# Rethinking logistics management

## Towards a strategic mind-set for logistics effectiveness and innovation

*June 30, 2018 · Academic*

Fredrik Nilsson, Fredrik Nilsson[1], Martin Christopher

**1** Lund University

Nilsson F, Nilsson F, Christopher M. Rethinking logistics management: Towards a strategic mind-set for logistics effectiveness and innovation. Emergence: Complexity and Organization. 2018 Jun 30 [last modified: 2019 Feb 24]. Edition 1. doi: 10.emerg/10.17357.06acc85b8a0457bf1dbbe40be0fbc0df.

### Abstract

The aim of this paper is to provide insights into, and perspectives on, the transformation of mindsets for logisticians. We argue that by exploring paradoxes inherent in the efficiency-focused paradigm of today, a strategic mindset can emerge in which central logistics management issues can be addressed, understood, and dealt with in order to enhance supply chain effectiveness and innovation. Based on a complexity theoretical perspective the paper challenges assumptions inherit in the logistics discipline which is argued to be needed in order to deal with contemporary logistics issues such as sustainable development. Four propositions for further research and practise have been suggested, each highlighting the required insights and understanding necessary for logisticians to make their mindset more strategically oriented i.e. developing logistics managers with the capabilities to enable a greater focus on effectiveness, innovation and other complex issues such as sustainable development.

### Introduction

One of the defining characteristics of modern supply chains is their complexity. Complexity in this sense does not just mean ‘complicated’, it also means inter-connected, ambiguous and paradoxical. Because of the multiplicity of nodes and links, distributed decision-making and inter-cultural situations that underpin supply/demand networks, the opportunities for the occurrence of unexpected interactive effects of interdependent decisions are considerable. To contend with the challenges created by these dynamic and often chaotic systems there is a growing need for logistics managers to be able to handle the complexity involved. Tatham et al.[1] conclude that supply chain managers need broader skills to handle their supply chains turbulent times rather than functional skills (e.g. transport, warehousing). In other words they must be able to recognise the inter-connections and inter-relationships across a supply network and be able to understand the sources of complexity across that network.

Historically, the majority of logistics managers’ efforts have been focused on efficiency-related efforts; optimality, prediction, planning and control, i.e. on reducing uncertainty and complexity in logistics and not on effectiveness and innovation[2]. For example Wagner[3] concludes that the transport industry spends some 1,1% of turnover on innovation and development, compared to the range from 4,8 to 17,8% that other studied sectors spent. One apparent explanation for this is the fact that logistics has not been regarded as a strategic issue until the last few decades[4,5,6] and logistics has been identified as a mere cost-reducing activity within firms. However, as logistics gains strategic importance, the dimension of effectiveness is becoming increasingly apparent and vital.[7] In this paper efficiency will be defined, in accordance with Porter’s[8] definition, as *doing things right* (i.e. activities which minimize/optimize costs, time or other resources), while effectiveness will be defined as *doing the right things* (activities generating revenues, serving customers, etc.). Kohn and McGinnies[7] describe two dimensions of logistics strategy which they found in all organizations, represented in a study they performed; *“One is an integrated orientation that seeks simultaneously to manage logistics flows, coordination, and complexity within the organization and with its external constituencies. The other is a process orientation that seeks efficiency, control, and cost reduction.”* The first dimension is that of effectiveness, while the second is the efficiency dimension. In the transformation towards a more strategic view of the supply chain we argue that complexity theory is an approach and a philosophy of great value for understanding supply chain phenomena.

Most of its proponents view complexity theory as an attempt to move science away from the strong emphasis of reductionism and positivism that dominates scientific disciplines today. Complexity theory addresses underlying assumptions and how these influence the way natural, business and social phenomena are dealt with. Simon[9] recognizes the science of complexity as a third wave of interest in complex systems after the first wave ended up in holism and gestalt followed by a second wave establishing the cybernetics and general systems theory. MacIntosh and MacLean[10] state that *“the development of complexity theory, …, is regarded by some as signaling the arrival of a new scientific paradigm in the Kuhnian sense”*. In logistics and SCM a number of authors have recently started to use complexity theory to advance the area.[11,2,12] Complexity theory has also been used to understand several other phenomena such as knowledge management,[13] organisation science,[13] strategy,[15,16] and operations,[17] to mention but a few.

The growing strategic role of logistics and supply chain management requires managers to develop strategic capabilities as well as novel approaches and business models, all of which is rather new to the discipline. However, in order to successfully make this transition, the managerial mindset has to change first.[18] This is because mindsets are based on earlier experience and knowledge which are used to understand the present and provide a basis for one's assumptions. This knowledge and experience then provides the basis for the design of actions to cope with contemporary and future issues and problems.[19] Hence, transforming logistics management from merely focusing on reducing and simplifying in order to cut costs, to also dealing with value creating and revenue enhancing activities ought to start with a change of mindset.

The issue of mindset is seldom raised in logistics literature. Christopher and Towill[20] highlight it when they discuss agility as a novel way to handle volatile demand and uncertainty in supply chains. They state that *"agility is a business-wide capability that embraces organizational structures, information systems, logistics processes and in particular, mindsets."* While the article introduces the idea of mindset, it provides no further discussion on what the issue of mindset means for logistics or supply chain management. Knoppen and Christiaanse[21] emphasize the mindset dimension of logistics and suggest that it has been largely ignored in the literature. They state; *"This is problematic as the behavioral elements, rather than economic or technical elements, are less well understood and experience more problems".*[21] Nilsson[22] reports that issues of sensemaking and common understanding are considered challenging for logistics managers as behavioral aspects of organizations are difficult to understand. Finally, Spekman *et al.*[23] conclude that for supply chain management to become real, a new mindset is required. They argue that the strategic dimension of supply chains must be handled collaboratively in order to handle the growing complexity and that a business transformation is needed for this to happen. In other disciplines the role of mind-set has been discussed more frequently e.g. strategic management[24] entrepreneurship[25] and innovation.[26]

However, the transformation of logistics management into a more strategic role, with an increased emphasis on effectiveness and innovation, implies great challenges, not least theoretical. Traditionally, the development of logistics has been based on a paradigm of positivism and mechanistic principles,[27] a view which still prevails in the literature.[21,22] Lewis and Suchan[28] state that *"logistics research may need a growth-inducing language about logistics managerial behavior, a new set of theoretical constructs that will help researchers reframe and thus "resee" their thinking and research designs in ways that help them break from variance theories and the larger positivist paradigm."* Additionally, as a result of the former it follows that what is taught in logistics education programs and MBAs is in line with the dominant thoughts in the discipline, i.e. positivistic and mechanistic. As McCarthy *et al.*[29] highlight: *"descriptive linear frameworks encourage linear management, which tend to produce only incremental innovations."* Moreover, Powell[30] states, *"for any empirical discipline, epistemological beliefs have theoretical and methodological consequences, and habitual beliefs can lead to dogmatism, illusion, or despair."* And, as Arlbjørn and Halldorsson[31] state: *"if we take this* [the positivistic] *view for granted, we may produce a unilateral view of logistics knowledge that only focuses on objective and observable phenomena."* Hence, in order to transform logistics management theoretically as well as practically, to a strategic level (i.e. handle questions of effectiveness and innovation) the paradigmatic foundation for logistics must be reassessed. Furthermore, ontological as well as epistemological considerations, i.e. changes of paradigmatic views might reveal new approaches and novel results or as Dent[32] describes it *"how we see things determines much of what we see."* Consequently, for a mindset change to take place the underlying assumptions need to be reassessed.

What is proposed in this paper is that logistics researchers and managers ought to consider a mindset change towards a more strategic focus with an emphasis on effectiveness. Consequently, the purpose of this paper is to provide insights into, and perspectives on, the transformation of mindsets for logisticians. We argue that by exploring paradoxes inherent in the efficiency-focused paradigm of today from a complexity theory perspective, a strategic mindset can emerge in which central logistics management issues can be addressed, understood, and dealt with in order to enhance supply chain effectiveness and innovation.

This research follows an interdisciplinary approach with its foundation in complexity theory and with influence from various fields such as psychology, strategic management, entrepreneurship, and innovation. It is based on narrative literature reviews of a great number of sources during the last 10 years. Empirically, the paper is based on numerous discussions, workshops and interviews with logistics managers and workers as well as researchers in the field of logistics and supply chain management involved in different research projects during the last 9 years. Consequently, this paper is a synthesis of various sources of ideas with the aim of providing insights for the further development of the logistics discipline in relation to challenges raised in both literature and practice.

The rest of the paper is organized as follows. We start by a discussion of mindset and assumptions related to the complexity perceived in the logistics landscape of today. With a mind-set mostly built on assumptions of reductionism and mechanistic principles versus a mind-set of complexity and social phenomena there will be differences in how logistics issues are handled, something both practice and literature reveals. The notion of paradoxes is then introduced and is followed by a discourse on paradoxes in logistics management resulting in propositions for logistics managers and researchers for the process of evolving a strategic mindset for logisticians. The paper ends with conclusions and suggested areas for further research.

## Complicated vs. complex

The perception of supply chains and logistics as being complex is emphasized by several authors.[33,34,35] Handling this

complexity, according to the predominance of positivistic assumptions underlying the logistics discipline, should by means of reductionist principles be decomposed into simplified and controllable units, and the goal would be to eliminate it in the longer perspective.[28] However, this complexity, from an effectiveness perspective, represents great opportunities for logistics improvements and innovations. Competitive advantage is gained through interwoven capabilities and resources which are difficult to imitate.[36] Consequently, being able to understand, handle, and use the increasing complexity related to logistics should be a strategic capability for logistics managers. Hence, the apparent difference in how this complexity is perceived may have major consequences for how logistics issues are approached and dealt with. Allen[37] addresses the issue of why situations or phenomena are hard to understand or analyze, and proposes two alternative views from which to interpret them:

- Either the situation considered contains an enormous number of interacting elements making calculation extremely hard work, although all the interactions are known.
- Or the nonlinear interactions between the components mean that bifurcation and choice exist within the situation, leading to the possibility of multiple futures and creative/surprising responses.

In this paper the first alternative will be referred to as a complicated phenomenon, while the second will be defined as a complex phenomenon. A complicated phenomenon can be decomposed and reduced into solvable parts and therefore it follows that from such an ontological standpoint the positivistic and mechanistic paradigm prevails. Thus, the quest for logistics managers is to unfold or find real cause-and-effect interactions, and then optimal solutions can be provided. On the other hand, a complex phenomenon involves paradoxes where both time and identity are based on human perception, interpretation, and action. Furthermore, when dealing with such processes or phenomena, there are no aspirations to find optimal configurations, only to make transformative changes into emerging situations and contexts.

This apparent difference in how a situation or a phenomenon is perceived, i.e. as complicated or complex, may have major consequences for how logistics issues are approached and dealt with. The apparent consequence of regarding logistics phenomena as complicated is that the researcher's or practitioner's mindset is focused on the fact that the problem or situation in question can be handled by reducing problems to solvable units, and by using mechanistic assumptions of how the parts work and are connected. For example, Chen and Wang[38] conclude in the context of large-scale steel production that *"cross-functional operations can be optimized and overall optimality can be obtained."* Story *et al.*[39] report that the logistics and supply chain management (SCM) literature is mostly focused on idealized schemas of optimal routes and quantities for demand fulfillment in the context of supply chains, i.e. it provides a complicated perspective on logistics and SCM.

Considering logistics as complex means that recognition of human involvement (which is apparent in any logistics process or phenomenon) must be considered when treating logistics issues. While interconnected technical artifacts, i.e. physical and information-related parts, can be regarded as both complicated and complex to a certain degree, another dimension is added when these artifacts are put into a social context. This means that inter-subjective perceptions and interpretations of decision makers working with the artifacts increase the perceived complexity of logistics phenomena Rigby.[40] Consequently, this paper takes the standpoint that logistics processes, where human beings are involved, are not simply a sequence of mechanical devices which can be assumed to work along positivist lines, but instead are a complex network of living, innovative, creative, and evolving creatures which react and adapt dynamically to their perceived environment, and try to proactively create what they themselves, or collectively with others, find to be beneficial for their own interests.[41] It is in the interaction between people that coherent patterns of meaning and identity are perpetually created. The iterative results of these processes are paradoxical situations where the interests of different groups of people (i.e. divisions, departments, functions or firms) are continually creating opportunities, at the same time as these processes restrain the development of other processes. This is a perpetual process, and as Stacey[15] states, there are no levels separating the interacting groups of people, *"only paradoxical processes of individuals forming the social while at the same time being formed by it."* In conclusion, treating logistics as complex means considering human involvement and the paradoxes created in human interactions. Consequently, it also means considering the concrete, actual work being done and the mental models created by the humans involved in such work.

## Paradoxes

In order to further develop these arguments a short discussion of the term *paradox* may be useful for the reader. The word *paradox* can be defined and interpreted in different ways. According to Stacey[15] paradox "*may mean an apparent contradiction, a state in which two apparently conflicting elements appear to be operating at the same time."* Using this definition of paradox, dealing with a paradoxical situation is a matter of knowledge. With increased knowledge of the paradoxical situation the contradiction can be removed or resolved by deciding that one element is to be preferred all the time. Alternatively the contradiction can be solved by changing the conditions or the problem, thereby preventing the contradiction from appearing again. This is in line with a classical, mechanistic, logistics approach to handling issues which arise in logistics efficiency-enhancing efforts. The assumption is of a dualistic character. However, the chosen solution to the contradiction inherited in the perceived paradox may lead to counterproductive situations in a wider sense, both in time and in space, i.e. the outcomes are

not always effective.

Another way to define the term paradox is in line with Hegel's dialectical logic. Here the term "paradox means the presence together at the same time of contradictory, essentially conflicting ideas, none of which can be eliminated or resolved".[15] In such a situation there is no way the paradox can be resolved or eliminated by positivistic assumptions and claims, and therefore a different kind of logic is needed; a logic of a dialectic character. Such paradoxes are apparent all the time in logistics research and practice, e.g. stability and instability at the same time, assumptions of controlling the uncontrollable, i.e. human free-will, optimization of processes in continual change, processes of reducing uncertainty create uncertainty, processes of learning create more to learn, etc.

In order not to confuse the reader it is important to mention that both types of paradoxes are apparent in logistics: the point to be made explicitly in this paper is that the second one i.e. based on Hegel's dialectical logic, has so far been of limited use in logistics research and literature and has often met with avoidance in both logistics research and practice. Nonetheless, as we argue in this paper, by exploring paradoxes of this second type a strategic mindset can emerge which may enhance supply chain effectiveness and innovation.

## Paradoxes in logistics

The focus of companies and their network partners is shifting from solely focusing on optimizing existing systems and processes, towards creating future improvements, i.e. exploring effectiveness and innovation dimensions. Robson[42] states that *"in a rapidly changing world, with ever-increasing competition, the effectiveness of the improvement processes is almost certainly more critical to long-term survival than the current level of performance of the operational processes."* Mentzer, Min, and Bobbitt[5] advocate the efficiency and effectiveness dimensions of logistics. They propose that logistics capabilities help firms achieve the cost leadership component of competitive advantage through **efficiency** (cost and capital reduction), and achieve the differentiation component of competitive advantage through **effectiveness** (customer service). Nonetheless, these dimensions might often constrain or come into conflict with each other, thereby creating different types of paradoxical situations. The efficiency/effectiveness paradox viewed from a complexity perspective is thus correlated to, and interdependent of, other paradoxical situations identified in logistics management such as the paradoxes of control, optimization, and cooperation.

Highly correlated to an efficiency paradigm is **control**. By exploring the paradox of control we argue that the assumptions creating inertia and reluctance for a mindset shift toward increased emphasis for effectiveness can be addressed. Hence we are given the insight that it is not just a change in focus (as proclaimed in demand management literature), but rather a change in assumptions which is needed for any effectiveness potential to be realized. Similar to the paradox of control, the underlying assumptions of **optimization** are of a mechanical character and are not aligned to the reality that confronts logistics management either operationally or strategically.

It is important to point out that this exploration of paradoxes is not an attempt to provide a complete list of paradoxes identifiable in the logistics context. The paradoxes presented here are the ones we have found to be of greatest relevance during our research and we encourage the reader to add others which he/she has experienced. These three paradoxes are now addressed.

## The efficiency/effectiveness paradox

Every manager, everyday, is faced with making decisions concerning what to do, when to do it, and how to do it. The effectiveness dimension, i.e. strategic considerations about what to do and when to do it, always preconditions the efficiency dimension, i.e. operational concerns, but they are not mutually exclusive since whatever is decided must also be carried out in the best way possible. The result is often paradoxical since what is best today might be disastrous a few years or months ahead, and the decision made may result in unexpected effects not logically derivable in other parts of the division, the organization or the supply network. Alderson[43] states for example that an *"executive will not invest a large amount in equipment designed to make this plant the most efficient in his industry today if he knows that much more effective techniques will be available tomorrow. … The executive will act in such a way as not to dissipate the power to act."* Not surprisingly, the logistics literature available is in scarce supply when it comes to effectiveness discussions, but it is full of best-practice cases and solutions[44] aiming at increased efficiency. Only recently has the issue of effectiveness been addressed in demand-oriented literature[45,46] where it has been stated and argued that beyond the efficiency function, logistics is a source of competitive advantage.[47,48]

However, while there are several capabilities, competences, and concepts offering the possibility of increased customer satisfaction, their potential might be constrained by mechanistically derived mindsets, theories, approaches, and methods. In such contexts organizations are treated as stable economic phenomena which best prosper in equilibrium, and with the unifying goal of profit maximization[49] and survival. Consequently, logistics becomes a means for achieving such constraining and limiting beliefs, the underlying assumptions are accordingly transferred to the value-adding features of logistics. Hence, the first proposition is as follows:

---

***P1: For a strategic mindset to emerge it is not just a change in focus (as proclaimed in demand management literature), but rather a change in assumptions which is needed to realize the effectiveness and innovation potential in logistics.***

---

Consequently, realizing the efficiency/effectiveness paradox in the search for demand-oriented effective research and practice could benefit companies' intentions to satisfy customer demands and thus lead to competitive advantage and survival. It is important to point out that realizing this paradox does not imply or mean "solving" the paradox, since that cannot be done. The alternatives will always be unlimited, and choices about what to do, and doing that right will be manifold. Nonetheless, in order to further elaborate on this paradox and realize any potential for increasing supply chain effectiveness and innovation there are other paradoxes which need to be assessed in the logistics context.

## The paradox of control

Theories and modeling approaches used in logistics management are most often based on simplifications, e.g. linear causality, reductionism and determinism, and the notion that logistics managers ought to be able to plan, design, and control the flow of goods in their supply chains. Lambert and Cooper,[50] for example, state: *"controlling uncertainty in customer demand, manufacturing processes, and supplier performance are critical to effective supply chain management"* and the concept of a seamless supply chain,[51,52] underline the need for logistics management to be in control. Childerhouse and Towill[51] declare that seamless supply chain is *"simple in nature and based on a control engineering approach."* All the twelve rules in the concept of seamless supply chain are based on reducing, simplifying, unifying, eliminating assumptions, e.g. rule seven; *"elimination of all uncertainties in all processes"*, and rule twelve where *"all players should think and act as one"*. In this control-focused logic it follows that logistics management (or other top management dealing with logistics) are also the ones who can determine strategy since they have the ability to set goals for the future.

Thus, logistics operations are frequently subject to a rationalistic approach and teleology.[41] Following this logic means that actions should be planned and decided by the executive management responsible for logistics, people who have the ability to view, and advantage of viewing, the logistics system from "above", i.e. their plan will be based on an objective view of the logistics phenomena. The planned actions are then properly distributed by management to the right places where each action is performed in accordance with stated subobjectives, i.e. a top-down approach. Furthermore, performance measurements are set for each part of the logistics flow. Hence, the assumption is that someone has the ability to stand outside "existing" systems such as the production system, the inventory system, and the transportation system. In this decision making process the assistance of normative methods and models ensure what has to be done. Reflection on such normative and simplified suggestions for the process of deciding the right things to do reveals that there are several questionable assumptions made which certainly create paradoxes in the minds of the decision makers when planned activities and processes are put into practice.

As confirmed by several logistics managers, real-life logistics practice is characterized by last-minute changes and rearrangements due to different people's interpretations, accidents, changes in customer demands, new information, supplier delays, innovations, machine and computer breakdowns, mistakes, etc.[22] Hence, for logistics managers it is a battle between the idealized models and theories of logistics structures and processes and the daily firefighting and changing of activities in reality. Weir [53] has observed this situation and states *"Most managers do not give up, but they develop routines, some simple, others sophisticated, for coping with the organisationally-induced complexity to which they are willfully subjected"*. Hence, in real life, logistics processes and activities are emergent outcomes of non-linear relationships of a self-organizing character which sometimes create novelty and innovation, and sometimes chaos and frustration for the people involved. Since self-organization is a non-controllable process for any manager, the emerging outcome is unpredictable, or, in the words of Stacey*et al.*:[54] *"if managers are choosing what emerges, then it is not emerging"*.

This apparent difference in theory and practice is paradoxical in its nature and certainly misleading in many contexts and situations since reality changes in unpredictable, and sometimes outrageous ways. Stacey*et al.*,[54] have observed that *"most managers continue to believe that their role is essentially one of designing an organization and controlling its activities."* However, they[54] also put forward another observation which could be regarded as paradoxical to the belief that managers can design and be in control, because several managers agreed that in their day-to-day operations they were *"the ones in charge but repeatedly finding that they were not in control."* Consequently, firms' efforts to manage logistics systems and processes have often resulted in frustration and anxiety,[17] not least for the managers who are supposed to be in charge. Nonetheless, treating planning and control from a complexity perspective reveals novel ways to approach and deal with logistics, as the

processes of planning and controlling are critical for both supply chain efficiency and effectiveness. It is important at this point to emphasize that a complexity approach does not claim that planning is not useful, however, it is the emphasis on the planning process among individuals involved in certain projects or processes which is of value, not the actual plan itself. As Allen[55] states *"it is this dialogue between successive "systems" and their own inner "richness" that provides the capacity for continuous adaptation and change."*

***P2: For logistics managers to handle the paradox of control, a mindset which is able to balance deliberate and planned execution of processes, and self-organized and emergent processes involving people on all levels and among several actors in supply chains, is needed.***

For logistics managers it is important to point out that this balance of controllability is the way it should be, i.e. not "being" in control should not cause anxiety but instead open up an exploration of novel ways of serving customers or the creation of innovation. Hence, one great challenge for logistics researchers and practitioners to consider in developing the logistics discipline, is the need to recognize uncertainty and complexity and "go with the flow" instead of solely trying to remove and control uncertainty. When it comes to issues of sustainability and innovation the ability to handle self-organizing and emergent processes is needed to an even greater extent than normal logistics practice since ambiguity is prevalent. Consequently, the following proposition is made:

***P3: A mindset where complexity is seen as normal and a resource for the creation of supply chain effectiveness and innovation, will provide logistics managers with the ability to handle the ambiguity needed for contemporary complex issues, e.g. sustainability and change management.***

## The paradox of optimization

One idea that has long been of interest in the natural sciences is that of optimization. Its mathematical definition can be explained in the following way: a function Image not readable or empty https://chart.googleapis.com/chart?cht=tx&chf=bg,s,FFFFFF00&chco=000000&chl=%24f%5Cleft(%20%7Bx% having two variables *x* and *y* which are defined in a phase space ? defined in *n* dimensions, i.e. Image not readable or empty https://chart.googleapis.com/chart?cht=tx&chf=bg,s,FFFFFF00&chco=000000&chl=%24%5Cleft(%20%7Bx%2Cy%7D%20%5Cright)% and in this phase space a maximum or minimum point (depending on what is predetermined) is to be found. Consequently, since logistics is based on mechanistic principles, the compelling notion of optimization in logistics has been prevalent. For example, when it comes to supply-management interface capabilities Mentzer *et al.*[5] make the following proposition: *"Logistics supply-management interface capabilities lead to optimization of the total process of logistics activities, which leads to minimization of system-wide total cost, which leads to competitive advantage."* This proposition is in line with mainstream research in logistics and implies, even when "softly" interpreted, mechanical assumptions and a rationalistic and/or formative teleology. The reasons for such interpretation are as follows; firstly, the use of optimization can be interpreted as finding the best solution possible, i.e. one seen from someone's subjective perspective (e.g. a logistics manager) in a specific context and a solution which is highly dynamically interdependent of other aspects and activities. However, as it is used in the logistics literature optimality might also be referred to as a belief in actually finding the best, most objective solution, i.e. that (with enough mathematics and physics) a countable optimum exists albeit hidden in the structures and procedures for any total logistics process. Secondly, the use of the total process implies another mechanistic assumption; that all relevant activities and processes can be identified and considered in the process of minimizing systemwide total cost. Again, this assumption of totality relies on objectivity and stable conditions, since any considerations of individual or group perspectives, i.e. subjective or multiple perspectives, are not taken into account. Finally, the belief is that logistics can be optimally designed, i.e. not only can the manager stand outside the system to be optimized, but he/she can also design it. Mears-Young and Jackson[56] argue that from a logistics perspective, people, as well as artifacts, can be engineered in order for the objective of optimization to be realized.

The result of such optimization efforts is repeatedly that changes in areas not directly involved, measured or considered, are not addressed, and when efforts *are* made to sum up the decomposed activities, the real-life result differs, sometimes extensively, from the intended one. A truck driver working for one of the major logistics providers in Europe explained that *"when driving a delivery from the north of Sweden to the distribution center in Malmö, nothing is permitted to go wrong. Construction work on the roads is not allowed, truck breakdowns cannot happen, police stops may be much too time consuming, and recovery breaks are heavily limited in time."* Despite the fact that unwanted factors are not "allowed" to interfere in optimally generated model results, these things do happen. Nonetheless, the optimization results in the models created are, of course, mathematically correct; they are the result of what was intended to be examined in the model, and the results can be generated over and over again, e.g. by

other researchers. However, as von Hayek[57] states *"I confess that I prefer true but imperfect knowledge even if it leaves much undetermined and unpredictable, to a pretence of exact knowledge that is likely to be false. … The credit which the apparent conformity with recognized scientific standards can gain for seemingly simple but false theories may, as the present instance shows, have grave consequences. "* Furthermore, Rigby *et al.*[40] discuss the possibilities of agility in supply networks and state that *"rather than treating … agile networks as predictable and in some way 'manageable', we would argue that a great degree of complexity exists in this domain. This may pose problematic questions for prescriptive accounts that map in some way an "ideal" solution for 'aligning' optimal solutions in an agile environment."*

Consequently, in order to further develop logistics capabilities an important point needs to be made regarding technical systems and socio-technical phenomena. From a complexity perspective it is not possible to "find" or "map" the interdependencies and interrelationships which exist in reality since they perpetually change, as do the perceptions of the people who observe them. In addition, apparent behaviors such as self-organization, emergence, and adaptation among the people working in logistics processes are not considered in optimization efforts.[41] Furthermore, by focusing on the effectiveness of different processes instead of on their efficiency, the dominant cost-reducing focus can be complemented with both profitability-enhancing activities and with higher leverage from improvement efforts. Profit-enhancing activities, i.e. effectiveness efforts, are restrained in logisticians' beliefs in optimization since these need a different type of sensemaking. This process of sensemaking covers human-related aspects, e.g. creativity, conflicts, luck, and innovativeness, from which novel processes and activities can be created, i.e. innovative ways of fulfilling customer requirements, and ensuring the satisfaction of other stakeholders involved.

***P4: Rethinking logistics processes as socio-technical phenomena leads to the recognition of complexity and mindsets of a transformational character, which leads to more emphasis on logistics effectiveness and innovation, which creates new possibilities for gaining competitive advantage.***

## Discussion

A complexity perspective on logistics research and practice challenges several of the existing common assumptions in logistics, and provides a dialectic perspective on the strategic dimensions of logistics management, i.e. how to handle and work with paradoxes. The avoidance of these paradoxes in theory and practice amplifies the self-reinforcing belief of running the machine faster, i.e. logisticians' focus on efficiency will be manifested even more. Hence, ignoring the practically identifiable paradoxical processes which take place on a daily basis, and the effect these have in theories which both researchers and practitioners use and are affected by, results, from a complexity perspective, in less valuable guidance and understanding. One could then ask: Why this great emphasis on efficiency?

There are, of course, several arguments for logistics research and management to focus on doing things right, i.e. on efficiency-enhancing efforts rather than on effectiveness. First of all, **a focus on efficiency is needed**. There has been much "waste" to be reduced in several logistics-related areas, i.e. inefficiencies that were devastating for business. However, as declared at the beginning of this paper, as turbulence in markets intensifies, the dynamics of market places and industries are escalating, that the question becomes more that of *what* to do, than just doing things fast and efficiently.

Secondly, **a focus on efficiency is easier**. It is far easier to divide and conquer, i.e. reduce a phenomenon to its "simplest" parts, and from that, approximate linear relationships among the set of "variables" in each subsystem created, than keep as much of the complex phenomena which, nonetheless, are where any actions that may be decided on should be "implemented". For example, Humphrey, Taylor, and Landers[58] state that *"many current solution methods for determining optimal stocking quantities are based on the simplifying assumption that parameters are known deterministically."* The quantification simplifies matters and with the new technology provided by ERP systems connected with real-time data from processes and activities performed globally, the quantification emphasis is a self-reinforcing process.

Thirdly, **efficiency can be measured.** While it is essentially impossible to measure all the choices which can be made, it is far easier to measure what has been decided on and actually been carried out, i.e. for the purpose of doing things right. As is often said; *"you get what you measure"*.[59] Consequently, in line with the mechanistic efficiency paradigm, making an effort in measurable activities or processes is one of the cornerstones of logistics research and practice. However, Robson[42] begins his article with the following statement: *"Measurement has become such an accepted approach within organizations that considerable effort is expended in trying to identify "What" can be measured and "How" to measure it. However, few people genuinely challenge "Why" they should measure in the first place."*

Fourthly, **efficiency efforts can be controlled.** Reducing an organization or supply chain to simplified and defined areas, processes or functions strengthens the belief that the unit of analysis can be controlled. For a purchasing, logistics or packaging department it is then much easier to define what is their responsibility and the rest is up to a supplier or another function to consider. While one cornerstone of logistics is about taking a holistic perspective in order to avoid suboptimization, the issue of controllability prevails in many businesses. As a keynote speaker at a recent conference expressed at the end of a seminar focusing on supply chain collaboration: *"At the end of the day it is all about contracts"*. Hence, the wish for controllability is central and taking an efficiency-oriented paradigm for granted reinforces this even more.

Finally, **efficiency efforts can be rewarded**. From the previous statement it follows that a fifth reason to focus on efficiency is that it can be rewarded. Since bonuses and rewards are often based on specific metrics, a production unit will strive to maximize production utility, inventory managers will seek to reduce inventories if, the transportation manager will aim to reduce delivery costs, etc. Taking a more holistic and complex approach will certainly be hampered by the fact that individual or suborganizational contributions will be less identifiable and, hence, bonuses and rewards more difficult to determine.

Nonetheless, while the dominant logistics focus is on global phenomena which can be divided into separate units and can then be made optimal, i.e. a top-down approach, by definition such an approach will cause suboptimizations and counterproductive outcomes. Furthermore, the conventional processes that are usually suggested are often idealized as they are based on economic and/or technical assumptions. A central point in complexity theory is the consideration of the actual work being done on a day-to-day basis, i.e. assumptions aligned to human organizational behavior and perceptions. This perspective, which is sometimes referred to as a bottom-up perspective,[60] could act as a complement to traditional reductionistic approaches in logistics. The reasons for such emergent perspectives on logistics are several.

Firstly, since *"the complex whole may exhibit properties that are not readily explained by understanding the parts"*,[61] the result is that emergent phenomena formed from the bottom-up, i.e. everyday activities, by local interactions of autonomous individuals and parts, are not being captured. Bonabeau[60] observes that in several cases emergent phenomena may be counterintuitive, which makes these emergent phenomena impossible for managers to either plan or control, especially with the aid of over-simplified models and tools.

Secondly, the fact that organizations are formed of individual is of major importance for logistics management since it is at this level that actions are performed by people with free wills. As a result of the daily activities carried out by individuals who are influenced and affected by their perpetual interpretations of the outcome of other individuals' actions, global phenomena emerge. Allen points out that in the process of sensemaking: *"there is a complex and changing relationship between latent and revealed preferences, as individuals experience the system and question their own assumptions and goals"*.[37] Bonabeau[60] states that it is the individuals within firms (and not processes) who make mistakes and cause errors and he goes as far to point to a paradigm shift from spreadsheet- and process-oriented approaches to a focus on individuals. Furthermore, individuals are the ones who are often involved in customer processes and consequently, their actions along the value-adding flow affect the performance of logistics processes.

Thirdly, the processes of self-organization underpin most of the actual work being done[62] and dynamic order emerges from those processes in the form of coherent patterns of behavior which are not controllable from a traditional point of view but are still highly apparent in most situations, especially in day-to-day activities.[54] Hence, from a positivistic perspective, self-organization causes uncertainty and since it cannot be effectively controlled, planned or designed it should be reduced, or even eliminated. However, in several cases this process of self-organization is the reason for novelty, creativity, and innovativeness, and needs to be considered in order for us to understand and make sense of logistics processes and phenomena. Consequently, the ability to understand and handle emergent phenomena and the paradoxes involved are fundamental to the process toward a strategic mindset for logisticians.

## Conclusions

This paper makes a modest but important contribution to the further development of logistics management by identifying the need for a mindset with increased appreciation of the complexity involved in logistics. This is required since complexity on the one hand causes efficiency-related problems, but on the other, and more importantly, brings with it business opportunities and sources of competitive advantage. Consequently, it causes paradoxical situations for logistics managers. We suggest that this complexity perspective is important and that with this perspective on logistics needs and activities, novel insights and increased understanding can be gained. In this paper four propositions for research and practice have been suggested, each dealing with insights and understanding for logisticians in making their mindset more strategically oriented i.e. making logistics managers prepared to place a greater emphasis on effectiveness, innovation and other complex issues such as sustainable development.

The interdisciplinary nature of this research is both a strength and a limitation. From a theoretical perspective the work is scattered and provides only fragments of ideas drawn from strategic management, entrepreneurship, innovation and psychology. Hence, more research is needed to further explore the establishment of a mindset change leading to an increased consideration of complex issues in new ways within logistics and supply chain management. Practically, this could mean behavioral studies of logistics managers in their daily work, studies designed to find out the effects of the way these managers

and their colleagues make sense of different situations and to examine what they base their decisions on. This would be highly beneficial in increasing logisticians' general understanding of the processes of turning theories into practice and vice versa. Furthermore, complexity theory is an emerging theory which needs to be further developed in the logistics context. Finally, while Simon,[9] Choi *et al.*,[17] and Nilsson[22] have pointed out its applicability to the field of logistics and see it as a natural development of systems theory as a guiding perspective of logistics, more research needs to be done on how complexity theory can provide increased understanding of and be better aligned to contemporary logistics issues.

## References


1. Tatham, P. Wu, Y., Kovács, G. and Butcher, T. (2017) Supply chain management skills to sense and seize opportunities, International Journal of Logistics Management, SSN: 0957-4093. 28(2), 266-289.

2. Nilsson, F. and Gammelgaard, B. (2012) "Moving beyond the systems approach in SCM and logistics research" International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 42(8), 764-783.

3. Wagner, S.M. (2008), "Innovation Management in the German Transportation Industry", Journal of Business Logistics, ISSN: 2158-1592. 29(2), 215-231.

4. Kent Jr, J. and Flint, D.J. (1997), "Perspectives on the Evolution of Logistics Thought", Journal of Business Logistics, ISSN: 2158-1592. 18(2), 15-29.

5. Mentzer, J. T., Min, S., & Bobbitt, L. M. (2004), "Toward a unified theory of logistics", International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 34(8), 606-627.

6. Stock, G. N., Greis, N. P. and Kasarda, J. D. (1999), "Logistics, strategy and structure A conceptual framework", International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 29(4), 224-239.

7. Kohn, J.W. and McGinnis, M.A. (1997), "Advanced logistics organization structures: Revisited", Journal of Business Logistics, ISSN: 2158-1592. 18(2), 147-163.

8. Porter, M.E. (1996), "What is Strategy?", Harvard Business Review, ISSN: 0017-8012. 74(6), 61-79.

9. Simon, H.A. (1996), The Science of the Artificial, 3 ed. MIT Press, Cambridge, MA. ISBN: 9780262193740

10. MacIntosh and MacLean (2001)

11. Ellram, L.M., Tate, W. and Carter, C. (2007), "Product-process-supply chain: an integrative approach to three-dimensional concurrent engineering", International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 37(4), 305-330.

12. Wysick, C., McKelvey B. and Hülsmann, M. (2008): "'Smart parts' supply networks as complex adaptive systems: analysis and implications", International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 38(2), 108-125.

13. McElroy, M.W. (2000), "Integrating complexity theory, knowledge management and organizational learning", Journal of Knowledge Management, ISSN: 1367-3270. 4(3), 195-203.

14. Anderson (1999)

15. Stacey, R. (2003b), Strategic management and organizational dynamics: the challenge of complexity, 4th edition, Pearson Education Limited, UK. ISBN-10: 0273658980.

16. Pascale, R.T. (1999), "Surfing the Edge of Chaos", Sloan Management Review, ISSN: 1532-9194. 40(Spring), 83-95.

17. Choi, T.Y. Dooley, K. J. and Rungtusanatham, M. (2001), "Supply networks and complex adaptive systems: control versus emergence", Journal of Operations Management, ISSN: 0272-6963. 19(3), 351-366.

18. Rigby, D., Gruver, K. and Allen, J. (2009) "Innovation in Turbulent Times", Harvard Business Review, ISSN: 0017-8012. 87(6), 79-86.

19. Stacey, R. (2003a), "Learning as an activity of interdependent people", The Learning Organization, ISSN: 0969-6474. 10 (6), 325-331.

20. Christopher, M. and Towill, D. (2001), "An integrated model for the design of agile supply chains", International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 31(4), 235-246.

21. Knoppen, D. and Christiaanse, E. (2007) "Interorganizational adaptation in supply chains: a behavioral perspective", International Journal of Logistics Management, ISSN: 0957-4093. 18(2), 217-237.

22. Nilsson, F. (2006), “Logistics management in practice - towards theories of complex logistics”, International Journal of Logistics Management, ISSN: 0957-4093. 17(1), 38-54.

23. Spekman, R.E., Kamauff, J.W. and Myhr, N. (1998), “An empirical investigation into supply chain management: A perspective on partnerships”, International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 28(8), 630-650.

24. Graetz, F. (2002), “Strategic thinking versus strategic planning: towards understanding the complementarities”, Management Decision, ISSN: 0025-1747. 40(5), 456-462.

25. McGrath, R.G. and MacMillan (2000) The entrepreneurial mindset, Harvard Business School Press, Boston. ISBN 9780875848341.

26. Talke, K. (2007), “Corporate mindset of innoating firms: influences on new product performance”, Journal of Engineering and Technology Management, ISSN: 0923-4748. 24(1-2), 76-91.

27. Mentzer, J.T. and Kahn, K.B. (1995), “A framework of logistics research”, Journal of Business Logistics, ISSN: 2158-1592. 16(1), 231-250.

28. Lewis, I. and Suchan, J. (2003), “Structuration theory: its potential impact on logistics research”, International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 33(4), 296-315.

29. McCarthy et al. (2006)

30. Powell (2003)

31. Arlbjørn, J.S. and Halldorsson, A. (2002), “Logistics knowledge creation: reflections on content, context and processes”, International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 32(1), 22-40.

32. Dent (1999)

33. Bowersox, D.J. Closs, D. J., and Cooper, M.B. (2002), Supply Chain Logistics Management. First International ed. New York: McGraw - Hill / Irwin. ISBN 10:0071123067

34. Christopher, M. (1998), Logistics and Supply Chain Management. 2nd ed. London: Pearson Education. ISBN-10: 0273630490.

35. Cox, A. (1999), “A research agenda for supply chain and business management thinking”, Supply Chain Management: An International Journal, ISSN: 1359-8546. 4(4), 209-211.

36. Barney, (2002)

37. Allen, P.M. (2000b), “Knowledge, Ignorance and Learning”, Emergence, ISSN: 1532-7000. 2(4), 78-103.

38. Chen, M. and Wang, W. (1997), “A linear programming model for integrated steel production and distribution planning”, International Journal of Operations & Production Management, ISSN: 0144-3577. 17(6), 592-604.

39. Story, (2006)

40. Rigby, C., Day, M., Forrester, P., and Burnett, J. (2000), “Agile supply: rethinking systems thinking, systems practice”, International Journal of Agile Management Systems, ISSN: 1465-4652. 2(3), 178-186.

41. Nilsson, F. (2005), Adaptive logsitics - using complexity theory to facilitate effectiveness in logistics, Division of Packaging Logistics, Lund University, Lund. ISBN 91-628-6511-0.

42. Robson, I. (2004), “From process measurement to performance improvement”, Business Process Management Journal, ISSN: 1463-7154. 10(5), 510-521.

43. Alderson, W. (1951), “A Systematics for Problems of Action”, Philosophy of Science, ISSN: 0031-8248. 18(1), 16-25.

44. New, S.J. (1996), “A framework for analysing supply chain improvement”, International Journal of Operations & Production Management, ISSN: 0144-3577. 16(4), 19-34.

45. de Treville, S. Shapiro R.D. and Hameri, A-P. (2004), “From supply chain to demand chain: the role of lead time reduction in improving demand chain performance”, Journal of Operations Management, ISSN: 0272-6963. 21(6), 613-627.

46. Frohlich, M. and Westbrook, R. (2002), “Demand chain management in manufacturing and services: web-based integration, drivers and performance”, Journal of Operations Management, ISSN: 0272-6963. 20(6), 729-745.

47. Lynch, D. F., Keller, S. B., and Ozment, J. (2000), “The effects of logistics capabilities and strategy on firm performance”,

Journal of Business Logistics, ISSN: 2158-1592. 21(2), 47-67.

48. Olavarrieta, S. and Ellinger, A.E. (1997), “Resource-based theory and strategic logistics research”, International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 27(9/10), 559-587.

49. Hopper, T. and Powell, A.. (1985), “Making sense of research into the organizational and social aspects management accounting: A review of its underlying assumptions”, Journal of Management Studies, ISSN: 1467-6486. 22 (5), 429-465.

50. Lambert, D. M., Cooper, M. C., and Pagh, J. D. (1998), “Supply Chain Management: Implementation Issues and Research Opportunities”, International Journal of Logistics Management, ISSN: 0957-4093. 9(2), 1-18.

51. Childerhouse, P. and Towill, D.R. (2003a), “Engineering the seamless supply chain”, International Journal of Logistics Management, ISSN: 0957-4093. 14(1), 109-120.

52. Towill, D. R., Childerhouse, P. and Disney, S. M. (2000), “Speeding up the progress curve towards effective supply chain management”, Supply Chain Management: An International Journal, ISSN: 1359-8546. 5(3), 122-130.

53. Weir, (2004)

54. Stacey, R., Griffin, D. and Shaw, P. (2000), Complexity and management - Fad or radical challenge to systems thinking? Routledge, London. ISBN: 9780415247610

55. Allen, P.M. (2000a), “The Dynamics of Knowledge and Ignorance” in Integrative Systems Approaches to Natural and Social Dynamics, Matthies, M., Malchow, H., Kriz, J. (Eds.) ISBN 978-3-642-56585-4.

56. Mears-Young, B. and Jackson, M. C. (1997), “Integrated Logistics - Call in the Revolutionaries!”, Omega, ISSN: 0305-0483. 25(6), 605-618.

57. von Hayek, F.A. (1989), “The Pretence Of Knowledge”, The American Economic Review, ISSN: 0002-8282. 79(6), 3-8.

58. Humphrey, A. S., Taylor, G. D., and Landers, T. L. 1998, “Stock level determination and sensitivity analysis in repair/rework operations”, International Journal of Operations & Production Management, ISSN: 0144-3577. 18(6), 612-630.

59. Hendry, L.C. (1998), “Applying world class manufacturing to make-to-order companies: problems and solutions”, International Journal of Operations & Production Management, ISSN: 0144-3577. 18(11), 1086-1101.

60. Bonabeau, E. (2002), “Predicting the Unpredictable”, Harvard Business Review, ISSN: 0017-8012. 80(3), 109-116.

61. Kauffman, S. (1995), At Home in the Universe: The Search for Laws of Self-Organization and Complexity. New York: Oxford University Press. ISBN-10: 0195111303

62. Allen, P., Ramlogan, R. and Randles, S. (2002), “Complex Systems and the Merger Process”, Technology Analysis & Strategic Management, ISSN: 1465-3990. 14(3), 315-329.

63. Bowersox, D.J. and Closs, D.J. (1996), Logistical Management, The integrated supply chain process. International ed. New York: McGraw-Hill. ISBN 10:0070068836.

64. Childerhouse, P. and Towill, D.R. (2003b), “Simplified material flow holds the key to supply chain integration”, ISSN: 0305-0483. Omega, 31(1),17-27.

65. Gulati, R., Nohria, N. and Zaheer, A. (2000), “Strategic networks”, Strategic Management Journal, ISSN: 1097-0266. 21(3), 203-215.

66. Johannessen, S. and Solem, O. (2002), “Logistics organizations: Ideologies, principles and practice”, International Journal of Logistics Management, ISSN: 0957-4093. 13(1), 31-42.

67. Kogut, B. (2000), “The network as knowledge: generative rules and the emergence of structure”, Strategic Management Journal, ISSN: 1097-0266. 21(3), 405-425.

68. Russell, D.M. and Hoag, A.M. (2004), “People and information technology in the supply chain: Social and organizational influences on adoption”, International Journal of Physical Distribution & Logistics Management, ISSN: 0960-0035. 34(2), 102-122.

69. Shapiro, J.F. (2001), Modeling the Supply Chain. First ed. Pacific Grove: Duxbury. ISBN-10: 0495126098

70. Stacey, R.D. (2001), Complex Responsive Processes in Organizations - Learning and knowledge creation. London: Routledege, UK. ISBN-10: 0415249198

71. Tan, K.C. (2001), “A framework of supply chain management literature”, European Journal of Purchasing & Supply Management, ISSN: 0969-7012. 7(1), 39-48.

72. Trim, P.R.J. and Lee, Y.I. (2004), “A reflection on theory building and the development of management knowledge”, Management Decision, ISSN: 0025-1747. 42(3), 473-480.

73. Vollmann, T. E., Cordón, C. and Heikkilä, J. (2000), “Teaching supply chain management to business executives”, Production and Operations Management, Vol.9, No.1, pp.81-90.