



LOGISTICS MATURITY MODEL IN THE SERVICE INDUSTRY: STATE OF ART AND RESEARCH IMPLICATIONS

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ABSTRACT. Background: Contemporary, logistics is regarded as a key factor in business success, which results in the emergence of the Logistics maturity concept. In the current literature, there is still lack of efforts to systematically review the state of the art of logistics maturation. Therefore, the aim of the paper was to address this gap by investigating the academic signs of progress in logistics maturity of service companies according to a developed literature review procedure.

Methods: The literature review method was used to verify current knowledge on the logistics maturity model, with the use of the developed method for literature review research.

Results: The literature review procedure was developed and used to analyze and categorize papers within the logistics maturity topic for identification of the logistics maturity, existing models, their structure and areas of maturity assessment. This study presents the research gap in logistics maturity models for the service industry.

Conclusions: Expected results of the research will contribute to the systematization of knowledge on the logistics processes realization in the service industry, so it will affect the state of theoretical knowledge of economics, management, and logistics. Findings of this review may be used as the basis for logistics maturity model development as well as a guideline for making a literature review.

Key words: logistics maturity, literature review, state of art, service industry.

INTRODUCTION

The competitiveness of companies require „mature logistics” as logistics has been perceived as a source of the competitiveness or key competence [Christopher 2016] and a major source of cost. Therefore, logistics has become an increasing area of strategic concern for companies, which compete in the turbulent environment.

Logistics is considered in a paper as a sum of undertaken processes aimed at efficient flow management into and out of a business in order to meet customers’ requirements. Thus, logistics has several different fields of emphasis, including procurement, distribution, warehousing, reverse logistics, which are

equally important. Considering the growing importance of logistics, there have been made some attempts to manage it and assess it. The increasing importance level of logistics has resulted in the term ”logistics maturity”, which took roots in the concept of process maturity.

Maturity models have been explored in the literature, resulting in many papers, also reviews e.g. made by Lacerda and von Wangenheim [2018]. Since these days, the publication amount of maturity-related topics has been steadily risen, resulting in new models dedicated to a specific sector or area. This growing diversity and scale of papers on maturity has made the field of maturity model research more and more confusing and interesting, at the same time.

Considering the above, authors assumed that logistics maturity model becomes necessary to be analyzed in a systematic way to describe what is state-of-art on that topic as the overall state of the art of research on logistics, maturity has so far been rather limited.

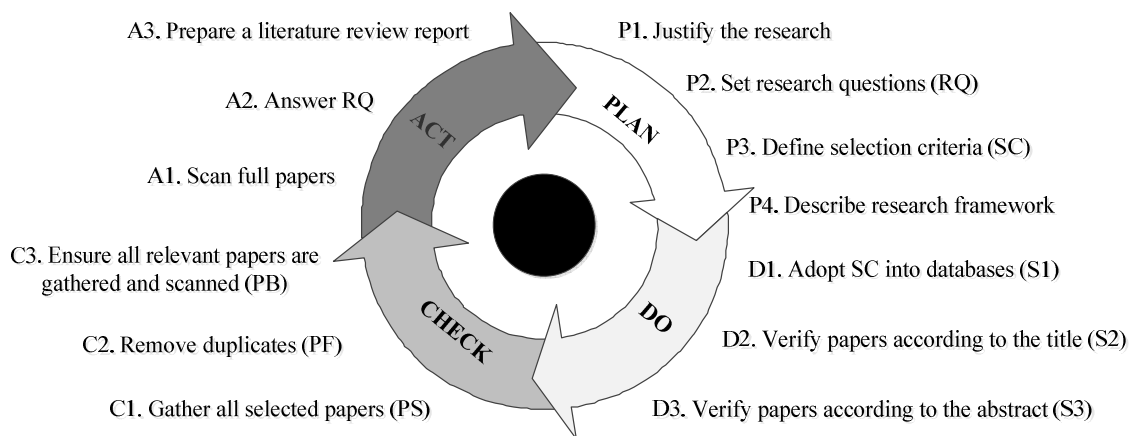
The major objective of the paper was to provide an overview of the current state of the art on the logistics maturity model. The research was carried out in the framework of the project entitled: “Research on logistics maturity of service companies”, realized in Poland (Project ID: 2016/21/D/HS4/02116). To achieve major objective of the paper, there was determined a literature review procedure.

The remainder of the paper is organized as follows. The research methodology is briefed in Section 2. Section 3 presents the methodology applied in this work. In Section 4 there are included answers for research questions used in Section 3. Section 4 provides

a brief conclusion to this paper regarding the main findings and future research directions.

REVIEW METHODOLOGY

The aim of this study was to obtain an overview of the logistics maturity model. Therefore, it was assumed, that systematic literature reviews as proposed by Kitchenham [2004] or Denyer and Tranfield [2009] is an appropriate approach for gaining comprehensive insights. Owing to the fact, that there has not been identified one common approach to the literature review, author decided to prepare a procedure useful for literature review on the specific topic, within PDCA (Planning (P), Doing(D), Checking (C) and Acting (A)) method framework. As a result, the revision procedure was performed, following four major stages presented in Fig. 1.



Source: own work

Fig. 1. Literature review procedure

Regarding Fig. 1, the major focus of the first stage of research is research planning (P). Following Kitchenham [2004], it was claimed, that the key activity for the literature review is to justify that it is required. For justifiable reasons, the research questions should be established (hereafter: RQ), which are

considered in a paper as a pre-requisite for the literature review success. As a consequence of the conducted literature research obtaining answers for RQ is expected. Finally, as the last step of the planning stage, there should be determined selection criteria (hereafter: SC). The most often used selection criteria include

keywords, Boolean operators, search fields, time window, language, publication type, subject area, inclusion/exclusion criteria. Finally, the framework for the searching should be established, considering review executors, time of research (dynamic changes in publications) and used databases adequate from the perspective of the research scope, however in the author’s opinion one repository is not enough.

Regarding Fig. 1, the major focus of the second stage of research is research doing (D), which requires papers selection according to specified requirements (SC). Firstly, SC should have been adopted into databases. It is noteworthy that, databases useful for the literature review offer different possibilities in selection criteria adoption on the initial selection, so research executors should describe search strings for each of the used databases. On the basis of the result of initial selection, a set of papers S1 is gathered, which is further verified in the scope of criteria fulfillment on the level of paper’s title, and later on the level of paper’s abstract.

With reference to Fig. 1, in the next stage of research the focus is put on checking papers and ensuring relevant works for further analysis. When a few databases are used, all satisfying results should be combined into one set of papers (set PS). In the next step, duplicates should have been excluded to get papers assigned to be fully screened (set PF). To ensure all relevant papers for further analysis, the snowball rule should be used so if there are some additional references, they should be added and verified (set PB).

Following Fig. 1, in the next stage there should be made an analysis of papers on the level of full paper content in order to answer RQ. The final step of this stage of a research is a research report. Research findings should be a summary of the current state of knowledge in the area of the problem under investigation.

LITERATURE RESEARCH ON LOGISTICS MATURITY MODEL IN THE SERVICE INDUSTRY – RESEARCH DESCRIPTION

Following the literature review procedure (Fig. 1), the literature research on the logistics maturity model was executed.

Considering the framework of the presented paper there was justified need to provide an overview on the current state of the art on the logistics maturity models as a part of research on logistics maturity of service companies, realized in Poland (Project ID: 2016/21/D/HS4/02116). The objective of this review was to elicit the state of the art on logistics maturity models. In this respect, to obtain an overview of the existing models the following research questions (RQ) were defined (Table 1).

Table 1. Research questions

Question ID	Description
RQ1	Is logistics maturity (as a whole) is a research subject?
RQ2	How to define the logistics maturity?
RQ3	How available logistics maturity models are built?
RQ4	Were existing models verified?
RQ5	Are there solutions dedicated for the research on logistics maturity in service companies, considering various sectors of services?

Source: own work

Considering the RQ (Table 1), there were defined SC as presented in the Table 2.

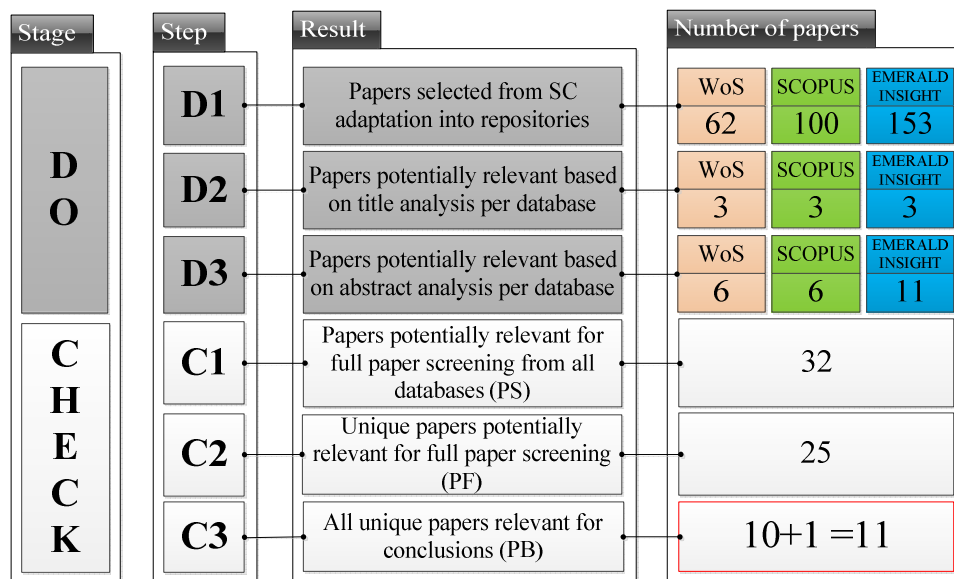
The searching framework included: time (August 2017), research executor (author of the paper) and scientific databases (“Web of Science”, “Scopus”, “Emerald Insight”).

Following Fig. 1, in the second and third stage of research, there were selected papers for full screening by SC adoption into databases used in the research. The results of these stages in numbers were presented in Fig. 2.

Table 2. Selection criteria used in research on logistics maturity model

Criterion	Description
Keywords	<ul style="list-style-type: none"> • Related to subject: maturity, maturation, growth, evolution • Related to the logistics: logistics, logistic • Including an assessment context: assessment, measurement, measures, assess, evaluation, evaluate • Considering: Method used for research on maturity: model, method, tool
Boolean operators	AND, OR
Search fields	title, keywords, abstract,
Time window	Till 2017
Language	English
Publication type	No limits
Subject areas	Engineering, economics, management, business, social Sciences, decision-making.
Inclusion criteria	I1: Studies regarding the evaluation of logistics processes using the maturity model. I2: Logistics maturity is being investigated on the company's level

Source: own work



Source: own work

Fig. 2. Papers selection for full screening

After an SC application into repositories, considering all required modifications of SC, there were 315 papers obtained from step D1 (set S1).

With reference to the Fig.1, in the next step all papers from the previous step were analyzed considering the title, in the scope of requirements related to logistics maturity topic fulfillment (step D2, Fig. 2). As a consequence, 9 papers from all repositories met these requirements (set S2).

Some of the papers required further analysis at the abstract level and 23 (set S3) of them were accepted after step D3 (Fig. 2).

As a consequence, there was obtained a set of 32 papers (set PS) from all databases

gathered within step C1 (Fig. 2) however, it had to be cleared of 7 duplicates (step C2), which resulted in a set of 25 papers (set PF) intended for full paper scanning. It accounted for 8% of all publications searched by introduction SC during the initial selection S1.

In the author's opinion it is essential to make some conclusions only on those works which are related to RQ, so the set of publications intended for conclusions was reduced by 56%. Consequently, 11 papers: [Janse et al., 2010, Eadie et al., 2011, Battista et al., 2012, Bemelmans et al., 2013, Cao, Jiang 2013, Battista, Schiraldi, 2013, Jellouli, Abdelkadhi, 2013; Mazur, Stachowiak, 2014, van Lith et al., 2015, Benmoussa et al., 2015, Tontini et al., 2016], were included in fourth stage of research (one paper was added

according to snowball rule). Based on those 11 papers, answers for RQ were obtained.

LITERATURE RESEARCH ON LOGISTICS MATURITY MODEL IN THE SERVICE INDUSTRY – RESEARCH RESULTS

RQ1: Is logistics maturity a research subject?

As a result of the literature review, it was stated that the logistics maturity has been the subject of scientific research, the interest rate is minor (only 11 publications). It is noteworthy, that in more than 70% of publications, logistics was considered in a narrow context, so researchers have taken up issues related to the maturity of selected logistics area e.g. distribution, supply, reverse logistics or supply chain-related issues. Considering research results, only one model makes possible to assess the maturity of the whole logistics system described by Battista et al. [2012] and Battista & Schiraldi [2013]. In the author's opinion, this confirms the ongoing research gap in this area, which should be a premise to undertake research to overcome the gap.

RQ2: How to define the logistics maturity?

Only in three papers, there was a logistics maturity model [Battista et al. 2012, Battista, Schiraldi, 2013, Jellouli, Abdelkadhi, 2013], so they were recognized as adequate to find the definition of logistics maturity. Unfortunately, even in these studies, there was no clear definition of logistics maturity, only a framework of existing maturity models. Owing to that fact, it was claimed that there has been identified a research gap. What is more, even in the case of a vast majority of rest papers analyzed in this paper, there was a lack of maturity definition in the context of a particular maturation object. There were identified only definitions of purchasing maturity in [van Lith et al. 2015] and [Bemelmans et al. 2013].

It was claimed, that the reason for the lack of logistics maturity definition is the fact that it has not been a well-recognized issue. Researchers intuitively use references to other

existing models, defining a framework for models developed by them, recognizing this as sufficient, but without definition, their understanding may be difficult or even not possible. In the authors' opinion, issues with definition as well as a small number of papers on logistics maturity may result from problems related to the adaptation of maturity models in logistics.

RQ3: How available logistics maturity models are built?

In order to answer to RQ3, all 11 papers were analyzed considering the structure of the maturity model, expressed by maturity levels number and the assessment dimension as well as the used framework and research methodology to build the model (Table 3).

Regarding Table 3, it was stated that the reference model has an impact on the number of maturity levels. It is noteworthy that, 100% of selected studies presented maturity levels as an element of maturity model. However, numbers of maturity levels vary between 4 and 10, but 5 maturity levels is the most common value. Limit of the maturity levels number seems to be justified from the point of view of factors determining a given level description. The more levels, the harder the model's description.

Considering the Table 3, it was stated that CMM and CMMI standard have been seen as those reference models which play a dominant role in maturity model determination (60% of all maturity models described in the paper). Taking that into consideration it was assumed that, researchers do not reinvent the wheel, so they use well-known frameworks. The key for the CMMI model is the representation of the maturity model in a graduated form, where a specific level of maturity corresponds to the degree of meeting the requirements in a given range. These requirements can be described using both variable values as well as linguistically from the perspective of certain assessment parameters state. Justification for CMMI model used as a maturity model framework was presented in [Veldman & Klingenberg 2009].

Table 3. Logistics maturity model specification

Reference	No of maturity levels	Assessment dimension	CMMI/CMM Framework	Research methodology
[Tontini et al., 2016]	4	Materials management, Purchasing process, Supplier evaluation, Procurement planning	Other	literature review, experts method, survey
[van Lith et al., 2015]	10	8 strategic processes and 6 enabling processes in purchasing	Other	literature review, case study, interview
[Benmoussa et al., 2015]	6	Processes identified by mapping	CMMI	literature review, case study
[Bemelmans et al., 2013]	6	14 aspects of procurement	Other	literature review, interview
[Eadie et al., 2011]	5	12 KPA related to the barriers and drivers for procurement	CMM	literature review, experts method, survey, interview, statistical analysis
[Mazur and Stachowiak, 2014]	5	Organization	CMMI	literature review, survey, observation
[Cao and Jiang, 2013]	5	Storage, Transportation, Cost, Time	CMM	literature review, mathematical modelling
[Janse et al., 2010]	4	Business strategy, Reverse supply chain management strategy and goals, Spare part management, Secondary markets and remarketing, Process recovery	CMMI	literature review, case study, survey, interview
[Battista & Schiraldi, 2013], [Battista et al., 2012]	5	4 dimensions according to SCOR (without reverse logistics)	CMMI	literature review, interview, brainstorming
[Jellouli and Abdelkadh, 2013]	4	Logistics, but no detailed data	No data	literature review, experts method, survey

Source: own work

With reference to research methodology, the literature review method was indicated as necessary, owing to the fact that it was used in each considered paper. It proves that knowledge is essential for developing a new model, even if existing models are used as a framework. Moreover, very often there are also used interviews and surveys as maturity the level is usually determined by the evaluation of answers, check-list points or assessed statements (usually on a Likert scale) in a self- or external evaluation (in 50% of models). In the author's opinion, it is relevant to use various methods, techniques, and tools, which should be adequate for the purpose of the research. It was stated, that research methodology should be adequate to the research object so the research instruments should be selected in such a way to allow an objective and unambiguous assessment of the company's logistics maturity.

Taking into consideration the assessment's dimensions, it was found that there has not been identified one clearly dominant approach. Moreover, it is worth noting that the dimensions of this assessment are a consequence of the logistics area. In the author's opinion, as far as the logistics

maturity model is concerned, all logistics areas (logistics systems) should be included in the assessment dimensions, which have been missing in the identified logistics maturity models.

To sum up, in the author's opinion each maturity level should be identified by requirements indicated at an adequate level, not descriptions of levels, as this may raise doubts during the maturity research. It should be noticed that the logistics maturity model may have an evolutionary character, so reaching the higher level must be preceded by the achievement of the lower level however, it is not a precondition.

RQ4: Were existing models verified? & RQ5: Are there solutions dedicated for the research on logistics maturity in service companies, considering various sectors of services?

In order to answer the last questions, there was made an analysis of papers according to their practical verification and potential to the adaptation to service industry (Table 4).

Table 4. Logistics maturity model development – models’ verification and application to services

Reference	Verification	Sector	Service adaptation	Remarks
[Tontini et al., 2016]	YES	Metal-mechanic, medical services	YES	
[van Lith et al., 2015]	YES	Construction	YES	
[Benmoussa et al., 2015]	YES	Furniture	Adaptable	Tests required
[Bemelmans et al., 2013]	Partially	Construction	Yes	Model verified in distribution. Additional activities required in other logistics areas
[Eadie et al., 2011]	NO	-	Adaptable	Additional activities required to adapt to the service industry
[Mazur and Stachowiak, 2014]	NO	-	Adaptable	Additional activities required to adapt to the service industry
[Cao and Jiang 2013]	NO	Manufacturing	Adaptable	Tests required. Additional activities required to adapt to the service industry
[Janse et al., 2010]	YES	Electronic equipment manufacturing	Adaptable	Additional activities required to adapt to the service industry
[Battista & Schiraldi, 2013], [Battista et al., 2012]	YES	Fashion industry	Adaptable	
[Jellouli and Abdelkadhi, 2013]	NO	-	No data	

Source: own work

With reference to the RQ4, it was claimed that 40% of maturity models were theoretical, as they had not been verified. Some of the presented solutions were verified, but there were identified additional activities required for their practical use [Benmoussa et al., 2015; Bemelmans et al. 2013; Cao and Jiang 2013]. Despite the fact that there were found maturity models for service enterprises, they were dedicated to representatives of a particular sector, and in addition, they did not undertake logistics in a broad but narrow sense [Tontini et al. 2016; van Lith et al. 2015; Bemelmans et al. 2013]. It is unlikely that presented models would be adapted to the services, even if it was assumed as possible for almost all models (excluding the last one). However, it is possible to adapt presented maturity models to the service selector, but it is not a non-invasive solution in the author’s opinion.

In summary, it was found that in the context of ongoing research on the logistics maturity of enterprises in the services sector, there has not been identified a comprehensive solution, which has resulted in the identification of a research gap in this research area.

CONCLUSIVE REMARKS

To sum up, companies should assess their state of logistics maturity in order to improve activities conducted within logistics. With

logistics assessment, the company has more control over its logistics processes and the achievement of its goals. However, there may be perceived solutions for logistics assessment but the focus on the chosen logistics function does not consider all functions, so it is not valuable, in the author’s opinion.

Considering the above, the logistics maturity of the service enterprises should be assessed, since the intangible service requires material logistic support, without which it cannot be performed. Achieved results of conducted research in this area will contribute to broadening the knowledge about the logistics maturity in the service sector. Consequently, this will close the research gap in this area. The expected research results will contribute to the systematization of the state of knowledge on logistics processes implementation in the service sector, thus affecting the state of theoretical knowledge in the field of economics, management, and logistics. In terms of civilization development, the research results will contribute to the improvement of logistics processes in service enterprises, which will positively affect the competitiveness of these enterprises. For practitioners, the results of such studies will be a starting point for further in-depth research in the field of logistics maturity in service enterprises.

The major conclusion of the research is that there is a research gap related to the logistics maturity model for service industry, so there is a need to develop a logistics maturity model, considering the achievements of previously defined maturity models available in the literature in order to define the best solution.

ACKNOWLEDGMENTS AND FUNDING SOURCE DECLARATION

This paper refers to the research financed by the Polish National Science Centre, project: Research on logistics maturity in service enterprises, grant no. 2016/21/D/HS4/02116.

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MODEL DOJRZAŁOŚCI LOGISTYCZNEJ PRZEDSIĘBIORSTW USŁUGOWYCH: STAN OBECNY I KIERUNKI DALSZYCH BADAŃ

STRESZCZENIE. Wstęp: Współcześnie logistyka uznawana jest za kluczowy czynnik sukcesu, co skutkuje istotnością zagadnienia dojrzałości logistycznej. Współcześnie, w literaturze wciąż brak jest systematycznego przeglądu literatury, podsumowującego stan wiedzy w zakresie dojrzałości logistycznej. Biorąc powyższe pod uwagę, za główny cel artykułu przyjęto wypełnić zidentyfikowaną lukę poprzez weryfikowanie aktualnego stanu wiedzy w zakresie rozwoju dojrzałości logistycznej przedsiębiorstw usługowych, wykorzystując przygotowaną procedurę do analizy literatury.

Metody: W pracy wykorzystano metodę analizy literatury celem weryfikacji aktualnego poziomu wiedzy na temat modelu dojrzałości logistycznej przedsiębiorstw usługowych, wykorzystując w tym celu opracowaną procedurę przeglądu literatury.

Wyniki: Opracowano procedurę dokonywania przeglądu literatury, która została wykorzystana do analizy oraz klasyfikacji zidentyfikowanych w literaturze opracowań podejmujących tematykę dojrzałości logistycznej celem identyfikacji dojrzałości logistycznej, istniejących modeli, ich struktury oraz obszarów dokonywania oceny. W rezultacie ukazano lukę badawczą dotyczącą modeli dojrzałości logistycznej przedsiębiorstw usługowych.

Wnioski: Oczekiwane wyniki badań przyczynią się do usystematyzowania wiedzy na temat realizacji procesów logistycznych w sektorze usług, co będzie oddziaływało na poziom wiedzy teoretycznej na temat ekonomii, zarządzania i logistyki. Rezultaty przeprowadzonych badań mogą zostać wykorzystane jako podstawa do opracowania podstaw modelu dojrzałości logistycznej, lecz również jako przewodnik w prowadzeniu badań nad aktualnym stanem literatury w danym zakresie.

Słowa kluczowe: dojrzałość logistyczna, przegląd literatury, aktualny stan wiedzy, sektor usług

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