (Sandberg, 2007, pp. 17-18). These statements thus tell us something regarding the ontological position of the systems approach that is applied, which in these cases can be classified as *realist*.

I have myself spent more than a decade as part of the same research group within which the two dissertations were produced, and it is my experience that the quotations reflect a perspective that is largely shared within that group.

Also, within that same group, that specific book mentioned previously (Churchman, 1968) is one of few commonly used literary points of reference when it comes to discussing the systems approach that is applied. C West Churchman is a scholar who by many is deemed to have had quite an impact on systems thinking (Flood, 1999; Jackson, 2000; Olsson, 2004). When studying the mentioned book, however, a tension

becomes apparent: *“The systems approach begins when first you see the world through the eyes of another.”* (Churchman, 1968, p. 231). The quotation is the first of three principles of a systems approach, which concludes that book. Who is this ‘other’ through whose eyes one should see the world, if not another individual than oneself? Is not in fact Churchman’s argument that one has to take in another individual’s de facto *subjective* world view in order to work under a systems approach? I am not alone in this interpretation: *“With Churchman, Ackoff, and Checkland, systems thinking becomes much more “subjective”, the emphasis shifts from attempting to model systems “out there” in the world towards using systems models to capture possible perceptions of the world.”* (Jackson, 1991, p. 133). And if this is the case, what happens with objectively accessing reality, or diminishing the importance of people? To further add to this tension, let us study the second principle of Churchman’s systems approach: *“The systems approach goes on to discovering that every world view is terribly restricted.”* (1968, p. 231).

My interpretation when putting the two principles together, is that no matter which view of the world one has taken in, it is not complete, and that what we might be able to capture are thus different incomplete perceptions of something which might, or might not, be ‘real’. And, logically then, that the capturing that we do is also incomplete, implying that the view that we construct will also be incomplete related to that which we are trying to capture. Thus, when attempting to ‘see the world through the eyes of another’ and then reconstruct it, we will end up with an incomplete view of an incomplete view of something which might or might not be real. One can therefore never be certain to obtain an objective and holistically complete view of a ‘real’ reality, neither when directly perceiving reality ourselves, nor when attempting to take in someone else’s perceptions of reality. If Churchman was right, that is.

Churchman’s (1968) third and final principle¹⁰ is that *“There are no experts in the systems approach.”* (p. 231), a somewhat ambiguous phrasing which is clarified in the following manner: *“The real expert is still Everyman, stupid, humorous, serious, and comprehensive all at the same time. The public always knows more than any of the ‘experts’, be they economists, behavioural scientists, or whoever; the problem of the systems approach is to learn what ‘everybody’ knows.”* (pp. 231-2). To my mind this

¹⁰ There is actually a fourth principle concluding that book, however presented in a tongue-in-cheek manner, and not elaborated. The principle reads “The systems approach is not a bad idea”.

emphasises the subjective inclination of Churchman's writings, and not only that actors can possess different perceptions of systems, they will also likely have different ideas about which goals 'the system' should aim to fulfil.

The last few paragraphs have revolved around my most immediate surroundings research-wise. This is intentional, because legacy, I believe is an important factor in shaping research practices. However, against the background of what is presented in the beginning of this section there might be reason to lift this discussion from this local setting to a more general level, one of conceptions of what a systems approach is, can, and ought to be within the logistics management discipline.

To summarise the discussion so far, it seems that there is a common belief within logistics management that systems thinking has been and is a central tenet (as illustrated by Figure 3), that there is one determined systems approach to research, and that this entails an ontology according to which the world is 'real', or at least can be objectively accessed. This belief contrasts those of some scholars outside of the discipline, who claim that there are many different systems approaches to research, and that reality must not necessarily be 'real', but rather socially constructed. This tension serves as justification for the present research effort.

The discussion so far has concerned systems thinking within logistics management research. Returning briefly to my personal interest in the topic, this also relates to the systems thinking of practitioners. This interest has been influenced by my previous attempts at undertaking research. In my licentiate thesis (Lindskog, 2003), in which I studied a change process within a logistics context¹¹, a narrative approach was applied, and ten actors with different roles were interviewed, and asked to tell their story of how the process unfolded. As I have later mulled over the narratives, I have reflected that these contained different references to what I perceive as systems thinking, in various forms. This is something that has grown gradually, and is not the fruit of any structured analysis. To illustrate, I have in Appendix 2 presented a selection of snippets from the original narratives. I have labelled this review as 'naïve', since no pre-determined theoretical analysis model, nor any formal coding procedure (see e.g. Miles & Huberman, 1994; Corbin & Strauss, 2008) has been applied. To my mind, the

¹¹ in that case it was the specific change of establishing third party logistics (TPL) that was examined, from the perspective of the shipper (goods owner) company.

chosen examples illustrate the importance of the following aspects of systems thinking:

- Actors' perceptions of systems
- Actors' perceptions of other actors' perceptions of systems
- Actors' perceptions of other actors' misperceptions of systems
- Actors' perceptions of values and goals
- Actors' perceptions of other actors' values and goals
- Actors' views on how to affect other actors' systems perceptions, values, and goals

I believe this gives an indication that actors can possess different perceptions of the practices of which they are part, i.e. their systems thinking can differ, and also that actors can regard systems perceptions – both their own, and those of other actors – as important. This implies that acknowledging actors' systems thinking not only is of interest from a theoretical point of view, it is also of practical relevance. This has in fact suggested by a few studies, in which 'seeing the big picture' has been put forth as an important ability for practising managers (Gammelgaard & Larson, 2001; Gammelgaard & Andreassen, 2004; Nilsson, 2006).

1.6 Purpose and research objectives

From the discussion so far, it can be seen that there is a widespread belief that systems thinking is central to logistics management, and has been so during the course of the discipline's development from the early days roughly half a century back, and up until the present. However, the nature of this relationship seems not to be particularly well-articulated. Given such calls that have been uttered for the development and clarification of 'logistics theory' (e.g. Dunn *et al*, 1994; Stock, 1997, 2002; Mentzer *et al*, 2004; Kovács & Spens, 2007), it might be beneficial for the discipline if the relationship could be clarified. The purpose of this dissertation is therefore ***to contribute to an increased understanding of systems thinking in logistics management research, both present and for future advances***. The domain of this dissertation is thus the discipline itself, rather than the unit of analysis in logistics management which can, as put forth in section 1.1, be regarded as 'the flow'. Despite the reference to calls for theory development, this dissertation does not intend to

contribute to any theory pertaining directly to this unit of analysis, as is the case in much research within the discipline. Rather, it aims to contribute with increased understanding of an area, i.e. systems thinking in logistics management, with potential to enhance the practice of conducting research on the core.

In order to fulfil the purpose, two research objectives are formulated. The first objective that springs quite naturally from the purpose is descriptive, and is articulated as follows: *To describe the nature of systems thinking in logistics management research.* The unit of analysis for this objective is logistics management research, and the objective relates to the ‘present’ part of the purpose. As presented above, there is a widespread view that systems thinking is central to logistics management research and that there is one way of conducting logistics management research under a systems approach. However, since there are also indications from outside the discipline that there exist several systems approaches, it is possible that there also exist several systems approaches to logistics management research. To fulfil this objective, therefore, the following research questions is addressed: *How can the systems approach(es) in logistics management research be characterised?* This encompasses both what logistics management researchers do when claiming to conduct research under a systems approach, and also how they value the term as such. A systems approach to research can, as discussed previously, be informed by systems theory. Given such claims regarding the application of systems theory within logistics management presented earlier, a second research question pertaining to this objective is: *Has logistics management research adopted systems theory, and if so, which parts and to what extent?*

This objective relates logistics management to systems thinking, as depicted in Figure 3 above. One way to approach these research questions would be without any a priori specifications of systems thinking. However, since there obviously exists a field of academic inquiry that has systems thinking as its heart, i.e. systems theory, and since there are claims within logistics management that it has adopted such theory, I find it reasonable to approach the objective from a theoretically informed point of reference. This is justified also by such criticism towards the lack of articulating systems thinking (see page 15), and calls for increased borrowing-in of theory to logistics management (Stock, 1997).

The second research objective is justified in part by the suggestions above that there exist systems approaches of a ‘subjective’ nature (see pages 17-18), in part by the

indications from revisiting the material from my own licentiate thesis (see page 19), in part by propositions by other authors within logistics management (detailed on pages 83-86), and in part by the findings from pursuing the first objective. Taken together, these indicate that exploring the merits of an interpretive systems approach to logistics management research is a worthwhile undertaking.

This second objective is *to explore the merits for logistics management research of an interpretive approach to actors' systems thinking*. The unit of analysis is systems thinking of logistics management practitioners, and the objective relates to the 'future' part of the purpose. This objective is formulated as an exploratory one, because an interpretive approach to systems thinking seems not yet to have been applied in logistics management research. The logic on which to base an assessment of this objective is that if it can be concluded that actors' systems thinking differ substantially – i.e. actors whom we based on the dominant approach would assume share world-views – then there is reason to propose that an interpretive approach has merit. By *actors whom we would assume share world-views* I mean practitioners of a mutual context, i.e. working within one shared logistics practice. The dominant approach of logistics management, I will argue, assumes that actors in such contexts share world-views. This gives the first research question: *Do actors' systems thinking differ, even in a mutual context?* To contribute to advancing logistics management research, the following question will also be addressed: *If so, what implications may this have?*

Summary of purpose, objectives, and research questions

Purpose: *To contribute to an increased understanding of systems thinking in logistics management research, both present and for future advances.*

- **Objective 1:** *To describe the nature of systems thinking in logistics management research.*
 - How can the systems approach(es) in logistics management research be characterised?
 - Has logistics management research adopted systems theory, and if so, which parts and to what extent?
- **Objective 2:** *To explore the merits for logistics management research of an interpretive approach to actors' systems thinking.*
 - Do actors' systems thinking differ, even in a mutual context?
 - If so, what implications may this have?

2 Research strategy, approach, and design

This dissertation is based on the theoretical perspective offered by *Critical Systems Thinking (CST)*, the main features of which are presented in chapter 3. One of the prominent features of CST is that different approaches can and should be applied, based on the situation at hand. Approaches differ with regard to ontology and, consequently, epistemology. The basic distinction is between on the one hand a realist ontology, on the other a nominalist. In this dissertation I apply both, since the purpose is fulfilled by pursuing two research objectives of quite different character, focusing on different units of analysis, however both pertaining to the ultimate aim to contribute to increased understanding regarding systems thinking in logistics management research.

2.1 Research strategy

This overall strategy is best described as *research approach triangulation*, where the 'object' being triangulated is the research within our discipline. Figure 4 illustrates:

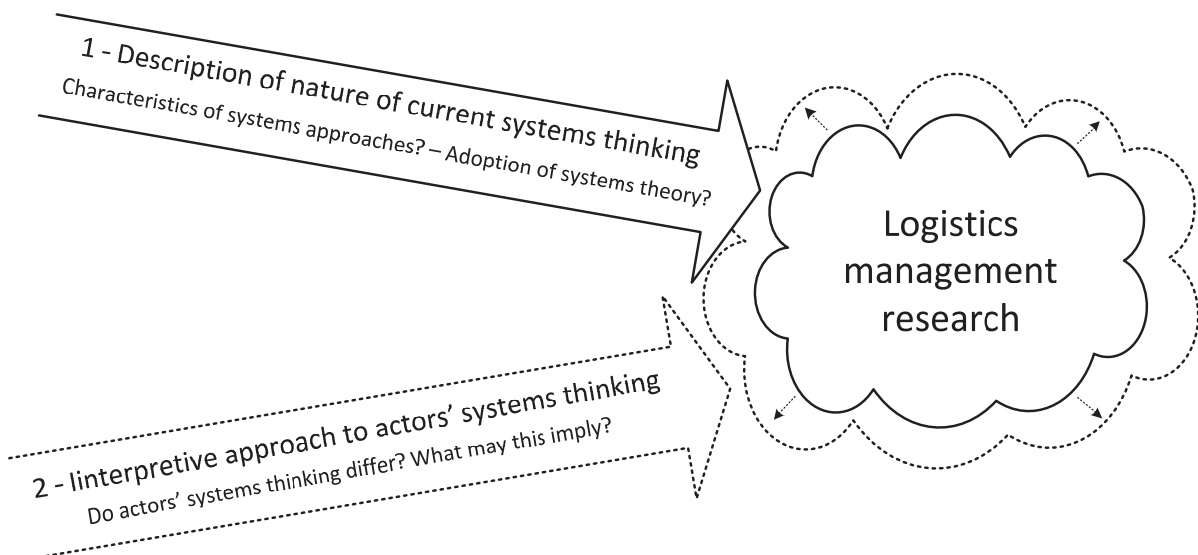


Figure 4. Illustration of overall research strategy.

The first objective aims at producing a description of the present nature of systems thinking in logistics management research. This includes characterising the systems approach(es) that are applied. Knowing the result of pursuing this objective, I have then applied another type of approach (interpretive), in order to see if this produces results that contradict what is assumed by the type of systems approach(es) that are identified under the first objective. One of these assumptions, I will argue, is that there exist a priori rationalities for systems, and in extension that actors' systems thinking can be treated as homogeneous and consequently can be disregarded.

The interpretive approach is therefore deliberately applied in a context where there is reason to presume a high degree of homogeneity in actors' systems thinking. The logic of this triangulation strategy is that if contradictions are revealed despite the assumed high degree of homogeneity, then it is demonstrated that the interpretive approach has value for logistics management research. If there on the other hand are only slight or no contradictions, then further research is needed in the form of applying the interpretive approach in more contexts, according to a logic of continuous attempts of falsification, where that being falsified is the presumption that actors' systems thinking is homogeneous.

The research designs for each objective respectively are outlined in sections 2.3 and 2.3.2. First a few words on the overall research approach.

2.2 Research approach

The unit of analysis for the first objective is logistics management research. What does this consist of? To begin with, it seems obvious to include the publications that present the products of the research, i.e. all the papers, reports, books, etc. that are the main means of communicating knowledge between researchers within the discipline, with other researchers, as well as with practitioners, students, policy-makers, and others. Reasonably it ought also to contain the actual practices of conducting research, with all that entails, from conceiving ideas on what to research, to writing up presentation of some sort in order to communicate the products. This is a rough sketch that only catches the most obvious features. Defining more exactly what constitutes 'the research' within a discipline is obviously very difficult, as it is a rather illusive concept. And yet, it must exist, because we all do it, and contribute to it, right?

The first research objective aims to produce a description of some basic characteristics of the 'unit', starting from two theoretical points of reference. The first being prior work on the topic, that is the present state of what we believe regarding systems thinking in logistics management today, i.e. that of the 'unit' which will be studied and eventually described. The second being the chosen school of systems theory, i.e. that which will provide the means to do the characterisation that is to be done.

Being descriptive, the objective aims to be value-free, i.e. seek these characteristics 'as is'. It is also pursued with an ambition to generalise. This also lies in the very nature of the objective; to portray some characteristics of the discipline as a whole. Taken together, this suggests working under a realist ontology and a positivist epistemology.

Turning to the second objective, the unit of analysis is the systems thinking of logistics management practitioners, subjective beliefs and values of different actors. The objective as such is to employ an interpretive approach, i.e. nominalist ontology and interpretivist epistemology, for the sake of assessing the potential value of such an approach to logistics management. Thus the justification of the approach is done already by formulating the objective.

2.3 Research design for objective 1

The research design for fulfilling the first objective is built on a strategy of triangulation on the somewhat illusive 'object' logistics management research. Two major sources of empirical material have been sampled, primary data in the form of a survey of academics, and secondary data in the form of publications. The latter in turn can be divided into two types, one being a direct study of published logistics management research, the other being a set of 'circumstantial evidence' of certain characteristics of research within the discipline. The former portion of the secondary data is linked with the primary in a combined qualitative-quantitative design, labelled 'substantial' evidence. The research strategy for fulfilling this objective is illustrated in Figure 5:

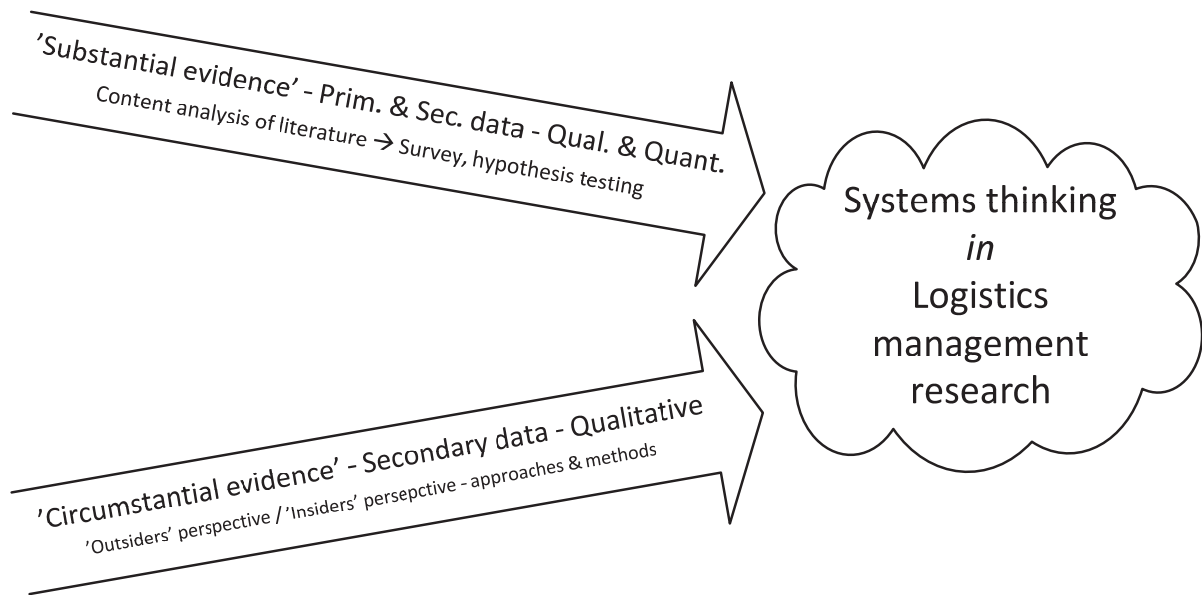


Figure 5. Illustration of research strategy for objective 1.

Two research questions, as presented in section 1.6, are addressed under this objective. The first one is *How can the systems approach(es) in logistics management research be characterised?* Answering this question requires a frame of reference upon which the characterisation can be drawn. This is supplied by the presentation of three generic systems approaches in section 3.4, which allows for classification along the dimensions of ontology, epistemology, and methods usage.

The second research question is *Has logistics management research adopted systems theory, and if so, which parts and to what extent?* Similar to the first one, this requires a frame of reference that allows the identification and categorisation of systems theory (as defined in section 1.2). This is done by the identification of ‘schools’ and associated scholars in Paper 1. Logistics management research is then scanned through this lens, to see which schools that have been adopted or not. Since the schools can be classified according to generic systems approaches of section 3.4, this question supports the answering of the previous one.

The research design for objective 1 is further outlined in the following subsections.

2.3.1 Substantial evidence

The first research objective is, as stated previously, spurred by proclamations regarding the role of systems thinking in logistics management. As seen in section 1.5, stating a relationship placing systems thinking in a central position has been a standing feature throughout the discipline's evolution. Since we have here two concepts, logistics management and systems thinking, as well as a relationship, this can be regarded as theory of sorts. 'Theory' of which there are some statements, but, to the best of my knowledge, on which little systematic research has so far been conducted.

With regard to the state of prior work on a subject, Edmondson & McManus (2007) suggest that theory can be classified according to different states of maturity. Although discussed as a continuum, the authors present three ideal states, which are summarised below:

Nascent theory: Proposes tentative answers to novel questions of how and why, often merely suggesting new connections among phenomena.

Intermediate theory: Presents provisional explanations of phenomena, often introducing a new concept and proposing relationships between it and established constructs. Although the research questions may allow the development of testable hypotheses, similar to mature theory, one or more of the constructs involved is often still tentative, similar to nascent theory research.

Mature theory: Presents well-developed constructs and models that have been studied over time with increasing precision by a variety of scholars, resulting in a body of work consisting of points of broad agreement that represent cumulative knowledge gained.

Adapted from Edmondson & McManus (2007, p. 1158)

If relating the issue of the nature of systems thinking in logistics management to this framework, I would say it is located somewhere in the vicinity of intermediary. The questions and connections are not new, thus indicating that the thoughts around systems thinking being central to logistics management are not nascent. At the other end there seems to be, as showed previously, broad agreement on the status of systems thinking in our discipline. However, the relationship is not thoroughly researched.

Edmondson & McManus (2007) suggest that, as knowledge on a subject matures, research can go from explorations based on qualitative data towards formal quantitative hypothesis testing. Especially intermediate issues can gain from employing combined qualitative-quantitative methods. This logic underlies the design for the substantial evidence part of fulfilling objective 1 in two sequential phases, a design supported by e.g. Miles & Huberman (1994). This sequence of induction followed by deduction can be described as an abductive approach, as presented by e.g. Kovács & Spens (2005, 2007). The phases correspond to the studies presented in appended Papers 1 and 2.

Inductive phase

The inductive phase was conducted as a focused literature survey on selected logistics management publications. Choosing this secondary data as the empirical source is justified by publications being the main means of communication of research, as stated previously. It also has the benefit of being easily accessible, and apprehension is regulated mainly by my own limitations. The analysed publications are of two kinds, peer-reviewed journal articles and basic textbooks. Sampling was made on the basis of judgements of importance, by cross-referencing several such judgements, and evaluations of importance of journals, made in other published articles. For details on sampling, please refer to Paper 1.

The analysis was carried out as illustrated in Figure 6 (reproduced from the paper):

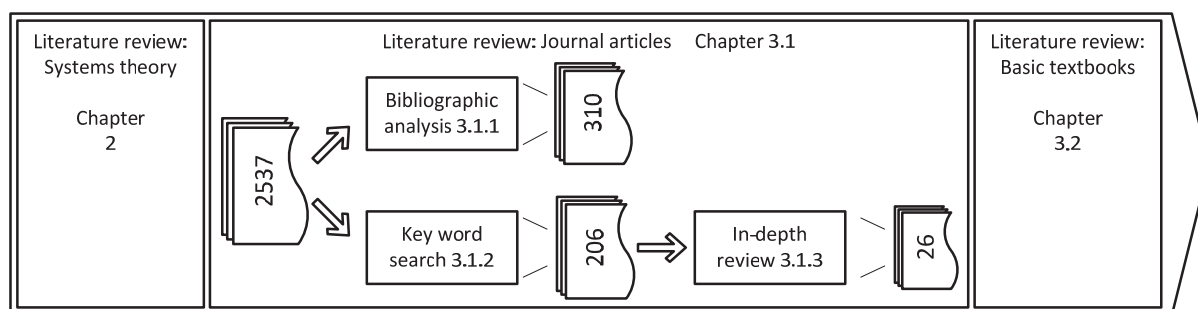


Figure 6. Outline of the research process for Paper 1 (Lindskog, 2012a, p. 64).

Note: Corrected vs. original in the paper, which states 2 547 articles in sample.

The frame of reference was a review of systems theoretical literature, in which a number of ‘schools’ of systems theory and associated authors were identified. This served as a foundation for three connected analyses:

- Review of 2 537 journal articles (all available full text of five influential journals)
 - Bibliographic analysis for identification of citations of identified systems theoretical authors.
 - Key-word based filtering followed by content analysis to trace sources of claims regarding the role of systems theory. Follow-up and continued analysis of supporting citations until no further claims were found and/or references were unattainable.
- Review of selection of basic textbooks by well-known logistics management scholars.
 - Content analysis of sections containing definitions of subject.
 - Subject index search for systems concepts.
 - Bibliographic analysis for identification of citations of identified systems theoretical authors.

For more specific details on how the analysis was conducted, please refer to Paper 1.

Deductive phase

The findings of the inductive phase were in Paper 2 utilised as foundation for a number of hypotheses. These were tested against empirical data in the form of a web-based survey of logistics management academics. Choosing this source of data is justified again by triangulation logic, and the aim to generalise. I argue that approaching the source of the publications studied in the first phase, i.e. those individuals conducting the research, renders other information on the studied phenomenon. Asking directly about researchers’ attitudes towards the systems concepts gives a picture that might not be reflected in publications, i.e. individual researchers might deem systems thinking central, but do not articulate it in writing with exactly the terms that were sought for in Paper 1. Also, it creates an opportunity to judge how knowledgeable logistics management researchers are of the identified

systems theoretical schools; the logic being that one can be familiar with a certain line of academic thinking without having applied it in a manner that would render citations in published materials.

The target population for this deductive phase is the community of researchers that can be regarded as those contributing to the core, as discussed previously. To identify exactly the members of this population is obviously very difficult. It was judged that the best way to approach the target population was through membership rosters of professional organisations involved with logistics management, and through which it was possible to target academic members specifically. Analysis was carried out by testing a number of hypotheses, formulated on the basis of findings from paper 1, with non-parametric statistic techniques. For details regarding the sampling technique and analysis, please refer to Paper 2.

2.3.2 Circumstantial evidence

The aim of this first objective is to get at the character of systems approaches employed in logistics management research. The substantial evidence drawn from what is outlined above gives important pieces of information for this characterisation. To further support the claims some secondary material has been collected and analysed according to what is presented in this sub-section. I have labelled this part ‘circumstantial evidence’ because it does not employ any ‘direct measurements’ of the ‘object’. Rather it seeks for certain types of indications and looks at in which directions these point.

Throughout the process of conducting the research presented in this dissertation I have, quite naturally, oriented myself by studying various literature I found related to my research. At times, this has led to finding publications dealing with the nature of research within the discipline, in terms of ontological and epistemological positions, and methodological approaches. These pertain to the classification of the systems approaches that are applied.

‘Outsiders’ perspective

Some of these are discussions the nature of systems approaches, conducted on the basis of the same theoretical foundation that is applied here, i.e. that of CST. Such evidence can thus be used ‘as is’, without much need for analysis or interpretation. This little chunk of evidence I have labelled the ‘outsider’ perspective, since it is authored by scholars not normally contributing directly to the core of logistics management, and it is presented in section 4.2.1.

‘Insiders’ perspective – approaches & methods

Some other literature rather discusses ontology and epistemology, and also methods usage, without direct reference to the CST framework. Such evidence has been analysed by comparing what is stated regarding logistics management, with the ontological and epistemological, traits of the generic systems approaches, as well as their common application of methods, as presented in section 3.4. The logic is that if e.g. the dominant ontology of logistics management is claimed to be realist, there is only one generic systems approach that accommodates for this position. The studied literature is authored by scholars normally contributing to the core, and I have therefore labelled this an ‘insider’ perspective. This part is presented in section 4.2.2.

2.3.3 Issues of research quality for objective 1

Substantial evidence

With regard to the inductive phase of the substantial evidence part, the research process is made explicit, thus making it possible to trace both procedures and links between questions, empirical material, and conclusions, thus making it possible to replicate the study as far as to the step in which article were pre-examined before in-depth review (i.e. the narrowing down from 206 articles to the in-depth review, see Figure 6 above). The logic underlying this step is presented in the paper along with examples, however, as with any judgements there is always a measure of subjectivity and thus a chance that another researcher would have made different decision with regard to individual articles. A weakness in the applied analysis is that no cross-

examination involving another researcher was applied, thus rendering the analysis dependent on my subjective judgements alone. I do not believe, however, that this has affected the results all too much since in the end the main finding – that overall there are very few references to systems theory at all – is based also on the replicable steps of the analysis, not on the in-depth analysis alone. I therefore think that the trackability and explicitness criteria (Halldórsson & Aastrup, 2003) are fairly well fulfilled for this part of the study.

As with any sampling there is always the issue of making a representative one, both in terms of quality and quantity. When selecting material for the literature review in Paper 1 this had to be based on judgement on which journals that can be regarded as most representative for the discipline. The selection of journals¹² is based on a synthesis of those judgements made by other authors, in published peer-reviewed articles (Stock, 1997; Gibson *et al*, 2004; Spens & Kovács, 2006). Other selections of intra-disciplinary oriented journals could of course have been done, which might have affected the results. However, the selected journals are deemed to be widely accepted and popular within the discipline, thus I believe these are fairly representative. Including articles from journals that are not primarily profiled towards logistics management was of course also a possibility; there are a number of journals that publish manuscripts related to the core of logistics management. However, as this effort centred on claims regarding something that is pointed out as essential to the discipline, it would be quite peculiar if one had to search ‘outside the realm’ to find it.

The sample of textbooks in Paper 1 is likewise based on the judgements of others. As stated in the paper, there had to the best of my knowledge at the time of writing the paper not been published any overview of basic logistics management textbooks and their ‘impact’. Instead, the selection was based on authors, and the ‘who’s who in logistics’ snowball sampling made by Davis-Sramek & Fugate (2007) in their peer-reviewed article on ‘logistics visionary perspectives’. In terms of quality criteria, this contributes to what Halldórsson & Aastrup (2003) label *transferability*.

¹² Int’l Journal of Logistics Management, Int’l Journal of Logistics: Research and Applications, Int’l Journal of Physical Distribution and Logistics Management, Journal of Business Logistics, and Supply Chain Management: An Int’l Journal.

With regard to the journal article analysis being based on keyword searches, there is of course the obvious possibility that authors might have employed a different vocabulary than the particular terms included in the search (*systems approach*, *systems thinking*, *systems theory*), i.e. that authors might indeed have discussed their applied systems approaches without having used those particular terms. However, recall again that the idea of this paper was to find the roots to such claims regarding these very terms, not to elaborate on the nature of systems approaches within logistics management. Also, the bibliographic search that was conducted serves to complement this analysis by identifying the extent of citing those systems theoretical scholars that in the paper were identified as central to each ‘school’, thus adding to the truth-value (Halldórsson & Aastrup, 2003) on this issue.

Turning to the deductive phase and the questions posed in the questionnaire for the survey study in Paper 2, construct validity is deemed to be good due to the formulation of the questions. The questions are formulated in such a way that they represent well what was being measured; either degree of agreement to generic formulations of such claims that are presented in section 1.5, or the degree of familiarity with and citing of certain given systems theoretical authors (see Appendix 1 of Paper 2), thus contribution to face/content validity (Mentzer & Flint, 1997).

With regard to measurement reliability, the employed item scales are either five-point Likert, or have given levels with concrete statements for levels of familiarity and citing (See Appendix 1 of Paper 2). There is however a risk that these have been interpreted differently by respondents, thus introducing some variation in measurement. Outlier analysis was performed, leading to omitting six of the 184 responses which were deemed non-realistic (for details, please refer to Paper 2). The statistical procedures employed are explicated in the paper, thus making it possible to trace how conclusions are drawn. Due to the data being ordinal, only non-parametric techniques were applied.

A weakness of this phase concerns external validity, which cannot be fully guaranteed through a single survey study (Mentzer & Flint, 1997), and is strongly affected by sampling. In this case, the target population is roughly known in character, but largely unknown in terms of its members. There is no way of finding out exactly how many logistics management researchers there are in the world at any given moment, nor is it

possible to identify which the individuals are. Non-probability sampling was therefore necessary. The sample to invite was created through membership rosters of a few established logistics management professional organisations, and filtering for members that have identified themselves as academics, thus increasing accuracy of invitations. However, in order to increase reach, invitees were encouraged to forward the invitation to fellow academics, thus decreasing sample control. This also made it impossible to produce an accurate response rate. The number of primary invitees was about 1 900, to this is added an unknown number of recipients of forwarded invitations. With 178 valid responses the response rate is at best just below ten per cent, which is rather low (cf. Melnyk *et al*, 2012), but in line with many of the mail survey studies covered by Larson's (2005) analysis of *JBL*¹³ 1989-2003. With regard to one of the possible concerns of low response rates, non-response bias, this was tested in Paper 2 and it was concluded that this should not be a problem for the study. Also, with few exceptions, the statistical significance levels of the employed tests indicate that there is very small chance that the detected differences are due to random effects. In terms of statistical power, this somewhat compensates for the low response rate. In all, the degree of external validity of the survey study is however not fully clear.

Circumstantial evidence

With regard to the produced circumstantial evidence, much of what is stated above regarding traceability and truth-value for the inductive phase is also applicable here. The sources of data are explicated, as is my interpretations of what is written. In most cases, the texts are taken at face value since they explicitly discuss the aspects that are sought, i.e. little interpretation is needed. The selection of sources is not very large, making transferability in statistical generalisation terms difficult. However, the sources have in their turn often covered somewhat large samples of published logistics management research, thus they are deemed representative.

¹³ Journal of Business Logistics

2.4 Research design for objective 2

Recalling the last paragraph of the introduction to this chapter (see page 24), the logic of the overall triangulation strategy is based on the possibility of revealing contradictions between what is assumed by the dominating type of approaches applied within the discipline, and what might be unveiled when applying an interpretive approach. As will be argued later, the dominating approaches can be said to assume homogeneity in actors' systems thinking. Thus, if an interpretive approach can demonstrate heterogeneity in actors' systems thinking, then I argue that such an approach has merit for our discipline. I.e. the strategy of this part of the dissertation is one of a falsification attempt against the assumption of systems thinking homogeneity in logistics practices. The stronger the a priori reasons for assuming homogeneous systems thinking in a certain context, the more powerful the falsification will be if heterogeneity is demonstrated.

An important distinction regarding this research objective is that it does not aim at building theory from the empirical data that is collected. I.e. there is no intention to advance from empirical observations of the systems thinking of those actors that are studied here, to any form of generalisation pertaining to the core of logistics management. The ambition goes instead via the falsification logic presented above, and is not aimed at building any new theory per se. Rather it aims at establishing a need for widening the scope of approaches to theory building within or discipline.

Two research questions, as presented in section 1.6, are addressed under this objective. The first one is *Do actors' systems thinking differ, even in a mutual context?* Answering this research question requires a design capable of eliciting, describing, and evaluating possible likenesses and differences in the systems thinking of several actors in one given context; a context in which there is good reason to assume a high degree of homogeneity in systems thinking. This is outlined in section 2.4.1 below.

The second research question is formulated as *If so, what implications may this have?*. This is a question that is more forward-looking and is by necessity answered in a reasoning, speculative manner, without aiming for comprehensiveness¹⁴. A design is therefore only presented for the first question.

¹⁴ Which is why the question is not formulated as: "*If so, what implications **will** this have?*"

2.4.1 Cognitive mapping of actors' systems thinking

The CST perspective on which this dissertation is founded, is committed to pluralism, and thus encourages the application of different methodologies and methods, based on the prerequisites of the situation at hand. In this particular situation, what is needed is a research design capable of unearthing the systems thinking of several actors in one mutual context, and visualising this in a way that makes it possible to compare, in order to identify the level of homo- and/or heterogeneity.

From the theoretical domain of cognitive psychology, various streams of management research has adopted the construct of *mental models*, a construct that it widely acknowledged to have originated through the works of Craik (1943), and later to have been further developed by Johnson-Laird (1983) and Gentner & Stevens (1983). Mental models are individual, internal constructs of the world that surrounds us, that shape what we perceive, how we interpret and make sense of events, how we rationalise actions, etc. (Klimoski & Mohammed, 1994; Westbrook, 2006). Rouse & Morris (1986) describes mental models as: “... *the mechanisms whereby humans are able to generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states.*” (p. 351), which suggests a link between mental models and systems thinking. The idea of mental models has therefore informed this part of the research.

Cognitive mapping is a label that has been placed on a number of methods and techniques to extract and represent aspects of mental models (Fiol & Huff, 1992). It should be noted that, regardless of which method that is employed, the result can never be a mental model in itself, since these always contain tacit elements (Eden, 1992). I.e. any cognitive mapping effort will only be able to elicit and portray aspects of an individual's thinking, and only to the degree that the individual is capable of articulating.

One commonly applied family of cognitive mapping techniques is *causal mapping* or *cause mapping*, methods aiming at portraying individuals thoughts on causal structures in the world surrounding them. These techniques are widely acknowledged to have been originated by Axelrod (1976). Causal maps are graphical representations of nodes and links between these. Nodes represent constructs, usually short sentences conveying the essence of meaning. Links represent relationships between constructs, how they affect each other. Due to the many interrelations and links intrinsic to the

core of logistics management, it is reasonable that any actor in a logistics practice thinks in terms of a number of such causal structures. In Paper 3, a causal mapping technique was therefore applied.

Context and interviewees

The causal mapping technique was applied on 13 actors all associated with a Swedish chain store retailer (*RetailCo*), all holding different roles in the company except two, who work for supply chain partners; one important supplier, one third party logistics operator. The underlying rationale behind choosing this specific context is explicated above. Being a chain store enterprise, with fully owned stores that do not act as separate profit centres, and what was deemed to be a high level of centralised planning and control, this enterprise was deemed to fulfil the requirements of a context in which actors can be expected to have a high degree of homogeneity in systems thinking, despite holding different roles in the logistics practice. For a more thorough description of the context and interviewee sampling, please refer to Paper 3.

Empirical data collection

The empirical data from which to construct causal maps can be any kind of text, be it primary (interview) data or secondary material (Huff & Fletcher, 1990; Laukkanen, 1990), one-to-one interviewing is however regarded as giving the best data for individual mapping (Eden & Ackerman, 1998). Therefore, individual interviews were conducted with each of the 13 interviewees.

In order to direct the interviews to the domain of the logistics practice of which the interviewee is part, an interview guide (see Appendix 1 of Paper 3) was developed on the basis of Churchman's (1968) five basic considerations of systems analysis:

1. *The total system objectives and, more specifically, the performance measures of the whole system;*
 2. *The systems environment; the fixed constraints;*
 3. *The resources of the system;*
 4. *The components of the system, their activities, goals and measures of performance;*
 5. *The management of the system.*
- (pp. 29-30)*

Each interview was recorded and transcribed verbatim. Finished transcripts were then checked against the recording.

Data validation

Prior to writing Paper 3, I have used this empirical data for creation of a slightly different kind of cognitive maps, reported in an unpublished research report (Lindskog, 2010). Although only a selection of finished maps were included in that report, due to limitations in the applied analysis technique, cognitive maps were actually created for all interviews. These maps were created during a second meeting with each interviewee, during which a map was built interactively. This mapping activity consisted of the interviewee sorting and placing out cards in accordance to their relationships, and illustrating these relationships. Each card contained a construct that I had elicited during a preceding analysis of the transcript. In all, there was one card each for every construct that had been elicited; constructs being short phrases or single words bearing my interpretation of the essential meaning of what was told during the original interview.

During the interactive session, the interviewee was asked to correct any errors in the cards that (s)he experienced, either if something was formulated in a way (s)he found incorrect, or if something was deemed unnecessary to include. Interviewees were also given the option to, if something important was found to be missing, to write entirely new cards. This procedure of communicative validation (Flick, 2009) meant that each interviewee got to check and confirm the correspondence between my interpretations and their own original meaning.

Creation of causal maps

For the mapping reported in Paper 3, only such constructs pertaining to the perceived goals of *RetailCo's* logistics practices were elicited. This was done in two consecutive steps, corresponding to the *categorisation* and *abstraction* operations as described by Spiggle (1994). The first step entailed in-vivo open coding (Corbin & Strauss, 2008; Flick, 2009), the second encompassed translation to English and creation of standardised concepts. The map creation exercise also contained identifying relationships between concepts, in order to elicit the causal structure of each map. The entire process of elicitation and map creation is detailed, along with examples, in Paper 3.

Analysis

With all the causal maps built on standardised concepts, it was possible to compare the maps both with regard to which concepts they contain, and how relationships between the concepts were articulated by each interviewee.

Comparison can of course be done simply by placing maps next to each other and conducting a visual comparison. Due to the way in which the maps were laid out, a visual comparison of graphical structures might however convey an illusion of greater differences than there actually are. To mitigate this, two cross-comparison matrices (see e.g. Bougon *et al*, 1977) of different levels of aggregation were created. These are presented in Appendices 4 and 5 of Paper 3; details regarding creation of the matrices are explicated in the paper.

2.4.2 Issues of research quality for objective 2

With regard to traceability and explicitness, much of the research process from selection of context and interviewees, through causal mapping and analysis, to conclusions is explicated within the sections above and in Paper 3.

The truth-value in terms of in-vivo constructs being representative of actors' meaning during the interview has been ensured to some extent due to the second meeting for mapping, as presented above. However, since the maps presented in Paper 3 are of a slightly different character and created post hoc without interacting with the interviewees, there is of course a risk that some of the original meaning has been lost. The constructs elicited here are however a subset of those elicited for the previous study, so as far as to the in-vivo coded there is a high degree of correspondence.

Some of the original meaning has however been shaved off quite deliberately, first in the construction of standard codes, and later during the grouping. This is a central trade-off when conducting this type of analysis, between on the one hand making comparisons possible and on the other retaining idiosyncrasy. It should also be noted that the 'seeing of the world through the eyes of another' by necessity has to be an ideal rather than a feasible activity. To truly and with certainty see what someone else sees, reasonably we must be that someone.

Whether or not this reduces the trustworthiness of my work to unacceptable levels must ultimately be judged by the reader. I argue, however, that the analyses conducted here do not suffer from any greater quality deficiencies than would any interview-based case study conducted by a self-proclaimed positivist.

Looking at transferability, this criterion is not applicable directly to the findings of the comparative analysis of paper 3, since no attempt has been made to generalise in any way directly from the empirical data. The generality of the conclusions is instead dependent upon logical falsification of the assumption of homogeneous systems thinking, as discussed above, especially from the point of view of the power of the chosen context. In this case, it has been argued that a rather high degree of homogeneity in systems thinking could be expected due to the nature of the context. Although the findings point in many directions, I believe the heterogeneities that are unveiled are sufficiently clear to motivate the conclusion that an interpretive approach has merit for research within our discipline.

To further strengthen this result, more studies in other contexts where a high degree of homogeneity can be expected would have been beneficial for this study. To hypothesize, one such context could perhaps be a planning office within a large industrial company, and the sample could be a number of planners working together but with e.g. different production segments. Another such context could be in the distribution for a multinational industrial company, and to compare maps for e.g. national sales company representatives. To mention just a few possible examples.

It should in this context be noted that the use of a structured interview guide probably have influenced the interviewees, e.g. by putting items on the agenda which may or may not have been thought of if the interview had been less structured. It is likely that the resulting maps would have become even more dissimilar if the interviews had been conducted without any a priori guide. The analysis was also only conducted on actors' beliefs regarding what goals their shared logistics practice aims for. It is likely that even more differences would become apparent if the analysis also covered actors' thoughts on how the logistics practices works to fulfil the goals. In summary, I argue that these biases actually strengthen the results, since any differences that become identified should be evaluated against the background that the applied method might have nudged respondents towards greater homogeneity.

2.5 Overview of research designs

Table 3 offers a summary of the research designs for objectives 1 and 2.

Table 3. Brief summary of research designs.

	Research objective 1		Research objective 2
	To describe the nature of systems thinking in logistics management research.		To explore the merits for logistics management research of an interpretive approach to actors' systems thinking.
Approach	<i>Inductive Realist-Positivist</i>	<i>Deductive Realist-Positivist</i>	<i>Inductive (w/o theory building aim) Nominalist- Interpretive</i>
Empirical data Type & Collection	<i>Secondary</i> Peer-reviewed journal articles Key-word search Basic textbooks Peer reference author selection Indicative evidence in selected literature	<i>Primary</i> Web-based survey of academics Non-probability convenience sampling	<i>Primary</i> One-to-one guided interviews Communicative validation
Analysis	Content analysis & follow-up analysis of claims regarding role of systems theory	Hypothesis testing Non-parametric statistical methods	Cognitive causal maps Standardisation of concepts Cross-comparison matrices
Publication	Paper 1 (Lindskog, 2012a)	Paper 2 (Lindskog, 2012b)	Paper 3 (Lindskog, 2012c)

2.6 Structure of the dissertation

The dissertation is a collection of four papers and this cover volume. The relationships between the parts are illustrated in Figure 7. Publications that are shaded grey are not part of the dissertation, but are related to the included publications as described below.

Chapter 1

This chapter presents the background and justification for the studies conducted within this dissertation. One of the sources for this is a re-analysis of the empirical material from my own licentiate thesis (Lindskog, 2003).

Chapter 2

The second chapter outlines the research approach, strategy, and design for the dissertation.

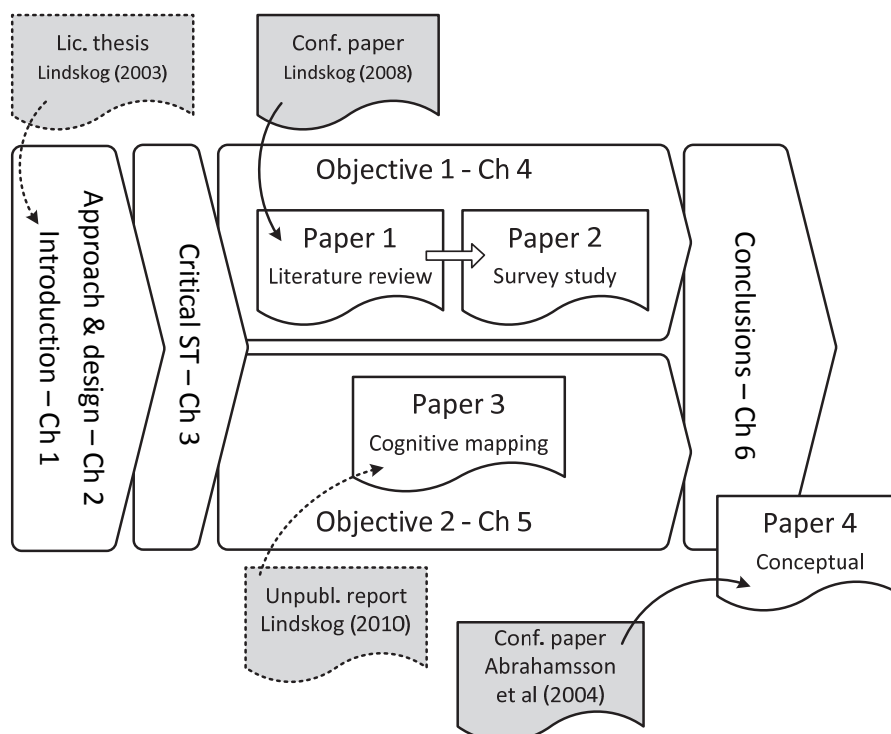


Figure 7. Structure of the dissertation.

Chapter 3

This chapter presents the main features of the theoretical frame of reference, *Critical Systems Thinking*. The chapter presents three generic systems approaches and is concluded with an illustration of how these have evolved over time.

Chapter 4

This chapter strives towards fulfilling the first research objective, which concerns the systems approaches and systems theoretical bases of logistics research. Two of the included papers, presented below, contribute to this objective. The chapter is concluded with a characterisation and elaboration of the systems approaches within logistics management research, and an illustration of how these have evolved over time.

Paper 1: Systems theory: myth or mainstream?

Magnus Lindskog

Logistics Research Vol 4, Iss 1-2, 2012, pp.63-81.

Paper 1 (Lindskog, 2012a) is a structured literature review of a large number of peer reviewed articles published in five important academic logistics management journals, as well as a selection of basic text books. The main purpose of this paper is to explore how systems theory has been explicitly treated within the logistics discipline.

A first version of this paper was presented at the 2008 NOFOMA Conference in Helsinki (Lindskog, 2008). The 2012 published version is substantially reworked and also covers a somewhat larger span of reviewed articles and books.

Paper 2: Mytbusting in the logistics domain: a second look at systems theory usage

Magnus Lindskog

2012. Accepted for publication in Logistics Research, in press.

Paper 2 (Lindskog, 2012b) reports on an international survey among logistics researchers carried out in 2011. It draws on the same frame of reference regarding system theory as Paper 1. The aim of this paper is to examine logistics researchers' views on systems theory, and to further explore to which extent our community has adopted various forms of it.

Chapter 5

This chapter serves to fulfil the second research objective. It contains an introduction to the current views on interpretive approaches within our discipline, and then continues by discussing the empirical study undertaken in the third appended manuscript:

Paper 3: Actors' systems thinking in a logistics context: An application of cognitive mapping

Magnus Lindskog

LIU-IEI-WP-12/0001

Paper 3 (Lindskog, 2012c) employs an interpretive systems approach. The systems thinking of actors is discussed from a theoretical perspective. This forms a basis for analysing the systems thinking of thirteen actors with different roles in one common logistics practice by means of cognitive mapping.

The empirical material for this paper was collected and analysed in a forerunner to this paper, in the form of an unpublished research report in Swedish (Lindskog, 2010).

Chapter 6

This concluding chapter rounds up the dissertation, by summarising the findings under each research objective, sharing some reflections and suggestions, and pointing towards some future issues to address. As part of this discussion, it relates to the fourth and final appended manuscript:

Paper 4: Visualisation for system learning in supply chains

Magnus Lindskog, Mats Abrahamsson and Håkan Aronsson

International Journal of Learning and Change, Vol 2, Iss 2, 2007, pp 170-191

Special issue on supply chain learning and change.

Paper 4 (Lindskog *et al*, 2007) is entirely conceptual. It is inspired by the ideas regarding systems thinking and learning put forth by Senge (1990), and discusses the potential of using microworld simulation combined with visualisation as a platform for developing the systems thinking of practitioners.

A first version of this paper was presented at the 2004 NOFOMA Conference in Linköping (Abrahamsson *et al*, 2004).

3 Systems thinking: a critical perspective

Many scholars from various disciplinary areas have at different times ventured to theorise on systems. Some have aspired to build ‘grand’ theories capable of guiding and building bridges between all research disciplines (cf. Bertalanffy, 1951). Others have aimed more at supporting interventions within practice, and have not aspired to produce systems *theory* but rather discussed systems *thinking* (Jackson, 2000; Ingelstam, 2002; Olsson, 2004). This dissertation has focused on such theoretical currents of pertinence for the wider area of management, in which logistics management can be seen as a part.

As with many other disciplinary areas, various authors have produced different types of reviews outlining the field. Paper 1 contains a brief overview of six identified ‘schools’ of systems theory, which was created through amalgamating the contents of a number of such reviews¹⁵; a meta-review of sorts. That particular way of structuring the systems theoretical field can of course be contested. Should a specific identified school really be categorised as a school in its own right, or as a version of another – or perhaps not as a theoretical strand at all? Can a certain school perhaps be regarded as all-encompassing, and that the others are just special cases of this school? Should an individual scholar be connected to this or that particular school? Should a certain school even be labelled as systems theory?

The intention of the overview in Paper 1 was to start advancing an understanding of an area with an abundance of research and academic debate, and that has evolved for quite a long time now; in fact, the ‘systems movement’ is by many claimed to have sprung to life in the 1950s-60s, i.e. roughly contemporaneously with the early days of logistics management. The meta-review was used as a lens through which a first look of the systems theory usage of logistics theorists could be taken. The understanding of the systems theoretical domain will now hopefully be taken one step further through the elaboration that is presented within this chapter.

¹⁵ The main sources for that review were Jackson & Keys (1984), Jackson (1990), Lane & Jackson (1995), Eriksson (1998), Umpleby & Dent (1999), Flood (1999), Jackson (2001), Ingelstam (2002), and Olsson (2004).

The present elaboration is based on the works of Michael C Jackson and colleagues¹⁶, scholars who are the most prominent within a field self-labelled as *Critical Systems Thinking* (hereafter CST). Why then choose this particular school? With an ‘upbringing’ in logistics management, I consider myself an outsider to the systems theoretical field. As I have tried to grasp the field as an outsider for some time now, I have realised that with all the debate that has taken place between different systems theoretical strands, finding sources without a perspective that is biased towards the supremacy of a particular school seems difficult at a level close to impossible. It should be noted that this is true of CST as well. However, CST as forwarded by Jackson *et al*, appeals to me because, as will become evident, it embraces all the other strands and sponsors the idea that these all have strengths to exploit under different circumstances.

The presentation of CST in this volume is thus mostly built with Jackson’s (2000, 2003) immense review as foundation – since those volumes summarise and reflect upon much of the previous work – but with reference to other publications at times when further clarification or exemplification is deemed useful.

3.1 Introduction to Critical Systems Thinking

CST is a strand of systems thinking influenced by critical social theory. Although it would be an interesting undertaking, this volume does not permit the space to go in-depth on social theory and the critical strands therein. I will focus CST itself, and here be content with merely pointing out its main sources of influence. What better way to do this than in the words of the central scholar himself?

“The ideas that have inspired critical systems thinking derive from two sources – social theory and systems thinking itself. Of particular importance, in the social sciences, has been work that allows an overview to be taken of different ways of analysing and intervening in organizations. For example, Burrell and Morgan’s (1979) book on social paradigms and organizational analysis, and Morgan’s (1986) examination of ‘images’ of

¹⁶ See Jackson (1985, 1990, 1991, 2000, 2001, 2003, 2006a, 2009), Jackson & Keys (1984) Flood & Jackson (1991b, a), and Flood (1990, 1995).

organization, have enabled critique of the assumptions different systems approaches make about social science, social reality and organizations. Critical social theory from Marx through to Habermas and Foucault, has also had a significant role to play. From Marx came recognition of the inequalities in capitalist society and exploitative relationships in many enterprises. Habermas' (1970, 1975) theory of three human interests, the technical, practical and emancipatory, and his warnings about the dominance of instrumental reason (wedded to the technical interest) informed reflection on the role of the various systems methodologies and provided justification for early attempts to conceptualize them as complementary since they could be seen as addressing different interests."

(Jackson, 2001, pp. 233-234)

When juxtaposed to the introduction to logistics management of section 1.1, we can see from this quotation that CST on a few points differs from the mainstream discourse of logistics management literature. One is the recognition of ("*... three human interests, the technical, practical and emancipatory...*"). Another is the viewpoint that more than one systems approach is possible, and that they might all have important roles to play ("*...complementary ... addressing different interests.*"). There is also the recognition of emancipatory viewpoints ("*...inequalities ... exploitative relationships*").

CST has three commitments around which its philosophy revolves: *critical awareness, improvement, and pluralism* (Jackson, 2000). *Critical awareness* entails an awareness of the theoretical foundations, of strengths and weaknesses of different systems methodologies. The commitment to *improvement* reflects the influence that emancipatory thinking has had, but within CST this does not have the 'grand' and radical aspirations of universal liberation, as hinted by the reference to Marx above. Rather, the idea is one of ethical awareness and to strive towards empowerment and fairness. The third commitment, *pluralism*, is presented in more detail in a separate section below.

With this brief introduction of its theoretical sources of influence as a backdrop, let us look closer at some distinguishing features of CST. But before going into any detail, I would like to share a personal reflection on CST. As I have interpreted this strand, and how the others are presented, it seems that the main aim is to improve managerial

practice. Thus, when methodologies, methods, etc. are discussed in CST literature, these are viewed from the perspective of practice, not primarily from the perspective of research. Or rather, from a perspective that research is and should be much closer involved in practice than what I believe is common within logistics management research, which commonly is more ‘detached’ (Frankel *et al*, 2005). This does however render neither CST, nor many of the named schools unsuitable for research purposes. The philosophical foundations can be adopted, as can many concrete methods, tools, techniques, and models.

3.2 Pluralism

Above all, CST strives to exploit the strengths of all available systems approaches. Drawing on Reed (1985), Jackson (2000, 2003) labels this a *pluralist* strategy to management research. Other strategies are the *isolationist*, the *imperialist*, and the *pragmatist*. *Isolationism* is described as a strategy of self-sufficiency, as being closed for influences from outside the own approach, and as paradigmatically bound to a single epistemological position. *Imperialism* is similar with regard to epistemological stance, but is on the contrary open for new influences, if these are deemed to strengthen the preferred approach. An imperialist position thus claims to be capable of explaining the existence of alternative approaches from the perspective of its own paradigm. *Pragmatism*, in contrast, is more oriented towards ‘whatever works’ in practice, and thus justifies application of various tools, techniques, methods, and models on the basis of producing results. It is regarded as more or less non-paradigmatic and non-theoretical.

The *pluralist* strategy of CST assumes that all systems approaches have different strengths with regard to tackling different problem situations, which are regarded as “...messes that cannot be understood and analysed on the basis of only one perspective.” (Jackson, 2003, p. 284). However, with the difference vis-à-vis pragmatism that sound theoretical groundwork is acknowledged as essential. It is necessary for informed application of methods, techniques etc. in any intervention in practice, and also for the possibility of advancing knowledge by theorising on the experiences from such interventions.

Inevitably, this idea of pluralism raises issues regarding paradigm incommensurability, the idea that competing ontological and epistemological positions cannot work together. This is due to the fact that, in essence, the systems approaches are founded in different paradigms, i.e. are based on different ontological and epistemological positions. Based on the fundamental idea of CST, the answer is that one will always lose something from switching from one paradigmatic stance to another. There is a trade-off between the strengths and weaknesses between the positions (Jackson, 2001).

Since problem situations most often will exhibit many and diverse characteristics, which make different methodologies suitable, it is recommended that a ‘dominant’ methodology is chosen, but which will be supported by other ‘dependent’ methodologies. This is when the trade-off between strengths and weaknesses of the different positions is done, in relation to the problem situation as currently comprehended. The *Systems of System Methodologies*, presented in a separate section below, is a useful supporting tool for choosing methodology (Jackson & Keys, 1984; Jackson, 1990, 2000). It is also recommended that the choice of dominant methodology is continuously reviewed in the light of how the perception of the situation evolves as the intervention progresses. As work proceeds, the dominant methodology might become replaced as new aspects of the problem situation unfolds. This is central to the pluralistic stance of CST, to not become ‘married’ to one single methodology which is applied in every situation regardless of context.

This feature of CST, which actually means that it is open to altogether shifting between different paradigmatic foundations, might be hard to grasp. I have therefore opted to borrow yet another piece of text which to my mind illustrates the idea:

“Let us say we begin an intervention with the interpretive approach as dominant. It is possible that an occasion will arise when a model introduced, simply to enhance mutual understanding, will appear to ‘capture’ so well the logic of the problem situation that a shift to a functionalist position will seem justifiable. The model will then be taken as a representation of reality and a shift made, which establishes the functionalist methodology as dominant. Similarly, there will be occasions when the ethics of the analyst or relevant stakeholders are so offended that the shift to an emancipatory rationale becomes clearly necessary.”

(Jackson, 2003, p. 314)

The pluralist position of CST also maintains that choice of a *methodology* does not necessitate the adherence to certain *methods* etc., as long as one considers carefully the theoretical underpinnings of the generic methodologies, the systems theoretical schools, and the available methods, tools, etc. It is thus possible to tailor these choices after the need of the specific situation, through application of the entire arsenal that is available through all the systems theoretical schools. An example would be to, under an interpretive methodology, employ constructs such as stocks and flows, feedback loops, etc. from *Systems Dynamics* as the ‘language’ of ‘verbalising’ different stakeholders’ subjective systems perceptions, being aware that the resulting models would not be, and thus should not be regarded as, models of ‘real’ systems, as is the case when such modelling is applied within a functionalist approach.

3.3 The System of Systems Methodologies

A central tenet of CST is an aspiration to improve real-world situations – often referred to as ‘problems’ – and much of it therefore revolves around problem solving methodologies. Flood (1995) explains that problem solving “... *actually means managing sets of interacting issues (rather than solving identifiable problems). Issues to be managed arise from the interaction of technical and human activities, how they are controlled, interaction of the organization with the environment, the organization’s mission, organizational design and management style, and people’s interpretations of all these.*” (p. 176). It is easy to see the relevance of such issues to any discipline of management, therefore the problem solving methodologies put forth within the systems theoretical field ought to have relevance for logistics management, be it in practice or research.

An important aspect of problem solving is to identify the context of the problem situation at hand, in order to let the most suitable methodologies guide the intervention. The *System of System Methodologies* (hereafter SOSM), which has been developed through a number of publications (Jackson & Keys, 1984; Jackson, 1987, 1988, 1990, 2000), is an aid for this purpose. The central idea of SOSM is that a grid of ‘ideal-types’ of problems contexts can be articulated along two dimensions.

One dimension concerns the participants in the problem situations, those stakeholders who are affected and/or involved in the problem in some way. The distinguishing

aspect regards the degree of agreement on objectives. If there is full agreement the situation is classified as *unitary*. If there are multiple objectives that are not agreed upon by participants, the situation is instead *pluralist*. There is also a third ideal situation, in which there exist power inequalities, dominance or open conflict. Such situations are classified as *coercive*.

The other dimension concerns the system in which the problem situation exists, and the two ideal types are *simple* and *complex*. This distinction is observer-dependent, i.e. a situation which seems to exist in a simple system for one actor, can be in a complex for another. Jackson & Keys (1984) acknowledge the difficulty of this classification, but offer some guidance: “*A simple system will be perceived to consist of a small number of elements, and the interactions between these elements will be few, or at least regular. A complex system will, on the other hand, be seen as being composed of a large number of elements, and these will be highly interrelated.*” (p. 475).

Although portrayed as having fixed scales of mutually exclusive options, both dimensions should rather be regarded as more as continuous in nature. Nevertheless, a rough classification of problem situations by means of a grid six ideal types can be derived, and in this grid, different systems methodologies can be placed according to the type of contexts in which they are best suited.

3.4 Generic systems approaches

Jackson (2000) presents an extensive review of the field of applied systems thinking, in which roughly two dozen more or less distinct theoretical strands of systems thinking is identified. These are analysed on the basis of a framework informed by Burrell & Morgan’s (1979) sociological paradigms and Alvesson & Deetz’s (1996) identified research approaches. The result is four generic systems approaches which have different positions with regard to ontology and epistemology, and thus employ different methods, techniques, tools, and models. These are the *functionalist*, *interpretive*, *emancipatory*, and *postmodern* approaches.

In the following sections I have opted to present the first three of these. Within each presentation below, examples are given of specific named schools that can be regarded as adhering to the generic approach. The functionalist and interpretive approaches are

included since it has been proposed that logistics adheres to the former, but has much to benefit from also adopting the latter (Mears-Young, 1993, 1995; Mears-Young & Jackson, 1997); this is elaborated in section 4.2.1. These propositions are, as will become evident a little further on, supported within this dissertation. Given new developments within the logistics management area, there might also be reason to glance at the emancipatory approach, why this generic approach is also included.

Each approach, in the order presented, has sprung into existence as a response to researchers identifying weaknesses in the previous approaches. Each new approach is also more directly geared towards practice (often managerial), than towards research. I have thus chosen to delimit this study from the most recent one, the generic postmodern approach, since the way in which I interpret its description by Jackson (2000, 2003), it is entirely geared towards practice, with a strong undertone of pragmatism. This, together with an assumption that already the attempt at borrowing in the interpretive, and perhaps the emancipatory, approaches in to logistics management research is quite a step to take, serves as my rationale for leaving the exploration of this last generic approach as a suggestion for future research.

3.4.1 Functionalist systems approach

The ontology of a functionalist systems approach is that of *realism*; reality is viewed as accessible by, and independent of, an outside observer. Systems are regarded as real, objective aspects of that reality, existing in their own right. Researchers engage in discovering laws that govern behaviour of the systems, and knowledge is seen as expert-dependent and aimed at increasing effectiveness and efficiency of the systems, in relation to some defined goal. The methods of choice stem primarily from the natural sciences, and are thus dominated by quantitative ones.

The methodologies of this approach were the first to become established, and the approach is also the one which has gained the widest influence. Belonging to it we find named schools such as early *Operations Research* (OR, see Churchman *et al*, 1957), *Systems Analysis* (see Miser & Quade, 1985), *Systems Engineering* (see Hall, 1962), *System Dynamics* (see Forrester, 1958), *Organizational Cybernetics* (see Beer, 1959), *Living Systems Theory* (see Miller, 1978), and *Autopoiesis* (see Maturana & Varela, 1980). When looking at the overview offered in Paper 1, we see that several of the schools identified therein can be sorted under this generic approach.

An example of a framework for analyses, taken from *Systems Analysis*, is presented in Figure 8 below:

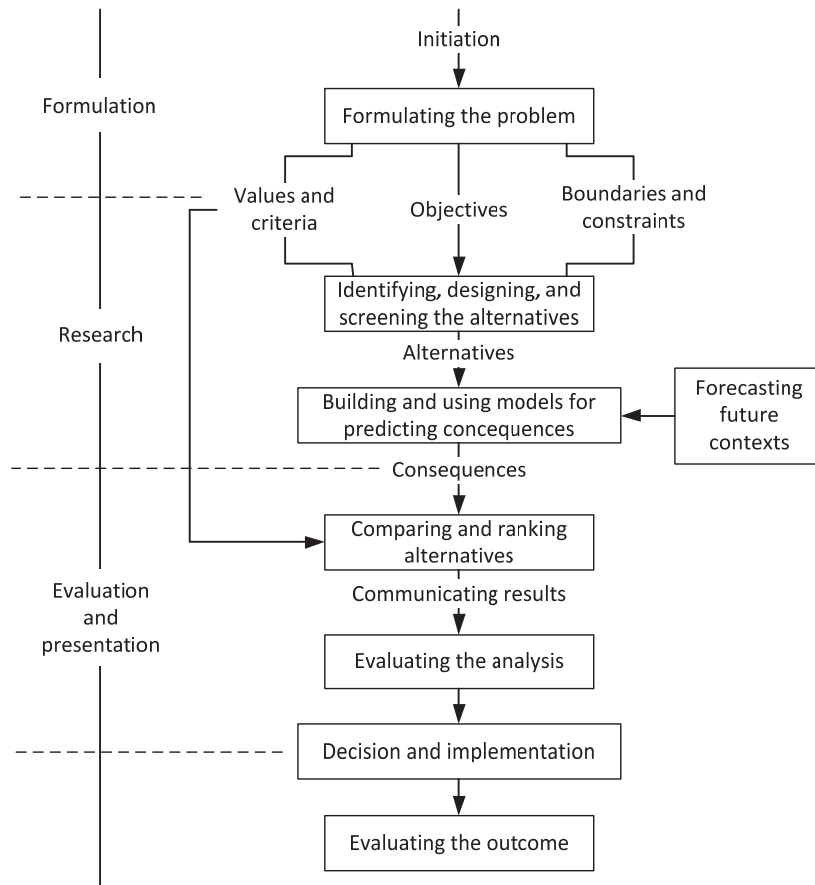


Figure 8. Framework of the Systems Analysis methodology (Miser, 1995, p. 217).

Albeit taken from one specific school, this framework is representative of the 'hard' view that dominates several of the schools within this generic approach. Focus lies on reaching the best system design and this is the task of experts. As put by Jackson (2000, p. 202): *"There is an assumption that once some version of the scientific method has been used to determine exactly how the system of concern should function, it is a reasonably straightforward matter to redesign the real-world system to meet this blueprint."*

Within this generic approach, there exist two different epistemological positions. One is that of positivism, according to which it is possible to reach predictive power by studying observable empirical phenomena; *"... relationships between the 'surface'*

variables...” (Jackson, 2006b, p. 875). The alternative stance is that of structuralism, which instead assumes underlying mechanisms to cause the observable phenomena, thus it is these hidden patterns and regularities which need to be uncovered by “...dig[ging] deeper...” (ibid., p. 875). Structuralism is by Jackson (see 2006c) equated to a critical realist (cf. Bhaskar, 1975) perspective.

3.4.2 Interpretive systems approach

The interpretive systems approach, often referred to as ‘soft’ systems thinking, developed in the 70’s and 80’s as a response to the at the time being dominant systems approach to management research, which was deemed ‘hard’. The soft-hard distinction lies mainly in the objective-subjective dimension. Whereas the functionalist approach, with its objectivist nature, disregards such aspects as values, beliefs, and perceptions of actors, the interpretive approach is instead subjectivist, and asserts that there can be multiple, conflicting perceptions of reality. I.e. the ontological position is *nominalist*.

Systems are thus not regarded as something that can be objectively accessed. Instead efforts are directed towards understanding subjective intentions and world-views of humans involved in the studied situations. “*Methodology should be geared to getting as close as possible to what is going on, preferably by getting “inside” people’s heads to find out and influence what they are thinking.*” (Jackson, 2000, p. 211). Systems models are thus not so much models of reality, as models useful for debate about reality.

With regard to named schools, these are fewer and less distinguishable than for the functionalist approach. Jackson (2000) identifies Churchman (see 1968, 1979) as one central scholar, and names his approach *Social Systems Design*, an approach which was a response to OR (which he himself pioneered, see above) becoming too functionalist in nature. This standpoint was shared by co-pioneer of OR Ackoff (see 1970, 1974), who forwarded *Social Systems Sciences* and *Interactive Planning*. Another important school within this approach is *Soft Systems Methodology* (SSM, see Checkland, 1981; Checkland & Scholes, 1990), often regarded as synonymous to soft systems thinking, and *Strategic Options Development and Analysis* (SODA, see Eden & Ackerman, 2001).

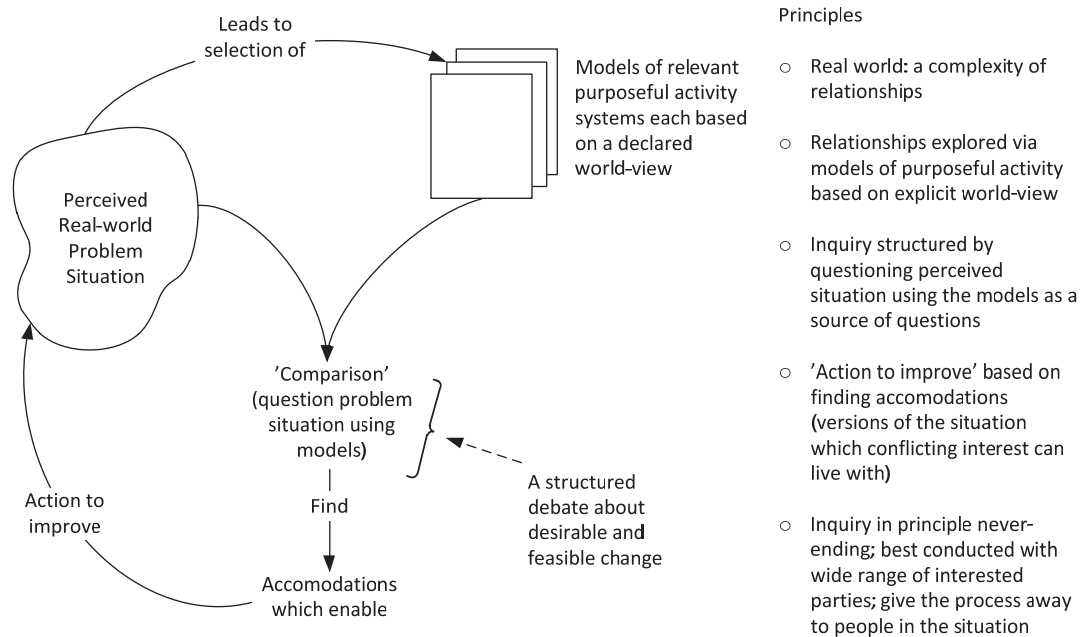


Figure 9. The inquiring cycle of SSM (adapted from Checkland, 1999, p. A9).

The inquiry cycle of SSM, see Figure 9, is chosen as an illustrative framework for the interpretive systems approach. Systems are regarded as those of purposeful human activity, which thus emphasis the intentions of actors. Interventions are seen not as one-off events but more as an on-going cycle of change, and much of the work lies in negotiation between world-views in order to find solutions that can be accepted by all involved parties. The process should preferably be carried by those involved, not by external experts. Under this generic approach also qualitative methods from the social sciences are employed, and research is not only intended to observe but also to participate and intervene in practices.

3.4.3 Emancipatory systems approach

Emancipatory system approaches are described as “...*suspicious of the current social order and seek to radically reform it.*” (Jackson, 2000, p. 291). This position is thus rather different from the previous two in that the aim is for improvement on an entirely different scale. Emancipation according to this approach means the liberation of groups in a disadvantaged position, due to structural inequalities with regard to power,

wealth, authority, or other aspects of society. With regard to ontology and epistemology, as well as methods usage, it is similar to the interpretive approach.

Having myself been ‘raised’ in a tradition of ‘business’ logistics management, this strikes me as somewhat peculiar, at least from a point-of-view of management of commercial enterprises. Informed by Munro (1997), Jackson reflects on the same note that “... *the idea of emancipation may for many people, both within and outside management science, seem an odd notion to associate with operational research and systems thinking. Nevertheless, during the 1980s and 1990s, it is the case that a number of theorists and practitioners working with these ideas and methodologies became dissatisfied with the systems approach used, unreflectively as a technical instrument or as a vehicle to promote debate, without reference to whose interests might be served by the intervention.*” (2000, p. 292). The main criticism towards both functionalist and interpretive systems methodologies is thus that these are seen as not paying enough attention to who is affected and in what way, by the systems designs produced by the intervention. Such positions are regarded as regulative in the sense that these maintain the status quo with regard to inequalities.

With regard to named schools, these become fewer and farther between as we progress through the approaches. Nevertheless, within the emancipatory there is e.g. *Interpretive Systemology* (see Fuenmayor, 1991; Fuenmayor & López-Garay, 1991), *Team Syntegrity* (see Beer, 1994), and *Critical Systems Heuristics* (henceforth CSH, see Ulrich, 1983, 1987).

To illustrate the emancipatory approach, I have chosen CSH. Central to this is the issue of boundary judgements, which from this perspective can be understood in two complementary ways. One is ‘whole systems judgements’, which concerns what ought to be viewed as belonging to the part of the real-world under consideration, the other, ‘justification break-offs’, concerns justification of the ‘normative implications’, the “...*life-practical consequences and side-effects of the ‘scientific’ propositions in question for those who may be affected by their implementation.*” (Ulrich, 1987, p. 276). This perspective thus puts a lot of emphasis on identifying all who are affected in different ways, and to give voice to their points-of-view. To do this, a number of *boundary questions* should be utilised:

Table 4. Twelve boundary questions of Critical System Heuristics (Ulrich, 1987, p. 279).

Checklist of boundary questions, the answers to which inevitably flow as normative premises into any concrete system design

1. Who ought to be the client (beneficiary) of the system S to be designed or improved?	8. What kind of expertise ought to flow into the design of S, i.e., who ought to be considered an expert and what should be his role?
2. What ought to be the purpose of S, i.e., what goal states ought S be able to achieve so as to serve the client?	9. Who ought to be the guarantor of S, i.e., where ought the designer seek the guarantee that his design will be implemented and will prove successful, judged by S's measure of success (or improvement)?
3. What ought to be S's measure of success (or improvement)?	10. Who ought to belong to the witnesses representing the concerns of the citizens that will or might be affected by the design of S? That is to say, who among the affected ought to get involved?
4. Who ought to be the decision taker, that is, have the power to change S's measure of improvement?	11. To what degree and in what way ought the affected be given the chance of emancipation from the premises and promises of the involved?
5. What components (resources and constraints) of S ought to be controlled by the decision taker?	12. Upon what world-views of either the involved or the affected ought S's design be based?
6. What resources and conditions ought to be part of S's environment, i.e., should not be controlled by S's decision taker?	
7. Who ought to be involved as designer of S?	

The boundary questions in Table 4 are supplied as an aid for this effort, and can be applied by all parties that are affected by an intervention. Ulrich distinguishes between four categories of actors: *Clients* – who stands to benefit? *Decision-takers* – who has power? *Planners* – whose expertise is called upon? *Witnesses* – who is affected but not involved? Each question also should be posed in two guises; how things *ought to be* (as formulated in the checklist), and how things in fact *are*. The idea is that the answers to these questions serve as basis for debate regarding boundary judgements. Any discrepancies between the ‘ought to’ and ‘is’-questions points to a ‘justification break-off’, i.e. a potential concern regarding the justification of a certain consequence for a certain party.

3.5 The System of Systems Methodologies revisited

After this review of three of the generic systems methodologies, it is appropriate to relate these to the SOSM presented earlier. The SOSM framework has been utilised to discuss the development of the different named systems schools, from the early days of the ‘hard’ schools and onwards. This progression is illustrated in Figure 10:

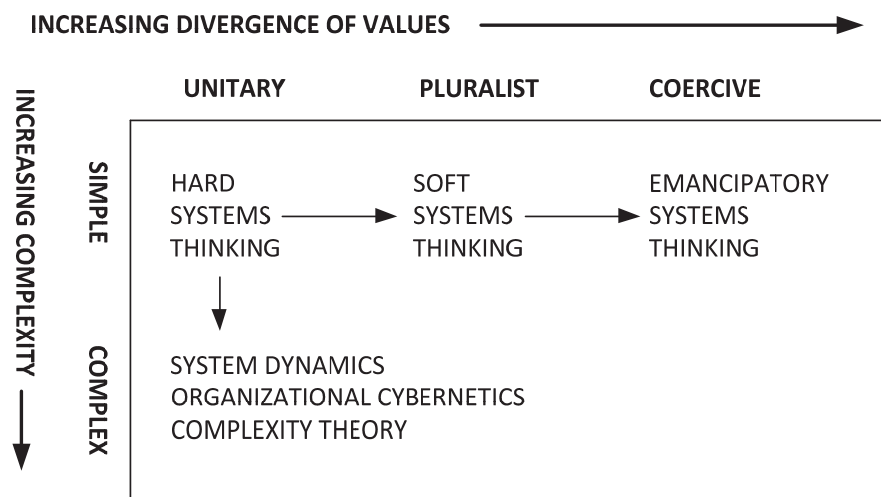


Figure 10. The development of applied systems thinking (Jackson, 2010, p. 135).

If we compare the illustration in Figure 10, with the descriptions of the generic systems methodologies along with the given examples of named methodologies there is, it lies close at hand to suggest the following modification to this figure. Figure 11 below is meant to portray my interpretation of the essence of the CST logic, i.e. that different generic systems approaches are suitable as dominant under different circumstances. I believe this framework can be applied in several different ways. One is to use it as an analytical tool for assessing systems approaches of previously conducted research, by comparing problem contexts to applied systems methodologies; a sort of meta-research. Any identified mismatches might indicate an opportunity to advance research by applying a better suited approach to the same context.

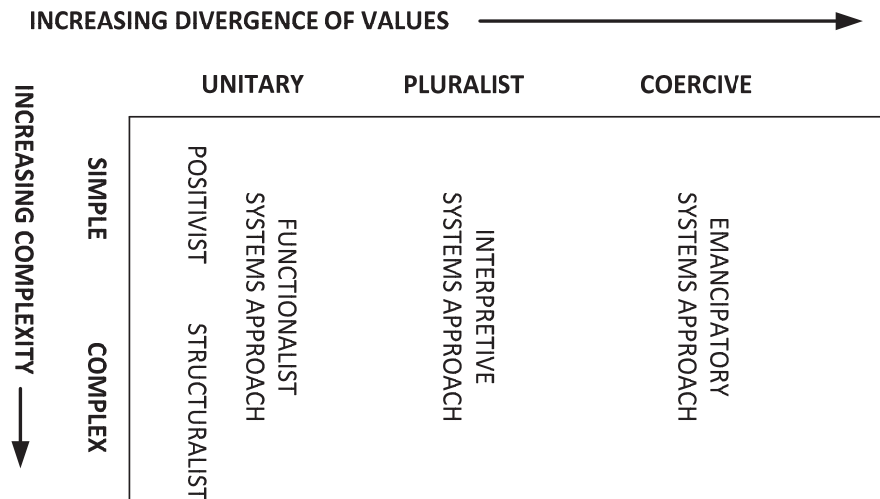


Figure 11. A system of systems approaches. Adaptation of the SOSM to the generic systems approaches, my interpretation.

Another mode of application is of course in the way suggested within CST, to direct the choice of dominant approach in any research venture. Any discrepancies identified in the meta-research suggested above will be obvious candidates. Alternately, turning things the other way around, it could instead be applied in an ‘inside-out’ mode. By this it is meant to begin with the questions “*With which systems approaches am I familiar?*” and “*Upon which premises do this/these approaches rest?*”. With these questions answered, one has some guidance concerning which types of problem contexts within one can operate with a reasonable chance of producing solid results. This simple framework thus offers a few rather useful modes of application. I will return to it at later points in this dissertation

3.6 Evolution of systems thinking

To summarise the evolution of the systems theoretical field, as it is presented within CST, I have in Figure 12 ventured to produce another graphical illustration which includes a rough timeline.

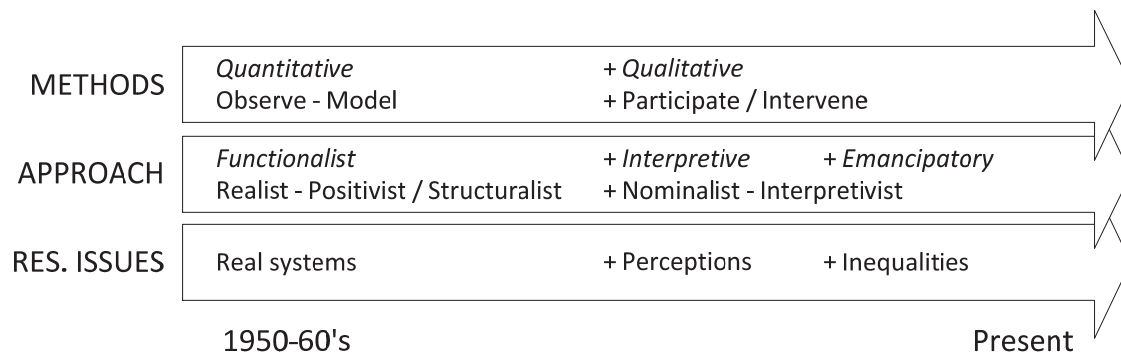


Figure 12. An illustration of the phases of development within systems thinking, with regard to research issues, approaches and methods.

The first ‘wave’ of systems thinking is represented by the generic functionalist approach. The ontology is realist, and epistemologies are either positivist or structuralist, since the main research issues concern making real systems more efficient in relation to some predefined goal. The ideal of research is to stand outside a ‘real’ system and to observe and model it, and the dominant methods are of quantitative nature.

As a reaction to this, the generic interpretive approach emerged and was based on a nominalist ontology and an interpretive epistemology. Research issues shifted towards perceptions of systems and their goals, rather than possible tangible ‘real’ systems. The ideal of research shifts towards a participative and intervening character within practices, and dominant methods become more qualitative in nature.

The generic emancipatory approach shares this world-view, but reacts also towards the interpretive since it is regarded as not paying enough attention to inequalities with regard to power, wealth, etc. Such issues are therefore with the adoption of this approach added to the systems researcher's agenda. The ideal of research leans even more towards intervening.

4 Systems thinking in logistics management research

In this chapter, the first research objective, and the associated research questions are addressed. These are:

- **Objective 1:** *To describe the nature of systems thinking in logistics management research.*
 - How can the systems approach(es) in logistics management research be characterised?
 - Has logistics management research adopted systems theory, and if so, which parts and to what extent?

The research design is outlined in section 2.3, and is now applied through the following sections.

4.1 Substantial evidence

The substantial evidence pertains to the classification part of characterising systems approach(es) within logistics management research, and the identification of which, if any, systems theory that has been adopted. This portion of the evidence is produced through the two connected studies reported in Papers 1 and 2, corresponding to the inductive and deductive phases of the research design.

The inductive phase, as outlined in section 2.3.1, is executed by means of the literature review that is presented in Paper 1 (Lindskog, 2012a). That paper takes as its starting point statements that lend systems thinking / systems theory the status of a foundation for logistics management research. Following a literature review in which six ‘schools’ of systems theory are identified, a method is applied in which a large number of peer-reviewed journal articles within logistics management are gradually filtered and reviewed. The review also covers a selection of basic logistics management textbooks.

One part of the analysis was to search for author names in the bibliographies of the articles included in the sample. The results of this search are presented in Table 2 of Paper 1, below reproduced as Table 5. These results can in this volume be analysed through a new lens, that of the generic system methodologies presented in section 3.4.

Table 5. Reproduction of Table 2 of Paper 1 (Lindskog, 2012a, p. 69)

	IJD&LM		IJLM		JBL		IJL:R&A		SCM:IJ		TOTAL SAMPLE	
No. articles w. searchable bibliographies	656		119		580		270		478		2 103	
Ackoff	6	0,9%	1	0,8%	4	0,7%	1	0,4%	0	0,0%	12	0,6%
Ashby	4	0,6%	1	0,8%	0	0,0%	0	0,0%	2	0,4%	7	0,3%
Boulding	1	0,2%	0	0,0%	3	0,5%	0	0,0%	2	0,4%	6	0,3%
v. Bertalanffy	4	0,6%	2	1,7%	3	0,5%	2	0,7%	2	0,4%	13	0,6%
Checkland	10	1,5%	3	2,5%	3	0,5%	3	1,1%	1	0,2%	20	1,0%
Churchman	4	0,6%	0	0,0%	2	0,3%	0	0,0%	1	0,2%	7	0,3%
von Foerster	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Forrester	48	7,3%	14	11,8%	16	2,8%	16	5,9%	44	9,2%	138	6,6%
Miser	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Quade	1	0,2%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	1	0,0%
Rapoport	2	0,3%	1	0,8%	1	0,2%	0	0,0%	0	0,0%	4	0,2%
Senge	14	2,1%	5	4,2%	6	1,0%	1	0,4%	9	1,9%	35	1,7%
Sterman	12	1,8%	5	4,2%	6	1,0%	5	1,9%	10	2,1%	38	1,8%
Ulrich	9	1,4%	4	3,4%	5	0,9%	1	0,4%	5	1,0%	24	1,1%
Wiener	3	0,5%	0	0,0%	2	0,3%	0	0,0%	0	0,0%	5	0,2%
Sum	118	18,0%	36	30,3%	51	8,8%	29	10,7%	76	15,9%	310	14,7%

Starting with the three most commonly cited authors, Jay W Forrester, John D Sterman, and Peter M Senge, these all belong to the *System Dynamics* school, which in turn can be placed within the *functionalist* methodology. With regard to the epistemological distinction within this methodology, *Systems Dynamics* can be classified as structuralist (e.g. Jackson, 2000). Together, these authors are cited 211 times in the sample of 2 103 articles, rendering a frequency of 10%, or about 2/3 of the 310 occurrences of systems theorist citations that were found.

The next in line with regard to number of citations indicates that Werner Ulrich and Peter M Checkland are cited a few times each, 24 and 20, respectively, corresponding to roughly one per cent each. Also the in-depth review of some articles that were deemed to discuss systems theory at any length points in the direction that *Systems Dynamics* is the most commonly adopted school.

Paper 1 concludes that application of systems theory is not particularly common within our discipline, and that if it is done, it is schools of the generic functionalist methodology that are found most appealing. However, there are a few logistics management theorists who have adopted schools from both the interpretive and emancipatory approaches, although this is quite rare.

The overall conclusion is however that no systems theory at all is applied, and that statements claiming that systems theory is a central aspect of logistics management are just part of the forwarding of a long-lived myth.

Drawing on these conclusions of Paper 1, a second study puts that myth to the test; this corresponds to the deductive phase as outlined in section 2.3.1. This was an international web-based survey of logistics academics that was administered during the first half of 2011. A usable sample of 178 complete responses was collected, mainly from European and North American academics. All academic levels, ranging from PhD students to professors are represented. The paper set out to “...*examine logistics scholars’ views on systems theory, and to which extent our community has adopted various forms of it.*” (Lindskog, 2012b, p. 4). This was fulfilled through two objectives, one concerning the extent of familiarity and application of the writings of those systems theorists identified in Paper 1, the second concerning views and valuations of certain systems terms, in relation to each other and to the discipline.

The results of the survey point in the same direction as those of the preceding literature review. With regard to adoption of system theory, it is concluded that on the whole this wide domain is largely unknown to logistics management theorists, and among those who are familiar to some extent, it is mainly schools belonging to the generic functionalist approach that have been adopted. There are some hints of applying ‘soft’ systems thinking, indicating some awareness of the interpretive approach, but these hints are few and far between. Contrasting the results of Paper 1, the author Werner Ulrich, in this volume associated with *Critical Systems* Heuristics, sorted under the generic emancipatory approach, seems not at all as well-known or cited as is Peter M

Checkland, associated with *Soft Systems Methodology* which is sorted under the generic interpretive systems approach. This indicates a difference between the generic interpretive and emancipatory approaches, suggesting that the former has gained a somewhat stronger position within our discipline than has the latter. However, both should be appreciated from a reference point of an in general quite low extent of borrowing-in systems theory. This relates to the actual use, in the survey measured through respondents' stated citing of certain authors.

Another measurement in the survey concerns logistics researchers' familiarity with their systems theoretical counterparts. Of those systems theorists (18 author names in total) included in the survey, the most familiar is Jay W Forrester; roughly 3 out of 5 respondents stated to have ever read one or more of his publications. But most of the identified systems thinking theorists are in fact not only never cited, they are also largely unknown to a majority of respondents. Out of the 18 listed systems theoretical scholars, 14 are completely unknown by more than half of the respondents. For 15 of the listed scholars, one third or less of the respondents have stated to have ever read any of their scholars' publications.

With regard to valuation of the systems terms (systems approach, systems thinking, and systems theory, see section 1.2), there seems to be no clear consensus on how these relate to each other. Some regard all three as more or less synonymous, some see them as different. With regard to their relation to the logistics discipline, most find systems approach and / or system thinking central, whilst fewer agree to the statement that logistics is rooted in system theory. Given the longstanding claims that a systems approach and/or systems thinking is central to logistics management, both in writing (see section 1.5), and logistics management researchers' attitudes when asked directly (see Paper 2), there must be some substance behind the claims. However, it seems not to be articulated so clearly, or to be based on systems theory to any extent. Deeper penetration of the 'soul' of logistics management systems approaches is suggested in order to further increase our understanding on these issues. Some steps in this direction are taken in the following sections.

4.2 Circumstantial evidence

As presented in section 2.3.2, the circumstantial part of the produced evidence does not ‘measure’ directly any characteristics of the systems approach(es) of logistics management research, but serve instead to offer some indirect support by classifying based on aspects such as ontological and epistemological positions, and methods usage.

4.2.1 An outsiders’ perspective

Beginning with an ‘outsider’ perspective on logistics management, the previously mentioned Mears-Young (1993, 1995) and Jackson (Mears-Young & Jackson, 1997) set off from Stock’s (1990) call to break away from a traditional, narrow, perspective of logistics. The remedy for this narrow perspective that is proposed within our discipline – as these outsiders have interpreted it – is that logistics should develop in a non-traditional, more integrative direction. That is, in the sense of including more functions in its scope than what the traditional perspective accommodates. This ambition is criticised by Mears-Young (1993) on the basis that it merely is ‘doing ‘more of the same’. Going a step further in analysis, Mears-Young (1995) applies the Burrell & Morgan (1979) framework of research paradigms to analyse our discipline, and finds that: *“However, even though non-traditionalists promote a new broader view of logistics they still continue to attempt to the ‘problem’ of logistics as **they** themselves see it – a system of interacting parts.”* (p. 581, emphasis in original).

Thus the conclusion of the nature of logistics management is quite obvious, since there is only one paradigm that approaches the world in this fashion: *“Hence, no matter which vision of logistics is presented, both traditional and non-traditional models of logistics are firmly based on a functionalist view of the world. They conceive of a world independent of the observer, which is predictable, stable and knowable. A world in which there is only one version of reality, and other functions interfacing with logistics are assumed to share this view.”* (Mears-Young, 1995, p. 581).

Mears-Young & Jackson (1997) continue along the same lines, and argue that this strong adherence to a single paradigm might hamper the advancement of the discipline. In connection to this they also pose a somewhat provoking question: “...

are logisticians even aware that they follow a consistent paradigm of thought?” (p. 610). Now that gives food for thought.

Logistics is said to view the world in a way that there exist tangible systems to be engineered, and that also human behaviour is seen as ‘engineerable’. Further, logistics in these analysts’ view strives to predict and control these systems, and that it is possible to construct quantifiable models of all relationships within the systems under study. This means that logistics employs a realist ontology, a positivist epistemology, a deterministic view of human nature, and that methodology is nomothetic. Taken together, this makes logistics to be of an objectivistic nature in the eyes of these beholders.

Further, Mears-Young & Jackson (1997) comment on the emergence of ‘integrated logistics’ that : *“Above all, what non-traditional logistics is trying to do is to eliminate the conflict non-traditionalists perceived apparent in the implementation of traditional logistics. Non-traditionalists believe that such differences can be eradicated by involving logistics at a strategic level. The whole emphasis of non-traditional logistics is on seeking consensus, trying to get the business world to accept logistics. It is clear that non-traditional logistics is based on regulative sociological thinking.”* (p. 612). According to these authors, taken together, all these indications point in the direction that logistics is firmly rooted in functionalism.

4.2.2 An insiders’ perspective

Also insiders, i.e. authors who themselves have contributed to logistics management literature, have conducted various analyses of the nature of research being carried out within our discipline. Several have for instance made statements pertaining to the ontology and epistemology of logistics research, which is of interest because, recalling the generic systems approaches, some of the distinguishing features are their ontological and epistemological positions. The same goes for methods usage. A few examples of statements are presented here.

Spens & Kovács (2006) conclude, after an ambitious content analysis of a large number of articles, that logistics research mainly is hypothetico-deductive in nature, with a strong tendency towards using survey methods. Frankel *et al* (2005) write:

“Many logisticians would say that their research tends to be more positivist in nature and utilizes variations of quantitative approaches as the primary research method.” (p. 185). Similarly, Mangan *et al* (2004) conclude: *“The majority of logistics research is, rightly or wrongly, primarily populated by quantitative research viewed through a positivist lens. This is a reflection of the (generally functionalist) paradigm, which many logistics researchers use to view the world...”* (p. 575)¹⁷. In the remainder of this section a few more of these insider reviews are selected and some of their findings presented in a little more detail.

Beginning with Gammelgaard (1997), who contemporaneously to the outsider papers referred to in the previous section, discusses the systems approach within logistics research from a number of different angles. It is concluded that logistics both has, and will, benefit from a systems approach. Gammelgaard suggests two possible sub-approaches to the systems approach to apply within logistics. One *system theoretical* according to which reality should be viewed as objective and within which quantitative methods are applied. The other one should be *system metaphorical*, and instead regard reality as objectively accessible, and apply qualitative methods. With regard to actors it is concluded that these have been regarded as 'black boxes' within logistics, and that an issue to resolve is whether or not this should continue to be the case in logistics research. None of the suggested systems approaches are however deemed capable of acknowledging actors.

Moving on, and across the Atlantic, to a roughly contemporaneous publication, we can read:

“To date, all logistics research has been founded in the positivist paradigm with no logistics research, to the authors’ knowledge, founded in the interpretive paradigm. Given the strong foundation in and continued emphasis on positivism in logistics, the framework proposed here is also housed within the positivist tradition.”

¹⁷ The authors apply the same paradigm framework as Mears-Young (1993, 1995) & Jackson (1997).

The words are those of Mentzer & Kahn (1995, p. 232), and the framework that is mentioned is a normative one for how good logistics research is to be carried out, which is drawn up in that article. Two years later, Mentzer & Flint (1997) declare that more rigor is needed in logistics research, and that rigor springs from ensuring validity, mostly from a perspective of statistical testing of causal relationships. This is all presented as necessary for the process of conducting rigorous positivistic research, which in that particular article is presented in a section that bears the heading ‘Sound science’. Thus, again, the message is rather clear that good logistics research is positivistic, and that there is a certain way for how to conduct it.

Mentzer & Kahn (1995) also study the methods applied in all articles published in *JBL*¹⁸ through vol 1, iss 1, 1978, to vol 14, iss 1, 1993, and conclude that roughly three out of four employ as main methods such that are predominantly quantitative: surveys, simulation, or mathematical modelling, where surveys account for 54,3%. In a later extension of Mentzer & Kahn’s *JBL* study, Kotzab (2005) carries on from vol 14, iss 2, 1993, through vol 24, 2003, and concludes that surveys as main method account for 44% of the total number of published articles.

Mentzer & Kahn’s (1995) statements above regarding epistemology have now and again been brought up various literary responses. Näslund (2002) looks at a few other sources, and suggests that there is a strong positivistic streaming in logistics, and that methods are primarily quantitative. There are also indications that there is a cultural difference in that the positivist inclination is seems stronger in North America than it is in Europe, an opinion that later is repeated by Lindgren (2003). Näslund also questions how useful research will be in the long run of this one-eyed state of affairs carries on, and makes a case for widening the scope of logistics research both paradigmatically and method-wise.

In response to this, as well as to the mid-nineties statements by Mentzer *et al*, and to Näslund (2002), Craighead *et al* (2007) conduct a retrospective analysis of research published in three major academic logistics journals during a ten-year period (1993-2003). They conclude that “... *logistics research is most appropriately categorized as*

¹⁸ Journal of Business Logistics

logical positivist/empiricist throughout the ten-year period of study." (p. 37). The authors also note that the relative dominance of this paradigmatic stance has increased during the studied time-frame.

In a response to the normative writings of Mentzer *et al*, similar to that of Näslund (2002), Arlbjörn & Halldórsson (2002) also question whether the single-paradigmatic road ahead is the only desirable, and argue that researchers should reflect not only on how to increase rigor, but to question their own presumptions. With regard to the state of systems thinking in logistics research, the authors note an interesting inconsistency: *"In this [systems] paradigm, it is assumed that the whole differs from the sum of the parts due to synergy effects, i.e. knowledge depends on the system and how it is defined. Paradoxically, this assumption is in contrast with the statement mentioned above suggesting that modern positivism (the whole equals the sum of its parts) is the main paradigm in logistics research."* (p. 26). This statement can be related to the somewhat provocative question posed by Mears-Young & Jackson (1997) regarding logisticians paradigmatic awareness (see page 65). Based on the identified paradox, Arlbjörn & Halldórsson (2002) reflect that perhaps the systems approach has been over-emphasised in logistics research.

Solem (2003) utilises Burrell & Morgan's (1979) framework (see section 1.4), and concludes regarding logistics: *"Formerly, logistics was building heavily on objectivist methodological suppositions and positivist theory of knowledge was dominating. Although the positivist tradition still has a strong position within the area, in recent years there have been new logistics epistemologies emerging, bringing logistics as knowledge somewhat closer to a more interpretive conception of social theory and subjectivist methodological suppositions."* (p. 452). Thus, yet another indication in the positivistic direction, however with a hint that something new is dawning.

This conclusion regarding subjectivism is not shared by Gammelgaard (2004), who applies another framework to find out if there exist different schools of logistics research. In this article, the framework of methodological approaches offered by Arbnor & Bjerke (1997) is applied, a framework according to which there are three basic approaches to (business) research: the *analytical*, the *systems*, and the *actors* approach. The main characteristics of these are summarised in Table 6:

Table 6. The main characteristics of the three research approaches (adapted from Arbnor & Bjerke, 1997).

Approach	Characteristics
Analytical	Reality is objective. The whole = sum of parts. Knowledge independent of individuals. Parts explained by verified judgements. Discover causal relationships to explain and predict events.
Systems	Reality is objective, or at least objectively accessible. The whole \neq sum of parts. Knowledge depends on systems. Parts are explained, sometimes understood, by characteristics of the whole.
Actors	Reality is a social construction. The whole only exists as structures of meaning. Knowledge depends on individuals. The whole is understood via actors' finite provinces of meaning.

Gammelgaard (2004) concludes that of the three approaches, the actors approach (which comes closest to subjectivism) has not yet been applied in logistics research, but the other two have, meaning that positivism (the analytical approach) is not alone; also the systems approach has been applied. This approach is however not labelled with any clearly distinguishable ‘-ism’. Although not yet applied, Gammelgaard sees that the actors approach would “... *enable us to explore the human side of logistics strategies and implementation in a new and alternative way.*” (p. 489).

Frankel *et al* (2005) take a look at methods usage in logistics research, through analysing *JBL* articles through 1999-2004, and conclude that “... *the majority of logistics research as published in JBL is based on methods within the detached, objective external perspective (i.e., experiments, surveys, literature/document studies) with surveys as the primary research method...*” (p. 201).

Golicic *et al* (2005) conduct an overview of four important logistics management journals (including *JBL* surveyed by other authors, see above) as well as the proceedings of one conference during 1994-2003, in order to examine the share of purely qualitative studies that are published. The authors conclude that the share is very small, but that there is a growing awareness of the need for and benefits from

qualitative research, and point to the example that *IJPD&LM*¹⁹ in 2002 ran two special issues on qualitative research methods.

Drawing on the Arbnor & Bjerke (A&B) framework in much the same manner as Gammelgaard (2004), Vafidis (2007) analyses 54 doctoral dissertation published in Sweden and Finland during 1994-2003. It is concluded that some research is carried out which adheres to both the positivistic (A&B: *analytical*) approach, and to the hermeneutic²⁰ (A&B: *actors*) approach, but that most falls in the middle, adhering to the systems approach. The systems approach is described as “... *somewhat positivistic, although the approach is also to bind the investigation with a holistic understanding of the investigated phenomena in a rather pragmatic way.*” (Vafidis, 2007, p. 39). Further underlining the ‘in-between’ character of the systems approach, it is later stated that “*The systems approach can include both the positivist and hermeneutic types of research...*” (ibid., p. 77).

With regard to the classification of research as hermeneutic, I personally find this study somewhat confusing. Dissertations are classified, it seems, as hermeneutic if empirical observations precede theory in order of application; what is normally regarded as an inductive approach (e.g. Kovács & Spens, 2005). It is however also concluded that “...*the common distinction between inductive and deductive research is not specifically linked to positivistic or hermeneutic approaches, as it was noted in a previous chapter that present-day positivism recognises both.*” (Vafidis, 2007, footnote p. 32). To further add to my confusion, one of the dissertations that is classified as hermeneutic is by the author himself classified as adhering to a systems approach, employing “... *a (nomothetical oriented) multiple case study.*” (Norrman, 1997, p. 50). Thus an alternate classification would be in the ‘middle’ category, with a tendency towards objectivism as described by Burrell & Morgan (1979).

Vafidis (2007) also studies methods used in the reviewed Nordic dissertations, and concludes that in the sample quantitative and qualitative methods are applied roughly equally, and that it is not uncommon that both are applied within the same dissertation.

¹⁹ International Journal of Physical Distribution & Logistics Management.

²⁰ “For the purposes of this study, it is sufficient to understand 'analytical', 'positivist' and 'naturalistic' as synonyms. Additionally, the terms 'hermeneutics', 'anti-naturalistic', 'interpretative', 'non-positivistic', 'antipositivistic', 'antinaturalistic', 'ethnomethodological', 'German idealism', 'historicism', 'Marxism' and 'critical theory' can all be seen to involve similar ideas towards theory generation and testing, and can therefore also be understood as synonyms. To simplify the terminology, this study applies the terms 'positivism' and 'hermeneutics'.” (Vafidis, 2007, p. 25).

Aastrup & Halldórsson (2008) have studied several of the publications that are presented here, and reflect that some of these claims regarding positivism as the predominant perspective of logistics research are based more on legacy than on actual evidence (referring e.g. to Mentzer & Kahn (1995)). Some of the claims on positivistic research are found to have produced evidence (referring e.g. to Spens & Kovács (2006)), but other sources point to a more nuanced picture (referring e.g. to Gammelgaard (2004)). Aastrup & Halldórsson (2008) conclude that logistics has applied a systems approach that regard systems as possible to design towards obtaining certain desired results, and which views social agents deterministically. They write: *“... we are tempted to propose that logistics has brought itself into an intellectual blind spot... Perhaps, the notion of positivism in logistics research is less accurate than assumed, and might deserve the status of a myth more than anything else.”* (p. 749). The route out of the blind spot, it is argued, goes through more thorough reflection on paradigmatic / epistemological concerns. The authors then go on to apply a critical realist perspective, and from this produce a solid argumentation justifying the use of case studies in logistics research due to their power in revealing underlying generative mechanisms.

4.3 One approach, two epistemologies

As noted in the introduction of this dissertation, the critical perspective that is employed here entails a reflection on presuppositions. Informed by this, the presuppositions, the implicit assumptions or ‘background beliefs’, of logistics management research are scrutinised; this is done by means of the circumstantial evidence produced in the preceding section.

Prior to that, the substantial evidence produced through the studies presented in Papers 1 and 2 measures more ‘directly’ the characteristics of the systems approach(es) within logistics management research (see section 4.1). Beginning with adoption of systems theory, the studies suggest that this is done to a rather small extent. Claims that logistics management is rooted in systems theory simply cannot be supported. Such claims were after the first, inductive phase, identified as potential myths rather than anything else. The deductive phase supports this, and produces strong indications that such claims have very little substance, at least as far as such systems theory goes that has been identified within this dissertation.

Insofar as any borrowing-in of systems theory is actually done, it seems that it is the *System Dynamics* school that is applied, but there are also sporadic occurrences of *Soft Systems Methodology (SSM)*. The former of these schools operates under the generic functionalist systems approach, and more specifically with a structuralist epistemology. The latter adheres to the generic interpretive approach.

Turning to the circumstantial evidence, and first the outsider perspective in section 4.2.1, this is built on the reflections of the same systems thinking foundation that has informed this dissertation. The critique of our discipline that is put forth there is that we have approached the world with a ready-made assumption of what the unit of analysis looks like – ‘*the logistics system*’ – and which goals this system has to fulfil. It is, somewhat challengingly, questioned if we at all have reflected upon presuppositions, and it is concluded that the systems thinking in logistics management research is of a functionalist nature.

Moving on to the insider perspective in section 4.2.2, this is not such a focused criticism of our discipline as is the outsider view. These sources make claims regarding mostly the epistemological positions of logistics management research, some also discuss the ontological dimension or the methods that have been applied. Obviously, epistemology and ontology are entwined notions; a certain view of reality affects how one assumes to be able to get to know things about that reality. This implies that a claim regarding the one has implications for the other.

A few patterns can be detected through this review. Most importantly there are several claims that logistics research is of a positivist nature. Some produce ‘hard evidence’ pointing in this direction, but, as reflected upon by Aastrup & Halldórsson (2008), some do not; similar to my own conclusion regarding the role of systems theory, the authors raise the question whether positivism is more of a myth. With regard to methods usage, the picture that emerges is that the discipline has been and is dominated by quantitative methods. But there seems to be a growing awareness of qualitative methods, and what can be gained from applying such.

Another pattern regards differences on two sides of the Atlantic. As reflected upon by Näslund (2002), it seems that claims of positivism seems stronger among North American logistics scholars than among European colleagues, as seems the use of quantitative methods. It should be noted however that the non-American perspective presented here is more representative for the Nordic region than for Europe as a whole, given the affiliation of cited authors.

If an attempt to classify logistics management research in terms of the three generic systems approaches is to be made based on this insider perspective, it must conclude similar to the preceding that we have mostly adhered to the generic functionalist approach. There are some hints of a growing awareness of the interpretive approach (see e.g. Solem, 2003), but these tendencies are portrayed in a rather emergent manner, and also contradicted by others (e.g. Gammelgaard, 2004). The functionalist approach seems so much stronger, given the circumstantial evidence provided.

As stated earlier, a positivist epistemology is accommodated only under this approach. Those viewpoints that claim to have applied something else than positivism, however not interpretivism, I argue, point at what Jackson (e.g. 2000, 2006c) would label *structuralism*. I.e. that reality is viewed as ‘real’ and objectively accessible, but that it is underlying mechanisms generating ‘surface’ phenomena that are sought, rather than causal relationships between those observable phenomena (see e.g. Aastrup & Halldórsson, 2008). If we acknowledge the view from CST that positivism and structuralism are two possible epistemological positions under a functionalist approach, things fall quite neatly into place regarding the somewhat unclear definition of the ‘other’, that ‘middle alternative’ between outright positivism and interpretivism, that some say that they do. That which is not positivism under the analytical approach of Arbnor & Bjerke (1997), but which is still objectivist in character. Among the Nordic scholars, applications of the Arbnor & Bjerke framework are not uncommon, and through this lens several see that logistics research not only adheres to the analytical approach, but also to the systems approach. Looking at how the latter is described ontologically and epistemologically, this is often done as a sort of negation of what the analytical approach entails, but not always clearly delineating what the exact position is. That, I argue, is applying a functionalist approach with a structuralist epistemology.

Taken together, I assert that all the evidence point in the same direction. This suggests that the dominant approach within logistics management research so far has been functionalist. Epistemologically it seems that both positivism and structuralism are strong. However, there are tendencies towards a growing awareness of the interpretive approach, and also some weak hints that some scholars are cognizant of the emancipatory. In Figure 13 below the systems approaches of logistics management are illustrated by modifying the system of systems approaches framework from section 3.5:

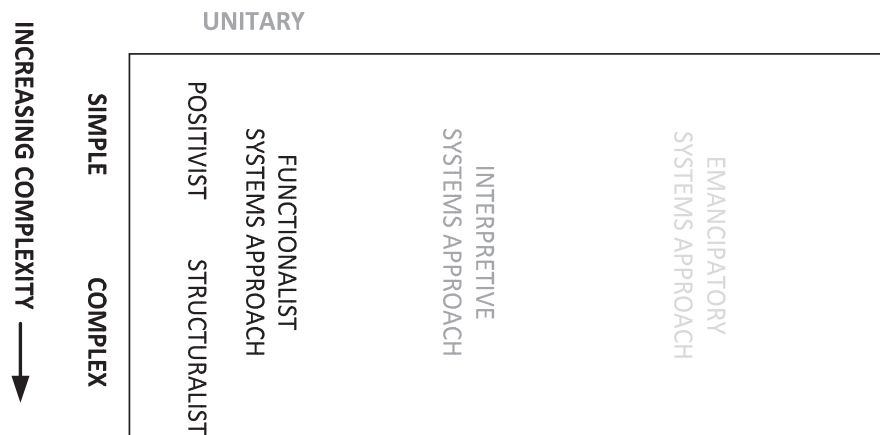


Figure 13. Classification of systems approaches within logistics management by means of the system of systems approaches framework.

With regard to the two dimensions of the framework, the complexity dimension has thus been addressed. The dimension concerning differing values among participants has however not been addressed; the findings suggest that unitary problem contexts have been taken for granted and other possibilities are unseen. This implies that the systems thinking of actors in logistics practices is assumed to be homogeneous.

The objective addressed in this chapter was *To describe the nature of systems thinking in logistics management research*. This was pursued through two research questions, the answers to which that have been produced so far are summarised below:

How can the systems approach(es) in logistics management research be characterised?

- Functionalist, employing positivist or structuralist epistemology.

Has logistics management research adopted systems theory, and if so, which parts and to what extent?

- If systems theory has been adopted, it is mainly in the form of *System Dynamics*.
- Most logistics management research does however not explicitly employ any systems theory.
- Explicit application of systems theory was more common in the early days of the discipline.
- Later developments within systems theory have to a large extent passed unnoticed within logistics management.

4.4 Elaboration of systems thinking in logistics management

The ‘sorting into boxes’ offered by the conclusion above is in all honesty only one rough characterisation, one that says little of innate features of the systems approaches applied in logistics management. Surely there must be something to such claims (see section 1.5) from which this dissertation departs? I believe there is.

Beginning with the word *system* this has a meaning that I believe most of us use in everyday language, probably with a connotation of something like “things that have some sort of relations and/or interact in some way”. Merriam-Webster offers a huge list of possible meanings, one of which is:

“a group of devices or artificial objects or an organization forming a network especially for distributing something or serving a common purpose”

<http://www.merriam-webster.com/dictionary/system>, accessed March 31st 2012

This ‘distributing something’, is not that exactly what our discipline was all about in its inception, when the management of previously separate activities slowly and gradually were being integrated to ‘serve a common purpose’? Study for instance the following quotation:

“The theme of ‘integration’ is central to logistics but ... its meaning has evolved over time. In the 1950s and 1960s, it was evident that fragmented logistics responsibilities often frustrated the development of a systems approach towards logistics management. The early development of the logistics concept, therefore, was marked by integrated decision making across areas such as inventory control and transportation selection. It was also associated with making a single manager responsible for these functions. More recently, it has been suggested that expanding the scope of a logistics organization’s responsibilities is one way of achieving greater integration.”

(Chow *et al*, 1995, p. 290)

This implies that one of the core ideas has been to bring things together, to make systems out of what was not treated as systems before. I find this consistent with that portrait of the discipline's evolution that is presented in the introduction to this dissertation. Those 'devices' that are integrated into systems are however not primarily 'devices or artificial objects' so much as 'organisations', or as we tend to call them: activities and / or functions. This integrative effort is not seldom illustrated graphically, as for instance in the following figure from a well-known textbook:

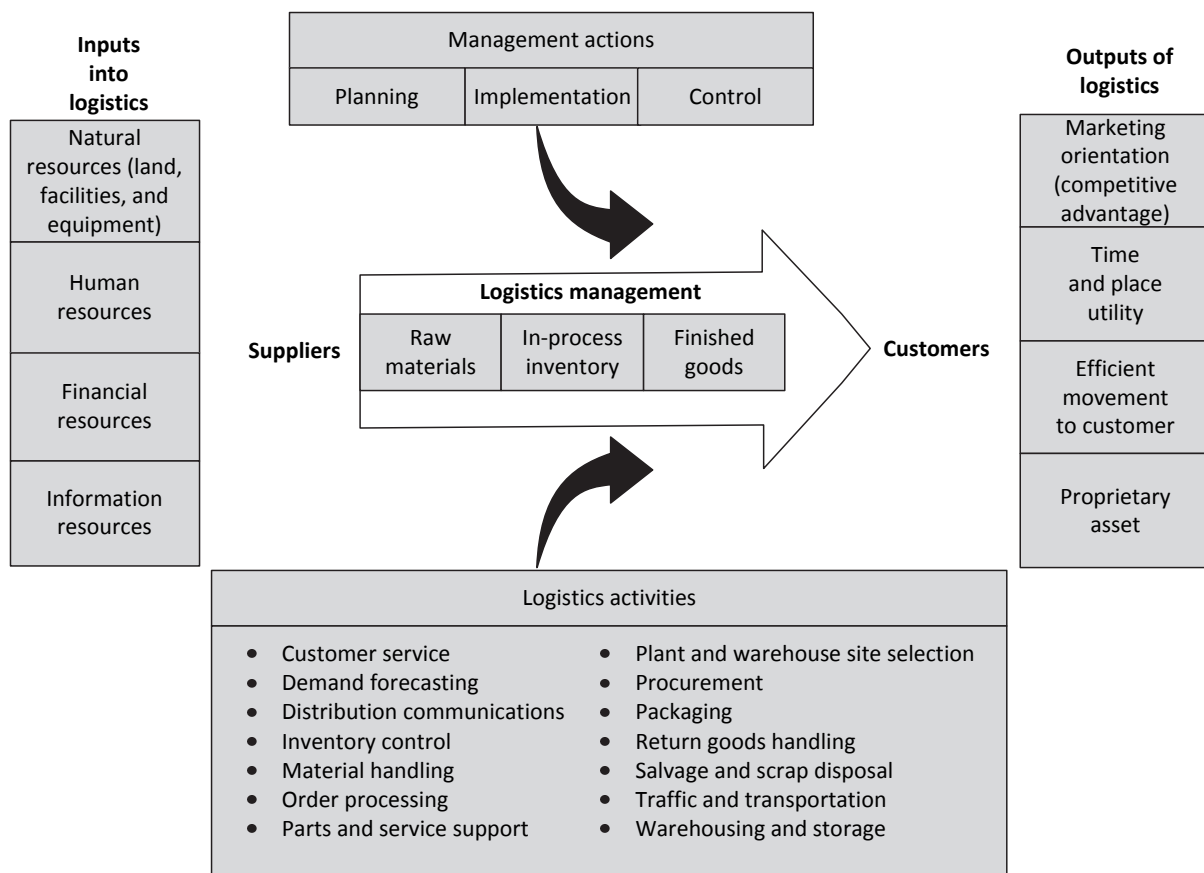


Figure 14. Components of logistics management (Lambert et al, 1998, p. 5).

Speaking of textbooks, the review of a number of such in Paper 1 offers a little more detail on the way in which systems are regarded within our discipline. Table 7 below reiterates a few of these views:

Table 7. Examples of systems views in logistics management textbooks.

Quotation	Source
<i>Logistics is, in itself, a system; it is a network of related activities with the purpose of managing the orderly flow of material and personnel within the logistics channel. ... The system approach simply states that that all functions or activities need to be understood in terms of how they affect, and are affected by, other elements and activities with which they interact.</i>	Stock & Lambert (2001), p. 4
<i>...the system relationship among transportation, inventory requirements, warehousing, exterior packaging, materials handling, and some other activities or cost centers was recognized.</i>	Coyle et al (2003), p. 13
<i>Logistics refers to the responsibility to design and administer systems to control movement and geographical positioning of raw materials, work-in-process, and finished inventories at the lowest total cost.</i>	Bowersox et al (2010) p. 22

We see here that what is regarded as central is the interaction among activities and functions, and also that total costs are at the heart of the matter when it comes to system efficiency. And also that the unit of analysis is essentially ‘the flow’ as put by Arlbjörn & Halldórsson (2002).

As concluded in the historical overview of the discipline and suggested above, there is an integrative ambition. This does not only concern activities or functions within on single enterprise. In more recent time, the ambition has expanded to encompass several enterprises; the widespread notion being *Supply Chain Management (SCM)*, which entails efforts of integrating, co-ordination, and collaboration along the flows . One illustration of this which has been reproduced in several publications is presented below:

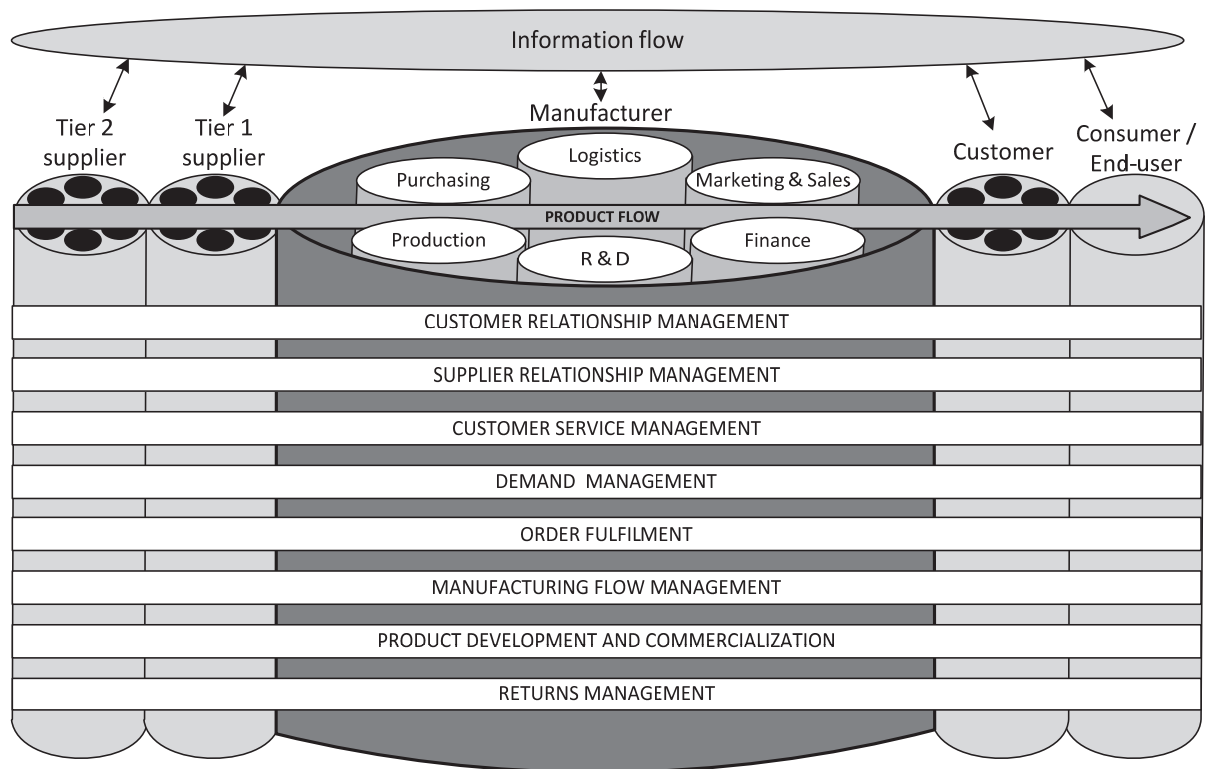


Figure 15. Supply Chain Management: Integrating and Managing Business Processes Across the Supply Chain (Lambert, 2008, p. 3).

Albeit being only a few examples, I believe these figures and quotations are representative for much of what is conceived of as part of the systems that logistics management encompass, i.e. systems that in some sense are ‘tangible’ or ‘real’, which are explicated in logistics-specific terms rather than in general systems theoretical ones, and which are essential for achieving effective and efficient flows.

Also, ‘people issues’ seems not to have been an issue at all within logistics management. Consider these two statements, the first an outsider comment, the second an insider one: *“People, as well as things, can be engineered in order to realise the system's objective of optimisation. ... All members of the organisation are implicitly assumed to be subordinate to the goals of logistics.”* (Mears-Young & Jackson, 1997, p. 611), and *“Overarching logistics economic and behavioral orientations have their foundation in the scientific approach of positivism. ... People are considered to be deterministic and reactive.”* (Mentzer & Kahn, 1995, p. 232).

These examples all fit well with the underlying logic of the functionalist approach. Striving for increased efficiency in systems is central to this approach, and criteria for this can be known a priori and are regarded as universal and accepted by all. Within logistics management these goals are illustrated by the total cost reasoning in the

examples here, by the increased scope that is presented in the historical overview in the introduction, and are also embedded in such definitions as those offered by CSCMP (see appendix 1).

From this brief elaboration, it is possible to add the following tentative answers to the first research question:

How can the systems approach(es) in logistics management research be characterised?

- Focused on ‘tangible’ or ‘real’ systems (the flow).
- Aiming for integration, co-ordination, and collaboration.
- Articulated in a ‘logistics language’ rather than a ‘systems language’.
- Deterministic view on human nature.
- Pre-determined goals of effectiveness and efficiency.

4.5 Evolution of systems thinking in logistics management

To summarise this view on systems thinking in logistics management, a figure that replicates the structure of that figure which summarised the evolution of systems thinking as such (see page 60) is offered; see Figure 16. This is based on the findings within this chapter and the historical overview presented in the introduction of this dissertation. It should be noted that the timing implied in the figure below should only be seen as relative between the concepts, not relative to the timeline at the bottom.

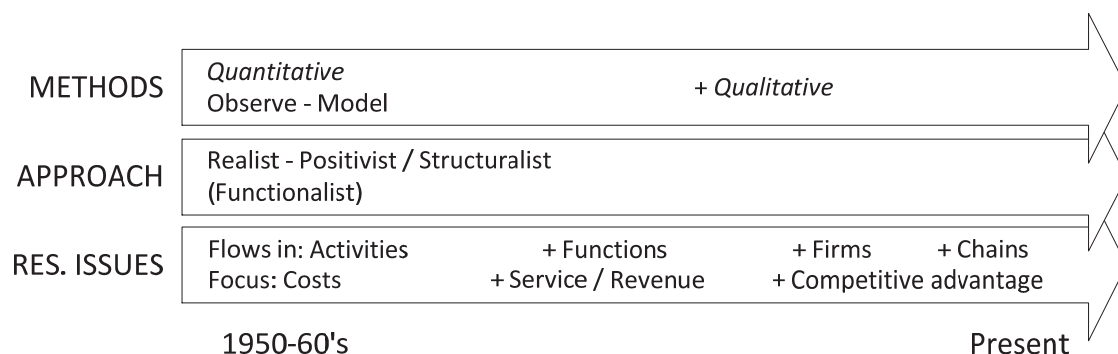


Figure 16. An illustration of the development within logistics management, with regard to research issues, approaches and methods.

Regarding research issues, the overviews are fairly consistent in portraying a scope that has gradually evolve to include larger portions of ‘the’ system in the scope of logistics management; from integrating activities, to functions, to entire firms and chains. Linked to this, there has been a gradual increase in the aims for logistics; from the cost reduction efforts of the early days, via the recognition of logistics as a decisive factor for customer service and thus revenue creation, to searching for ways of increasing the overall competitive abilities of supply chains.

Approach-wise, as concluded in the previous section, the dominating ontology has been and is realist, and epistemologically there are both positivist and structuralist positions. In all this corresponds to a functionalist approach.

The methods usage is also largely consistent with the dominant approach, being mainly quantitative in character. However, there is a growing recognition of qualitative methods, why it seems fair to include this in the illustration.

5 An interpretive approach to actors' systems thinking

In this chapter, the second research objective, and the associated research questions are addressed. These are:

- **Objective 2:** *To explore the merits for logistics management research of an interpretive approach to actors' systems thinking.*
 - Do actors' systems thinking differ, even in a mutual context?
 - If so, what implications may this have?

The research design is outlined in section 2.4.

In the preceding chapter it was concluded that logistics management research to a large extent has worked under the functionalist systems approach, or at least on the same fundamental assumptions as those of this generic approach. Returning to the adapted SOSM (Figure 11 on page 59), and mapping these conclusions against problem contexts, we can see that logistics management research thus has worked in a manner according to which problem contexts are regarded as unitary with regard to the participants dimension. It seems that the complexity dimension has been addressed, since both positivist and structuralist epistemologies are employed, but the participants dimension thus far seems largely unquestioned, implying an assumption that actors' systems thinking is homogeneous.

The outsider critique of logistics (see section 4.2.1) suggests that our discipline has a lot to gain from adapting an interpretive perspective, i.e. recognising that problem contexts also can be pluralist in nature. In concrete terms, this means that actors can have different world-views; regarding how logistics practices function and how different parts work together, regarding what goals logistics practices should fulfil, regarding which 'problems' there are, and regarding which solutions there might be to such issues. I.e. that actors systems thinking can be heterogeneous.

This viewpoint is not unique to these outsiders. There are in fact some logistics theorists that have pointed quite distinctly in this direction before, one example is presented here:

“Thus, there is a big distance from the systems approach’s idealistic, rational world of fulfilling goals to an organization with individuals who does not automatically work toward the systems goals. Individuals and various groups will have different goals and life worlds and if you are not aware of this there is a high probability that they will counteract each other. An objective world view will not be able to bring forward the subjective pictures of the world as those e.g. caused by difference in power between the actors in the system. Consequently the perception of reality becomes insufficient if systems theory is the only approach in logistics. Furthermore, the research questions and answers that is given in the discipline become one-sided. The consequence is that there are questions that never will be asked because there are problems that never are seen.”

(Gammelgaard, 1997, p. 13)

It should be noted that the publication from which this quotation is taken seems to build on the same assumptions of systems thinking that are common within logistics management, i.e. that a systems approach must entail a realist ontology, and that there is one systems approach / systems theory. I think, however, that this quotation is rich with food for thought. It quite sharply points out the major shortcomings of only working under a functionalist approach.

Lindgren (2003) conducted an intradisciplinary literature review, and concludes much along the same lines that actors are given very little space in logistics management research. To look at the potential of an actors approach, Lindgren performed an extensive interview study of no less than 48 different actors belonging to one supply chain. One of the main results of this study was that among the actors, there were clusters with different views on the organisation and which its main issues were, with regard to logistics practices. These differences were also identified as part of the reason for some of the main problems that actors experienced. One such issue that caused concern among the actors was the management of change initiatives, i.e. how implementation of new logistics solutions were approached.

Change processes is in the topic of another actor-oriented study within the logistics management domain, that of Carlsson (2000), in which it was concluded that actors play a decisive role for successful implementation of new logistics solutions. Six important themes related to actors were identified as having an impact on change processes:

- Internal political processes
- Actors' self-experienced need for change
- Actors' systems knowledge
- Actors' experiences of previous change
- Key actors' ability to lead the change process
- Actors' learning processes

As presented earlier, my own licentiate thesis (Lindskog, 2003) also studied change within a logistics context. Regarding the studied change process it was concluded that:

“The single most important finding of this thesis is that when studying the change process of TPL establishment from an actor-oriented perspective, the linear model is not sufficient to describe all the mechanisms of the process. The studied case shows that not only purely rational analysis, argumentation and decision-making from an overall system perspective are necessary for describing the change process of establishing TPL.”

(Lindskog, 2003, p. 122)²¹

It is also concluded that previous descriptions of this process in literature are based on a foundation in which rationalistic decision-making is the only aspect, and which are incapable of acknowledging the actor side of things. Unknowingly at the time of writing, it was in fact a feature of the functionalist approach that I criticised. Jackson (2000) describes the common view of approaching change according to that approach in the following way: *“There is an assumption that once some version of the scientific method has been used to determine exactly how the system of concern should function, it is a reasonably straightforward matter to redesign the real-world system to meet this blueprint.”* (p. 202). This is very much like the criticism towards how change is approached in logistics management that has been articulated by e.g. Carlsson (2000) and myself (Lindskog, 2003). It seems that one aspect of great importance for logistics management, change in terms of implementing new logistics solutions, cannot be sufficiently handled within the functionalist approach.

An important aspect of changing logistics practices is the systems thinking of affected actors, i.e. the subjective perceptions of logistics practices by those who are to carry

²¹ For a presentation of the models of change which are related to in the above quotation, please refer to the licentiate thesis, and to the original source Carlsson (2000).

out, and change, these. In the words of Nilsson (2006): *“Thus, logistics is about people, and people’s perceptions about changes. Their perceptions rely on their understanding and sense-making of the logistics activities needed for complying to customer demands and for the exceeding of these, on a daily basis.”* (p. 51). This is what the remainder of this chapter is concerned with.

Recalling the SOSM, an important aspect of the participants dimension is the level of divergence of values among actors, i.e. to which extent there is (dis)agreement on which issues are important, what goals to pursue, and how to fulfil these. According to the CST perspective, if values converge, the functionalist approach that so far has dominated logistics management research is sufficient. But if world-views and goals instead diverge, an interpretive methodology is more suitable. Perhaps there is even coercion, calling for an emancipatory approach.

It is important to recall here that the ideas of CST revolve around interventions. In this context of logistics management, this would mean efforts to change logistics practices. This is not the case in much logistics research, at least in the sense that logistics practices are manipulated or affected as a direct result of research, in the fashion of action research (although there are those who argue for more of that within our discipline, e.g. Näslund, 2002; Näslund *et al*, 2010). I believe, however, that also research within our discipline has a lot to gain from adopting this critical systems perspective, because also research will inevitably have to face the possible consequences of missing to ask all the pertinent questions, as cautioned by Gammelgaard (1997) above.

The argumentation thus far has revolved around a central proposition that actors’ world-views *might* differ. In previously published studies, some indications thereof can be identified. It seems, however, that if the main shortcoming of logistics management research is failing to acknowledge the possibility of divergent world-views among actors, more and deeper investigations into this dimension are necessary. We need to start investigating the systems thinking of those actors who inhabit the logistics practices that we study, in order to find out if we can continue assuming homogeneity or if we need to adapt our research approaches to accommodate for heterogeneous systems thinking. In essence, to make the ‘thinking’ part of systems thinking the unit of analyses, instead of, as has been standard practice so far, only the ‘systems’ part.

5.1 Actors' systems thinking – a mental model approach

Paper 3 (Lindskog, 2012c) of this dissertation begins with recognising that logistics management research on SCM often reports along two different streams; one which is visionary in character and portrays a 'promised land' of logistical opportunities that lies ahead down the SCM-path. The other responds that this vision is far from reality. An underlying assumption here is that the way in which change is approached in logistics practices might have an impact on the success rate of SCM-inspired initiatives. Some logistics management researchers have reflected that actors are important for what goes on in those systems we normally study (e.g. Skjoett-Larsen, 2000; Knemeyer & Naylor, 2011). As mentioned previously, Carlsson (2000) points to actors' systems knowledge as one important factor in processes of logistics change. Other authors have identified that practitioners point at the need to 'see the big picture' as an important capability (Gammelgaard & Larson, 2001; Lindgren, 2003; Gammelgaard & Andreassen, 2004; Nilsson, 2006); another way to express this could be to 'know the whole system', in essence: to 'systems think'. The re-analysis of the empirical material from my licentiate thesis in Appendix 2 (see section 1.5) indicates that actors in that case refer to actors' systems thinking in various forms; their own as well as others'. In all, I believe there is ample motivation to study closer the systems thinking of the actors who inhabit those normally uninhabited, tangible, logistics systems that are the bread-and-butter units of analyses within our discipline.

Paper 3 serves double ends in this setting. One is that it examines more deeply whether actors' systems thinking differs in ways that ought to affect research within our discipline, as suggested above and in accordance with the second research objective of this dissertation. The other is that it, in doing so, also contributes by exploring research methods that can be applied in logistics management research under an interpretive systems approach. The paper draws on literature on individual cognition and sense-making in organisational contexts, and cognitive mapping, as presented in section 2.4.1.

5.1.1 Causal mapping of goal structures

The analysis focused on the actors' articulated views regarding the goals for the logistics practices of the selected context, the Swedish retail company *RetailCo*. Due to idiosyncrasies of individual maps, a lot of detail and idiographic data had to be shed and standardised, in order to make inter-actor comparisons possible.

The main patterns that emerged from this analysis was that there were some beliefs that were largely shared between the actors, but that there was also quite some variation, even on the highly generalised level on which comparison took place.

In this context it is important to note that the empirical material from which the causal maps were created was transcripts from interviews, which were conducted on the basis of a standardised interview guide (see Appendix 1 of Paper 3). The use of this guide will probably have influenced the interviewees, e.g. by putting items on the agenda which may or may not have been thought of had the guide not been used. With even less structured interviewing, it is therefore likely that the resulting maps would have become even more dissimilar.

The analysis was also only conducted on actors' beliefs regarding goal structures. It is likely that even greater differences would be identified if the analysis went on to discern actors' views on how the logistics practices works to fulfil the goals.

5.1.2 Assessment regarding assumptions of homogeneity

The crucial question is whether or not the study conducted in Paper 3 reveals sufficient enough heterogeneity in actors' systems thinking to conclude that assumptions of a functionalist approach are falsified. I believe it does, based on how the patterns that emerge from this analysis look when compared to those assumptions of homogeneous systems thinking that are inherent to the functionalist approach.

Beginning with the assumed universal rationality of the dominant approach, one pervasive feature is that of total cost thinking, and also that total costs are in a trade-off relationship with logistics performance. On the highly generalised level, almost all maps contain some reference to cost minimisation in some way.

When scrutinising the thirteen maps, however, it turns out that only four of the maps contain *total* cost, and out of these, two do not relate this in any trade-off relationship with any other construct. Costs are mentioned by three more actors, but then in terms of *logistics* costs and that these costs according to *RetailCo*'s policies are not allowed to exceed more than a certain percentage of sales revenues. One actor in fact explicitly states that if sales revenues go up, then logistics is allowed to cost more, indicating a sort of localised thinking with regard to the logistics function of the company.

Five actors in fact do not mention costs at all, of which two have central operative roles, two work locally in stores, and one is a supply chain partner; implicitly assumed to share total cost thinking with *RetailCo* according to the SCM jargon. The other supply chain partner, the manager of the TPL operated distribution centre, does not discuss total cost either, but merely looks rather locally at picking costs.

Turning to the other side of the generally assumed trade-off, that of logistics performance or customer service, all actors except the TPL site manager mention this in one way or the other. But when looking in detail, there are some rather clear differences, both with regard to how high levels of customer service are achieved, and with regard to the local-global distinction; e.g. one store manager talks about maximising sales in the local store, whereas the other store manager instead points to maximising sales for *RetailCo* as a whole.

Apart from this comparison with the generally assumed goals of logistics management, it is also of interest to estimate the degree of (dis)similarity between the maps overall. The more dissimilar, the stronger the argument for discarding the homogeneity assumption.

One way of looking at this is at the number and nature of the constructs that are included in the maps. Another way, which is perhaps even more pertinent to systems thinking, is to look at the relationships between constructs, i.e. which causalities the actors see and to which extent these overlap between them.

If we look at Table 8, and begin with the actors represented by the columns at the left hand side of the matrix, we can see that there is a cluster of many positive relationships from constructs grouped as pertaining the efficiency and performance of

DC²² operations. This represents that these actors regard the operations as DC having potential to positively affect the attainment of many other goals. Looking more to the right in the matrix we cannot see the same relationships. The two store managers, however, are alone in pointing out that the performance of DC affects operations in the stores; views that are not shared by the central actors.

Table 8. Matrix representation of group relationships.
Reproduction of Appendix 5 of Paper 3 (Lindskog, 2012c)

	Log Mgr	Log Developer	Former PMgr	New PMgr	Inbound Log	Purchaser	Sales Ctrl	SMgr Alpha	SMgr Beta	WMgr Alpha	WMgr Beta	Product Mgr	TPL Site Mgr
A - General													X
B - General - Flow	+G				+D / +I	+D				X		+I	
C - Revenue - Sales volume	X / +E		X / -E	X		+I	X	X	X			X	
D - Revenue - Customer service		X / -E	+C	+C / -E	X	+C	+C	X	+C			+C	
E - Costs	X / -G	X / -D	X / -C	X / -D	X			X / -J	X				X / -G
F - DC Operations - Efficiency	+B / +E / +G	+E / +G	+E / -G		+B / +E	X							+A
G - DC Operations - Performance	+C / -E / +J	+D / +J / +K	+C / +J	+J				+H / +K	+H				+A / -E
H - Store Operations	+C	+D / +K	+D	+C	+B	+D	+D / +I	+C / +D / +K	+D / +K	+K			
I - Inventory - Reduce capital					±D / +E	X	+C / -D		X / +E / -J			+C	
J - Inventory - Availability	+G	+D	+C	+D		+C		+C / -E	+C / -I	X	X		
K - Inventory - Control	+J	+J	+J	+J		+J	+D	+J	+J	+J	+J		
L - Suppliers	+F / +G	+F / +G	+F / +G		+B / +F	+B / +F			+G			+D	+G

Also, with regard to what affects customer service and sales volumes, the local actors do not see the same direct links from DC operations as do the central ones. Another similar difference is the views regarding suppliers' abilities to affect operations at DC, but one goal that is not explicated to the same extent by central actors is reduction of tied up capital.

²² Distribution Center, see Paper 3.

I believe these examples show that the assumption of homogeneous systems thinking is inadequate at least for the data that has been analysed in Paper3. There are aspects of differences both in relation to the generally assumed goals of logistics, and between the goals that are explicated by the actors included in this study.

To conclude, the first research question under this objective, *do actors' systems thinking differ, even in a mutual context?* can simply be answered: 'yes'. This is what the present study indicates. To further strengthen this result, more studies of (dis)similarities between actors' systems thinking in varying contexts, as discussed briefly in section 2.4.2, would be beneficial.

5.2 Implications for logistics management research

The second research question of this objective is a continuation of the first, and concerns which implications it might have if actors' systems thinking differ, even in a mutual context. To recall, a mutual context is here defined as a logistics practice in which all studied actors are involved, however in different roles. The analysis that is undertaken in Paper 3 reveals both likenesses and differences in the studied actors systems thinking. In the following sub-sections a few possible implications that this might have are discussed.

5.2.1 Data collection and quality

One obvious implication relates to research quality, data collection, and choice of informants. If we work under a realist ontology, we believe that the world is real, and objectively accessible. If it is so for us as researchers, it must be so for our informants as well. This in turn implies that when we conduct for instance interviews, the informants will tell us everything they know, which obviously must be everything there is to know, because according to our fundamental assumption everything is objectively accessible to them. And when they tell us what they know, we subsequently also get to know everything there is to know.

Now ponder, against the empirical material in Paper 3: If we were able to choose only one or a few of the informants included there for an objectivist case study, which of

the pictures of the world should we accept as true? And would the image that was rendered based on that data be enough?

This problem with accuracy in, and discrepancies between, mental models is not unique for case studies. The same basic problem applies to the methodology of choice number one within our discipline: surveys (Mentzer & Kahn, 1995; Kotzab, 2005). As put by Klaus (2012): *“The researcher will not know which assistant to the presumed addressee, at what level of insight and motivation, in what context, will have answered the survey. But ‘facts’ gained like this are often presented and treated as if it they were ‘primary’ and authentic. Data quality, in those cases, approaches trash level.”* (p. 2). Although this comment relates to the possibility of someone else than the intended addressee (presumably a logistics executive) responding, the basic problem is the same: can we trust the mental models of the respondent to portray an objective, full, and universally valid image of ‘the world’?

What is important with the findings in Paper 3 of this dissertation are thus not so much the actual likenesses and differences of mental models per se, as the implications that stem from the possibilities of different mental models on what according to a functionalist approach is one ‘real’ thing – *the* logistics system. Returning to an issue that was raised in the introduction of this dissertation, how can we be certain that we have obtained an ‘objective’ description of some aspect of *the* logistics system, when the image is built on data we have collected from actors that have different mental models of that system; mental models that may be incomplete, contradictive, or perhaps outright faulty, and also partially tacit. The simple answer is: we cannot.

But the potential problems we face can be even more far reaching than mere issues of data quality. Recalling the role of mental models, we know that actors not only see the world differently, actors also *act* based on the rationality that stems from their mental models. This implies that meaning, values, beliefs, intentions, and actions can differ throughout ‘a logistics system’, perhaps to such a degree that we cannot be certain to discover true law-like regularities; perhaps neither at the cause-effect level of positivism or the ‘underlying mechanisms’ level of structuralism. What ‘underlying mechanism’ – that excludes anything that would require an interpretive approach – can be unravelled to explain e.g. the phenomenon of ‘maverick purchasing’? Can such behaviour really be ascribed only to actors responding to their environment, as the determinist view would argue?

To my mind, the most important implication is that a strict realist ontology, along with a determinist view of actors, simply is not sufficient. We can describe and understand a lot from such a perspective, but not everything. Logistics practices inevitably involve human beings, and humans beings are social actors holding individual rationalities which may not be fully in line with the assumptions of the functionalist approach of logistics management. We will therefore have to realise that no full, objective, and ‘true’ view of ‘the logistics system’ is possible to obtain. This issue is commented by Jackson, who, drawing on the philosophy of Churchman, writes:

“For Churchman, systems and whether they work or not are in the mind of the observer, not in the ‘real world’. A model captures only one possible perception of the nature of a system. To gain an appreciation of the whole we have to engage with multiple subjectivities. And the results of a systems study can only receive their guarantee from the maximum participation of different stakeholders, holding to various Ws [Weltanschauungen / World-views], in the design process. ‘Objectivity’, it turns out, can only emerge from open debate among holders of many different perspectives.”

(Jackson, 2003, pp. 152-153)

I would like to highlight two aspects of this quotation that are pertinent for logistics management research. The first is that the search for ‘objectively accessible reality’ ought to be replaced with a search for multiple ‘subjectivities’ to instead form a kind of ‘negotiated objectivity’, as a proxy for a ‘real’ reality.

The second aspect is the one regarding ‘open debate’. We should engage stakeholders themselves in debating and forming the ‘negotiated objective’ view of ‘the’ system, not relying solely on our own (subjective and limited) ability to form an ‘objective’ view from interview transcripts (or whatever mode of data collection we employ) with one or a few stakeholders with (likely) similar but limited perspectives. Negotiation should be reserved for those ‘in’ the system, not for us who stand outside, peeping in, holding our own a priori subjective beliefs.

The discussion so far has concerned implications for collection of empirical data, a domain which ought to be profoundly affected if a nominalist ontology becomes more accepted. It is however a one-way communication scenario that to this point has been discussed.

5.2.2 Implementation and change in logistics practices

With regard to an aspect that has been touched upon, the implementation of new logistics solutions, this is an area where we might have to adopt new approaches and methods to support logistics management practices. The one-way communication of empirical data from practice to research, followed by another one-way communication in the other direction in the form of normative writings on ‘best practice’, might perhaps not be sufficient; at least not when the writings are only about the systems, not about the thinking. An interpretive approach implies putting also the ‘thinking’ part of systems thinking on the research agenda

Although individual, mental models can be shared among actors to varying degrees, and research has suggested that shared mental models can have a positive influence on co-operative action in e.g. organisational contexts (Stout *et al*, 1999; Mathieu *et al*, 2000; Lim & Klein, 2006; Gurtner *et al*, 2007). It is therefore reasonable that shared mental models would be beneficial for concerted action in logistics practices. This ought to be applicable not only to acting in daily practice, but also when it comes to changing how logistics practices are carried out.

The scope of the normative output of our research might thus perhaps have to advance to include not only ideas on what should be done with those flows that we to date have embraced, but also on how to support development of shared and functional mental models, i.e. sufficient systems thinking, among actors of logistics practices. I.e. looking at how we can support those who tend to the elephant²³ to continue improving their work with for instance the trunk, but at the same time support thinking about how that part of the elephant functions together with the whole animal, with the herd, and with the ecosystem of which the herd is part?

Let us briefly return one of the central themes of systems thinking in logistics management, as identified in the preceding chapter: integration. If we believe we as logisticians are in a vantage position to promote integration both within and between enterprises, should we not have a lot to gain from employing an approach that would help us take in the possibly disparate world-views of all those separate functions we aim to integrate? Mears-Young & Jackson (1997) reason along such lines:

²³ See the ‘elephant story’ to which is referred in Paper 3.

“In order to reach a consensus on objectives requires an understanding of the points of view and intentions of those involved. What little research has actually examined the relationship between logistics and other functional areas has been based on functionalist principles, and hence could not prove valuable since, from the subjectivist point of view, it would not be conducted on the basis of respect for a variety of equally valid viewpoints.”

(p. 614)

This is in essence a question about who should aim to understand who? That logistics management is of strategic importance for enterprises, and that it should be recognised as such, well that is a message that is easy to accept as an ‘insider’ logistician. As is the view that other functional areas ought to recognise this importance. But what about ‘us’ recognising ‘them’ as well, i.e. logistics being open to recognising viewpoints and values of other functional areas? This perhaps is one way of gaining a better understanding on issues of importance for overcoming such barriers to SCM-informed co-operation that is reported in literature.

To engage more in the ‘thinking’ part of systems thinking, we probably will need to engage in closer co-creation of meaning, to work closer together with practitioners to elicit and affect their systems thinking, i.e. their mental models of logistics practices. This implies more borrowing-in of substantive theory as well as methodologies and methods. This implies developing methodologies for building not models of systems, but of different actors’ perceptions of systems. One such example is presented here in the form of the constructs and methods borrowed in Paper 3. The causal mapping technique applied there can be one way, but given the extensive effort such a method demands, it might not be practical for daily work life.

We will need to work closely together with practitioners to develop methods for incorporating systems thinking and development of mental models in logistics practices. This implies acting to promote debate among actors on which goals to strive towards, and how context-specific activities to support the attainment of these goals can be configured, rather than attempting to impose expert-based designs based on ‘best practice’ studies. With regard to research strategies, this implies more action-oriented research efforts as promoted e.g. by Näslund (2002) *et al* (2010).

The implications that have been pointed at here should by no means be regarded as an exhaustive list, but rather as a few areas open for debate. Much more careful considerations are needed within the discipline in order to fully open up for a nominalist ontology, and all that such a paradigm-shift may give rise to.

5.3 Summary of findings for second objective

The findings from pursuing this second research objective, *to explore the merits for logistics management research of an interpretive approach to actors' systems thinking*, are summarised below:

Do actors' systems thinking differ, even in a mutual context?

- Yes, this is what the present study indicates.
- More research in varying contexts is needed to further strengthen results.

If so, what implications may this have?

- Regarding data collection and quality, no objectively true image of logistics systems can be obtained.
- 'Negotiated objectivities' may be one way to come closer to more comprehensive pictures.
- Determinist view of social actors is insufficient.
- Logistics management research is perhaps better suited to promote systems debate among stakeholders, than to impose expert-based 'best practice' systems designs justified by taken-for-granted rationality.

6 Conclusions and discussion

This dissertation set out to *contribute to an increased understanding of systems thinking in logistics management research, both present and for future advances*. This was pursued through two research objectives, with associated research questions. In this chapter, the objectives, questions, and answers are revisited and discussed.

6.1 Systems thinking in logistics management research

The first objective is to *describe the nature of systems thinking in logistics management research*. Below, the two questions, and the answers to these that have been produced, are presented:

How can the systems approach(es) in logistics management research be characterised?

- Functionalist, employing positivist or structuralist epistemology.
- Focused on ‘tangible’ or ‘real’ systems (the flow).
- Aiming for integration, co-ordination, and collaboration.
- Articulated in a ‘logistics language’ rather than a ‘systems language’.
- Deterministic view on human nature.
- Pre-determined goals of effectiveness and efficiency.

Has logistics management research adopted systems theory, and if so, which parts and to what extent?

- If systems theory has been adopted, it is mainly in the form of *System Dynamics*.
- Most logistics management research does however not explicitly employ any systems theory.
- Explicit application of systems theory was more common in the early days of the discipline.
- Later developments within systems theory have to a large extent passed unnoticed within logistics management.

Recollecting the statements from which this dissertation departed, there seems to be a widespread view that systems thinking is central to logistics management, and that we to a large extent have been theoretically informed by systems theory (refer to Table 2 on page 14). It is also widely asserted that there is one systems approach to research.

This relationship was generically depicted in Figure 3 (see page 15), in which systems thinking and logistics management are depicted as having evolved closely since the 1950s up until the present day.

In chapter 3 an overview of generic systems approaches, and how these have evolved, was presented. This resulted in the generic depiction of Figure 12 (see page 60), in which evolution of research issues, approaches and methods are pointed out. Based on the findings of chapter 4, a similar generic depiction of the evolution of logistics management is presented in Figure 16 (see page 80).

When comparing these two evolutionary descriptions, I propose that Figure 3 is an incorrect portrayal of the relationship between logistics management and systems thinking. A more suitable representation is suggested in Figure 17:

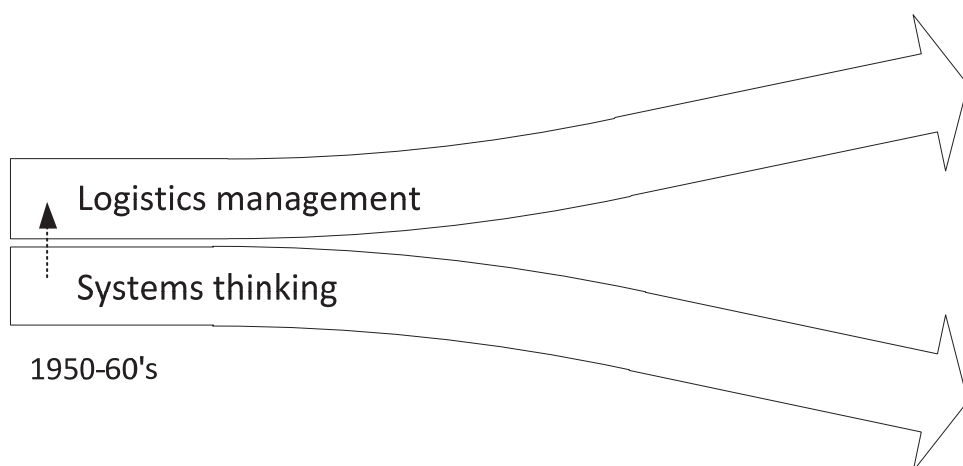


Figure 17. Suggested generic depiction of relationship between logistics management and systems thinking.

Beginning with the bottom arrow, the bent shape is introduced to denote the ontological break from realism that is a fundamental aspect of the interpretive and

emancipatory approaches. This is not to say that *all* formalised systems thinking has walked away from realism, and thereby functionalist approaches. But the evolution of the 'systems movement' on the whole has come to encompass more than pure functionalism.

Turning to the arrow that represents logistics management, the bent shape is intended to denote that systems thinking seems to have had a stronger influence in the early days, but that later it has become more taken for granted and/or less explicated. This is moreover associated with the use of only one vertical arrow in the beginning, which also has been drawn as dashed since, even though it seems that the explicit adoption of systems theory was clearer in the early days, the analyses conducted within this dissertation indicate that no extensive borrowing-in of systems theory seems to have taken place. Systems thinking might have been influential for total cost thinking and the integrative ambitions, but it appears too strong a statement to claim that logistics management is rooted in systems theory, or anything similar.

The overall image is that systems thinking, in its more formalised forms, and logistics management, have evolved in directions that have brought the two apart. Logistics management has continued to employ a version of realism as the only accepted ontology, and aimed towards integration of larger and larger 'tangible' or 'real' systems. As put by one commentator on this manuscript: "*It seems we are stuck in the sixties*". This is not to say that logistics management does not employ systems thinking. Rather, it seems that logistics management has developed its own version of systems thinking, explicated in its own language.

An image that surfaces through the analyses conducted here is that we have largely worked under an assumption that all actors in logistics practices share world-views and values. Recalling the *System of Systems Methodologies* framework (see section 3.5), this can be expressed as in terms of *unitary* problems contexts along the participants dimension. This dimension appears to have been largely neglected.

With regard to the complexity dimension, this seems to have been addressed by the, however mostly implicit, adoption of not only positivist but also structuralist epistemology.

6.2 An interpretive approach to actors' systems thinking

The second objective is *to explore the merits for logistics management research of an interpretive approach to actors' systems thinking*. Below, the two questions, and the answers to these that have been produced are presented:

Do actors' systems thinking differ, even in a mutual context?

- Yes, this is what the present study indicates.
- More research in varying contexts is needed to further strengthen results.

If so, what implications may this have?

- Regarding data collection and quality, no objectively true image of logistics systems can be obtained.
- 'Negotiated objectivities' may be one way to come closer to more comprehensive pictures.
- Determinist view of social actors is insufficient.
- Logistics management research is perhaps better suited to promote systems debate among stakeholders, than to impose expert-based 'best practice' systems designs justified by taken-for-granted rationality.

This objective is a first attempt to close the gap between logistics management and contemporary systems thinking, by applying an interpretive approach to actors' systems thinking. Informed by other areas of research in the management domain, there is good reason to assume that actors' systems thinking affect rationalities, and that this sense-making is decisive for shaping conscious action.

Looking at what constitutes logistics practices, what is it if not conscious action? Take away the human and her conscious actions, and what logistics will there be to speak of? I find this standpoint irrefutable, and applicable both to the carrying out of all the activities that make the flows flow, and also to activities for implementing new solutions into the flows.

The merits of an interpretive approach lie in its ability to work with not only the *systems* per se, but also the *thinking*. This is not possible under a pure functionalist approach, since this disregards subjectivities, assumes homogeneity in systems thinking, and thus settles for discussing the systems as such. I believe the quotation from Gammelgaard (1997) on page 84 captures the essence of what we face by adhering only to functionalism: "... *there are questions that never will be asked because there are problems that never are seen.*" (p. 13). One such 'problem', I argue, is that of actors' systems thinking. It seems that within our discipline we think we have addressed this, because we have reasoned in terms of systems. But this relates only to one aspect, the substance of systems thinking. It is not concerned with the other important aspect, the thinking.

I believe that if we widen our scope to include also the – inherently subjective – thinking aspect, we will become better equipped to do what we aim to do, being an applied discipline: to affect logistics practices. Not only through normative writings pertaining to the core, i.e. on how to configure the flow, but also through ways of affecting actors' mental models. Ultimately it is these mental models that we are reaching for, and in order to do so, we must equip ourselves with the ability to see, understand, and affect these.

Therefore, I argue, logistics management needs to move beyond some of the presumptions that seem to have dominated our discipline since its inception. In the following section I have attempted to elaborate some thoughts on this.

6.3 Some reflections and suggestions

In this section I will share some thoughts that have emerged during the process of producing this dissertation, and some associated suggestions for how we can advance research within our discipline.

6.3.1 The systems approach vs. systems approaches

In the explorations of systems thinking in logistics management research, we have seen several statements in which *the* systems approach is mentioned; definite form is used in writing. It appears that many logisticians see one way of doing research under a systems approach. This seems especially true when looking at the writings of Nordic academics within our discipline, among which the Arbnor & Bjerke (1997) framework of three research approaches is a common reference.

I wish to argue however that the Arbnor & Bjerke volume, although full of ‘food for thought’ with regard to ontological and epistemological considerations, in some senses is somewhat devious. This has to do with the way in which the methodological approaches are presented. On the one hand the book very clearly discusses three methodological approaches, the *analytical*, the *systems*, and the *actors* approaches. These are consistently listed in that order throughout the book, and separate chapters are devoted to describing them. It is easy to think of the three as clearly demarcated from each other; as three separate boxes of which you can only choose one into which your research is sorted.

On the other hand, Arbnor & Bjerke (1997) also relate the approaches to *six* groupings of social science paradigms that they identify. The main ontological characteristics of each group are presented in Figure 18 below.

Related to ontological positions are epistemological ones, and the authors make a distinction between on the one hand *explanatory* creation of knowledge, and on the other *understanding* ditto; the former is often labelled *positivism*, and the latter *hermeneutics*.

The authors relate the three approaches to ontological and epistemological positions in the manner below. It should be noted that Figure 18 is an amalgamation of several figures in the original publication.

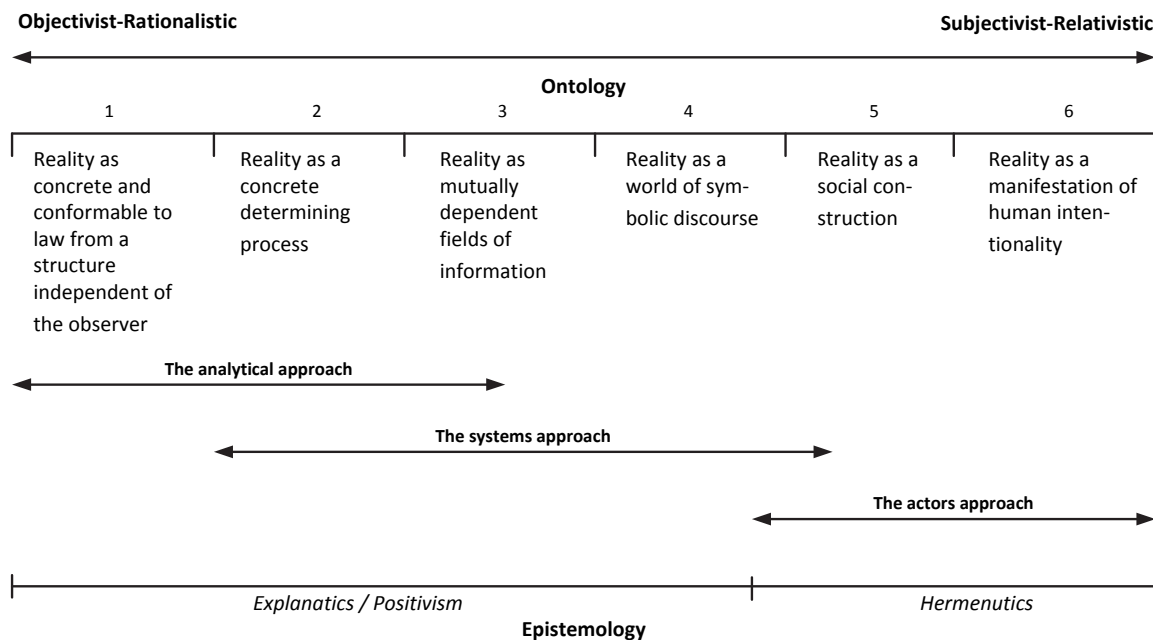


Figure 18. The three methodological approaches related to ontologies and epistemologies (adaptation of Arbnor & Bjerke, 1997, pp. 27-46).

This conveys an image that the three approaches might not be all that distinct in character, at least not so sharply delineated against each other as the division into three suggests. The authors however comment on this in the following way, which somewhat contradicts the overlap between the systems and actors approaches: “*Even though the approaches overlap to some extent, there is a clear distinction between the actors approach and the two other methodological approaches.*” (Arbnor & Bjerke, 1997, p. 38).

This is however yet once more contradicted a little later, in commenting on the distinction between positivism and hermeneutics: “*We claim that the “boundary” between the two (which in this case, certainly, is blurred) can be placed so that some systems-oriented creators of knowledge are interested in the latter.*” (ibid., p. 45). This last quotation, I argue, contradicts their own distinction into three separate approaches of which one is *the* systems approach; the quotation clearly leaves an opening for more

than one type of systems approach, and within that also for more than one position regarding ontology and epistemology, ranging from quite objectivistic / positivistic (realist ontology) positions, to subjectivistic / hermeneutic (nominalist ontology) ones.

My impression is hence that the message of Arbnor & Bjerke is somewhat unclear, and that some parts of how the approaches are presented make it tempting to regard them as three distinct ways of conducting research, each with their own ontological and epistemological positions, whereas other parts put things in a different light, opening for much fuzzier divisions. The former interpretation, I believe, is dominant in those Nordic logistics management publications referred to in section 4.2.2. I want to raise the question if such an interpretation might be part of the explanation for some of the confusion there seems to be concerning *'the'* systems approach?

Let us recall the SOSM, as discussed in section 3.5. The horizontal (participants) dimension can be related to the ontological distinction between realism and nominalism. The leftmost category relates to problem contexts that are unitary in character, i.e. in which subjective perceptions are not relevant and the world can be regarded as objective and 'real'. The other two, pluralist and coercive, in contrast acknowledge differences in subjective perceptions. If the epistemological distinction of Arbnor & Bjerke (1997) is introduced alongside the horizontal dimension of the SOSM, we end up with something like in Figure 19:

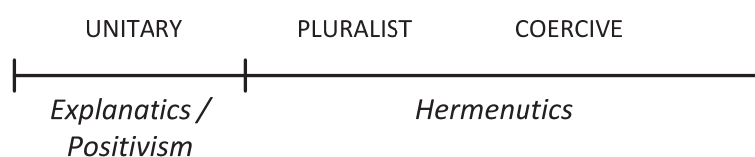


Figure 19. Epistemological positions of the Arbnor & Bjerke (1997) framework related to the three categories of the participant dimension of the SOSM.

This leads to an interesting situation if we also attempt to position the three methodological approaches along the participants dimension of the SOSM. Especially regarding the systems approach, since it is on the one hand clearly stated that it neither is hermeneutic in character, because in that slot the *actors approach* resides, nor is it – as it seems to be interpreted by several Nordic logistics management researchers –

positivistic; this space is reserved for the *analytical approach*. That leaves us with the only option to place in a sort of paradigmatic ‘no man’s land’, something like in Figure 20 below:

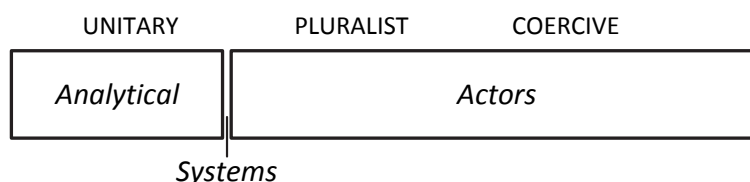


Figure 20. The dominant interpretation of the three methodological approaches of Arbnor & Bjerke (1997) related to the participants dimension of the SOSM.

As has been argued already in a previous section (see 4.3) I think the SOSM with its second dimension helps bring some more clarity into this somewhat confusing situation, by introducing *structuralism* as an epistemological position that works under a realist ontology.

I believe however that we might be able to progress even further if we acknowledge the possibility of many different types of systems approaches, even beyond the realist ontology. This is, as mentioned above, suggested by Arbnor & Bjerke (1997). In fact, these authors are open for a similar type of pluralism as CST: “...*it is not only possible but in many situations desirable to let the different approaches be included in a kind of **complementary principle** ... one approach is then made into a **methodological base approach**; that is, the creator of knowledge confesses to one of the methodological approaches and its ultimate presumptions. ... Within the framework of the chosen approach, other methodological approaches can be used at the same time as the study proceeds.*” (ibid. pp. 439-440, emphasis in original). If we compare this to what is written in section 3.2 there are some obvious likenesses.

The essential suggestion is that any researcher should contemplate whether any single way of looking at the world will render a comprehensive image. Or will pluralism perhaps take us further than isolationism?

6.3.2 A consistent paradigm of thought?

Within the ‘outsider’ perspective in section 4.2.1, a thought-provoking question was illuminated; the question regarding whether or not we as logisticians are aware of following a consistent paradigm of thought (Mears-Young & Jackson, 1997). This can be related to the findings of that chapter, in which it is suggested that we have mostly worked under functionalist assumptions. This can be seen as the paradigm of logistics management, if we so wish.

However, the question does not relate so much to the nature of the paradigm, as to our awareness of the same. With regard to this, there might be reason to rephrase the question on an even sharper note. If we look at the dominance of positivism, the following can stand as an example of this paradigm: “*Positivism has the goal to explain and predict reality, where reality is considered to be objective, tangible, and fragmentable.*” (Mentzer & Kahn, 1995, p. 232, emphasis added). This viewpoint stands in direct opposition to one of the underlying premises of how systems thinking seems to have been conceived within logistics management: the integrative ambitions and the total cost thinking. Compare also to such statements that are influenced by Arbnor & Bjerke’s (1997) framework, according to which a systems approach acknowledges that the whole is different than the sum of its parts (see page 70).

The thoughts are, simply put, incompatible. So the question should perhaps not be phrased as to whether we have been aware of our paradigm or not, but rather to question if we have at all reflected upon it and acted consistently?

I believe this indicates that we need to pay closer attention to the ‘meta level’ as discussed by Arlbjörn & Halldórsson (2002), i.e. issues pertaining to philosophy of science. Much more considerations on fundamental assumptions, and consequences of choosing the one or the other, seem to be a promising way forward for our discipline.

6.3.3 Is all ‘theory’ theory?

Closely associated to issues of philosophy of science is the illusive term ‘theory’. In part, it is the use of this term that has sparked my interest in the topic of this dissertation. For the sake of this discussion I have reused, as an illustrative example, one of the quotations that are listed in Table 2 (see page 14): “*Supply chain management is based on the systems theory of the firm.*” (Randall & Farris, 2009, p. 671). The viewpoint is elaborated in the following manner: “*Classically systems theory is a firm level management technique. The adoption of a systems approach means reducing total cost by linking previously separate functions such as in- and out-bound transportation*” (ibid. p. 671).

Some questions arise in my mind when reading this. Can we really equate a management technique to ‘a theory’? Does it suffice to aim at linking separate functions to achieve the status of ‘theory’? Maybe it does, I am myself not in a position to say whether this is theory or not. And my intention is not to hang these particular authors out to dry. My aim is rather to caution against practices which, to my mind, endangers us to become more and more myopic. As I have demonstrated in this dissertation, there exist several distinct schools of systems theory that have been born and live prosperous lives outside of our domain. Schools that sometimes are built on vastly different presumptions than our own. But if we accept the above as ‘*the systems theory*’, why should we bother to open an article or book published within any of those schools? The argument is not to say that that the statements above are non-systemic, but to point out that this is but *one* way of thinking systemically, definitely not *the* (only) way.

My suggestion is therefore in line with those of Stock (1997, 2002), that we should be much more open to outside influences. And to this I want to add the suggestion that we probably need to become more careful in valuing something as ‘theory’.

In this context, I also want to raise the issue of one of the aspects of systems theory. This needs not, as shown in this dissertation, be substantive theory pertaining to ‘systems’ as such; what in logistics management terms would be our core, ‘the flow’ (the ‘what’ aspect of research). Much of what is contained within the different schools of systems theory is concerned with the ‘how’ aspect of research, i.e. approaches, methodologies, methods, techniques, tools, etc. The suggestion to open up for more borrowing-in applies perhaps even more to this aspect.

6.3.4 Must systems thinking go hand in hand with integration?

Some of the prominent features of systems thinking within our discipline, as concluded in section 4.4, are the ambitions for encompassing larger and larger tangible systems, and the aim for integration across activities, functions, and firms. It seems that systems thinking for many of us has become equated to integration. I would like to raise the question if this really has to be the case?

When moving to the level of supply chains, collaboration is one means of expressing the integrative ambition. Sandberg (2007), although adhering to the common view that there is one systems approach, makes an important contribution by showing that having a systems approach to supply chain practices does not necessitate collaboration. It is demonstrated that non-collaborative relationships can be the result of conscious choice, based on a system-oriented view of the supply chain. Sandberg (2007) also draws a similar conclusion with regard to process orientation, arguing that a systems approach need not necessitate giving processes priority over functional efficiency. Considering trade-offs between functions and processes can, based on systems understanding, lead to decisions to prioritise either one over the other.

These conclusions are very important when put in relation to the argumentation in this dissertation regarding the thinking part of systems thinking. In fact, I contend that they strengthen the case I wish to make. Under a strict functionalist approach, such distinctions as identified by Sandberg (2007) simply are not possible to discern, because what is observed under such an approach is *the* system. This system can be configured according to either collaborative or non-collaborative aspirations, either as highly process-oriented or the opposite, or anything in between. Since either such configuration can be the result of conscious systems thinking, it is logically impossible to draw any conclusion regarding the systems thinking from looking only at the configuration of logistics practices. I.e. Sandberg's (2007) distinctions prove the inadequacy of functionalism as the only approach to logistics management research. To discuss the systems *thinking* requires an approach capable of also embracing thinking, and thinking is done by actors, which are excluded in a functionalist's world.

6.4 Beyond unitary

Much of what we have done so far in logistics management research seems, as previously proposed, built on presuppositions that include an objective world within which there exist ‘real’ systems, the goals of which we as researchers know more or less a priori, and which are assumed to be shared by all actors. This can be regarded as a more concrete aspect of the ‘meta level’.

In the perspective of CST, these issues relate to problem contexts, as discussed in section 3.3. The common approach in logistics management seems to assume unitary problem contexts, seen to the left on the horizontal axis in Figure 21 below. The common systems approach, it has been suggested here, is the generic functionalist systems approach.

6.4.1 In business enterprise contexts

With regard to the vertical axis, which concerns the complexity dimension of problem contexts, logistics management has gradually ‘swept in’ more in its scope, steadily going from functions, to firms, to chains and networks. Supply chains and the management of these are today common topics of logistics management literature. As a response to this, perhaps, positivist systems theoretical schools within the generic functionalist approach, have been complemented by also adopting structuralist ones (see section 4.3). Logistics management, as of today, can be classified as seated within frame A in Figure 21.

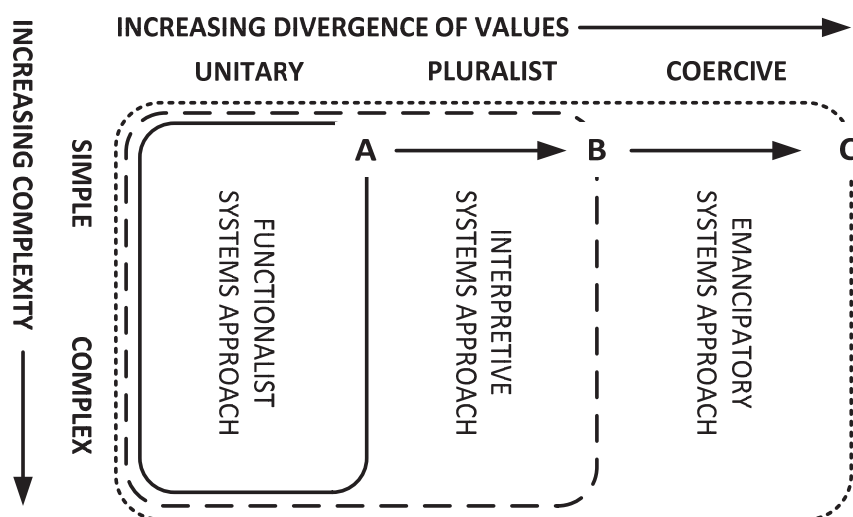


Figure 21. Three possible views on problem contexts and related systems approaches in logistics management.

I would like to argue, however, that the ‘sweeping in’, in functional terms, moving towards larger ‘tangible’ systems, cannot be sufficiently comprehended only in terms of a shift down the vertical axis. The wider such system boundaries are drawn, the more actors become stakeholders in the situation. Subsequently, the more likely there is divergence of values. This is not recognised in contemporary logistics management literature. As Aastrup & Halldórsson reflect: *“In literature, logistics solutions are provided in a normative fashion and to an increasing extent on a more complex level, i.e. in supply chains rather than firms. ... It is more or less implicitly assumed that the normative elements suggest a solution that is consistent with other agents in that particular supply chain.”* (p. 758).

The idea that “supply chains compete, not companies” (see Christopher, 2005) is an enticing one. The brave new world that can be envisioned is full of promise. But is it realistic to think of one single mindset throughout entire supply chains? Take the following example from Christopher (2005): *“... a shirt manufacturer is a part of a supply chain that extends upstream through the weavers of fabrics to the manufacturers of fibres, and downstream through distributors and retailers to the final consumer. Each of these organizations in the chain are dependent upon each other by definition and yet, paradoxically, by tradition do not closely co-operate with each other.”* (p. 17).

As seen in Paper 3, within one retail company different mindsets can exist regarding goals of the enterprise. What reason do we have to believe this is different in any of the retailers selling the shirts of this example? What reason do we have to believe that actors with different responsibilities within the shirt manufacturing company do not have different views? And so on. My argument is that there is reason to assume that pluralist problem contexts are possible in logistics management, calling for an expansion of our scope of approaches to accommodate also the interpretive, corresponding to frame B in Figure 21.

If we go one step further, is it reasonable to believe that there exists one shirt manufacturer, one weaver, one manufacturer of fibres, etc.? Probably not. Subsequently, there will be competition not only with regard to end consumers, but at all levels of the thought supply chain. One weaver might very well sell to more than one shirt manufacturer, who compete for the same consumers, and the same shelf space at the same retailers.

The point I want to make is not that the idea of supply chains competing with supply chains is wrong. Of course the performance of one entity affects other entities. Of course increased cooperation can have positive effects on performance. Rather, the point I want to make regards the paradox that Christopher (2005) points out. Viewed through a functionalist lens, the lack of cooperation in supply chains is paradoxical, because it is counterproductive relative to universal goals that are believed to be shared by all. Viewed through an interpretive lens, however, the world might look different and then the apparent paradox is perhaps not as apparent anymore.

What I want to get at is the possibility not only of pluralist contexts, but actually of coercive ones; supply chains by definition give rise to potential conflicts (see e.g. John & Prasad, 2012). This implies problem contexts which would render the commonplace functionalist approaches quite ‘far from home’, seen from a perspective of in which contexts they are best suited. Could perhaps our failure to acknowledge such possibilities be part of the explanation for SCM practice showing “... *another reality than that ideal picture given in the SCM literature.*” (Sandberg, 2007, p. 288)?

6.4.2 Expansion of unitary goal sets, and into new contexts

Recalling the tendency to ‘sweep in’ more into ‘the studied system’ of logistics management research, another similar trend can be discerned: a widening of the scope of goals for logistics and SCM, to include not only the impact on traditional values such as profitability, but also on the environment and the surrounding society.

There is a growing awareness of ‘green’ issues in logistics management research, for instance one of the dissertations already mentioned (Kohn, 2008) deals with this topic. It has made its way into the agendas of academic conferences, and into our journals; e.g. the *IJPD&LM*²⁴ had a special issue on “*Logistics and SCM in times of climate change*” (Vol. 40, No. 1/2, 2010), and *SCM:IJ*²⁵ had one on “*Green supply chain*” (Vol. 17, No. 1, 2012). Also *Corporate Social Responsibility (CSR)* has been identified as important; this is manifested e.g. through a special issue in *SCM:IJ* on “*CSR in supply chains*” (Vol. 14, No. 2, 2009). These expansions put new demands on logistics

²⁴ International Journal of Physical Distribution & Logistics Management

²⁵ Supply Chain Management: An International Journal

management research to accommodate for values of stakeholders outside of the enterprises traditionally included in our research.

But logistics management has not only begun to include more in the frame of goals for such enterprises traditionally included in the scope. Recently, steps have also been taken towards new application areas, in which the values of many different stakeholders become even more apparent as factors to consider. Examples of such non-traditional contexts are health care (e.g. Aronsson *et al*, 2011), municipality services (e.g. Arlbjörn *et al*, 2011), or humanitarian logistics, on which *IJPD&LM* ran a special issue, “*Transforming Humanitarian Logistics*” (Vol. 40, No. 8/9, 2010). There is thus ample reason to expand the scope of approaches even further, to frame C in Figure 21, to embrace also emancipatory approaches.

It should here be noted that coercion does not necessarily have to imply outright conflict between parties. For instance, in the case of health care logistics one can easily imagine several groups of stakeholders with different interests: citizens demanding convenient and fast access to safe and reliable cure of ailments; care givers wanting reasonable working conditions, salaries, and the best for patients; funding bodies seeking maximum ‘healthcare bang for tax bucks’, etc. This is of course only speculation on my behalf, the image I present might be both incorrect and incomprehensive. I cannot reasonably claim to know the goals and values of all stakeholders to the immense and complex healthcare practices. As can probably no other logistics management researcher.

The functionalist idea of correctly assuming a priori the goals and values of all stakeholders just might not, quite likely, be sufficient in such contexts as these mentioned here. There are voices that have to become heard to legitimise logistics management research in such domains. Fortunately, there is good help to be found for this within the emancipatory frame.

Thus, some questions I suggest that logistics management need to consider in the future are: Will a functionalist approach, assuming unitary contexts, be sufficient? Or could we perhaps have something to gain from applying interpretive and emancipatory approaches? With regard to e.g. coercion, this is bound to become an even stronger factor as the interests of various parties – those involved and with power to affect

logistics practices, as well as those affected and without such power – are taken into consideration. Will we then be best served by continuing to view ourselves as capable of drawing correct boundaries around ‘the systems’ to study, simply based on our way of defining and viewing the world? Or could we perchance have something to gain from e.g. adopting the appreciation of different *Weltanschauungen* as within *Soft Systems Methodology*, or by applying the boundary questions of *Critical Systems Heuristics* (see section 3.4.3)?

6.4.3 To replace or to complement?

I would like to point out one important feature of Figure 21, which is that frames B and C are deliberately drawn to enclose the respective preceding frame. This is in line with the pluralist thinking of CST. My suggestions should not be interpreted as an argument that the functionalist approaches with which we thus far have been engaged should be buried and forgotten. These have proven their value, and have a lot to offer, given the application in appropriate contexts. The main argument is that we need to recognise the rich scope of problem contexts in which such approaches are not appropriate, contexts in which other approaches will be much more useful. Truly adopting systems theory, preferably in the form of *Critical Systems Thinking*, I believe, can help our discipline to advance in this direction.

Embracing interpretive or emancipatory approaches will thus not have to entail completely abandoning functionalism. I personally believe that we can talk about some aspects of systems in the ‘hard’ fashion that we have done so far, without violating the actors’ perspectives. Take as a hypothetical example a case in which a buyer-seller relationship between two companies includes a VMI²⁶ solution for a group of articles. It would be ridiculous to start debating whether or not this actually takes place. As would it be an utter waste of time to approach the situation as if there were as many different sets of control parameters to a particular reordering point inventory control system, as there are actors involved in the logistics practices in which this little system operates. These kinds of approaches are beside the point of such arguments to question a ‘real’ reality that have been raised. If there is for instance an IT-system in use for the reordering point example, it is probably an easy task to find out which parameters that are set, and these need not be debated. On site observations, some contracts and

²⁶ Vendor managed inventory

invoices will probably be sufficient ‘evidence’ that the VMI solution is there, and is real. Reaching a ‘negotiated objectivity’ is probably an easy task in these cases, and it most likely safe to state certain things about these logistics practices as ‘hard facts’.

The point, rather, is to also engage in what meaning actors might attach to the logistics practices. Take again the VMI solution as an example. Different actors might have interpreted the reasons for entering into this agreement in different ways. Actors belonging to the vendor- or customer organisations respectively are likely to value the solution differently. Rationalities, values, and beliefs surrounding this little sub-system might differ. And, recalling that our mental models affect our actions, and also our observations, the actors might interpret events in this system differently. There might even be so large discrepancies between the intended designs, and some actors’ views, that some actions might counteract the intentions of the original design, thus acting in ways that affect the business relationship between the parties in unexpected ways. Or, in the case of the reordering point system, some actors might have interpreted the intentions of the systems in ways that lead them to question its value. Perhaps to such an extent that ordering suggestions by the IT-system are disregarded, thus causing the flow to behave in a different way than intended by the systems designers.

Although only some very brief, crudely simple, and hypothetical examples, I believe these serve an important purpose to point out one of the main possible benefits of embracing a critical perspective on systems thinking in logistics management. The examples illuminate aspects that would not become visible under a strict functionalist approach.

6.5 Improving practice

As noted in the introduction, this dissertation is geared towards contributing to logistics management research. The findings herein will not end up in any normative writings on how to best design, plan, manage, or carry out any logistics practices, as is commonplace in research within this applied discipline. Being applied, however, there are inevitably links between research and practice, and if we take steps towards more interpretive and emancipatory approaches, it will probably be necessary to rethink what character such links can have. As noted previously, the interpretive perspective entails “... *getting “inside” people’s heads to find out and influence what they are*

thinking.” (Jackson, 2000, p. 211), and the emancipatory is “... *suspicious of the current social order and seek to radically reform it.*” (ibid., p. 291).

This implies that when leaving the functionalist frame, research ideals might shift from pure observation of ‘facts’ and subsequent analysis and generalisation, towards more involvement in what is actually going on. We might be well served by looking closer at action research as argued by Näslund (2002; Näslund *et al*, 2010).

In logistics management contexts, we might not be aiming at ‘overthrowing’ anything, as is the case in some of the more radical tenets of emancipatory approaches. However, with the expanded scope towards research topics including functions of societal welfare, or in fact the wellbeing of this only planet that we have to live on, our ethical awareness might call upon us to shift from merely observing, to attempting to intervene. As researchers we might find ourselves in more advantageous positions to do so than many other groups. The suggestion, therefore, is that we must perhaps reflect more on our position as researchers and what power we might have to affect society.

6.5.1 Changing actors’ systems thinking – a visionary outlook

One of the angles of the mental models study discussed above is that of shared mental models among actors, and how this can affect implementation of new solutions, and performance. Recalling Carlsson’s (2000) findings regarding logistics change processes, actors’ self-experienced need for change, and actors’ systems knowledge, were identified as important factors. The former can be assumed to stem from the latter; perceived needs to change logistics practices grow out of actors’ perceptions of those practices, and perceived performance relative to attainment of perceived goals. I.e. their mental models of the logistics practices.

Paper 3 of this dissertation concerns one way to find out about mental models. In Paper 4 (Lindskog *et al*, 2007) the topic is instead how to affect mental models of logistics practices. It should be noted here that my own thinking on these topics has changed since that article was published, and not everything that is stated therein fits squarely into the theoretical frames of this dissertation. However, some of the ideas are worth developing.

One of the assumptions of that paper is that actors' mental models of logistics practices are affected by what is perceived in everyday life in those practices. These perceptions are, quite naturally, incomplete seen from the perspective of 'the whole' logistics system – as seen from the traditional functionalist perspective. Regardless of whether or not this functionalist view on the state of things is correct, there is quite likely a lot more to any logistics practice than any one actor can perceive from whatever position he or she holds. Recalling briefly the findings of Lindgren (2003), and the indications from the re-analysis of the empirical material from the licentiate thesis (see section 1.5), the assumption seems to have at least some empirical support. Looking also at the causal maps of Paper 3, it is possible to discern some differences that seem to be influenced by where in the logistics practice that the actors are active. But at the same time we see that both practitioners and theorists regard the ability to see 'the big picture' and to have a 'supply chain orientation' as important (e.g. Gammelgaard & Larson, 2001; Gammelgaard & Andreassen, 2004; Nilsson, 2006; Mentzer *et al*, 2001); abilities that seem difficult to develop from the necessarily limited 'business-as-usual' outlook.

The logistics visualisation arena discussed in Paper 4 might offer a way to alleviate this situation somewhat. The central idea of the arena is that it allows actors to observe much more of 'the overall system' of their practices than would the normal day-to-day situation. It builds on a model of 'the logistics system' which can be manipulated by the participating actors, and it utilises visualisation techniques to enhance observability of system behaviour. It allows for experimenting with e.g. new policies outside of the 'real' system, and it allows for time-compression so that long-term effects can be observed.

With the critical awareness comes however a number of issues that need to be addressed for any effort to employ such an arena in a 'live' setting. One of the most important ones, which is left untouched, assumedly seen as unproblematic in Paper 4, is that of how to build the model? Whose mental models will be given the status of 'correct' representations of the 'real' system? Stemming from a functionalist approach, this is an issue that in the paper implicitly is taken to be resolved by those 'logistics and system thinking experts' that are part of the arena. Informed by a critical perspective, however, it seems that more emphasis needs to be placed on such 'negotiated objective' systems models as could result from the kind of debating that is mentioned in the previous section. It is likely that for any attempt at utilising such an

arena for changing actors' mental models, much more effort needs to be spent on producing models that are taken as valid from the subjective points of view of system actors. One way to do this might be through such cognitive mapping techniques as touched upon in Paper 3.

If it is possible to develop methods for creating systems models that are valid for all stakeholders, such a visualisation arena, as the one discussed in Paper 4, has great potential as an example of multi-approach pluralism, by employing interpretivism in the initial systems modelling phase, functionalism for creating the simulations model, and relying on an interpretive logic when working with reflections to affect actors' mental models of their logistics practices.

6.6 Future research

The work that has been conducted here can, with regard to both the research objectives, be described as in an early, tentative, stage. To advance our knowledge further regarding the systems thinking within logistics management, one path would be to employ an interpretive approach to logistics management researchers' systems thinking, i.e. to attempt to get closer to the meaning-making of our fellow theorists with regard to systems approaches. As has been pointed out previously, it seems that the systems thinking within our discipline in some aspects is not always so clearly articulated. An interpretive, intradisciplinary study on the topic could probably lend more insight into the nature of our systems thinking.

More studies on the core, which explicitly adopt those identified systems methodologies adhering to the generic systems approaches presented in section 3.4, would likely also prove valuable. As concluded in Paper 1 there are examples of applying *Systems Dynamics* and *Soft Systems Methodology*, but much more attempts, in different contexts, will be needed in order to test the merits of these different methodologies for logistics management. Also, combinations of different methodologies as urged by the pluralist commitment of CST can be a worthwhile effort.

This of course also relates to the second research objective of this dissertation. As has already been discussed, more studies under an interpretive approach, in varying contexts, will give more insight into actors' possible (dis)similarities in systems

thinking, and what implications this might have for logistics management research. Such research efforts should probably not primarily be aimed at building empirically grounded theory, but to continue exploring the possibilities of researching systems thinking per se. Different contexts in which different degrees and types of homo- and heterogeneity in actors' systems thinking should be sought, and different aspects of systems thinking should be investigated.

An important aspect in this setting is an issue that was brought up in section 6.3.3; the distinction between substantive theory and methodological / method theory. Logistics management will most likely need to borrow in a lot of methodologies, methods, techniques, etc., from disciplines that traditionally have not been approached by us. The cognitive mapping techniques, e.g. the causal mapping technique applied in Paper 3, are but one family of methods that can be applied under an interpretive ontology. There are many other methods that might prove valuable.

On a related theme, action oriented research, as proposed by e.g. Näslund (2002) *et al* (2010) might also be a promising venue, especially with regard to developing methods and techniques for promoting systems thinking in daily logistics practices. Approaching such issues quite reasonably must be in an 'emerged' fashion, rather than from a distance. Only practitioners themselves can value the merits of any effort to encourage systems thinking.

One topic that might be well served by adopting an interpretive approach is the issue of top management roles for supply chain management practices, the topic of a recent dissertation that has already been mentioned here. Sandberg (2007) writes "*Despite the massive call for top management support, most articles within the SCM literature avoid going into details on the subject.*" (p. 4), and thus answers the call to overcome this shortcoming in literature. One of the starting points is a study by Larson *et al* (2007), which concludes that five main barriers for implementing SCM are: "... *functional silos, incompatible technology/systems, lack of a common SCM perspective, conflict in the supply chain, inadequate employee skills...*" (p. 14). If we look at the nature of these, I argue that at least the last three cannot be fully understood from a strict functionalist perspective. A common SCM perspective reasonably must relate to actors' systems thinking, simply because no enterprise can think without the thinking of the individuals that constitute it. Conflict has to do with values, beliefs, aims, i.e. again aspects of actors' thinking. Lastly, employee skills speaks for itself.

Sandberg's (2007) study is however explicitly based on a positivist systems approach, and approaches top management as a function. I believe it would be an interesting and worthwhile effort to complement that study with an interpretive approach, informed for instance by the study of the cognition of management team members conducted by Tomicic (1998, 2001).

Also, referring Larson *et al's* findings regarding employee skills to other survey studies' indications of the importance of context-specific skills, and the ability to 'see the big picture', (Gammelgaard & Larson, 2001; Gammelgaard & Andreassen, 2004), interpretive studies into the skills, competencies, and abilities aspects of SCM also seems to be a promising research opportunity.

6.6.6 A concluding remark

"... every world view is terribly restricted."

(Churchman, 1968, p. 231, emphasis added)

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Appendix 1

CSCMP's definitions

Appendix 1 – CSCMP’s definitions

Source: <http://cscmp.org/aboutcscmp/definitions.asp>

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CSCMP’s Definition of Logistics Management

Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.

Logistics Management – Boundaries and Relationships

Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. To varying degrees, the logistics function also includes sourcing and procurement, production planning and scheduling, packaging and assembly, and customer service. It is involved in all levels of planning and execution--strategic, operational and tactical. Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology.

CSCMP's Definition of Supply Chain Management

Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

Supply Chain Management – Boundaries and Relationships

Supply chain management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance, and information technology.

Appendix 2

Revisiting the licentiate thesis

Appendix 2 – Revisiting the licentiate thesis

The empirical material of my licentiate thesis (Lindskog, 2003) is in this appendix revisited, and looked upon from a ‘naïve’ actors’ systems thinking point-of-view. The intention is to illustrate one of the influences for my interest in systems thinking.

The licentiate thesis concerned the change process of establishing third party logistics. Although the original analysis carried out in that study did not explicitly concern systems thinking, I have since then reflected that the actors’ narratives that are the empirical base do contain statements of their subjective views of the system. For the sake of saving space I have opted not to reproduce the entire empirical material, since these narratives occupy some hundred-odd pages. The interested reader is referred to the original publication.

I have labelled what I have done here as ‘naïve’. The reason for this is that I have not applied any pre-determined theoretical analysis model, nor have I attempted any formal coding as suggested by e.g. Miles & Huberman (1994) or Corbin & Strauss (2008). The point has not been to produce any solid foundation for any arguing within the dissertation, but rather to display one of the sources of influence for my interest in the main topic.

In the following, I present and comment on some examples that I find illustrative. I believe that much of what is presented speaks for itself. Beginning with a few snippets from the narrative of the actor called *Operations Development Manager (ODM)*:

During the period when backorders was a big problem, logistics was always an issue on the agenda of subsidiary manager meetings. Already during the first meeting, some awareness awoke among them, some realised that they also were part of the problem, that backorders weren't entirely HQ's fault.

I explained that increasing inventory levels and producing more and faster wouldn't solve the problem. It was also an issue about asking oneself how to structure the business, and how to work. It won't do as a subsidiary to only protect one's own market. At the time being, the backorder lists distributed by HQ were interpreted more as a recommendation for purchase orders, than – as intended – a recommendation to take it easy and hold back orders for a while.

Operations Development Manager

In this first example, it is the actor who had the most 'strategic', central, role during the studied change process who relates to an argumentation that was put forth towards the managers of the subsidiaries (national sales companies) of the case company *Shipper*. As can be seen, the argumentation revolves around the role different actors' behaviour plays for creating a situation of large back-orders that had been a 'standing issue' in the company for some time. The actor also relates not only to how he sees the situation (his systems thinking), but also to that he gained some acceptance from other actors for this viewpoint. Much of the argumentation that was applied to 'sell' the idea of direct distribution (before the change all subsidiaries held local inventory) revolved around 'the whole' system:

At one such meeting, I challenged the subsidiary managers by showing them that in the total distribution system, there was more than enough stock to meet the total demand, but that some subsidiaries held too much and others got too little. ... We put a lot of effort into convincing the subsidiary managers that a centralised warehouse would offer better product availability and lower costs. We used real examples of sales data and stock levels to illustrate the difference between today's situation and what would happen if we centralised stock keeping. ... Another important part of the "sell-in" was analysing how much time and money the subsidiaries spent on purchasing and inventory management, and how much this would cost in a centralised structure. Our results showed that total costs also would decrease, by some 10-12 MSEK group-wide. It was very hard for the subsidiary managers to oppose such savings for the company.

Operations Development Manager

We see here how this actor relates to values and goals for the system, as perceived by that actor. The snippet shows how this actor relates to other actors' systems thinking, and how to affect that.

This actor also relates to an episode after direct distribution (DD, which was implemented in conjunction with TPL) had been implemented for one subsidiary, when these local actors had complained about poor performance:

Some time after we had implemented DD in Germany, sales on that market were going bad. The subsidiary people blamed this on poor logistics due to DD, and argued that the local warehouse should be re-established. ... It turned out, however, that they had misunderstood how responsibilities were divided between Provider, HQ and themselves; it wasn't clear for them who were responsible for what. Somewhere along time, there had been an information lapse in the German subsidiary. ... The subsidiary people simply had a lot of expectations on Provider, which were never part of their job to fulfil in the first place.

So we charged them with the task to conduct a customer study to find out the real reasons behind the drop in sales, and it turned out that poor delivery service wasn't at all the reason. Instead, there were complaints among customers about poor information about the new distribution system. That ended the discussions to resurrect the German warehouse.

Operations Development Manager

This episode shows that not only the systems thinking of internal actors was deemed as important, but that this in turn also can affect the system thinking of customers. It also relates to what is conceived as misperceptions of the system.

Going back to the initial argumentation for DD that was put forth by the central actors, the *Project Leader (PL)* who worked closely with *ODM* during the change process, reflected on commonly held beliefs within the company:

The common view within the company was in fact that one should build large inventories. I've seen one of the earliest vision statements from that time, in which it was written "we should hold large inventories in order to ensure good customer service". So the common idea was that customer service is built on large inventories.

So, that was the view on logistics, every subsidiary built up their own inventory. ... So another important issue was to find arguments to use with the subsidiaries, to be able to show them what they could gain from direct distribution.

Project Leader

This actor reflected on that there were a lot of old conceptions to be fought in order to convince local actors that what they previously had thought was a good way to run the system, now was rejected (i.e. relating to upon the values and goals held by other actors). Reflecting on her own systems understanding...

While we were preparing the warehouse move we also visited all the subsidiaries to gather information and to inform about Direct Distribution (DD). We tried to map how they worked in the subsidiaries, because none of us really knew anything about that, we knew nothing about all their special solutions.

Project Leader

... this actor displays an understanding that it is not only the local actors understanding of 'the whole' that is important, also those who have more 'central' roles need to understand local details.

Another actor that was involved, the logistics consultant that was hired during parts of the project, also reflects on the systems understanding of central actors, but on a slightly different note:

We compiled data as we went, and managed to draw quite a clear picture of the situation. We developed our pre-study to be able to point out the weaknesses in their current structure; we tried to open the managers' eyes to this. Through my years of consulting, I have seen so many times that companies' management groups, or rather anybody in a company, seldom really knows how things are done in their business, from a holistic perspective. We always try to work from a holistic perspective to be able to figure out how things fit together, and we also give out recommendations from that perspective.

Logistics Consultant

This quotation clearly points not only to the perceived importance of understanding details, but also to seeing 'the big picture' (systems thinking). *A note: the importance of this has been lifted to the fore in a number of studies of what practicing logistics / supply chain managers regard as important abilities in such roles (Gammelgaard & Larson, 2001; Gammelgaard & Andreassen, 2004; Nilsson, 2006).*

Returning to *PL*, this actor also reflected on different parties' views on objectives, on who stands to benefit from the logistics practices:

I think we viewed things differently. From our perspective it would have been our customers that would suffer if we hadn't got the warehouse operational in time, but that's not how they saw things, for them we were the customers. ... When we had our warehouse in Swedetown, the warehouse and we shared the customer, but now things are different. Provider is such a large organisation that we just become a very small part, and if they have to prioritise it's not at all certain that it will be us they help. But we are the ones who have to take the discussions with our customers if that happens. ... I see some parallels with the ERPsys-project. For the ERPsyscon consultants, it was the system as such that was the point, and for Provider it's logistics that is the point. But that's not it, for us it isn't. Even if their brochures tell something different, it's so obvious that their focus is to make the warehouse as such to work, it's almost as if they want the warehouse to function in a little world of its own. But that's missing the point, the warehouse exists only because we need it to ship products to our customers. But we have to stay on them and remind them of that constantly. What was our tool for achieving a certain goal, was their goal.

Project Leader

Regarding goals in the context of systems thinking, one dimension is thus that of goals for the whole vis-à-vis goals for a certain part. The quotation above shows one side of this. The snippet below shows another:

We felt that if they were to go through with this central warehouse, they would have to show us that it would really be better than what we had. So we wanted to show them how things worked. It was Subsidiary Manager (SM) who pushed for that; that we should evaluate closely what we had and if things really got better afterwards. ... We weren't exactly thrilled over this, but there are both pros and cons with this. One could see the advantages of not having to take care of handling logistics; having all these warehouses to keep an eye on all the time. One could free up resources for other things; I could see other things I could do with my time, that I would be able to work more with customer service. But at the same time we worried that we were going from something good to something that was worse, that was our main concern. I mean, if you should do a change like this, you want it to be for the better.

Subsidiary Logistics

This is the actor responsible for logistics at the Nordic subsidiary of the case company. What we can see here is that this actor relates to the subsidiary's perspective when evaluating the DD solution, rather than the 'whole system'.

To me the examples presented here suggest that the systems thinking of actors seem to have played a role in the studied process, and that many of the actors in various ways have reflected on the systems thinking, both of themselves and of other actors. To summarise, the examples to my mind illustrate the importance of the following aspects of systems thinking:

- Actors' perceptions of systems
- Actors' perceptions of other actors' perceptions of systems
- Actors' perceptions of other actors' misperceptions of systems
- Actors' perceptions of values and goals
- Actors' perceptions of other actors' values and goals
- Actors' views on how to affect other actors' systems perceptions, values, and goals