

## INNOVATION PROCESS AT LOGISTICS SERVICES PROVIDERS: BARRIERS AND STIMULATION FACTORS

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**Purpose:** Dynamic changes in the logistics services industry are forcing Logistics service providers (LSPs) to implement innovations. In this area, there is a need for a better understanding of the process and the factors behind the successful implementation of innovations at LSPs. This study aims to discover stages in the innovation process at Logistics service providers and identify drivers for innovation implementation at LSPs.

**Design/methodology/approach:** The study used a two-step approach. The first stage is a systematic literature review following the procedure proposed by Tranfield, Denyer, and Smart (2003). The second stage was carried out using the Delphi research method.

**Findings:** The survey results show that the LSP innovation process consists of 8 steps. At each stage of the innovation process, undertaken activities were identified that were not recorded in the literature. A list of factors (barriers and stimulators) determining the process of implementing LSPs innovations was identified.

**Research limitations/implications:** Despite the value of research results and their contribution to knowledge, this research has some limitations. The limitation of this study is that it included experts from Poland. Therefore, it is recommended to repeat the survey with experts from different geographical locations, which will include experts from other countries and even continents, to obtain more general conclusions.

**Practical implications:** The results of the research can be used as a contribution to the improvement of activities in the field of implementation of the innovation process for companies from the logistics services industry willing to enter a higher level of implementation and offering of services.

**Originality/value:** The findings presented in this area can be treated as new research findings, thus a voice in the discussion that opens the possibility of further deeper exploration and inference.

**Keywords:** Innovation process, Logistics service providers (LSPs).

**Category of the paper:** Research paper.

## 1. Introduction

Growing customer requirements, the struggle to gain a competitive advantage, continuous improvement of processes (e.g. inventory management process), or the search for cost reductions seem to stimulate the implementation by operators (3PL) and logistic integrators (4PL) of innovations and innovative solutions in the logistics service provided. According to Flint, Larsson, Gammelgaard, and Mentzer, knowledge about innovation in logistics is relatively small, hence we know little about the innovation of logistics service providers and innovation itself (Flint, Larsson, Gammelgaard, Mentzer, 2005). The authors state that logistics innovation is "all logistics-related services, from basic to comprehensive, which are perceived as new and helpful for a specific group of recipients (business partners or internal recipients)". They also point out that logistics innovations can be very simple or complex and can refer to small improvements to processes or services and the development of new services (Grawe, 2009). Similarly, Wallenburg and Lukassen point to the need for more intensive research in this area (Wallenburg, Lukassen, 2011).

On the other hand, Wagner and Sutter (Wagner and Sutter, 2012) emphasize that research into innovation in logistics services is still at an early stage of its recognition. Undoubtedly, a critical topic in innovation research, specifically innovation management, is the process of creating innovation by 3PL operators and 4PL integrators. The logistics industry includes many logistics service providers (LSPs) that provide logistics services to their customers (Delfmann et al., 2002). Globalization, outsourcing influenced the development of the logistics services industry, initially offering simple logistics services, for example, transport or warehousing services, to this day offering a wide range of services through logistics operators (3PL) offering combined and more complex logistics services (Selviaridis, Spring, 2007; Wagner, Sutter, 2012) and subcontracting and coordination by external LSPs (4PL) to other service providers (Win, 2008; Zacharia et al., 2011) (Cichosz, Wallenburg, Knemeyer, 2020).

The article aims to present the issue relating to the process of shaping innovation by logistics service providers in the logistics service of supply chains. The article presents selected results of the Delphi study covering the identified stages of the process of shaping innovation by logistics service providers (3PL, 4PL) and determinants stimulating and limiting the shaping of innovation by logistics service providers. The article is organized as follows. The first part describes the research methodology. Then the results of a systematic literature review and the Delphi study results were presented. The last part of the article summarizes the results and discusses the direction of future research.

## 2. Literature Review

### 2.1. Logistics innovations process

Undoubtedly, creating (shaping) innovations is important in the context of research related to innovation management. This process has become the subject of consideration of many researchers. Hence the literature offers various, often different views or interpretations of the concept of the process of innovation. For example, Griffin describes the process of innovation as "the process of developing, applying, activating, developing a creative idea and managing its maturation and decline (Griffin, 2004). A slightly different perspective of defining the concept of the process of innovation can be seen in the proposal of McGowan (McGowan, 1994), signalling that it is "a continuous process that begins with noticing an opportunity, the need to satisfy it or a problem to be solved that aims to completion when a decision is made to implement a specific idea, selected from among many considered, and proceed to implementation". The author proposed twelve stages that make up the innovative process, it is also worth mentioning that the author indicates the last stage as optional, and it does not mean resignation from starting works aimed at improvement. When considering the innovative processes presented in the literature, described as models, it should be emphasized that from the historical perspective, the first models characterizing the innovation process appeared in the early 1950s. The evolution of the innovation process models was presented in his concept by R. Rothwell (Rothwell, 1994).

However, concerning the research on the issue of the process of shaping innovation and its stages in logistics services provided by 3PL operators and 4PL logistics integrators, it should be emphasized that this issue appears exceptionally rare in the literature (da Mota Pedrosa, Blazevic, Jasmand, 2015). This sporadic research on this subject is clearly emphasized by Busse and Wallenburg (2011, pp. 187-218). Flint et al. focus on generating innovation by 3PL logistics operators from a process perspective (Busse, Wallenburg, 2011). Based on the systematic literature review, a small number of publications relating to the process of shaping innovation by logistics service providers were selected. Although the time range in the systematic literature review covered a longer period, the results of the query correspond to the conclusions of Buss and Wallenburg and are presented in Table 1.

**Table 1.**

*Stages of the innovation process (innovative forms of logistics services) by logistics service providers - results of a systematic literature review*

<b>Publication record</b>	<b>Proposed stages of the innovation process</b>
<b>Author/s, year, keywords, country, geographic area of research</b>	
Flint, Larsson, Gammelgaard, Mentzer 2005 No keywords Sweden, UK, USA	Four stages (phases): - setting the stage activities (collecting ideas) - customer clue-gathering activities - negotiating, clarifying, and reflecting - inter-organizational learning
de Mota Pedrosa, Blazevic, Jasmand 2015 Keywords: Logistics innovation, Microfoundations, Knowledge acquisition, Customer contact employees, Boundary- spanning, Broad knowledge, Deep knowledge	Four stages (phases): - idea generation - deepening knowledge - concept development - business analysis - implementation
Björklund, Forslund 2018 Keywords: Sustainable logistics, Innovation process, Case study, Innovation management Sweden	Five stages (phases): - generating ideas, including proactive problem / needs search - selection of ideas - concept development - developing a business case for sustainable development (separate stage) - implementation and learning

Source: own study.

In exploring the research of Flint et al., it should be emphasized that the authors, when analyzing innovations in the logistic operator-customer relationship, focused on the stage of generating ideas and concepts (Flint, Larsson, Gammelgaard, Mentzer, 2005). They assumed that the key role in the creation process is played by the interaction between process participants (i.e. the logistics operator and his client) and the analysis of how innovation affects the organizational structure, processes, or market opportunities of the enterprise - logistics operator. Based on the research conducted, Flint et al. developed a process of cooperation between the operator and the customer on logistics innovation, in other words, they focused on the operator's interaction with the customer and analysis of how the innovation affects the organization of the operator's operations. The innovation process proposed by the authors includes four Stages, the graphic form of the process is illustrated in Figure 1. In the proposed process stages, the authors distinguish:

- *setting the stage activities*, i.e. activities aimed at creating a favorable environment interacting with and listening to customers, and being an inspirational organization includes the very activities of collecting or analyzing data. These are planning and training activities which precede the collection of clues, data analysis and interpretation (etc.),
- *customer clue gathering activities*, i.e. managing customer groups, activities related to collecting customer guidance, i.e. managing customer groups, engaging in in-depth interviews with individual customers, conducting joint strategic planning meetings and outsourcing customer surveys (etc.),
- *negotiating, clarifying, and reflecting activities*, among others: joint efforts to internally negotiate the interpretation and implications of the client's voice, constantly explaining what was heard, exchanging ideas; clear interpretation - understanding the needs of the new client. Internal negotiations included choosing what information to convert into known organizational terms and what to leave in its original form for internal recipients, rethinking the implications of customer data and internally selling customer-related innovations. Reflection on the data obtained from the client (etc.),
- *inter-organizational learning*, i.e. new perceptions and understanding (common to LSPs managers and clients), joint learning of the operator and the client from the perspective of presenting different interpretations of the same data, as well as differences complementing data to the process, social interaction across organizational and functional boundaries enables the emergence of new opportunities (ect.).

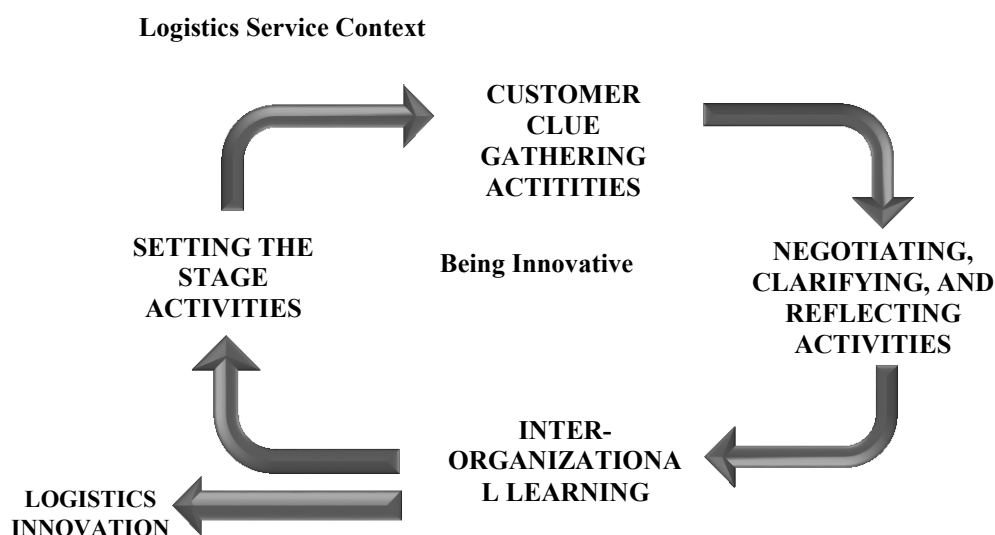


Figure 1. A logistics innovation process.

Source: own study based on: Flint, Larsson, Gammelgaard, Mentzer, 2005, pp. 113-147. <https://doi.org/10.1002/j.2158-1592.2005.tb00196.x>.

Therefore, the role of the logistics operator in the process of creating logistics innovation should focus on the use of own human resources (i.e. knowledge and skills), financial resources, and technical preparation in cooperation with the customer of a logistics innovation generating value for this customer (Flint, Larsson, Gammelgaard, Mentzer, 2005).

On the other hand, da Mota Pedrosa et al., Studied the actions and behavior of employees of 3PL logistics operators who have contact with the client in order to deepen and expand their knowledge about the future needs and expectations of clients, but also to engage clients in the development of innovation (da Mota Pedrosa, Blazevic, Jasmand, 2015). As a result, researchers identified key differences in the underlying patterns of customer-facing employees' acquisition of customer knowledge, suggesting that logistics service providers are able to find different ways to develop individualized and standard logistics innovations effectively. As a result of the research, the authors distinguished four Stages of the process of creating innovation, in which they mention (da Mota Pedrosa, Blazevic, Jasmand, 2015):

- *idea generation* – is one of the key stages in the authors' opinion. Meetings with customers' top managers enabled the identification of a logistics innovation need and prompted representatives of LSPs to perform activities that deepened customer knowledge during the idea generation stage;
- *business analysis* is a stage aimed at analyzing the potential success of innovation and deciding whether a change should be introduced; it included statistical analyzes carried out by the logistics operator, hence at this stage the surveyed companies resigned from engaging customers for active participation;
- *implementation*, the last stage involving the introduction of innovation and development of additional functions in order to improve it, thus improving.

Although the study covered a small research sample (six logistics service providers), the authors captured the perspective of different sequences in which employees engage in deepening and expanding knowledge about the customer depending on whether individualized or standard logistics innovations are developed. In conclusion, they emphasize that extensive research on the development of logistics innovations confirms that gaining knowledge about the customer is of key importance for successful logistics innovations (da Mota Pedrosa, Blazevic, Jasmand, 2015).

From a slightly different perspective, Björklund and Forslund (Björklund, Forslund, 2018, pp. 204-217) analyzed the aspects relating to the innovation process. The authors focused on researching the innovation process in sustainable logistics. According to the authors, describing the process with an indication of the stages provides a clear and sequential structure of the actions taking place, and forms a kind of "backbone" that plays an important structural role. Björklund and Forslund examined three logistic operators and three companies from various industries in the adopted method of multiple case studies. Based on the research, the authors distinguished the following five phases in the process of shaping innovation in sustainable logistics (Björklund, Forslund, 2018):

- *generating ideas* - including proactive searching for problems/needs of clients, interactions with clients play a key role in this phase, hence many internal stakeholders are involved,
- *selection of ideas* - important activities in this phase: speed, clearly selected criteria for choosing concepts and ideas,
- *concept development* - in this phase, the following activities and challenges were identified: first of all, the correct selection of teams, building trust with the logistics operator, as well as the development of simple concepts,
- *developing a business case* - this is a separate phase; it includes the following challenges: assessment of the economic, environmental, and social consequences of the innovation process in sustainable logistics, this stage is critical from the perspective of competing with other enterprises. Hence an important role is played by the assessment of financing and profitability of the implemented innovation,
- *implementation and learning* - sharing knowledge - in this phase, the speed of actions taken, and learning of the organization is emphasized, it is equally important to choose places for testing the developed process, i.e. companies can describe the diffusion of innovation, e.g. test them in the organization's departments or sister companies.

The authors conclude that the management of the innovation process in sustainable logistics may, on the one hand, contribute to reducing costs, but also to generating income. In addition, they indicate certain managerial challenges that need to be addressed. They are, among others involving customers to a greater extent and in several stages, more clearly informing about the selection criteria and conducting business case studies related to the issue of sustainable development in logistics. As the authors emphasize, the obvious direction of further research is to check the results of this study by replication on a larger sample. The study did not include producers, which, in the authors' opinion, seems to be an interesting area for further research (Björklund, Forslund, 2018).

Summing up the considerations about the process of shaping innovation by logistics service providers, it should also be emphasized that due to the nature of logistics services, innovation in logistics often arises not because of a formal plan or process, but as an "ad hoc" response to the customer's request (Wagner, Franklin, 2008). Moreover, the development of logistics innovations is a dynamic process that develops over time and requires companies to engage in various activities at different stages (Busse, Wallenburg, 2011).

As a result of the conducted systematic review of the literature, no studies dealing with the issues of the process of shaping innovation by enterprises operating in the form of a 4PL logistics integrator were identified in any of the selected publications. The author completed this research gap in the conducted empirical research.

After analyzing the above-specified scope of publications, for the purposes of the research carried out following DJ Flint et al., the concept *of the process of shaping innovation/innovative forms of logistics service of supply chains was adopted by 3PL operators and 4PL logistics integrators*, interpreting it as *a response to the customer's needs resulting from interaction with*

*the customer (group of customers) or identified own needs of the 3PL operator/4PL logistics integrator, covering a sequence of phases over time aimed at the implementation of innovation that generates value for the client (s) and/or the logistics service provider.*

Moreover, based on the results of research by Flint et al., Björklund, Forslund, and da Mota Pedrosa et al., *In the process of shaping innovation/innovative forms of logistics service of supply chains by 3PL operators and 4PL logistics integrators*, the following sequence:

- Stage 1 - preparation of an innovation implementation plan by the operator (3PL)/logistics integrator (4PL),
- Stage 2 - collecting ideas,
- Stage 3 - choosing ideas,
- Stage 4 - sharing knowledge,
- Stage 5 - planning activities and resource use - concept development,
- Stage 6 - implementation of innovation - implementation - testing,
- Stage 7 - identification of gaps, planning, and implementation of improvement actions,
- Stage 8 - verification and evaluation of the achieved results of the implemented innovation.

The adopted definition and the distinguished stages of the process of shaping innovation/innovative forms of logistics service of supply chains by 3PL operators and 4PL logistics integrators were the basis for designing a research tool and correct conclusions about its results.

## **2.2. Barriers and Drivers of Innovation in LSPs**

The implementation of innovation (innovation process) at logistics service providers may be determined by numerous stimulating (motivating) factors or barriers limiting its success. The issue of barriers and factors stimulating the implementation of innovations in the logistics services industry has already been raised by researchers. For example, Kandampully, in his research, analyzes the factors underlying the growth of logistics services and the emerging views on what constitutes a "resource" for service organizations (Kandampully, 2002). To this end, technology, knowledge, and relationship networks are examined as interdependent factors. The researcher argues that today's "resources" are the culmination of various advances in knowledge. The role of technology makes it easier to maintain a network of relationships with customers and partners inside and outside the company. The network of relationships makes the company's capabilities "amorphous" in nature. Chapman et al. in the conducted research, using industry examples, indicated factors supporting innovation in logistics services (Chapman et al., 2002). Researchers are looking for imperatives for innovation, and claim that: innovation is essential for logistics providers serving the market in the new economy, which they believe can be examined on the basis of three determinants of innovation in services. These factors, the authors, based on earlier research by Kandampully, describe them as "imperatives for innovation" in logistics services, identifying them as:



- technology,
- knowledge,
- relationship networks.

Table 2 presents the drivers of innovation and barriers to innovation in the logistics services sector (LPSs) identified during the systematic literature review.

**Table 2.**  
*Factors and barriers determining the implementation of innovations in logistics services - selected results of a systematic literature review*

Factors driving innovation		Barriers to innovation	
Author	Factor (s)	Author	Barriers/Limitations
W. Zinn (1996)	<ul style="list-style-type: none"> <li>• growing competition</li> </ul>	A.J. Gellman (1986)	<ul style="list-style-type: none"> <li>• legal regulations - ordinances</li> <li>• impact of work - lack of human resourcesbrak innowacji wśród uczestników kanałów</li> </ul>
R.L. Chapman et al. (2002)	<ul style="list-style-type: none"> <li>• knowledge</li> <li>• technology</li> <li>• relationship networks</li> </ul>		
H. Håkansson G. Persson (2004)	<ul style="list-style-type: none"> <li>• pooling resources in supply chains</li> </ul>		
<b>P.M. Panayides, M. So (2005)</b>	<ul style="list-style-type: none"> <li>• learning the organization</li> <li>• relationship orientation</li> </ul>	A. Oke (2004, 2008)	<ul style="list-style-type: none"> <li>• reactive versus proactive innovation</li> <li>• specific clients</li> <li>• ineffective knowledge transfer</li> <li>• Inability to protect innovation with patents</li> <li>• technology as the main source of innovation</li> <li>• no effective development processes</li> </ul>
D.J. Flint et al. (2005, 2008)	<ul style="list-style-type: none"> <li>• learning the organization</li> <li>• scope of teaching supply chain management</li> <li>• scope of innovation management</li> </ul>		
S.M. Wagner (2008)	<ul style="list-style-type: none"> <li>• training and education</li> <li>• gaining of knowledge</li> </ul>	B. Gammelgaard (2008)	<ul style="list-style-type: none"> <li>• no long-term relationship</li> <li>• information misuse and consumption of resources due to information sharing</li> <li>• improper cooperation,</li> <li>• no openness</li> </ul>
C.W. Autry, S.E. Griffis (2008)	<ul style="list-style-type: none"> <li>• structural capital</li> <li>• relational capital</li> <li>• the development of knowledge about the supply chain</li> </ul>		
S.J. Grawe et al. (2009)	<ul style="list-style-type: none"> <li>• customer orientation</li> <li>• focus on competition</li> </ul>	A.V. Razzera, M.A. Machado (2017)	<ul style="list-style-type: none"> <li>• bureaucracy, consensus, customs, culture, cost, adaptation without customer expectations, resistance to change, cooperation, sharing information, networking with partners, reducing costs, establishing relationships, customer knowledge, avoiding negotiations</li> <li>• institutional work,</li> <li>• budget and financial resources</li> <li>• lack of understanding of the existing needs in terms of innovation</li> </ul>
P. Daugherty et al. (2011)	<ul style="list-style-type: none"> <li>• decentralization</li> <li>• formalization</li> </ul>		
A.V. Razzera, M.A. Machado (2017)	<ul style="list-style-type: none"> <li>• openness, communication, commitment, maturity, innovation profile, perseverance, planning, relationships</li> <li>• information, networking with supply chain partners, crises, insight</li> <li>• adjusting expectations, transparency</li> </ul>		

Source: own study based on the results of a systematic literature review.

### 3. Methodology

The Delphi study is part of a research project carried out by the author, including research within the framework of a prepared doctoral dissertation. The research was carried out following the principle of triangulation and included a quantitative study (CATI, N = 201, preceded by a pilot study) and qualitative research, i.e. a case study and a Delphi study. A systematic review of the literature preceded empirical research according to the procedure proposed by Tranfield, Denyer, and Smart (Tranfield, Denyer, Smart, 2003), who indicate its three basic stages. In the first stage, a detailed literature review plan was defined, the aim of the research was determined and research questions were formulated. The second stage included the selection of primary literature, the selection of publications for analysis, and the development of the publication database. The second stage of the systematic literature review focused on the following activities: selecting digital full-text databases and defining the scope of database searches (full-text databases such as DOAJ, Emerald Insight, JSTOR, ScienceDirect, Scopus® were selected, Springer Nature Journals and Wiley). The publications available in the Polish BazEkon and CeOn database were also analyzed, and the EBSCO Discovery Service tool was used to search for publications in order to improve the research process). The bibliometric analysis stage, including publication count analysis and citation analysis, was performed using tools available in the following selected full-text databases: Springer (Citations.Springer.com), Scopus® (CiteScore), and scholar.google.com databases. The third step is to present the results of the review (treated as a report). In the systematic literature review, the time range for the analysis of publications from 1990-2021 was adopted.

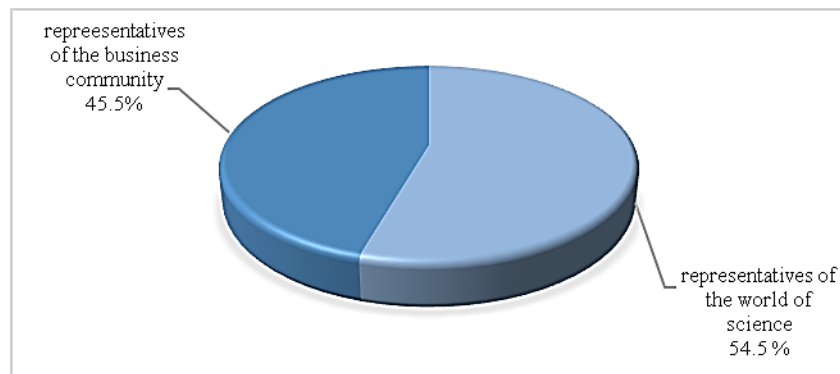
The Delphi method was used considering that it consists of structuring the process of group communication, which enables a group of independent people to jointly solve a complex problem (Linstone, Turoff, 1975). It can be used to estimate the time interval of events, phenomena, or states and to analyze and study the existing reality. The universal nature of the Delphi method favors its use both for research in the field of social and economic life, as well as in science and technology (Sudoł, 2016). The Delphi study has already been used in similar research, for example, research on creating innovation in third-party logistics (TPL) provider–customer relationships Stephan M. Wagner, Reto Sutter (2012) or research by Gossler, T., Falagara Sigala et al. (2019) presenting best practices of aid agencies for outsourcing logistics to commercial logistics service providers (LSPs) in disaster relief. In the Delphi study, a sequence of six steps was adopted (following the sequence proposed by Matejun, 2012). In the first stage, the concept of the Delphi study was developed. The first step at this stage was to formulate the research problem and adopt the research objectives, which were, among others:

- *characterizing the process of shaping innovative forms of logistics service for supply chains by operators (3PL) and logistic integrators (4PL),*
- *identifying and classifying determinants of the process of creating innovative forms of logistics services in modern supply chains.*

In the second stage, the study was prepared, with the following planned: time frame of the study, rules of communication with experts, sending invitations to participate in the study, and selecting a group of experts. The Delphi study was conducted from May 2021 to mid-June 2021. The experts were contacted by electronic means (e-mail) when sending invitations to participate in the study and in the actual study. Following experts' anonymity rules, correspondence was sent individually to the e-mail address of each expert. Although there are no specific criteria for selecting experts in the Delphi study (Hasson, Keeney, 2011; McKenna, 1994), it seems obvious that the knowledge and experience of the participants in the study determine the credibility of the results of the Delphi study (Hasson, Keeney, 2011). Experts are people working (scientists, representatives of business practice) in a given field (area) and having significant knowledge of the studied issue (McKenna, 1994, Powell). The selection of the expert group was preceded by establishing the selection criteria (K), which were formulated as follows:

- K1: scientists recognized as authorities, deliberately selected for their expertise related to the topic under study,
- K2: managing managers in enterprises from the logistics sector in Poland,
- K3: supply chain managers, especially responsible for outsourcing logistics services,
- K4: specialists who are members of an organization associating forwarders and logistics specialists (PISIL, The Polish International Freight Forwarders Association) and/or the Polish Logistics Association (PTL).

Based on the adopted criteria, a list of 15 experts who were invited to participate in the study was prepared. In response, consent was obtained for participation in the study from 11 experts, who were: representatives of the world of science - eminent experts on the issues discussed, representatives of practice - occupying the highest and managerial positions in enterprises providing logistics services for supply chains (who are also members of organizations indicated in the selection criteria), as well as logistics customer service specialists. The final list of experts participating in the study was drawn up on this basis. The structure of the division into groups of experts is presented in Figure 2. The first group includes representatives of the world of science, they accounted for 54.5% of the respondents. The second group consisted of business community representatives (45.5%).



**Figure 2.** Structure of the expert group in the Delphi study.

Source: own study based on the results of the Delphi study.

This division made it possible not only to capture opinions from different perspectives but also to confront the views of two circles, leading to the development of a consensus on the phenomena studied.

As Hogarth (Hogarth, 1978) signals, the number of 6 to 12 expert group members is optimal for implementing the Delphi method. It should also be emphasized that the literature also indicates that 11 to 50 experts most often participate in the Delphi research, such a position is expressed by Diamond, Grant Feldman, Pencharz, Ling, Moore, Wales (2014).

The third stage covered the research in the first round, in which the Delphi questionnaire was sent to selected experts. As mentioned earlier, in order to preserve the anonymity and sovereignty of the opinions expressed by experts, individual contact with each of the experts was used via electronic means (e-mail).

Then, in the fourth stage, initial conclusions were drawn after receiving the experts' responses. Preliminary results of the analysis of the received responses (opinions) of the experts were prepared, which were included in the developed second questionnaire of the Delphi study (feedback) so that in the second iteration, each of the experts again referred to the studied issues. The literature selected in the systematic literature review was again used in order to develop the second-round Delphi questionnaire properly.

The fifth stage was focused on commencing activities in the next iteration - the implementation of the second round of the study. Another questionnaire (the second) was sent, and as a result, experts' responses were obtained, which allowed for obtaining convergent opinions (consensus). Hence the number of iterations has been exhausted. Obtaining a consensus with this number of rounds would be impossible if the proper selection of experts was neglected. It seems important to signal that we will not find a unified position among researchers regarding the number of rounds in the Delphi study. Most Delphi studies consist of two or three rounds (Diamond et al.). Hence, it was assumed that two rounds will be carried out in the study.

In the sixth stage, the responses received from experts participating in the second round of the study were analyzed. They formed the basis for the smooth implementation of the seventh stage. The seventh, and last stage focused on developing the final analysis of the results, which was prepared using the Microsoft Excel 2019 spreadsheet. Based on the analysis, conclusions were drawn and the completed Delphi study was summarized.

#### 4. The process and determinants of shaping innovation by logistics service providers - results of the Delphi study

The study focused on obtaining expert opinions on achieving the goal, which was to *characterize the process of shaping innovative forms of logistics service for supply chains by operators (3PL) and logistics integrators (4PL)*. Hence, taking into account the views of experts obtained in the first iteration (first round), in the last round of experts, the opinions were asked to obtain a consensus on this area. Experts gave their opinion on which of the indicated stages should be considered a necessary and therefore extremely important stage, which can be indicated as optional, and which of them should be indicated as redundant. The results of the analysis, including the collected views of experts, therefore the consensus in this area is presented in Table 3.

**Table 3.**

*Stages of the process of shaping innovative forms of logistics service for supply chains*

<b>(The process of shaping innovative forms/services/solutions in the field of logistics services)</b>			
<b>Stages of the process of shaping innovative forms in logistics services</b>	<b>Number of expert opinions</b>		
	<b>Essential stage</b>	<b>Optional stage</b>	<b>Stage redundant</b>
Stage 1 - Preparation of a plan (project/concept) for the implementation of innovation by the operator (3PL) and logistics integrator (4PL) (problem identification; identification of stakeholders (recipients/recipients) of the innovation - internal or/and external innovation (related to the client/clients); identification of "drivers" - stimulators of innovation implementation. involvement of the top management from the planning stage (design) to implementation and scaling; involvement of human resources, the appointment of divisions/departments/employees for the implementation of planned activities)	10	1	0
Stage 2 - Generating ideas (collecting ideas within the organization, i.e. at the 3PL operator and 4PL logistics integrator; identification of the needs of stakeholders; characterization of the producer's needs; analysis of customer / s expectations; analysis of the competition's offer, industrial and/or development research; participation in conferences; membership in research consortia (networks); searching for available solutions, collecting data)	7	4	0

Cont. table 3.

Stage 3 - Specifying and selecting innovations/ideas for innovations (analysis of the collected ideas; analysis of the collected data; analysis and risk assessment; selection of innovation - meetings, and involvement of appointed teams/departments - stakeholder parties, determination of an acceptable level of investment in innovation; determination of the time frame to implemented innovations; personalization of comprehensive logistics services (taking into account changes taking place on the TSL market)	8	3	0
Stage 4 - Knowledge sharing (inter-organizational learning - i.e. using the customer's perspective to jointly learn from the logistics operator (3PL) / integrator (4PL) and the customer; knowledge transfer both between organizations and within the operator and customer organization; sharing good practices and previous experience in implementing innovations)	7	4	0
Stage 5 - Planning activities and use of resources (meetings and involvement of appointed teams/departments - stakeholder parties; identification of possessed and necessary resources to use: human (knowledge and skills), financial, infrastructural, IT, ICT; matching own capabilities to the needs (e.g. . IT system, technical possibilities; planning the schedule of activities carried out in the implemented innovation)	10	1	0
Stage 6 - Implementation of innovation (implementation of activities according to the adopted schedule; monitoring of activities and activities undertaken, implementation of innovation)	7	4	0
Stage 7 - Gap identification, planning, and implementation of improvement actions (meetings of appointed teams, meetings, and involvement of appointed teams/departments - stakeholder parties in order to identify existing / possible gaps/problems; controlling, improving the idea, improving)	10	1	0
Stage 8 - Verification and evaluation of the achieved results of the implemented innovation (s) (monitoring; data collection: parties - stakeholders; meetings and involvement of appointed teams/departments - stakeholder parties in order to summarize and verify the achieved results, involvement of the top management; analysis of the actual effects (including financial) by the parties involved)	7	4	0

Source: own study based on the results of the Delphi study.

Referring to the expert opinion results presented in the table above, it should be noted that the vast majority of experts agreed in expressing their views on the sequence of stages in the process of shaping innovation, innovative solutions, solutions in logistics services. In the opinion of experts, each of the stages is necessary or slightly assessed as optional. Moreover, the experts did not indicate that any stage could be considered redundant. It is also worth adding that in this respect, there were slight differences in views between the opinions of experts representing the world of science and the opinions of representatives of business practice. These differences were related to the expressed views on the *optional stages*, which were indicated in the vast majority of economic practice representatives, except for the first stage assessed as *optional* by an expert representing the world of science.

Then, the focus was on achieving another goal of the Delphi study, which was to *identify and classify the determinants of creating innovative logistics services in modern supply chains*. In this area, experts were asked for opinions on the extent to which the indicated factors stimulate and limit 3PL operators and 4PL logistics integrators in implementing innovations

(innovative services/solutions) in the logistics service of supply chains. A scale from 0% to 100% was adopted for individual factors, where 0% - does not stimulate at all, and 100% - stimulates the maximum. A strong, and thus considered significant, level of the impact of individual factors indicated by experts was adopted according to criteria including the scale of the impact degree from 50% to 100%. The stimulating and limiting factors groups are divided into internal and external factors. Table 4 presents groups of factors stimulating operators and logistic integrators in implementing innovations.

**Table 4.**  
*Determinants stimulating operators (3PLs) and logistic integrators (4PLs) to implement innovations (innovative services/solutions) in the logistics service of supply chains*

<b>A group of stimulating factors</b>		
<b>Category of factors</b>	<b>%</b>	<b>The degree of influence (%) in the opinion of experts</b>
<b>Internal factors</b>	<b>experts</b>	
Organization level	<b>45.45%</b>	90%
	<b>36.36%</b>	80%
	18.18%	70%
Structural changes	<b>45.45%</b>	90%
	<b>18.18%</b>	80%
	<b>18.18%</b>	70%
	9.09%	60%
	9.09%	50%
Financial conditions	<b>36.36%</b>	90%
	<b>36.36%</b>	80%
	18.18%	50%
	9.09%	60%
Resources owned	<b>18.18%</b>	100%
	<b>27.27%</b>	90%
	<b>18.18%</b>	80%
	<b>36.36%</b>	70%
Learning between organizations	9.09%	100%
	9.09%	90%
	9.09%	80%
	9.09%	70%
	<b>18.18%</b>	60%
	<b>36.36%</b>	50%
<b>External factors</b>	<b>% of experts</b>	<b>The degree of influence (%) in the opinion of experts</b>
Customer requirements	<b>27.27%</b>	100%
	<b>45.45%</b>	90%
	9.09%	80%
	18.18%	70%
Industry requirements	<b>18.18%</b>	100%
	<b>36.36%</b>	90%
	<b>18.18%</b>	80%
	9.09%	70%
	18.18%	60%
Globalization and internationalization	9.09%	100%
	<b>18.18%</b>	90%
	<b>54.55%</b>	80%
	9.09%	70%
	9.09%	60%

Cont. table 4.

Requirements of suppliers - cooperators	9.09%	100%
	<b>36.36%</b>	90%
	<b>27.27%</b>	80%
	<b>27.27%</b>	60%
Pro-ecological requirements	9.09%	100%
	<b>36.36%</b>	90%
	<b>27.27%</b>	70%
	<b>27.27%</b>	60%
Political conditions	9.09%	100%
	<b>18.18%</b>	90%
	9.09%	80%
	9.09%	70%
	<b>18.18%</b>	60%
	<b>27.27%</b>	50%
	9.09%	20%
The growing role and pace of process (technological) and product innovations	9.09%	100%
	<b>36.36%</b>	80%
	<b>36.36%</b>	70%
	18.18%	60%
Competition	<b>18.18%</b>	90%
	<b>63.64%</b>	80%
	9.09%	60%
	9.09%	50%
Availability of financial support	<b>54.55%</b>	80%
	<b>45.45%</b>	70%
Increased interest in sustainable development	9.09%	90%
	<b>18.18%</b>	80%
	<b>18.18%</b>	60%
	<b>27.27%</b>	50%
	<b>27.27%</b>	40%

Source: own study based on the results of the Delphi study.

Considering the expert opinions, the conclusion can be drawn to the most important internal and external factors motivating 3PL operators and 4PL logistics integrators to create and implement innovations. In the group of internal factors, the following factors should be distinguished:

- related to *the level of organization* - understood as the adopted assumptions, goals for further development, as well as openness to the adaptation and implementation of innovative solutions, for example, personalized services, or new services for the markets or industries served, etc. (from 36% to 45% of experts indicated the degree of impact in the range between 80% and 90%),
- *structure change* - read in a positive sense (decentralization, centralization, mergers, acquisitions, strategic alliances) (from over 18% to over 45% of experts indicated the degree of influence from 70% to 90%),
- *financial conditions* - own financial resources, as well as the possibility of obtaining support from financing institutions, is an internal stimulating factor, the degree of impact of which at the highest level of 80% and 90% was indicated by over 36% of experts.



- *resources* - technological resources (technology and information flow, including the availability of IT and ICT solutions and openness to sharing information) as well as human resources (human resources, personnel qualifications), as well as knowledge and experience (also certificates, licenses, " know-how ") (the degree of impact at the level of 70% was assessed by over 36% of experts, the level of 100% of the impact was indicated by over 18% of experts),
- *learning between organizations* - interpreted as organizational learning, relationship orientation, openness to learning of both top management and lower-level employees, as well as openness in establishing partnerships (cooperation - relationship networks) (over 36% indicated the degree of impact at the level of 50%, over 18% of experts assessed the degree of impact at the level of 60%, the highest level of impact from 70% to 100% was emphasized by almost 10% of experts). It is also worth mentioning that the experts did not indicate the lowest thresholds for the level of influence (from 0% to 40%) for any internal factor.

The most important in the group of external factors stimulating 3PL operators and 4PL logistics integrators in creating innovations (innovative forms, services) in logistics services, experts indicated *competition*. Competition is understood as activities of other competitive enterprises on the local, regional, and industry market, as well as new trends and solutions appearing on the market, as well as striving to achieve a competitive advantage (and focusing on the high quality of services provided). Over 63% of experts indicated this factor's impact at 80%, and almost 19% of experts assessed its stimulating effect at the level of 90%. Interestingly, a slightly smaller group of experts, i.e. about 10%, assessed the motivating influence of *the competition factor* at the level of 50% and 60%.

A significant external factor indicated by a group of over 54% of experts is the factor related to *globalization and internationalization*, the impact of which was assessed by experts at the level of 80%. A smaller group of experts (over 18%) indicated the motivating impact of *globalization of internationalization* at 90%.

Equally high, almost similar, indications of experts can be observed in assessing the impact of factors such as customer and *industry requirements*. Almost 30% of experts indicated the highest degree of impact of the *customer requirements factor expressed at the level of 100%*. A much larger group of experts, over 45%, assessed the impact of this factor at the level of 90%, and less than 10% of experts indicated the 80% level of impact. In turn, the impact of the factor *industry requirements* was assessed by 18.8% of experts at the level of 100% and 80%. On the other hand, the most numerous group of experts (36.6%) indicated the stimulating effect of this factor at the level of 90%.

*Availability of financial support* is another external factor stimulating the innovative activities of 3PL operators and 4PL logistics integrators, indicated by a large group of experts. The impact of this factor was assessed by over 54% of experts at the level of 80%. On the other hand, the level of 70% of the impact in relation to this factor was indicated by almost 46% of experts.

As shown by the results of the study, equally important external factors inspiring to innovation, in the opinion of experts, are also:

- *pro-ecological requirements* (the growing importance and awareness of the implementation of pro-ecological actions by 3PL operators and 4PL logistics integrators, as well as pro-ecological policy (legislation and policy in the field of safety and environmental protection of the EU) (over 36% of experts indicated the impact at the level of 90%, over 27%, impact at the level of 60% and 70%),
- *political conditions* (over 18% of experts indicated the impact at the level of 90% and 60%),
- *the growing role and pace of process (technological) and product innovations* (strong impact at the level of 70%, 80%, and 100%),
- *increased interest in sustainable development* (over 27% of experts indicated the impact at the level of 50% and 40%).

When examining the group of limiting factors and their impact on implementing innovations by 3PL operators and 4PL logistics integrators, they were also divided into two categories, internal and external factors. The results of the analysis of the collected opinions of experts in the area of identified key internal factors (including their impact) are presented in Table 5.

**Table 5.**

*Restrictive external and internal factors and their negative impact in shaping innovation by 3PL operators and 4PL logistics integrators*

External factor (restrictive)	The degree of influence of the factor									Internal (limiting) factor	The degree of influence of the factor									
	100%	90%	80%	70%	60%	50%	40%	30%	20%		100%	90%	80%	70%	60%	50%				
	% of expert opinions										% of expert opinions									
Customer requirements	36%	18%	9%	18%	9%	0%	0%	9%	0%	Organization structure	9%	27%	0%	9%	9%	45%				
Crises: Epidemiological	18%	27%	36%	0%	0%	9%	9%	0%	0%		Related to resources	0%	27%	45%	9%	0%	0%			
Legal conditions	18%	27%	27%	9%	9%	0%	0%	9%	0%			Economic/financial conditions	0%	36%	27%	9%	0%	0%		
Unstable political and economic situation	18%	18%	18%	18%	18%	0%	9%	0%	0%				Ecological requirements	0%	18%	9%	18%	36%	9%	0%
Cyber attacks; terrorist attacks	9%	18%	9%	36%	18%	0%	0%	9%	0%	Intercultural aspects	0%	9%		9%	0%	27%	27%	18%	9%	0%
Global market requirements	18%	9%	18%	27%	9%	18%	0%	0%	0%											
Related to the attitude of logistics service providers - subcontractors	9%	27%	0%	27%	9%	27%	0%	0%	0%											

Source: own study based on the results of the Delphi study.

The highest indications of experts in relation to the group of internal factors limiting the development of innovations (innovative forms, solutions) by 3PL operators and 4PL logistics integrators, according to experts, are:

- conditions *related to resources (impact at the level of 80%)*, more specifically human resources, including the lack of qualified staff, the reluctance of employees to self-improve, or the growing costs of employee maintenance, etc.,
- *economic/financial conditions* - according to experts, these conditions should be associated with the lack of financial resources of 3PL operators and 4PL integrators, thus the lack of the possibility of financing innovations/innovative solutions and investing in research and development. In this aspect, experts also indicated high costs of searching for and implementing innovations (impact at the level of 90%),
- *organizational structure* - defined by experts as "rigid" structures, centralization, and the inability to individualize activities and development of a branch/sector (limiting impact at the level of branch/unit).

In the group of external factors, experts distinguished a much larger spectrum of barriers, also pointing to their limiting influence in shaping innovation by 3PL operators and 4PL logistics integrators. The factor related to customer requirements is the first factor indicated by experts with a high degree of influence (adequately in terms of the degree of influence at the level from 60% to 100%). In the group of external factors limiting innovative activities with a strong level of influence (the percentage of indications of the degree of influence on a scale from 60% to 100%), the experts distinguished the following factors:

- *legal conditions* relating to tax and fiscal changes; differences in regulations/legal directives in different countries and regions (e.g. EU); changes in customs law (including Brexit),
- *epidemiological crises*, including historical and contemporary crises (in the opinion of experts, e.g. swine flu, avian flu, SARS-CoV-2 pandemic, etc.; economic; migration; natural disasters, natural disasters),
- *unstable political and economic situation, requirements of the global market, and cyber attacks - terrorist attacks*.

Moreover, among the equally important external factors, the following determinants were indicated in the opinions of experts that have an extremely destimulating effect on the creation of innovative initiatives by 3PL operators and 4PL logistics integrators:

- *the attitude of logistics service providers - subcontractors*, therefore, in the opinion of experts, means resistance to change, to sharing information, creating networks with partners, to establishing relationships, sharing knowledge with clients/partners, avoiding negotiations (lack of openness, reluctance to establish long-term relationships; inappropriate cooperation),

- *diversified access to resources*, meaning, in the opinion of experts, human resources, IT resources, technical and technological resources - IT gap - a gap in access to IT/ICT solutions in different regions, countries, etc.),
- *intercultural aspects*, interpreted as multiculturalism, different customs on domestic and international markets,
- *environmental requirements*, commented by experts as restrictions on the introduction of innovations related to environmental protection as a barrier, including differentiation in terms of national, and international legal regulations in the field of environmental protection.

Summing up, it should be noted that the vast majority of experts indicated a more substantial influence of external factors, both stimulating and limiting the innovative activity of 3PL operators and 4PL logistics integrators. The spectrum of factors indicated by experts representing the scientific community and business practice, therefore from the perspective of two environments, is an extremely valuable contribution to the theoretical research conducted so far, the results may also be of interest to representatives of business practice.

## 5. Discussion and conclusions

The identified and classified list of factors determining the process of creating and implementing innovations and innovative forms (solutions, services) by 3PL operators and 4PL logistics integrators in the logistics service of supply chains will undoubtedly change. Hence, the catalog of identified and classified determinants should be treated as open. The shape of the list, including the emergence of new factors or the exclusion of individual factors, will most likely be influenced by globalization and internationalization, as well as progressing digitization (including the development of new technologies). It should also be assumed that the strength and direction of the impact of individual factors will also change. It is worth noting that this area is still valid and is a valuable insight for science, knowledge, and practice in general.

Based on the results of the study, activities in the process of shaping innovative logistics services were identified, and its stages were characterized. As indicated earlier in the research results published so far, fragmentary and often selective discussion on the implementation of the process of shaping innovation by logistics service providers (for example the previously mentioned research by Björklund and Forslund) was noted. Hence, the findings presented in this area can be treated as new research findings, thus a voice in the discussion that opens the possibility of further deeper exploration and inference.

The results and conclusions from the conducted research lead to the formulation of implications for economic practice. The research conclusions confirm that logistics service providers should demonstrate a high level of awareness that today's customers are increasingly demanding. Logistics service providers should be aware that customers expect proper logistics service and that logistics companies will follow the dominant trends in technology, pro-ecological activities, and the scale of services provided. Logistics service providers should be open to the "voice of the customer" and its role in creating innovation to obtain information on customer needs and preferences and their opinions on the services and solutions offered. In this way, logistics service providers will obtain key information in creating various types of innovations, including, in particular, the directions of improving the services offered.

Despite the value of the research results and their contribution to knowledge, the research has some limitations. The limitation of this study is that it covered experts from Poland. Hence, the direction of further research is recommended to repeat or even extend the research in new contexts. For example, they can be experts from various geographic locations that will cover other countries and even continents to produce more generalized conclusions.

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