logistics

MDPI

Review

Learning from Returned Products in a Closed Loop Supply Chain: A Systematic Literature Review

Ilkka Ritola *, Harold Krikke and Marjolein C.J. Caniëls

Faculty of Management Sciences, Open University of the Netherlands, P.O. Box 2960, 6401 DL Heerlen, The Netherlands; harold.krikke@ou.nl (H.K.); marjolein.caniels@ou.nl (M.C.J.C.)

* Correspondence: ilkka.ritola@ou.nl

Received: 5 March 2020; Accepted: 31 March 2020; Published: 8 April 2020

Abstract: Product returns are a source of valuable information that can be used by firms and supply chains to improve products, services, and decision making. However, firms are struggling to maximize the value of this information, and the extant scholarly literature is scattered among various research streams. Using a systematic literature review, the state-of-the-art of product returns informational value research and limitations in the current body of work were examined and future directions for research suggested. Three types of informational value were identified, namely operational information, product related information, and customer-related information, along with four value-creating factors, namely strategic information system (IS) decisions, organizational learning, information sharing, and technological solutions. Implications for practitioners are discussed. Lastly, the limitations are discussed, along with recommendations and directions for future research work.

Keywords: closed loop supply chain; circular economy; reverse logistics; product returns; organizational learning; knowledge management; information systems; innovation

1. Introduction

Sustainability and green business practices can have a variety of benefits when properly utilized [1]. Circular economy practices, closed loop supply chain (CLSC) management, and product returns management are among these emerging value-adding business practices [2]. Product returns, in particular, are a source of valuable information [3–5]. The value of this information stems from its benefits to operational and strategic decision making [6]. Product returns are part of reverse logistics (RL) and CLSC management. Following Guide and van Wassenhove, the researchers define CLSC as "the design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time" [7]. Scholars have recently identified four types of CLSC values: economic value, environmental value, customer value, and informational value [3]. Informational value stems from the fact that products are returned for a reason, and by understanding returns reasons, firms can derive essential insights for their specific situation. What makes returns information particularly valuable is the fact that it offers a window into the use of a product by its end customer. At the same time, advances in big data technologies [8] and knowledge management practices [9] have made it possible for firms to derive new insights from a variety of sources. When properly utilized, product returns information can serve as a source for customer, economic, and environmental value, ultimately leading to increased performance through process and product improvements and an improved ability to meet changing customer wants and needs.

While undoubtedly valuable, firms are struggling to learn from product returns information adequately. There are several reasons for this. First, many firms still undervalue the value of CLSC information [10]. Secondly, firms lack the necessary information and capabilities to capitalize on this

information. For instance, a recent study found that most online retailers lack the data and learning capabilities to manage product returns information properly [4]. Scholars can improve the situation by conducting relevant research. Unfortunately, while relevant research does exist, it is scattered among different research streams, making it challenging for practitioners to implement solutions based upon the findings and for academics to build upon the existing insights cumulatively.

This literature review aimed to address this lack of clarity by bringing together relevant insights from different streams of research. In addition, this study complements recent, and related, literature reviews in the topics of green value chain practices [1], big data analytics [8], knowledge management [9], and CLSC value creation [3]. The research question was therefore formulated as follows: What types of valuable information are there in product returns processes and how can organizations utilize information embedded in product returns for value creation? In order to address this research question, a content analysis based inductive literature review was employed. Accordingly, this literature review aimed to clarify what valuable information is in product returns and how organizations can utilize information embedded in product returns for value creation. Additionally, this literature review provides directions for further research by clarifying what is currently known on the topic, what theories and frameworks have been applied in order to address the topic, and identifying gaps in the literature.

2. Materials and Methods

In order to address the research aim, this study followed the methodology of the systematic content analysis-based literature review [11]. In line with the systematic approach to literature reviews [11] and similar recent literature reviews [3], this study was conducted using the following steps: (1) the research question was defined; (2) the relevant studies were located and downloaded; (2) descriptive analysis was done; (3) inductive content analysis was done; (5) results were reported. The research question was explicated and motivated in the introduction. This section details how the studies were located, how the descriptive analysis was carried out, and how the inductive content analysis was carried out. The descriptive results are presented in Section 3.1 and the thematic results, derived from the content analysis are presented in Section 3.2. For locating the relevant studies, two search engines were used to find suitable papers for this review: Web of Science and EBSCO (databases: Academic Search Elite, GreenFile, Business Source Premiere). These databases offer substantial coverage of high-quality research in terms of management and organizational research and are frequently used in literature reviews.

Keywords were formulated with the aim of locating relevant research works from a variety of research strands. In order to choose the correct set of papers, several underlying assumptions were articulated. This research took aboard a wide range of theoretical perspectives and research streams in order to best answer the research question. It was assumed that superior ability to handle information flows requires information systems (IS), but IS alone is not enough alone to understand how information is best utilized [6]. Therefore, the aim was to identify the studies that best illuminate our understanding of how the valuable information is collected, processed, and shared, along with the agents who need it most, and ultimately how to implement changes based upon the information.

With this in mind, the keywords "closed loop supply chain", "circular economy", "product return*", and "reverse logistics" were chosen. For each of these, the AND function was used to pair it with each of the following; "information management", "information sharing", "information systems", "knowledge management", and "organizational learning". The purpose of the * symbol is to define a placeholder character in order to broaden the search. The keywords used are presented in Table 1. In total, 20 unique searches were made using each search engine, totaling 40 searches. At this stage, only peer-reviewed journal articles written in English were considered. After removing duplicate papers, a total of 199 unique English language peer-reviewed papers were retrieved.

Table 1. Key words used for article search.

Closed Loop Supply Chain Related Keyword	Informational Value Related Keyword
Closed Loop Supply Chain	Information Management
Circular Economy	Information Sharing
Product Return*	Information Systems
Reverse Logistics	Knowledge Management
	Organi*ational Learning

The remainder of the study location process was conducted in three phases. First, titles and abstracts of the studies were read, and articles that were outside of the scope of RL, CLSC, and product returns management were excluded. Moreover, papers that did not have a component of information, data, or knowledge in the reverse supply chain or CLSC context were removed. Thus, the papers included were English language peer-reviewed research works that deal with the creation, storage, and use of information/data/knowledge originating from reverse supply chain-related activities. The inclusion and exclusion criteria are summarized in Table 2. After these phases, two more papers were added using a snowball process, meaning relevant papers not yet included in this literature review were identified from the ones cited by the included papers. A total number of 59 papers were included in the final analysis.

Table 2. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
English language studies were included	Studies in any other language other than English were excluded
RL, CLSC, Product Returns related studies were included	Studies not related to RL, CLSC, Product Returns were excluded
Studies with a significant focus on data, information, and knowledge were included	Studies without significant focus on data, information, and knowledge were excluded
In terms of time of publishing, all studies were included	Studies that were not peer reviewed were excluded

For the purposes of descriptive analysis, the name of the study, journal name, journal category, year published, methodology, and theoretical underpinnings, for each study were recorded. The descriptive results are reported in Section 3.1. In terms of inductive content analysis, following the guidelines set by Seuring and Gold [11], the selected studies were analyzed using a content analysis approach, similarly to several recent related literature reviews [1,3]. Considering the novelty of this research topic, explorative rather than a theoretically grounded approach to category analysis was chosen. This means the analytical categories were built and refined inductively through several iterations of content analysis coding [11]. The coding rules were defined from the outset to match the research aim, namely, to identify the types of information, technologies, and practices that create value from the information. In practice, the reviewed articles were coded multiple times in order to create themed categories. The categories were then organized and interpreted in order to answer the research question. Moreover, the emerging categories were validated by all the three researchers and further refined during the iterative analysis process.

3. Results

3.1. Descriptive Results

The 59 papers analyzed fall under the period of 2002–2020. Most of the studies were published during the more recent years, 2012–2020, while the early 2000s rarely had more than one paper

published in a given single year. It is evident that this topic is garnering increasing attention from the research community.

Studies on the topic of our research were published by the International Journal of Production Research (5), European Journal of Operational Research (3), and International Journal of Physical Distribution and Logistics Management (3). The rest of the journals included either one or two studies. The journals cover topic areas such as logistics/operations management, information systems, manufacturing/production/technology, and sustainability as detailed in Table 3 below.

Table 3. Journal categories.

Journal Categories	Number of Articles
Logistics/Operations	19
Information Systems	15
Manufacturing/Production/Technology	12
Business/Economics	5
Sustainability	3
Marketing	3
Other	2

There was a substantial amount of diversity concerning the methods used in the studies. The majority of the papers were empirical, 26 case studies, and ten surveys. The rest of the papers (23) were not empirical and fell under conceptual, mathematical, and simulation. The prevalence of case studies can be understood to reflect the relatively new topic of research along with its complexity and the multitude of stakeholders involved. Moreover, most of the studies were RL-related studies, and a smaller number of papers took the CLSC view. While these concepts are related, it is essential to note that there are differences between the way various authors use these concepts. It is interesting to note that the majority (38) did not explicitly rely on management theories. The most commonly used theories were the resource-based view, knowledge-based view, and various approaches to knowledge management.

3.2. Thematic Results

3.2.1. Informational Value

There are three types of informational value embedded in CLSC processes, broadly speaking. This categorization is based on the utility, or the value, of the information types. First is information that can be used to improve the efficiency and effectiveness of the CLSC operations. The second type of informational value has to do with the information regarding a product, which can be used to improve existing products. The third type of informational value is information regarding the customer base, customer wants and needs, and reasons for the returns, which can be used for strategic decision making. Table 4, depicts the studies contributing to each type of information.

Table 4. Overview of the types of informational value.

I Operational Information	II Product Information	III Strategic and Customer Information
[12–55] [56–62]^{I,III}	[5,6]^{II,III} [63,64] [65]^{II,III}	[4] [5,6]^{II,III}[66,67] [56–62]^{I,III}[65]^{II,III}

Note: The superscript denotes a study that contributes to several types of informational value, whereby the number indicates which types.

The type of informational value that has garnered the most amount of scholarly attention, by a wide margin, is the first type, namely operational information. This information is used to create value by increasing the effectiveness and efficiency of CLSC-related policies, such as return

policies [28,58] and processes, for instance by predicting quantities [12,21,33,55] and quality [25] of product returns, improving inventory management [37], handling recalls [47], returns processing, and redistribution [57], especially with regard to time sensitive returns [14,24]. This information stems from quantitative operational [12] and transactional data [13,14,56,62] as part of the various CLSC processes. It can additionally be qualitative and tacit knowledge [56] or automatically collected data using radio-frequency identification (RFID) [16]. These data are used to improve the efficiency of operations [18], improve operational decision making [15], for cost reduction [18], and to reduce uncertainty regarding returns quantities and quality [19]. Overall, increasing CLSC information visibility [24] and quality, both inside a firm as well as supply chain partners [26,27], has substantial benefits for CLSC management.

The second type of informational value is used to improve existing products by harvesting relevant information from CLSC processes. In the extant literature, the mechanism of how this happens is often not explicated. However, the research shows that CLSC processes do contain information that can be used to improve products [65]. This information can be sourced from qualitative feedback on product design [63,64] or through systematic quantitative data collected during the return transaction. However, as a recent case study [65] illustrates, sometimes products are returned too late for firms in high speed industries to properly learn lessons from them.

The third type of informational value is information regarding the customer base. This category includes general information about the customer base [65], but also the reason for the return as stated by the customer [57]. Additionally, the data collected can serve as a source for data mining to better understand the underlying reasons for returns and analyze customer segment behavior, preferences [58], and returns patterns [66]. The value of this type of information is realized through insights into strategic decision making by the way of understanding customer needs and wants better.

3.2.2. Value Creation Factors

In order to better understand how concrete value is created from CLSC information, the researchers identified value-creating factors from the analyzed studies. The inductive content analysis revealed four value-creating CLSC information factors. This means, these factors emerged from the extant literature through bottom-up analysis rather than through a theory-driven approach. These value-creating factors are strategic IS decisions, organizational learning, information sharing, and technological solutions. Many of the studies had elements that contribute to more than one value-creating factor, and thus they were included in multiple categories when necessary. Table 5 below gives an overview of the value-creating factors and the relevant articles associated with each of them. In this section, the researchers explicate and detail the value-creating factors.

Table 5. Overview of the value-creating factors and associated studies.

I Strategic IS Decisions	II Organizational Learning	III Information Sharing	IV Technological Solutions
[14]^{I,II}[17,18][22,23] [24]^{I,IV}[25] [26]^{I,III} [27][28]^{I,III}[29]^{I,IV}[30,31] [32]^{I,III}[33]^{I,IV} [34, 35]^{I,III}[36,37][45]^{I,III}[51] [57]^{I,IV}[59][65]^{I,II,III}[66]	[5][14]^{I,II}[20]^{II,IV}[21][38] [39]^{II,III}[56]^{II,III,IV}[60,61] [64]^{II,III}[65] ^{I,II,III}	[13]^{III,IV}[16]^{III,IV}[25][26]^{I,III} [28]^{I,III}[32]^{I,III}[34,35]^{I,III} [39]^{II,III}[40–43] [45]^{I,III}[49]^{III,IV}[53][56]^{II,III,IV} [63]^{III,IV}[64]^{II,III}[65]^{I,II,III} [67] ^{III,IV}	[12][13]^{III,IV}[15][16]^{III,IV} [19][20]^{II,IV}[24]^{I,IV} [29]^{I,IV}[33]^{I,IV}[44][45,46, 46–48] [49]^{III,IV}[50][52][54,55] [56]^{II,III,IV}[58][57] ^{I,IV} [62][63]^{III,IV}[67]^{III,IV}

Note: The superscript denotes a study that contributes to several value creating factors, whereby the number indicates which factor.

As depicted in Table 5, the first value-creating factor involves strategic IS-related decisions. IS is a major part of CLSC management, and the results of this study affirm that creating value from product returns information is no exception. The use of IS in the context of the CLSC has seen increased

attention recently. It is clear that IS-related resources and capabilities are critical for the collection, processing, and sharing of product returns and other RL-related data. IS is also the most researched value creation factor. Under the umbrella of strategic IS factors are IS capability, logistics IS, and CLSC partnership-related IS.

IS capability is the capacity of information technology to support business operations, in this case, RL and CLSC operations. The importance of IS capability for RL and CLSC management has been studied using various outcome measures and with varying results. The results of the earliest IS capability-related study in our review [22] indicates that IS capability has no relationship with either financial performance nor management satisfaction. Likewise, a more recent study [36] found no significant relationship between IS capability and RL performance at neither economic nor operational level. However, other studies have shown that high IS capability increases economic performance [51], RL service quality [51], and goal setting and goal attainment, ultimately leading to better performance through goal setting [33]. Furthermore, another study showed that IS capability helps in maximizing the informational value of product returns leading to strategic goal attainment [66]. A recent case study showed that a value creation-focused CLSC, as compared to cost reduction-focused one, requires a more sophisticated IS [27], and specifically, when it comes to generating customer and environmental value, where both internal IT but also external partner and customer-focused IT is required. Overall, it can be stated that value creation-oriented CLSC has different requirements as compared to cost reduction-focused or following the bare minimum regulatory requirements-oriented CLSC. Olorunniwo and Li [26] underscored the importance for firms to consider managerial and human resource issues when making IS related decisions. Nonetheless, it is clear that a minimum level of IS capability is required in order to collect and process information efficiently, leading to efficient RL operations, as was demonstrated by a recent study in Africa, where the lack of RL IS remains among the most significant barriers to effective RL [17].

While the results of the studies on the efficacy of general IS capability vary, more CLSC and RL-related and -targeted IS measures seem to show more unambiguous results. This means IS measures specifically targeted towards logistics, RL, and CLSC seem to be more effective in terms of informational value generation than general IS capability. For instance, several studies have shown that logistics IS improves economic performance [32,66], along with operational performance [45,57,66], and strategic performance [36]. However, a survey [35] conducted on the mobile phone industry in China revealed a lack of relationship between logistics IS and RL performance, indicating that even CLSC-focused IS is not the whole story.

Along with logistics IS, partnership- and customer-focused IS is another vital part of strategic IS CLSC decisions. There are several ways partnership- and customer-focused IS facilitates value creation in a CLSC. First, it can facilitate information sharing and improve cooperation between partners in a CLSC, leading to improved operations and customer value creation [26,34]. Secondly, by focusing on customer-facing IS, firms can improve their economic and operational performance [36] and attain strategic goals [66]. A recent case study confirmed the benefits of having an IS extending to customers, along with supply chain partners, while emphasizing the need for both internal as well as external IS [27]. Moreover, IS resource commitment to RL IS can lead to improved third party RL and strategic benefits [45], however these investments should be RL focused rather than general in nature [51].

The second value-creating factor is organizational learning. This value-creating factor refers to organizational learning and knowledge management routines inside and between firms that aim at gathering, storing, and utilizing product returns information in a productive manner. While studies are limited, they illustrate some of the ways in which firms can use the informational value of product returns to create further value. For instance, by the creation of RL knowledge, firms can learn how to handle the inherent unpredictability of product returns better, reduce costs, and increase overall value recovered from returns [21]. Additionally, studies indicate that RL knowledge creation increases decision making quality [61], information visibility, and distribution [60], ultimately leading to strategic change and innovation [60], and increased firm performance [61]. Additionally, several case studies

have illustrated the potential of qualitative returns information. This qualitative information, for instance, from interviews or short talks with the returning customer, can be disseminated inside a firm and used for various purposes, for instance, for new product development [64]. However, as noted by a recent case study [5], the cross-functional nature of product returns management requires good communication conditions and firm wide business practices. The results of another study indicated that the codification of product returns information increases firm performance [38]. Another study showed the potential of utilizing a CLSC expert system to detect potential upcoming CLSC related problems [20,59].

The third value-creating factor, information sharing, is a widely researched issue in CLSC and RL. While information sharing is closely related to CLSC IS, as in most cases information between partners is shared using IS, it is not merely an IS-related issue. Instead, information sharing involves barriers and enablers beyond the technological IS-related factors. These include decisions regarding when and under what circumstances it is advantageous to share information and how can firms do it to maximize value creation.

The earliest study on RL information sharing was a case study involving the development of a web-based demand planning system [13]. Unsurprisingly, the web-based system proved to be more efficient as compared to phone or fax. Studies since then have shown the benefits of information sharing beyond a rudimentary web-based IS used for information sharing. These include simplified product returns policies [28], increased RL operational performance [34,39,49], product recovery efficiency, and responsiveness [25,41]. The sharing of product returns information can be especially beneficial for manufacturers who do not have direct customer contact but rely on retailers for sales and returns [42]. However, different participants in any given CLSC often have different goals and incentives, and this influences their willingness to share information [40]. Considering the benefits of sharing returns information in a CLSC, it is therefore important for firms to understand when it is in their interest to share information among their partners and how the incentives between them can be aligned in order for them to create a win–win situation [53,67].

The fourth value-creating factor is technological solutions. This factor refers to technological advancements such as data mining techniques and big data analytics, along with the use of RFID in RL and CLSC. These technologies, when properly utilized, can help firms to collect data more efficiently and gain insights from the data in ways not possible, or very difficult, without them. The studies conducted on this domain show the different ways in which these technologies can be used to maximize CLSC informational value.

RFID is considered useful in a RL and CLSC context [44]. Studies show that they can be used to gather more precise, accurate, and timely data [50]. This can lead to improvements in inventory management [16]. At its best, the use of RFID in a CLSC can help firms to make their operations more efficient, reduce their operational costs, and provide the firm with quality information in the form of life-cycle and module-level data.

RL and CLSC data mining is another major technology-related factor that has gathered attention from scholars. Studies indicate that data mining can often be a significant benefit for CLSC informational value creation. Yu and Wang, in their 2008 study [58], illustrated a hybrid data mining approach that can be utilized by firms to cluster products and customers, giving the firms insight into marketing strategies and returns policy development. Another study [19] showcased a fuzzy expert system that uses product returns data to predict the number of returns in order to reduce the inherent uncertainty of RL operations. Likewise, machine learning can be used to predict return volumes [55]. Another expert system uses RL data to provide decision makers with decision recommendations regarding returns, which helps them to predict product returns as well as reduce the number of unwanted product returns [20]. The author of the same study viewed product returns as an essential form of customer interaction, which, when properly taken advantage of, can lead to a competitive advantage [20]. Finally, using an algorithm and an experiment, Fu et al. [62] showed that firms can identify the most likely product returns, along with the reasons for the returns, possibly helping firms to identify fraudulent

returns, and to identify shipping problems and products in need of better descriptions in the online shopping environment. The studies, therefore, clearly illustrate that data mining has great potential in RL and CLSC context. At the same time, firms are struggling in practice to take advantage of the most salient advantages shown by these studies [36].

4. Discussion

The results of this systematic literature review show that CLSC informational value is a multifaceted source of value, with its peculiar challenges and opportunities. The pay-off from learning from this information can be high. The results of this study identified four value-creating factors and three informational types. The separation between the processes and technologies used to gain value from the three types of information is not strict, and it is possible that they support each other. Regardless, it can be stated that when moving from the operations-oriented issues of the first type of informational value to the more tactical and strategic level of the second and the third types, complexity increases, and more actors need to be involved inside and outside of the firm in order for value to be created. If utilized correctly, the informational value can be leveraged for improved processes, product design, new knowledge assets, marketing strategies, and ultimately to increased firm performance. In short, by developing the ability to capitalize on product returns information, firms can gain insights into product development, customer needs and wants, operational issues, and strategic decision making. Below the researchers discuss the three types of value in the light of the four value creation factors.

4.1. Operational Information

Operational information is the most researched and best-understood type of informational value. In this regard, the essential value-creating factors have to do with fundamental IS-related capabilities. Good quality, visible, timely data are required in order for firms to increase their understanding of CLSC operations. Technological advancements, such as the use of RFID and data mining, hold potential for operational information. RFID, in particular, has been shown to reduce costs, increase the quality of data, and lead to better decisions in this regard. Lastly, the literature shows the benefits of operational information sharing, although the conditions for sharing must be right and ensured by the supply chain participants. Overall, the value of operational information is achieved through predicting return quantities, improved understanding of the quality of the returned product, improving returns decision making, and reducing the number of unwanted returns.

The results of this study have implications for research and practice. For instance, it is not clear to what extend high IS investments and the newest technologies improve operational information value beyond a certain point. Therefore, firms should be mindful regarding the purpose of their RL and CLSC operations along with their managerial and human resource situation, and invest accordingly. In addition, more research is required in terms of operational information. For instance, research on the cost–benefit analysis of CLSC technologies and IS. Moreover, it is not clear exactly how organizational learning processes lead to concrete actions from operational information, as the research has mainly focused on IS and technology-related issues. Therefore, more research on organizational learning routines in the context of RL and CLSC should be conducted. Green business practices are another area that could benefit from operational CLSC information, considering such practices require a holistic approach [1]. Lastly, to complement a recent call for more CLSC information sharing [2], it is suggested that information sharing research should combine interorganizational learning routines to better understand what is required for better CLSC collaboration and coordination.

4.2. Product Information

In contrast to operational information, product-related information is substantially less well understood. Clearly, capitalizing on this value fully is more complicated and difficult. Still, it is evident that product returns, especially end of life returns, present firms with an opportunity to improve their

products. The research points to the potential of product and service information, but the learning processes, barriers, and enablers are not thoroughly researched.

More product information research is required. One interesting avenue for research would be to explore the utility of interorganizational sharing of product information along with interorganizational learning routines in terms of product improvement along a CLSC. With this in mind, case studies involving a retailer and brand owner could be one useful approach. Additionally, researchers should consider studying the types of IS needed for a CLSC in terms of product information value creation. This could be a fruitful approach considering the emergence of RL and CLSC-dedicated IS. Lastly, the researchers recommend studying the combination of qualitative returns information with quantitative, and approaches to product and service improvement routines based upon them. Overall, in line with the current trend in CLSC research moving to holistic [2], value creating [3], and strategic [7] concerns, devoting more research effort to product information and strategic and customer information is another step in that direction.

4.3. Strategic and Customer Information

Understanding the needs and wants of customers is a real benefit of learning from CLSC information. This can happen through qualitative information or quantitative data analysis. Therefore, the results are in line with previous studies in big data and knowledge management in other fields [8,9]. The benefits of organizational learning via qualitative data have been showcased in this regard. Similarly, data mining has been shown to be a valuable tool, especially for larger firms dealing with large amounts of quantitative data.

However, studies are limited both in number and in scope. For instance, while data mining approaches have been shown to be beneficial by the showcase of various tools and mathematical approaches, it seems to be much harder for firms to actualize these benefits. Therefore, more case studies are needed that show the use of data mining techniques in actual business practice. This would shed more light on the barriers and enablers to actualizing the benefits of strategic and customer information. Such case studies could be combined with other value-creating factors, such as organizational learning, IS capabilities, and information sharing, and possibly used in terms of the other informational types, operational information specifically. Knowledge management for instance, has seen growth in overall management research in recent years [9], and strategic and customer information could benefit from exploring it from that point of view. While the benefits of using products returns as a firm-wide feedback mechanism have been postulated, it is not clear how such learning systems are set up and managed [5]. Studies regarding other suitable conditions for maximizing strategic and customer information are also encouraged. These could include, for instance, the position of firm in the value chain, industry, business model, and firm size.

5. Conclusions

5.1. Summary

Developments in the fields of supply chain information systems, organizational learning, value creation, and CLSC gave rise to the following research question: What types of valuable information are there in product returns processes and how can organizations utilize information embedded in product returns for value creation? To address this question, a systematic literature review on the current body of scholarly knowledge from a multidisciplinary perspective was conducted. Although extant literature is relatively limited, new insights were obtained.

Product returns are the 'mirror' of the forward supply chain. Closing the information loop by maximizing CLSC informational value can and should be done. By doing this, firms can improve their products, processes, and strategic decision making. Still, there is a world to be won. Returns information gives firms a view into the world of their customers; thus, product returns information is not merely a matter of product returns management and RL. Instead, it can be argued that firms should

focus on collecting, storing, and disseminating returns information with the explicit aim of improving their existing products, services, and processes for developing new products, and adapting their business continuously to changing business environments and changing customer needs and wants.

This literature review illustrates the large variety and high potential of valuable information that can be attained from product returns and CLSC processes. While most of the research has focused on the information used to improve the CLSC processes, it is clear that the information can also be leveraged for product improvements and understanding the customer base better. Furthermore, a set of value-creating factors were uncovered by this study.

5.2. Limitations

Like any study, this study is not without its limitations. It is possible that some relevant studies were omitted, for instance, due to them being written in a language other than English or because they might have been published in a non-peer-reviewed journal. Moreover, it is possible that certain studies were missed due to different terminology used. However, the researchers are confident that the majority of the relevant studies were captured by this review, thus making the results robust. More importantly, because of the relative novelty of this research topic, many of the studies analyzed involved only one aspect of creating value out of product returns information. Moreover, many of the studies took the view of RL, which might limit the scope of their study and thus influence the results of this literature review.

5.3. Recommendations and Future Research

This study has several implications for practitioners. It is clear that product returns information can be a valuable asset, not only concerning cost savings and operational issues, but also for value creation. Firms should investigate the potential of returns information for product and service innovation, as well for strategic and customer-focused decision making. Additionally, firms should consider the purpose of their CLSC strategy and what can be gained from product returns information before making investment decisions regarding IS, skill development, and other factors. Lastly, knowledge management and organizational learning practices should be considered together with technological solutions in order to put the insights into action.

In addition, the results of this study found some new avenues for research. For instance, new studies can explore the relationships between the value creation factors empirically to generate more robust findings. This will contribute to the growing literature on CLSC value creation [3]. Additionally, studies should take a holistic value creation view when studying product returns information. More concretely, case studies regarding the use of data mining on product returns data in a real business context are required. Understanding what is required to move from data mining to product innovation or a better understanding of customer wants and needs would be beneficial for both the literature on big data [8], as well as knowledge management [9]. Moreover, cost–benefit analyses should be conducted on CLSC IS and technology investments. Studies on combining interorganizational information sharing with interorganizational learning routines are encouraged. The researchers recommend, in addition, that more attention is put on organizational learning and knowledge management practices regarding each three information types. Lastly, CLSC informational value could be an area of interest for green and sustainable business practice [1]. Therefore, researchers could investigate how informational value can be used for creating environmental value.

Author Contributions: Analysis, gathering of bibliometric data, and original draft preparation, I.R.; reviewing and editing, H.K. and M.C.J.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Hasan, M.M.; Nekmahmud, M.; Yajuan, L.; Patwary, M.A. Green business value chain: A systematic review. *Sustain. Prod. Consum.* **2019**, *20*, 326–339. [CrossRef]
2. Shekarian, E. A review of factors affecting closed-loop supply chain models. *J. Clean. Prod.* **2020**, *253*, 119823. [CrossRef]
3. Schenkel, M.; Caniëls, M.C.J.; Krikke, H.; van der Laan, E. Understanding value creation in closed loop supply chains—Past findings and future directions. *J. Manuf. Syst.* **2015**, *37*, 729–745. [CrossRef]
4. Röllecke, F.J.; Huchzermeier, A.; Schröder, D. Returning Customers: The Hidden Strategic Opportunity of Returns Management. *Calif. Manag. Rev.* **2018**, *60*, 176–203. [CrossRef]
5. Klapalová, A. Customer product returns – feedback and knowledge management. *Meas. Bus. Excell.* **2019**, *23*, 149–164. [CrossRef]
6. Jayaraman, V.; Luo, Y. Creating Competitive Advantages Through New Value Creation: A Reverse Logistics Perspective. *Acad. Manag. Perspect.* **2007**, *21*, 56–73. [CrossRef]
7. Guide, V.D.R.; Van Wassenhove, L.N. OR FORUM—The Evolution of Closed-Loop Supply Chain Research. *Oper. Res.* **2009**, *57*, 10–18. [CrossRef]
8. Hasan, M.M.; Popp, J.; Oláh, J. Current landscape and influence of big data on finance. *J. Big Data* **2020**, *7*, 21. [CrossRef]
9. Gaviria-Marin, M.; Merigó, J.M.; Baier-Fuentes, H. Knowledge management: A global examination based on bibliometric analysis. *Technol. Soc. Chang.* **2019**, *140*, 194–220. [CrossRef]
10. Krikke, H.; Hofenk, D.; Wang, Y. Revealing an invisible giant: A comprehensive survey into return practices within original (closed-loop) supply chains. *Resour. Conserv. Recycl.* **2013**, *73*, 239–250. [CrossRef]
11. Seuring, S.; Gold, S. Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Manag.* **2012**, *17*, 544–555. [CrossRef]
12. De Brito, M.P.; van der Laan, E.A. Inventory control with product returns: The impact of imperfect information. *Eur. J. Oper. Res.* **2009**, *194*, 85–101. [CrossRef]
13. Edwards, J.; kadi, A.; Kehoe, D. A web-based Demand Planning System (DPS) to enable coordinated re-manufacture of automotive components. *Int. J. Internet Enterp. Manag.* **2004**, *2*, 366–382. [CrossRef]
14. Guide, V.D.R.; Muyldermans, L.; Van Wassenhove, L.N. Hewlett-Packard Company Unlocks the Value Potential from Time-Sensitive Returns. *Interfaces* **2005**, *35*, 281–293. [CrossRef]
15. Ketzenberg, M. The value of information in a capacitated closed loop supply chain. *Eur. J. Oper. Res.* **2009**, *198*, 491–503. [CrossRef]
16. Nativi, J.J.; Lee, S. Impact of RFID information-sharing strategies on a decentralized supply chain with reverse logistics operations. *Int. J. Prod. Econ.* **2012**, *136*, 366–377. [CrossRef]
17. Meyer, A.; Niemann, W.; Mackenzie, J.; Lombaard, J. Drivers and barriers of reverse logistics practices: A study of large grocery retailers in South Africa. *J. Transp. Supply Chain Manag.* **2017**, *11*, 1–16. [CrossRef]
18. Zhou, H.; Reid, R.D.; Benton, W.C., Jr. The drivers of product return in the information age. *Int. J. Internet Enterp. Manag.* **2006**, *4*, 100. [CrossRef]
19. Tekin Temur, G.; Balcilar, M.; Bolat, B. A fuzzy expert system design for forecasting return quantity in reverse logistics network. *J. Enterp. Inf. Manag.* **2014**, *27*, 316–328. [CrossRef]
20. Wang, C.-S. An Agent-Based Expert System Architecture for Product Return Administration. *IEICE Trans. Inf. Syst.* **2013**, *96*, 73–80. [CrossRef]
21. Mihi Ramírez, A. Product return and logistics knowledge: Influence on performance of the firm. *Transp. Res. Part E Logist. Transp. Rev.* **2012**, *48*, 1137–1151. [CrossRef]
22. Daugherty, P.J.; Myers, M.B.; Richey, R.G. Information support for reverse logistics: the influence of relationship commitment. *J. Bus. Logist.* **2002**, *23*, 85–106. [CrossRef]
23. Dhanda, K.K.; Hill, R.P. The role of information technology and systems in reverse logistics: A case study. *Int. J. Technol. Manag.* **2005**, *31*, 140–151. [CrossRef]
24. Jayaraman, V.; Ross, A.D.; Agarwal, A. Role of information technology and collaboration in reverse logistics supply chains. *Int. J. Logist. Res. Appl.* **2008**, *11*, 409–425. [CrossRef]
25. Wadhwa, S.; Madaan, J.; Verma, M. Flexibility Focused Decision and Information Sharing Model for Product Recovery System. *Glob. J. Flex. Syst. Manag.* **2009**, *10*, 15–22. [CrossRef]

26. Olorunniwo, F.O.; Li, X. Information sharing and collaboration practices in reverse logistics. *Supply Chain Manag.* **2010**, *15*, 454–462. [CrossRef]
27. Koppius, O.; Özdemir-Akyıldırım, Ö.; van der Laan, E. Business Value from Closed-Loop Supply Chains. *Int. J Supply Chain. Manag.* **2014**, *3*, 107–120.
28. Yao, D.-Q.; Yue, X.; Wang, X.; Liu, J.J. The impact of information sharing on a returns policy with the addition of a direct channel. *Int. J. Prod. Econ.* **2005**, *97*, 196–209. [CrossRef]
29. Madaan, J.; Kumar, P.; Chan, F.T.S. Decision and information interoperability for improving performance of product recovery systems. *Decis. Support Syst.* **2012**, *53*, 448–457. [CrossRef]
30. Huscroft, J.R.; Hazen, B.T.; Hall, D.J.; Hanna, J.B. Task-technology fit for reverse logistics performance. *Int. J. Logist. Manag.* **2013**, *24*, 230–246. [CrossRef]
31. García-Rodríguez, F.J.; Castilla-Gutiérrez, C.; Bustos-Flores, C. Implementation of reverse logistics as a sustainable tool for raw material purchasing in developing countries: The case of Venezuela. *Int. J. Prod. Econ.* **2013**, *141*, 582–592. [CrossRef]
32. Hazen, B.T.; Huscroft, J.; Hall, D.J.; Weigel, F.K.; Hanna, J.B. Reverse logistics information system success and the effect of motivation. *Int. J. Phys. Dist. Logist. Manag.* **2014**, *44*, 201–220. [CrossRef]
33. Hazen, B.T.; Overstreet, R.E.; Hall, D.J.; Huscroft, J.R.; Hanna, J.B. Antecedents to and outcomes of reverse logistics metrics. *Ind. Mark. Manag.* **2015**, *46*, 160–170. [CrossRef]
34. Morgan, T.R.; Richey, R.G., Jr.; Autry, C.W. Developing a reverse logistics competency: The influence of collaboration and information technology. *Int. J. Phys. Dist. Logist. Manag.* **2016**, *46*, 293–315. [CrossRef]
35. Vlachos, I.P. Reverse logistics capabilities and firm performance: The mediating role of business strategy. *Int. J. Logist. Res. Appl.* **2016**, *19*, 424–442.
36. Verma, P.; Mahindroo, A.; Samalia, H.V. Information systems road map to enhance economic and operational reverse logistics performance. *Int. J. Logist. Syst. Manag.* **2018**, *29*, 215–240. [CrossRef]
37. De Brito, M.P.; Dekker, R. Modelling product returns in inventory control—Exploring the validity of general assumptions. *Int. J. Prod. Econ.* **2003**, *81–82*, 225–241. [CrossRef]
38. Aitken, J.; Harrison, A. Supply governance structures for reverse logistics systems. *Int. J. Oper. Prod. Manag.* **2013**, *33*, 745–764. [CrossRef]
39. Zheng, B.; Yang, C.; Yang, J.; Zhang, M. Pricing, collecting and contract design in a reverse supply chain with incomplete information. *Comput. Ind. Eng.* **2017**, *111*, 109–122. [CrossRef]
40. Chen, J.; Bell, P.C. The impact of customer returns on supply chain decisions under various channel interactions. *Ann. Oper. Res.* **2013**, *206*, 59–74. [CrossRef]
41. Insanic, I.; Gadde, L.-E. Organizing product recovery in industrial networks. *Int. J. Phys. Dist. Logist. Manag.* **2014**, *44*, 260–282. [CrossRef]
42. Hosoda, T.; Disney, S.M.; Gavirneni, S. The impact of information sharing, random yield, correlation, and lead times in closed loop supply chains. *Eur. J. Oper. Res.* **2015**, *246*, 827–836. [CrossRef]
43. Zhang, P.; Xiong, Z. Information Sharing in a Closed-Loop Supply Chain with Asymmetric Demand Forecasts. *Math. Probl. Eng.* **2017**, *2017*, 1–12. [CrossRef]
44. Cassina, J.; Tomasella, M.; Taisch, M.; Matta, A. A new closed-loop PLM Standard for mass products. *Int. J. Prod. Dev.* **2009**, *8*, 141. [CrossRef]
45. Sharif, A.M.; Irani, Z.; Love, P.E.D.; Kamal, M.M. Evaluating reverse third-party logistics operations using a semi-fuzzy approach. *Int. J. Prod. Res.* **2012**, *50*, 2515–2532. [CrossRef]
46. Zhou, W.; Piramuthu, S. Remanufacturing with RFID item-level information: Optimization, waste reduction and quality improvement. *Int. J. Prod. Econ.* **2013**, *145*, 647–657. [CrossRef]
47. Kumar, S. A knowledge based reliability engineering approach to manage product safety and recalls. *Expert Syst. Appl.* **2014**, *41*, 5323–5339. [CrossRef]
48. Huang, C.-C.; Liang, W.-Y.; Tseng, T.-L.; Chen, P.-H. The rough set based approach to generic routing problems: Case of reverse logistics supplier selection. *J. Intell. Manuf.* **2016**, *27*, 781–795. [CrossRef]
49. Soto Zuluaga, J.P.; Thiell, M.; Colomé Perales, R. Reverse cross-docking. *Omega* **2017**, *66*, 48–57. [CrossRef]
50. Kim, Y.; Chang, T.-W.; Park, J. Gen2 RFID-Based System Framework for Resource Circulation in Closed-Loop Supply Chains. *Sustainability* **2017**, *9*, 1995. [CrossRef]
51. Daugherty, P.J.; Richey, R.G.; Genchev, S.E.; Chen, H. Reverse logistics: Superior performance through focused resource commitments to information technology. *Transp. Res. Part E Logist. Transp. Rev.* **2005**, *41*, 77–92. [CrossRef]

52. Huang, Y.; Wang, Z. Information sharing in a closed-loop supply chain with technology licensing. *Int. J. Prod. Econ.* **2017**, *191*, 113–127. [CrossRef]
53. Chen, J. The impact of sharing customer returns information in a supply chain with and without a buyback policy. *Eur. J. Oper. Res.* **2011**, *213*, 478–488. [CrossRef]
54. Garrido-Hidalgo, C.; Olivares, T.; Ramirez, F.J.; Roda-Sanchez, L. An end-to-end Internet of Things solution for Reverse Supply Chain Management in Industry 4.0. *Comput. Ind.* **2019**, *112*, 103127. [CrossRef]
55. Cui, H.; Rajagopalan, S.; Ward, A.R. Predicting product return volume using machine learning methods. *Eur. J. Oper. Res.* **2020**, *281*, 612–627. [CrossRef]
56. Sonya Hsu, H.; Alexander, C.A.; Zhu, Z. Understanding the reverse logistics operations of a retailer: A pilot study. *Ind. Manag. Data Syst.* **2009**, *109*, 515–531. [CrossRef]
57. Chouinard, M.; D'Amours, S.; Aït-Kadi, D. Integration of reverse logistics activities within a supply chain information system. *Comput. Ind.* **2005**, *56*, 105–124. [CrossRef]
58. Yu, C.-C.; Wang, C.-S. A hybrid mining approach for optimizing returns policies in e-retailing. *Expert Syst. Appl.* **2008**, *35*, 1575–1582. [CrossRef]
59. Lee, C.K.M.; Lam, J.S.L. Managing reverse logistics to enhance sustainability of industrial marketing. *Ind. Mark. Manag.* **2012**, *41*, 589–598. [CrossRef]
60. Ramirez, A.M.; Girdauskiene, L. Creation of Knowledge and Reverse Logistics. Empirical Analysis from Perspective of the Resource Based View Theory. *Inz. Ekon. Eng. Econ.* **2014**, *24*, 478–487. [CrossRef]
61. Ramírez, A.M.; Morales, V.J.G. Improving Competitiveness Trough Creation of Knowledge and Reverse Logistics. *Eng. Econ.* **2011**, *22*, 443–450. [CrossRef]
62. Fu, Y.; Liu, G.; Papadimitriou, S.; Xiong, H.; Li, X.; Chen, G. Fused latent models for assessing product return propensity in online commerce. *Decis. Support Syst.* **2016**, *91*, 77–88. [CrossRef]
63. Spicer, A.J.; Johnson, M.R. Third-party demanufacturing as a solution for extended producer responsibility. *J. Clean. Prod.* **2004**, *12*, 37–45. [CrossRef]
64. Jaaron, A.A.M.; Backhouse, C. A systems approach for forward and reverse logistics design: Maximising value from customer involvement. *Int. J. Logist. Manag.* **2016**, *27*, 947–971. [CrossRef]
65. Schenkel, M.; Krikke, H.; Caniëls, M.C.J.; der van Laan, E. Creating integral value for stakeholders in closed loop supply chains. *J. Purch. Supply Manag.* **2015**, *21*, 155–166. [CrossRef]
66. Mahindroo, A.; Samalia, H.V.; Verma, P. Moderated influence of return frequency and resource commitment on information systems and reverse logistics strategic performance. *Int. J. Product. Perform. Manag.* **2018**, *67*, 550–570. [CrossRef]
67. Toyasaki, F.; Wakolbinger, T.; Kettinger, W.J. The value of information systems for product recovery management. *Int. J. Prod. Res.* **2013**, *51*, 1214–1235. [CrossRef]