Lessons on knowledge creation in supply chain management

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Received 15 December 2014
Revised 19 March 2015
Accepted 21 March 2015

Abstract

Purpose – The purpose of this study is to convey lessons learned from a long-term research project and present a coherent approach for researching relevant areas, ranging from ontology to quality.

Design/methodology/approach – A PhD process is used as a case to present conceptual ideas on performing research in logistics/supply chain management (SCM).

Findings – The research integrates different views on knowledge and the world and how to perform research in logistics/SCM. Models explaining micro and macro abduction, and the relationship between research, the context and researcher subjectivity are suggested.

Research limitations/implications – Knowledge on why and how critical realism can be used in logistics/SCM research is advanced. Abduction is presented as a micro/macro process, which should not have any specific "finish line", and is supported with both ontological and epistemological arguments.

Practical implications – Research in logistics/SCM can be improved by connecting different aspects of viewing and creating knowledge. Reflecting on how exactly a publication is related to a project, researchers can better describe how they contribute to knowledge creation, and also understand the relationship between micro and macro abduction.

Originality/value – Through presenting an approach to knowledge creation in the context of a PhD thesis, this research distinguishes itself in a field with a growing need to define its own views of the world and of knowledge. The paper advances current understanding of knowledge creation in logistics/SCM, expanding on earlier models and presenting a broader view of the research process and the associated dilemmas. The paper also contains novel considerations of the differences between publication types and how these affect the presentation of the research.

Keywords Critical realism, Knowledge, Epistemology, Quality, Ontology, Methodology, Abduction, Supply chain management (SCM), Systematic combining

Paper type Conceptual paper

1. Introduction

Completing a PhD degree and defending a thesis contain both moments of near despair and those of great reward. The despair derives from the thesis being a long-term project, in which the student often feels both alone and clueless, but remains responsible for progress. Nevertheless, great rewards emerge from the journey of scientific inquiry. This journey is not necessarily confined to the specific research area, but may also include considerations about the nature of the world and what is considered knowledge, according that worldview. In this paper, a specific view on ontology, epistemology, methodology, methods and quality criteria (OEMMQ) in supply chain research is advocated. PhD students and senior researchers should be able to improve the quality of

The author would like to acknowledge Dr Brian Bloch for his comprehensive editing of the manuscript.

European Business Review
Vol. 27 No. 4, 2015
pp. 346-368

0955-534X
DOI 10.1108/EBR-12-2014-0086

their research and ensure that their research truly contributes to knowledge creation through a coherent approach to OEMMQ.

Research is a process devoted to the creation of knowledge (Danermark *et al.*, 2003), although it is difficult to define knowledge. Bryman and Bell (2007) suggest that various research disciplines have different assumptions about what is really considered knowledge. The philosophical considerations presented in this paper are derived from the research area of "textile management". However, the research was conducted from a supply chain management (SCM) perspective, focusing on sustainability and corporate social responsibility (CSR) in the textile context. (Sustainability and CSR will be referred to as "social responsibility".) The paper also targets researchers in related fields, who are interested in a coherent approach to knowledge creation, especially in fields where these issues are a common topic of discussion or when an unconventional approach is chosen.

Logistics is an intermediary step toward the development of SCM (Childerhouse, 2002, p. 9). As a discipline, logistics is commonly considered to be mainly positivistic (Mentzer and Kahn, 1995; Kovács and Spens, 2005), although this has not been proven conclusively true. Other authors consider the above assumption a misconception that can be traced back even further in the development of the discipline (Aastrup and Halldórsson, 2008). Several of these issues might be related to maturity in the field of SCM, which is both eclectic (Halldórsson *et al.*, 2007) and lacks a coherent theoretical base (Storey *et al.*, 2006). It is important for SCM to form an explicit opinion about what constitutes knowledge in the discipline, so that researchers can devote their efforts at research design and problems, and data collection and analysis, according to a more accurate picture of the fundamental assumptions of the research discipline. Also, the ambiguity and ill-defined nature that currently signifies the field make it even more important for researchers to reflect upon and motivate their research approaches.

In relation to confusion as to the predominant perceptions about the nature of the SCM discipline, two main aims are pursued in this paper. The first is to share lessons learned from writing a PhD thesis with other PhD students, but also with researchers, undergraduates and scholars involved in the long-term research projects. The second aim is to present an approach to knowledge creation encompassing OEMMQ. The approach to knowledge creation is directed primarily toward the field of SCM, but also to researchers interested in knowledge creation according to critical realism epistemology, or who wish to explore OEMMQ. Through these objectives, the paper contributes to an important discussion that is emerging in the research discipline, and with far-reaching implications for the future view on what constitutes knowledge within SCM. Drawing sound conclusions on these matters enhances the legitimacy not only of specific research approaches but also of entire research fields. Moreover, the paper is intended to encourage PhD students to adopt a scientific paradigm and address concepts such as ontology and epistemology in their theses, which has been certainly overlooked in most Swedish and has declined in Nordic theses (Gubi *et al.*, 2003; Zachariassen and Arlbjørn, 2010).

The remainder of the paper is structured as follows. Section 2 presents the theoretical framework, extending from an abstract to a concrete level; Section 3 describes the methods applied in this article; Section 4 presents a thesis project as a case study on an approach to knowledge creation; Section 5 analyses how knowledge was created in the thesis in question, from concrete to abstract applications; Section 6 refers back to the

frame of reference; and Section 7 contains conclusions with regard to the aims of the paper.

2. Frame of reference

2.1 Critical realism: ontology and epistemology

Initially outlined by Bhaskar (1978), critical realism ontology has gained substantial acceptance by researchers. In critical realism, the fundamental assumption about the world is that objects exist independently of our knowledge about them. However, our senses and understanding are limited, and we may not be able to perceive reality correctly.

Critical realism consists of three ontological domains: the real, the actual and the empirical (Bhaskar, 1978). The empirical domain consists of observable experiences, the actual domain consists of events that occur in the world, whether or not we observe them, and the actual domain consists of mechanisms that generate events (Danermark *et al.*, 2003). Generative mechanisms cannot be investigated directly. Instead, by studying the empirical domain and expanding it through including events from the actual domain, it is possible to gain knowledge about the generative mechanisms (Danermark *et al.*, 2003). Accordingly, it follows that our pursuit of knowledge about the actual domain is experienced through the events we study (Björk, 2011). To understand the actual domain, we are thus faced with two problems. The first is that we cannot study the actual domain directly, and the second is that we are limited by our senses and subjectivity.

It is not easy, however, to proceed directly from one event in the empirical domain to a mechanism in the actual domain. Events interact, and sometimes, one event can be eliminated because of other circumstances. Addressing this issue, Sayer (1992, p. 109) outlines how the events we study should be understood not only through both the events we study but also through the context in which the event occurs.

Objects have powers to cause events, but manifest themselves differently, depending on conditions. For instance, dynamite has the power to explode, but the explosion will create different events, depending on the specific medium. A dimmer has power over a light bulb, but the dimmer will create different events, depending on the dimmer setting and the particular light bulb. Consequently, to understand mechanisms that generate events, it is also important to understand the context. Critical realism, therefore, does not focus on inevitable, specific and measurable conditions, but rather on tendencies of mechanisms to generate observable events (Alvesson and Sköldberg, 2009). Accordingly, Sayer (1992, p. 251) claims that the aim of social science is "to construct a coherent description and explanation of the world".

Rotaru *et al.* (2014, p. 121) outline a process that is aligned with Sayer's, but they describe the goal as that of identifying the most relevant generative mechanism(s). Identification is the fifth step in their proposed process, as outlined below:

(1) *Resolution*: "Theory-free classification of empirical data".

(2) *Rediscription*: "Representation of the empirical data through the prism of a selected theory".

(3) *Retroduction*: "Postulation of underlying generative mechanism(s)".

(4) *Elimination*: "Isolation of hypothetical generative mechanism(s) and elimination of alternative one(s)".

(5) *Identification*: "Identification of most relevant generative mechanism(s)".

Other researchers do not consistently mention the first step of resolution. Soosay *et al.* (2012) claim that observation is theory-laden (i.e. we are affected by our background and the frame of reference we bring to the research), so that theory-free classification is not possible. Kovács and Spens (2005, p. 139) also argue that research departs from a point where existing theory is present:

> […] a closer examination of this starting point leads to the conclusion that even if prior theories are given, abductive reasoning starts at the point which an observation in the empirical research does not match these prior theories.

In the context of SCM, this approach seems particularly suitable in light of Halldórsson *et al.* (2007, p. 292):

> The research implication of this eclectic approach to SCM is that we cannot rely on one theoretical explanation […] when analyzing phenomena in SCM. We have to consider several theories and how they may complement each other to provide a more comprehensive view of SCM.

Abductive reasoning is the methodology suggested by several researchers in connection with critical realism, and also for the second part of the framework presented here.

2.2 Abductive reasoning: methodology

Abduction is a methodology that utilizes both deductive and inductive reasoning in a back-and-forth process (Kovács and Spens, 2005). It is, therefore, important to outline the basics of deduction and induction before discussing abduction.

Deductive reasoning starts with the investigation of theory. From theory, logical conclusions are derived and presented as hypotheses and propositions for future events (Kovács and Spens, 2005). These are tested to establish whether the generalizations can be applied to specific instances (Hyde, 2000). Inductive reasoning is performed in the opposite way to deductive reasoning. Through observations, conclusions are presented as hypotheses and propositions for past events (Kovács and Spens, 2005). These specific instances are then used to establish generalizations (Hyde, 2000). According to Kovács and Spens (2005, p. 139), abduction may or may not start with prior theoretical knowledge. Either way, the process of abduction is a back-and-forth process between real-life observations and theory. When theory and observations are aligned, new theories, hypotheses and propositions are presented, and it is possible to apply the conclusions in practice. The methodologies are depicted in Figure 1.

Following this explanation, it is possible to better understand the relationship between critical realism and abductive reasoning. Fox and Do (2013, p. 741) summarize critical realism in three key points:

- Critical realism seeks to determine casual mechanisms [described similarly to Sayer's (1992) explanations of conditions to which generative mechanisms are subject] and casual context which can enable an action to bring about an outcome;
- can provide a unifying direction for application of scientific theories and research techniques; and
- uses abductive reasoning more than induction or deduction.

Along the same line, Danermark *et al.* (2003) argue that scientific work, according to critical realism, requires thinking, reflection, reason, creativity, abstraction capacity

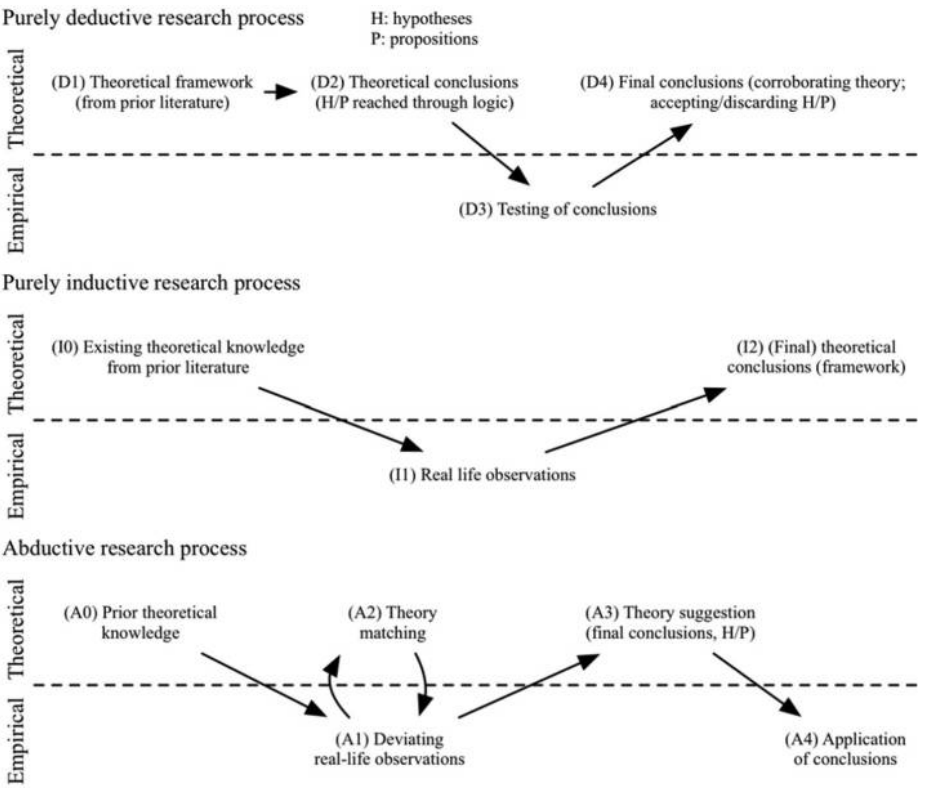

Figure 1.
Research methodologies

and a theoretical framework to find meaning and structure in the empirical reality. Consequently, the process cannot be confined strictly to deductive or inductive reasoning. In their paper, Rotaru *et al.* (2014) equate abductive reasoning with retroduction, which explains how their model of critical realism also relies on abductive reasoning. Kovács and Spens (2005, p. 136) actually point out how abduction was originally called retroduction, but the meaning was confused because of corruption of Aristotle's text.

A strong case can evidently be made from the literature that critical realism and abduction are a good combination. However, the methodologies need to be applied in the actual research.

2.3 Systematic combining: method

Dubois and Gadde (2002) contribute the next step in explaining how researchers often conduct abductive research. They call the method "systematic combining" and received praise from the research community for describing how they made sense of case studies by matching, direction and redirection between the empirical world, framework, theory and the case. They had finally put into words what researchers had been doing for a long time (Dubois and Gadde, 2014). Dubois and Gadde (2002, p. 555) argue that research is

not an inherently linear process, but sometimes requires an integrated approach based on abduction. They found:

> […] that the researcher, by constantly going "back and forth" from one type of research activity to another and between empirical observations and theory, is able to expand his understanding of both theory and empirical phenomena.

The research framework is thus not only a tool used in the research but also a product of the research itself.

Dubois and Gadde (2002), as well as Kovács and Spens (2005), placed considerable emphasis on the use of qualitative data. These methods do not need to adopt a complementary role to the positivistic paradigm focused on generalization, but can, through in-depth and extensive observation of the most important events, contribute to the generation of new theories according to a critical realist epistemology (Aastrup and Halldórsson, 2008).

2.4 Quality criteria

Several authors have pointed to how the research process is initiated by observations of events that do not conform to existing theories. Sayer (1992), similarly to Soosay *et al.* (2012), argues that researchers are theory-laden, which needs to be considered in research. To observe events that have no corresponding theory, can result, for example, from an absence of theories, poor knowledge of theories and a subjective interpretation of the events.

Lincoln and Guba (1985) argue that the most important criterion in evaluating qualitative research is that the reader be able to determine whether or not the research is trustworthy. They suggest four main criteria related to the planning and execution of research: credibility, transferability, dependability and conformability (Table I).

Trustworthiness criterion	Description
Credibility	
Prolonged engagement	Being involved in the empirical setting long enough to understand the context in which the phenomenon is being studied
Persistent observation	Taking the time needed to identify the most important events for the study and to study them in-depth
Triangulation	Cross-checking data to ensure a true picture
Peer debriefing	Exposing the researcher and the research to a disinterested peer with the aim of exploring aspects of the research that may otherwise remain only implicit within the researcher's mind
Negative case analysis	Revising the hypothesis with the benefit of hindsight
Referential adequacy	Keeping some of the data raw to facilitate findings to be revisited
Member checks	Allowing informants to review data
Transferability	The ability to provide a thick description that allows someone interested to determine whether a transfer of the findings is possible
Dependability	Providing opportunity for the reader to examine the process of inquiry
Confirmability	Assessing the product of the research and the consistency between theory, framework, data and findings

Table I. Trustworthiness criteria described, based on Lincoln and Guba (1985)

Research is not always strong in all criteria, and not all are suitable for critical realism and abductive reasoning.

Systematic combining and abduction focus especially on a process that creates confirmability and transferability. Dependability implies that this process should be presented in detail. It also follows from researchers being theory-laden (Sayer, 1992) that a sufficiently detailed description about the phenomenon studied allows the reader to determine whether findings can be transferred to different contexts (it is called a "thick description"). Thus, an examination of the inquiry process and the consistency of the research require an inclusion of and consider the researcher. Information about the researcher's background and the decisions that guided the process are integral parts of research development. Suddaby (2006) argues a similar point, advocating that instead of following the convention of deductive presentation logic, researchers should be more daring in the structures of their papers. Such presentations could improve dependability.

3. Methods in this article

The frame of reference is compared with the development of a PhD thesis (Eriksson, 2014). The thesis project extended over five years, but the work presented covers a time span of seven years. As such, the thesis here is similar to a longitudinal case study selected for illustrative purposes (Yin, 2009). The purpose of presenting the process is to suggest a coherent approach to knowledge creation in SCM.

This article subscribes to the quality criterion proposed by Lincoln and Guba (1985), which is mainly concerned with transferability and confirmability. The reason for focusing mainly on these quality criteria is coherent with the aims of this paper. The first is to share ideas with researchers regarding long-term research project and to inspire those in the SCM field to include ontological and epistemological considerations in their dissertations. The second is to contribute to an important debate in the field of SCM by presenting a research approach containing OEMMQ. These aims are important if other researchers are to apply the approach presented here.

4. Thesis research process

A Swedish PhD entails four years of full-time study and usually includes one year of academic work for the university. A PhD degree is thus supposed to take five years in total. PhD students either present their thesis as a monograph (Arnäs, 2007; Urciuoli, 2010) or as a collection of articles and an introduction (Hellström, 2007; Kalantari, 2012). The cumulative doctorate can be read as a stand-alone text that summarizes the findings in the appended articles and presents results from the entirety of the work. PhD students who opt for the later alternative usually present a licentiate thesis halfway through the PhD process. From here on, "thesis" is used to refer to the cumulative dissertation type that is written with an introduction. The outlined thesis process focuses on the development of the appended papers.

4.1 Outlining the case research process

The PhD studies commenced in 2009. At that time, it focused on value creation through increased consumer perceived value in a premium market segment. The interconnection between new product development (NPD) and SCM was central to the research. How a supply chain could be managed so to as support a specific outcome; in this case, value

creation and NPD, was the central focus of the research. The thesis topic was officially changed late in 2012, about one year after the presentation of the licentiate thesis.

In 2007, the Swedish media reported on misconduct in an African mineral mine supplying raw material to the global electronics industry. Later the same year, H&M gained media attention when it was discovered that their clothes contained cotton picked by child laborers, following orders from the Uzbek Government. Excuses that were made pointed to structural issues that enabled Swedish companies to avoid responsibility. Based on earlier SCM knowledge, mainly the concept of decoupling points (Mason-Jones *et al.*, 2000), I cynically assumed that the company had purposely constructed what I called "moral decoupling points", so that they did not have to take responsibility for the conduct in their upstream supply chain. At this time, the collection of reports on ethical misconduct and companies that tried to improve social responsibility in their supply chain began. If companies decoupled moral responsibility to avoid accountability, responsible companies should, conversely, construct their supply chain without moral decoupling points.

Over the following years, the idea of moral decoupling points was still considered, but not developed. In 2010, during a random search including key words similar to moral decoupling, the theory of moral disengagement (Bandura *et al.*, 1996; Bandura, 1999) was identified. Moral disengagement explains how individuals deal with dissonance between moral convictions and actions. Eight mechanisms are outlined, grouped into four main processes: cognitive restructuring, minimizing one's agentive role, disregarding or distorting consequences and victim attribution (Bandura, 1999).

4.1.1 Research paper 1. The first paper sets out to explain moral decoupling points, which was still a rather cynical notion. At this stage, it was unclear how to gather data. To overcome this issue, it was decided to review media reports on misconduct where companies blamed the structure of the supply chain. Three earlier-known supply chains, with different levels of horizontal integration (i.e. integration between actors in the direction of the material flow from extraction to consumption) were used as typical examples, so as to illustrate how control and transparency create conditions that companies used as excuses for misconduct in their supply chains. Some of the mechanisms of moral disengagement were not strictly related to structural issues, so it was suggested that moral disengagement might occur not only as a result of the structure but also as a result of the SCM. Moral decoupling was proposed and defined as the separation of moral responsibility from the other flows in the supply chain. A moral decoupling point was defined as an identifiable point where moral decoupling occurs. At this stage, moral decoupling was still considered a side project, and no plans for further research were made.

4.1.2 Research paper 2. Shortly following the first paper, the co-authors suggested writing a follow-up paper for a journal special issue on sustainability and ethics in global transportation networks. This paper linked the eight mechanisms of moral disengagement to specific aspects of SCM. Based on descriptions of the mechanisms of moral disengagement, it was first suggested how SCM might result in moral disengagement. Second, three supply chains were used to identify whether their management included those suggestions and whether they could result in moral decoupling and a moral decoupling point. At the time, it became clear that this paper would be accepted for publication, so it was also decided to pursue the topic in the thesis.

4.1.3 Research paper 3. Moving from independent articles to a thesis containing four papers had several implications for the ensuing research. Originally, Papers 3 and 4 had been written as one paper. The first and third parts of the original paper became Paper 4, and the second part of the original paper became Paper 3. Changing the order made it possible to use the framework from Paper 3 in Paper 4.

Up to this point, the literature on social responsibility had played an important role, but had not been reviewed thoroughly. The thesis required both a broader and deeper overview on the topic, so that a decision was made to find a new co-author who could contribute to the research with a fresh pair of eyes. Paper 3 contributed with a literature review on social responsibility issues. A framework that grouped recommendations, lessons and conceptualizations into 16 main elements was presented. Consequently, the framework presented state-of-the-art knowledge on how to improve social responsibility.

4.1.4 Research paper 4. Paper 4 sets out to tie up the loose ends. The first two papers presented moral decoupling and the third paper a framework of social responsibility elements. The elements were compared with recommendations that could be deduced from the issue of moral disengagement. As it was not possible to show that the deduced recommendations were made prior to the research presented in Paper 3, it was important to ensure consistency between moral disengagement, the conditions in which moral decoupling is likely to occur and the recommendations. What was not possible to show chronologically consequently increased emphasis on consistency. An overlap between the two research streams was found. Social responsibility and moral disengagement converged into one model, thus supporting the concept of moral decoupling as an explanation of how SCM can result in individuals disengaging their moral.

4.2 Communicating the process and decisions concerning the process

Initially, the intention was to write the thesis to reflect the research process as closely as possible. The first chapters were "Introduction" and "Research Approach", followed by four chapters, each dedicated to one article. The articles were each followed by "Answers and Analysis", "Interpretation of the Research" and "Conclusions". The researcher's theoretical background was outlined in the Introduction, and more theory was introduced along with the papers. In "Answers and Analysis", the final theoretical framework was presented. Colleagues found this structure hard to follow, so the theoretical framework was moved to a separate chapter after the Introduction (see Appendix for complete table of contents). This entailed a trade-off between a clear illustration of the research process and readability.

To increase trustworthiness and to reflect on the process, seven of the ten chapters include a section entitled "The Author's Thoughts". These sections were dedicated to presenting my personal views on the research, both to explain the decisions taken during the process and enable the reader to better understand the process. The later parts of the thesis also include what could have been done differently, if more had been known from the start. As such, these sections also highlight potential weaknesses of the thesis.

4.3 Models created

While it has been stated that research is a process devoted to creating knowledge, ontology, and epistemology is usually not part of a Nordic thesis (Gubi *et al.*, 2003; Zachariassen and Arlbjørn, 2010). In writing the thesis, it was decided to argue

how knowledge was created according to critical realism, outline a process that creates knowledge according to that definition and draw conclusions that include how knowledge was created according to the epistemology. A summary of these views on knowledge creation is presented in Figure 2, and is based on the theory presented in Section 2 of this paper. In the thesis itself, it is found in Chapter 2, "Research Approach".

The first part created in Figure 2 comprised the ontological domains. Both the researcher and the research community investigate the empirical domain. Depending on the relationship between the researcher and the literature, models and tools, different contributions to the body of knowledge are made. According to how the research progresses, the researcher needs to include more specific actual events into the empirical domain. When the body of knowledge increases, it becomes possible for the researchers to understand the nature of the generative mechanisms. If these are understood correctly, it is possible to make deductions about what events should be identifiable in the actual domain, which becomes the empirical domain when studied.

The process of knowledge creation was also compared with that outlined by Rotaru *et al.* (2014; Figure 3). In the thesis, it is found in Chapter 9, "Interpretation of the Research". One difference between Rotaru *et al.* (2014) and the thesis is that the former compared two different theories to determine what theory was most relevant. The thesis only identified one theory and, instead, compared deductions from that theory with deductive and inductive findings from the SCM research community. No other theories or concepts could be identified that were able to explain the phenomenon or provide such detailed descriptions that are applicable in SCM.

5. Analysis of knowledge creation in the thesis

Section 2 presented concepts, starting with abstract and ending with the specific. This section applies an opposing logic to make the reasoning easier to follow.

5.1 Quality criteria

The quality criteria relevant for this article will be addressed separately according to the descriptions from Lincoln and Guba (1985) and based on the criteria's relevance for the arguments in this paper. For discussion, see Table I.

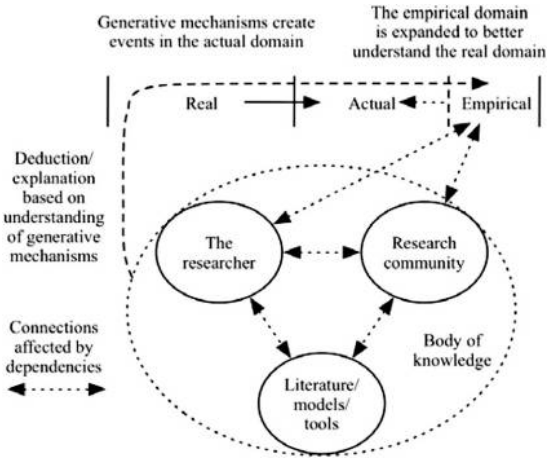

Figure 2.
Summary of research assumptions

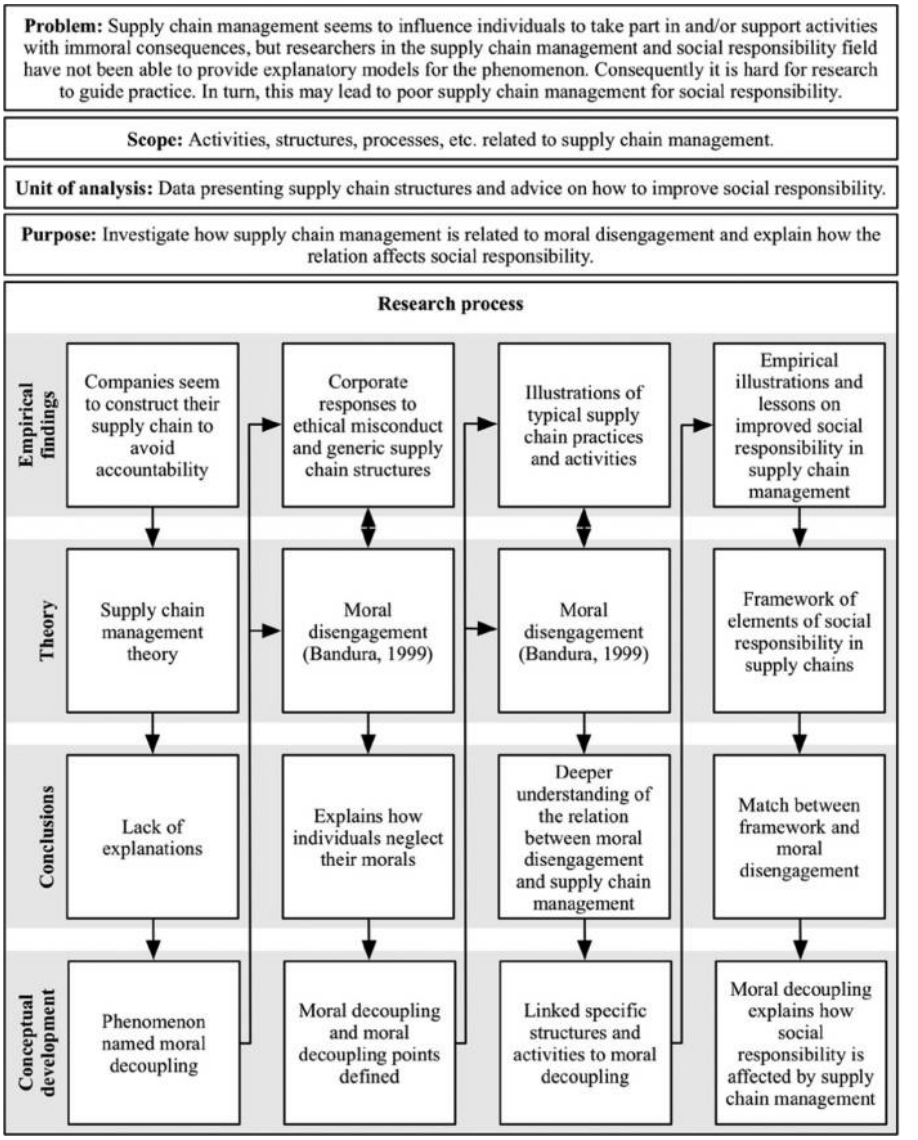

Figure 3.
Summary of the research

Credibility consists of seven (i-vii) criteria. Prolonged engagement (i) and persistent observation (ii) go hand-in-hand. Through long engagement, it was possible to achieve depth, but being involved long enough and with sufficient depth are somewhat dubious in relation to critical realism. Critical realism strives to understand more about the generative mechanisms (Danermark *et al.*, 2003), and it is fair to assume that more time will lead to greater depth and further understanding of the real domain. What is sufficient thus needs to be explained in relation to the delimitations of the research.

Triangulation (iii) has been used in various ways. Flick (2009) suggests four types of triangulation: data, investigator, theory and methodological. The described iterative research process has used all four types of triangulation. Theory triangulation is a result of systematic combining (Dubois and Gadde, 2002) and abduction (Kovács and Spens, 2005). Various theories have been included to better understand the studied phenomenon. While it could be assumed that abduction *per se* results in methodological triangulation, this is probably a fallacy resulting from claims that abduction is both deduction and induction. Here, the methodological triangulation is a result of Papers 1 and 2, and Paper 3 being compared in Paper 4. The methodology is elaborated in the next subsection. Peer debriefing (iv) has mainly taken place in review processes with editors and reviewers commenting on the research. Negative case analysis (v) means revising hypotheses in hindsight. This does not apply to how the methodology or methods were used (Hulthén, 2002). However, systematic combining can be seen as a constant questioning of earlier hypotheses, conclusions and frameworks in the research process, devoted to understanding more about generative mechanisms. Member checks (vii) simply allow informants to review data. A similarity in critical realism is accepting that we experience the world subject to the limitations of our senses (Björk, 2011) and the researcher interprets the data in relation to his or her background (Sayer, 1992). Accordingly, it is important that researchers avoid errors because of this bias.

Compared to research papers, the thesis has considerably more space. As such, it is able to provide a particularly rich and detailed description of the studied events and the research itself, which also increases transferability to other empirical settings. The format also provides room for improving dependability by outlining the process of inquiry to the reader. However, a dilemma needs to be addressed in this context, namely, whether to write chronologically, so as to accurately represent the process of inquiry, or to explain the chronology separately from the structure of the text. The abductive approach is discussed in the next subsection, and it is evident that, depending on how detailed one chooses to be, the process of inquiry can be confusing, because of both its iterative nature and multiple lines of reasoning taking place at once. Confirmability is part of the emergent research process of systematic combining (Dubois and Gadde, 2002). As such, the methods and methodologies (here systematic combining and abduction) should keep the level of consistency tight. In critical realism, knowledge is created through iterative processes, which was also the case in the thesis. The analysis shows that the quality criterion of trustworthiness is not only suitable for critical realism, abduction and systematic combining, it is intrinsically related to that research process.

5.2 Methodology and method

This section refers to Figure 1. Activities separated with a comma occur in the given order, activities separated with forward slash occur simultaneously. The research process below is complex and hard to follow, but it is important to highlight just how complicated a research process can be. This enables us to understand the need for models and concepts that simplify communication and increase understanding. It also reveals that it is not always easy to determine whether a process is abductive, deductive or inductive, thus highlighting the need for concepts such as systematic combining.

The research process in the thesis adopted the typical starting point of abductive research. That is, it started with the discovery of an empirical phenomenon about which no theoretical explanation was known to the researcher (A0). While it is generally

suggested that the first step of abduction is to identify matching theory (A1/A2), it is difficult to describe the exact course of the research, but deviating real-life observations (A1) were compared with theory (A2). The process applied theories from SCM to formulate a proposition (A3), that moral responsibility can be decoupled, and that it is used to avoid accountability.

When moral disengagement was discovered as a concept, it provided a new theoretical lens that would into develop moral decoupling. At this stage, both theory and data were introduced (A1/A2). This relates both to how systematic combining (Dubois and Gadde, 2002) attempts to match parts of evolving research and how knowledge is created in critical realism through including the actual domain into the empirical (Danermark *et al.*, 2003). The methodology is similar to the description of systematic combining, where "a creative iterative process […] of 'theory matching' or 'systematic combining' starts" (Kovács and Spens, 2005, p. 139). It could be argued that, if isolated, the process is similar to induction (I0, I1, I2), but that methodology implies a chronology between prior known theory and observations, which does not meaningfully illustrate the progress over several years. This part of the work did not yield a final hypothesis or framework, but a proposition of the concept moral decoupling.

To gain more knowledge about the mechanisms generating the observed events (Danermark *et al.*, 2003) and especially the contextual conditions (Sayer, 1992), it was decided to create a stronger link between moral disengagement and SCM. The next phase of the research entails similarities to a deductive approach. Through combining knowledge from two theories, deductions were made as to the supply chain configurations within which moral decoupling was likely to occur (D1, D2). In deductive reasoning, the next step would have been to test this conclusion (D3). It was not clear how to construct a controlled test or survey that measured moral decoupling according to the proposed configurations, so instead, observations were used to identify whether the specific configurations could be identified. The empirical domain was inherently expanded (I1), resulting in a detailed explanation of how moral decoupling can arise in supply chains, but it was still not a conclusion that corroborated any hypothesis/proposition about moral decoupling, nor was it a final theoretical framework. Consequently, this step might be seen as a continuation of the theory matching (A1/A2).

The third paper yields theoretical conclusions through logic (D1, D2). This is, once again, similar to a deductive methodology, but without any testing of conclusions. Still, one important objection needs to be made. Much of the literature presents findings on how companies succeed in implementing sustainable practices. As such, they are secondary sources of empirical data, which is not consistent with deduction, but reveals how induction yields conclusions from observable events (I1, I2). Consequently, depending on whether the reviewed literature is considered data or theory, it could be argued that this step was either deductive, inductive or both.

The fourth paper was dedicated to comparing moral decoupling, a result of an abductive process that constitutes a new theoretical framework (A3, D1), with logical conclusions from the literature review (D1, D2) and theoretical conclusions from observable events (I1, I2) that constitute a new theoretical framework (D1). These classifications are not conclusive, but illustrative of the process. This step is somewhat problematic for the research dependability (Lincoln and Guba, 1985). Papers 3 and 4 do not follow a chronological order, and therefore, it is possible to argue that recommendations based on moral disengagement are created to fit the elements of social

responsibility. To avoid criticism of circular argumentation, it became important to increase confirmability (Lincoln and Guba, 1985). Consistency is part of confirmability, which is one of the goals of systematic combining (Dubois and Gadde, 2002). Consequently, the quality criterion is matched with the method.

The fourth paper compares theoretical conclusions relating to moral disengagement and moral decoupling (D1, D2) with a framework from theory and observations (D1). It could, therefore, be argued that theoretical conclusions (D2) and a theoretical framework (D1) create new theoretical conclusions (D2), and that the final "product" is a theoretical conclusion (D2). If the literature review is considered as empirical data, it could be argued that the theoretical conclusions have been tested (D3). If so, the process can be seen as deductive (D1, D2, D3, D4). If the literature review is considered as theory alone, it could be argued that it was a deductive process, but that the testing of conclusions related to theory (D'3) instead of empirical data (D1, D2, D'3, D4).

This section has perhaps been the hardest to read in the entire paper, as it mixes complicated concepts with a detailed presentation of a research process. However, reflecting on what was complex, it is possible to make simplifications that can help to frame similar processes, as in Figure 3. The process of matching theory with empirics has been conducted on two levels. There is a micro process matching empirical findings and theory in a back-and-forth manner. There is also a macro process where conclusions from the micro process are proposed, and then brought back into a new micro process. The micro process is performed to obtain closure, whereas the macro process is performed to present and test propositions. The macro process has, in this case, also been spurred on by the need to publish findings throughout the course of the PhD. The micro process is then very similar to systematic combining, as defined by Dubois and Gadde (2002) and Kovács and Spens (2005). The micro process can be found in A1-A2 in Figure 1. The macro process is similar to the entire span of activities in the same figure. It follows that abductive processes are perhaps not best illustrated as a linear process from left to right, but rather as a circular process (Figure 4). A circular view of the process is also aligned with how research, according to critical realism, constantly

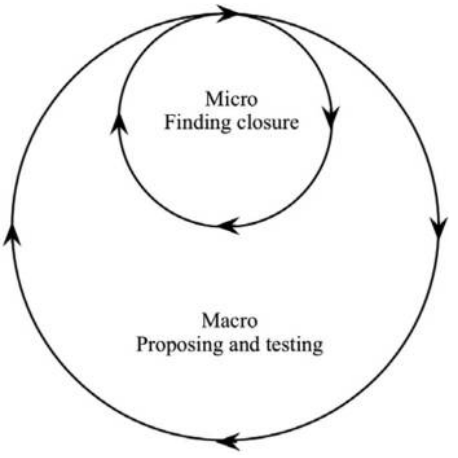

Figure 4.
Micro and macro processes of abduction

strives to provide a better understanding of the generating mechanisms (Bhaskar, 1978; Danermark *et al.*, 2003).

5.3 Ontology and epistemology

After the inclusion of moral disengagement the process was goal-oriented toward explaining why some individuals do not feel moral responsibility. This is coherent with Figure 2, which outlines how the researcher constantly interacts with both the empirical domain and the body of knowledge. Consequently, the researcher is able to better understand the mechanisms generating the observed events or find tendencies enabling assumptions as to what events will be generated depending on the objects studied and their context. The process does not focus on inevitable, specific and measurable conditions, but rather on tendencies of mechanisms to generate events based on the causal context (Sayer, 1992; Alvesson and Sköldberg, 2009).

Systematic combining and abduction describe the iterative process needed to work toward a better understanding of both generative mechanisms and the causal context. Abduction and critical realism share the assumption that research is an ongoing process. However, Kovács and Spens (2005, p. 139) argue that abduction ends with the application of hypotheses and propositions in an empirical setting, which can be characterized as a deductive part of the research. This statement can be interpreted as there being a final point where research is truly complete. Such a statement relies on an epistemology by means of which some "final truth" can be reached. A consequence is that we also accept that our senses are able to correctly interpret data, and generate knowledge that accurately describes generative mechanisms. In critical realism, this would imply a blurring of the line between ontology and epistemology. The presented thesis shows how abductive conclusions (A3) constituted the starting point for more inquiry in an ongoing micro/macro process (Figure 4).

Continuous efforts to gain knowledge about the real domain contradict the notion that there is a point where research can stop. There are, however, very good operational reasons to try and find some form of closure in a research project (Ragin, 1992). Research projects are limited in time, and there are limits to how much a researcher is able to convey in one single publication. A thesis is perhaps one of few contexts in which a researcher is able to pursue and present knowledge really comprehensively.

6. Discussion

It is may not be that confusing that the research shows the importance of matching OEMMQ. In SCM, however, this issue has not been developed in accordance with advances in the research field. Research devoted to the topic is somewhat limited in breadth. Aastrup and Halldórsson (2008) focus on ontology, epistemology, methodology and methods. They thus present a broad and encompassing approach, also acknowledging that issues with quality criteria are troublesome for the discipline. An implication from this paper is accordingly that researchers are now presented with an all-encompassing approach. This should help researchers to motivate clearly how they have contributed to knowledge creation, which is at the heart of the research. As such, the actual contribution of both longer and brief publications, mainly theses and peer-reviewed papers, can be improved. Paradoxically, even though this paper draws on a PhD thesis and is largely directed at PhD students who are researchers-in-training, the topic discussed is highly complex. Parts of the paper might, therefore, be difficult for

PhD students to internalize. The complicated parts are accompanied by models that simplify the most important findings, and the paper contains many of the most important sources that are helpful for learning the different topics included in this paper and the advocated approach to OEMMQ.

The above-mentioned implication includes the fact that it is possible to find suitable quality criteria for research in critical realism. Here, trustworthiness is suggested, as it provides solutions to several important criteria. Some of these are similar to or the same as the positivistic criteria suggested by Yin (2009). These are commonly used in the field of SCM. The findings imply that, although it might not be possible to find a single quality concept, it is possible to advocate a coherent approach, which should be done after careful consideration of ontological and epistemological assumptions and of the methodology and methods applied to create knowledge.

The analysis of methodology and methods illustrates several effects that follow from abduction. When a long-time project is presented, it might well be presented as abductive. However, it may consist of parts that are purely inductive or purely deductive. The researcher needs to carefully evaluate how much depth is suitable for presenting the methodology. The level of detail in this paper may confuse the reader and is, therefore, only appropriate if the end justifies the means.

When the research is presented, the chosen publication type might have an effect on how to describe the methodology. In a thesis, it is possible to include several papers, with some containing purely deductive or inductive methodologies, while the Introduction presents an overreaching abductive methodology. In a similar manner, an individual paper could be presented as a deductive or inductive part of a long-term research project. This would demonstrate that the thesis is a larger project than any individual paper, of which the paper represents only one part. Depending on how the individual paper contributes to knowledge creation and its role in the larger research project, it might be suitable for more commonly applied quality criteria. This discussion implies that researchers can improve their publications by highlighting how they contribute to the body of knowledge, through revealing the relationship between entire research projects and parts thereof, and how the presented scope relates to different publication types.

This research has shown how subjective writing constitutes an important part of critical realism. The research process starts with a theory-laden position (Sayer, 1992; Kovács and Spens, 2005) and is constantly directed and redirected (Dubois and Gadde, 2002). In the presented thesis, subjectivity determined the need to follow new paths of inquiry. The trajectory of the research process has always been to explain a causal context of moral disengagement and to identify generative mechanisms for the observed events (Rotaru *et al.*, 2014). As discussed above, this does not detract from the quality of the research. On the contrary, it increases the trustworthiness (Lincoln and Guba, 1985) and is a way of escaping the positivistic "rucksack" that is carried by researchers in the field (Aastrup and Halldórsson, 2008). The subjective writing has, however, been carefully separated from the analytical parts of the thesis, in which typical measures for increasing credibility were employed, such as triangulation, member checks and prolonged engagement (Lincoln and Guba, 1985).

The importance of and the reason for embracing both subjectivity and objectivity, and how they relate, is illustrated in Figure 5. The area represents the uneven context in which research takes place. Some areas are like mountaintops – hard to reach, and others are like pits – easy to fall into. The black sphere represents the research. Inside the sphere, measures

are taken to ensure that the output is correctly interpreted, but the lens of interpretation is determined by the researcher's frame of reference. The hand represents the researcher who, being theory-laden and subjectively oriented, considers both the output and the research landscape, and determines the research direction. This implies that to produce high-quality research, it is important to explain the landscape, how the research is performed, the results and how these shaped the ongoing research process.

The thesis was initially chronologically structured to increase trustworthiness (Lincoln and Guba, 1985), to adhere to recommendations on avoiding positivistic writing (Suddaby, 2006) and to openly demonstrate that the research did not attempts to comply with the positivistic expectations imposed on researchers in the field (Aastrup and Halldórsson, 2008). The analysis shows how difficult it can be to untangle all the research approaches and identify snippets of deductive or inductive reasoning, and that simplified models are perhaps better, even if they remove some of the finer details. The findings imply that abduction is a label that needs to be applied with caution. Researchers need to question whether it is appropriate to explain parts of research as deductive or inductive, and consider the need to relate these methodologies to the overall methodology and considerations of knowledge creation and quality criteria.

Starting the research with a phenomenon that had not so far been explained, led to several interesting conclusions, enabled through mechanisms that would otherwise never have been foreseen. It also begs the question of how the research would have progressed with a positivistic or interpretivist approach. Bryman and Bell (2007, p. 16) summarize the key points of positivism as follows:

> Only the phenomena and hence knowledge confirmed by the senses can genuinely be warranted as knowledge […]. The purpose of theory is to generate hypotheses that can be tested and that will thereby allow explanations of laws to be assessed […]. Knowledge is arrived at through the gathering of facts that provide the basis for laws […]. Science must (and presumably can) be conducted in a way that is value free […]. There is a clear distinction between scientific statements and normative statements and a belief that the former are the true domain of the scientist.

Critical realism differs in several ways, for example, stating that we experience the empirical domain through our senses (Björk, 2011). Accordingly, the purpose is not to generate testable hypothesis, but to gain knowledge about the mechanisms which generate events and the context in which they are activated (Fox and Do, 2013). To arrive at knowledge, one does not study facts in critical realism, but interpretations of

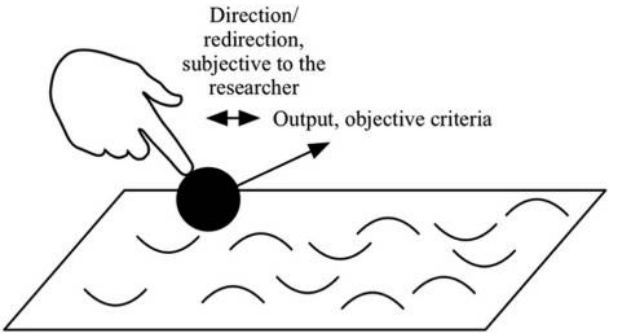

Figure 5.
Interplay between research, the context and researcher subjectivity

observable events (Danermark *et al.*, 2003; Björk, 2011), and science is conducted by theory-laden researchers and is, therefore, subjective (Sayer, 1992).

Bryman and Bell (2007) explain that interpretivism is an alternative to the positivistic orthodoxy. It is said to respect the differences between people and objects of the natural sciences. Consequently, social scientists are required to understand the subjective meaning of social action. There may be one important lesson to learn from interpretivism. Even if social behavior and natural objects are both considered to be governed by generating mechanisms according to critical realism, it may not be suitable to investigate the phenomena in a similar fashion. Perhaps, it is possible to measure some events, while others need to be understood, at least until we know more about the mechanisms that generate the events.

The findings imply that researchers should be careful in stating what methodology they have used and how they have operationalized it to create knowledge. Abduction does not conform to a positivistic or interpretivism epistemology, and claims at knowledge based on abduction need to be made according to a suitable view of knowledge.

This paper has implications for entire research fields, showing that it is important to embrace the subjective differences between different researchers. Two different researchers with different backgrounds are likely to follow different research paths, if they depart from the same observed events. Imagine Figure 5, but with two black spheres starting at the same point! The initial output should be the same, but the researcher interpreting the output would find different interesting snippets of information and see different places in the research landscape in which he or she prefers to continue the research. Both destinations have the potential to individually suggest generative mechanisms for the studied events or to jointly eliminate the least relevant ones.

The research presented here could benefit, if someone who has studied similar events through a different lens were to contribute with their subjective interpretation and research path. In some sense, that is actually what this research contributes to the body of knowledge. A joint understanding of the generative mechanisms would constitute a platform for understanding the mechanisms even better. This implies that, according to critical realism, researchers can advance research by simply continuing the abductive process through the inclusion of theories not previously used. Advancements can be made by concluding that the theory did not explain the generative mechanisms, or, as in the presented thesis, provide a new tool for interpretation that facilitates a deeper understanding of events that have been observed for decades.

7. Conclusions

This paper pursued two goals. The first was to present lessons learned from writing a PhD thesis, and the second to present an approach to knowledge creation encompassing OEMMQ. Sharing what was learned by outlining an academic process that followed a certain approach constitutes an empirical contribution. Coupled with the approach to knowledge creation, the paper makes several theoretical contributions, for example, the models presented in Figures 2, 4 and 5.

The approach to knowledge creation has been presented in an analytical manner, from theoretical the framework to the discussion. The suggested approach combining critical realism, abduction, systematic combining and trustworthiness contributes with an approach to knowledge creation that includes considerations relevant to both abstract and

concrete aspects of research. The approach is also carefully developed, so as to have high internal consistency, based on how research in the field can be conducted.

The appropriateness of combining critical realism and abduction has been established. At the heart of critical realism lies humbleness toward the assumption that we can only study generative mechanisms through the events they cause. By way of an abductive methodology, we are able to work constantly toward an improved understanding of these mechanisms. Abduction has been presented here as a micro/macro process (Figure 4), where systematic combining is the micro process. Although other authors have already concluded that systematic combining is central to abduction, the model presented here highlights how they are related in a process without any clear finish line. This model is particularly useful for publications that present parts of a research project, or that aggregate several parts into a larger project. Finally, trustworthiness has been shown to support the type of iterative, researcher-dependent process that this approach constitutes.

The suggested approach included several implications that are important for researchers. Consequently, it also constitutes a practical contribution. Researchers who find it useful can apply the specific approach to improve the quality of and knowledge creation in their work. Other researchers who do not subscribe to the same views on the nature of the world or the nature of knowledge can also benefit from this paper, if they internalize the demonstrated importance of retaining consistency and coherence between OEMMQ.

Important works on methodology and methods (Eisenhardt, 1989; Dubois and Gadde, 2002; Kovács and Spens, 2005; Aastrup and Halldórsson, 2008; Yin, 2009) contain one shortcoming that did not motivate this paper but has been addressed implicitly. The works are primarily concerned with how to conduct research. As shown in this paper, the publication type is important for several reasons. If the outlet is generous with space, it allows the author not only to describe the research in greater detail, it is also likely that the research will cover a longer time-frame. If the publication type, on the other hand, is limited in space, the author might need to use simplifying models to describe the research and might also cut down the research description, so that only a few steps are included. The reduced process could imply a methodology that is not consistent with the views on knowledge that guided the research. This could convey an inconsistency between ontology and epistemology, and methodology and methods. It could also perpetuate misconceptions on what researchers currently consider to be acceptable knowledge in a discipline.

Critical realism includes both ontological and epistemological considerations. Abduction is a commonly advocated methodology in relation to critical realism. At the heart of abduction, methods can be found that are explained by systematic combining. In addition to systematic combining, a communication approach that does not attempt to hide, but rather publicly displays subjectivity, is advocated. An illustration of the relationship between objectivity and subjectivity, and researcher, research and research landscape is provided. Instead of evaluating the research based on "classical" quality criteria, a more appropriate approach with greater trustworthiness has been advocated. The conclusions imply that researchers can find support for approaches not considered to be the norm. However, the selected approach requires deliberation on what is considered knowledge, how knowledge is created and how the research has contributed to knowledge creation. Accordingly, this should not be seen as the "final" conclusion, but just one step closer to understanding how researchers in SCM, and related fields, can go about creating knowledge. This paper has offered one such approach.

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Figure AI.

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