
Project Teams as a Supply Chain Integration Tool

Submitted 01/10/20, 1st revision 05/11/20, 2nd revision 30/11/20, accepted 15/12/20

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Abstract:

Purpose: The purpose of this paper is to confirm that inter-functional or inter-organizational project teams are one of the supply chain integration tools.

Design/Methodology/Approach: A theoretical framework is based on the identification of issues and trends discussed in the literature on the subject grouped in two scientific bases: Scopus and Web of Science. The empirical framework analysis of the research data through statistical analysis has been used.

Findings: Cross-functional and cross-organizational teams' improvement may enable companies to develop stronger relationships with members of their supply chain, which will affect its integration.

Practical Implications: The presented findings and associated theoretical framework offer useful new insights regarding the process of supply chain integration and an opportunity for future research. A more in-depth analysis may also be conducted regarding supply chain integration levels.

Originality/value: The paper is among the first to focus the role of inter-functional or inter-organizational project teams on supply chain integration process. While the structuring of integrated "hard" supply chain flows is well established, much less is understood concerning the contribution of such "soft" areas as inter-functional or inter-organizational project teams.

Keywords: Supply chain integration, inter-functional integration, inter-organizational integration, project teams.

JEL classification: J24, O15, M12.

Paper Type: Research and empirical study.

Acknowledgments: The project is financed by the Ministry of Science and Higher Education in Poland under the programme "Regional Initiative of Excellence" 2019 - 2022 project number 015/RID/2018/19 total funding amount 10 721 040,00 PLN.

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1. Introduction

The success of supply chains is primarily dependent on the ability to integrate and coordinate the activities of the network participants products, information, and financial resources flow processes from the acquisition of raw materials to the places of consumption, which (as it is emphasized in the literature of the subject) contributes to the creation of a competitive edge of a supply chain and its customers. The cooperation of individual entities in the supply chain is based primarily on many standardized processes and often also on projects. The literature deals with the integration of enterprises in the supply chain, pointing to its benefits. Some of the authors noticed the need to integrate suppliers and customers to make a supply chain successful (Vereecke and Muylle, 2006). Researchers suggest that relationship development between supply chain participants facilitates value creation by leveraging the resources that each firm brings to a relationship, enabling goods and services differentiation (Ulaga, 2003; Vargo and Lusch, 2004) and is a way to achieve efficiencies, flexibility, and sustainable competitive advantage (Nyaga, Whipple, and Lynch, 2010).

Collaboration, defined as two or more companies sharing the responsibility of exchanging common planning, management, execution, and performance measurement information (Anthony, 2000), is a concept discussed in the supply chain integration literature (Skjoett-Larsen, Thernøe, and Andresen, 2003; Fawcett and Magnan, 2004). It is also presented as the formation of interfirm linkages or partnerships in which the companies involved work together and share information, risk, resources to achieve their goals (Bowersox, Closs, and Stank, 2003; Golicic, Foggin, and Mentzer, 2003). Typically, close relationships first develop across functional areas within an organization. This is the foundation for functional interdependence extending into the partner firm, but the result is an integration of intra- and interfirm activities. Participants become functionally interdependent and pursue beneficial outcomes.

Supply chain entities create cross-organizational linkages because they have something to gain (Min *et al.*, 2005). Many papers focus on the different ways of achieving supply chain integration. Most of them emerge mainly from operations, information systems, and information technology (Alvarado and Kotzab, 2001; Themistocleous, Irani, and Love, 2004; Min and Zhou, 2002). Nevertheless, according to Scholten and Schilder (2015), several integration factors could be related to achieving collaboration in the supply chain: information-sharing, collaborative communication, joint relationship effort, and jointly created knowledge.

In the literature, however, there is no reference to the operationalization of this process by indicating specific solutions for economic practice. The authors' empirical research presented in the empirical part of the article shows that the tool that allows for merging and joint activities of supply chain entities is the

establishment and operation of project teams therein. Its nature, regardless of whether they are monofunctional or interdisciplinary, is characterized by temporariness, concentration on a specific goal, a departure from power based on formal authority in favor of expert power, and the lack of strict division of labor within the team (Pinto, Pinto, and Prescott, 1993; Zmund and McLaughlin, 1989). The specificity of a project team in the supply chain is characterized by going beyond functional and/or organizational boundaries. Notably, the criteria for deepening ties between entities in the supply chain include, *inter alia*, personnel exchange (Menon, 2012), which in the operational dimension is carried out by appointing inter-organizational teams. Few studies show that communication and teamwork are essential competencies for successful supply chain integration (Prajago and Sohal, 2013).

The article's primary goal is to confirm that inter-functional or inter-organizational project teams are one of the supply chain integration tools. The main objective is complemented by the following specific objectives related to it: (i) the identification of issues and trends discussed in the literature on the subject grouped in two scientific bases: Scopus and Web of Science; (ii) the analysis of the research data through statistical analysis.

2. Methodology

The research procedure was divided into three interdependent stages. The first two stages comprise bibliometric analysis of scientific research on the role of project teams in the process of supply chain integration. However, the third stage is related to presenting the results of the authors' research within this thread carried out on 500 companies that are leaders in their supply chains in Poland. A nomothetic approach was adopted to obtain them to present an overall picture of the analyzed problem.

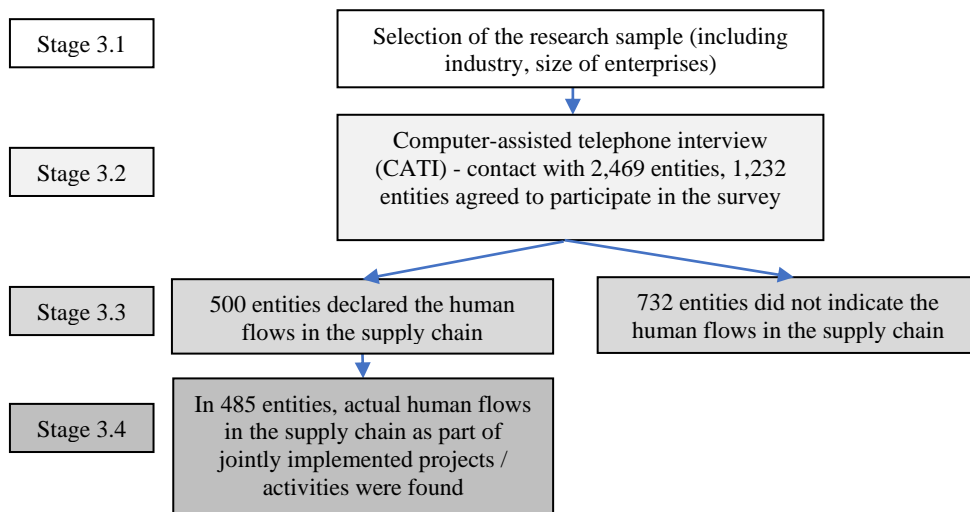
The first step (i) is a quantitative analysis, to find and characterize articles about project teams as a supply chain integration tool. The authors of this article reviewed the two largest scientific databases, Scopus, and Web of Science (WoS). The VOSViewer computer software was used for quantitative analysis, making it possible to group articles into four clusters indicating the richness of the subject matter. The second stage (ii) was qualitative analysis, the main aim of a thorough review of the literature identified in the previous stage and dealing with issues related to project teams' subject as a supply chain integration tool.

On this basis, the articles were classified into four areas, which collectively define the issues discussed therein. The publications which indicate that project teams are a tool for supply chain integration were analyzed in detail. Stage three (iii) focused on the research process was the actual research carried out in autumn 2019 (Figure 1). The authors of the article built the interview questionnaire to analyze human flows in supply chains in a computer-assisted telephone interview (CATI) study. The authors equate them with sending/delegating the company's employees to other

supply chain links. The following industries in Poland were selected for the analysis: home appliances, construction, chemical, wood industry, electrical machinery industry, metal industry, electrotechnical, energy, retail, wholesale trade, medical/pharmaceutical, oil and gas, clothing/textile, food, telecommunications, transport/rail/logistics, armaments, and other enterprises (Figure 1).

Human flows occur in the following areas: quality control, IT systems integration, audit, training, supplying the supplier's workforce in case of insufficient production capacity, replacement, accident, joint tasks/projects. The respondents who provided interviews were HR managers in enterprises that are the leaders in supply chains.

Figure 1. Empirical Research Procedure

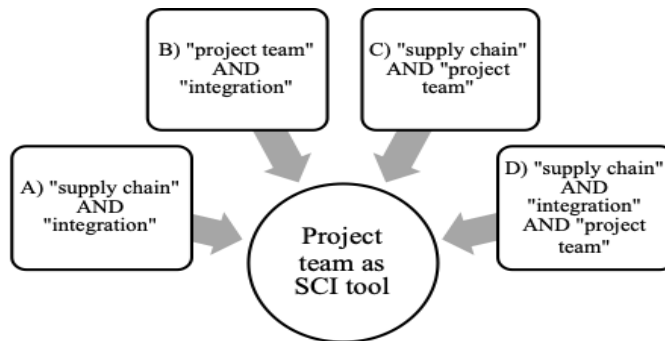


Source: Own elaboration.

During the initial analysis, which is the stage preceding the actual quantitative analysis, the authors of the article decided to select the existing publications in terms of several keywords relating to project teams as a supply chain integration tool (see Table 1). In connection with the above, the following assumptions were made regarding the combination of keywords (see Figure 2): "supply chain" AND "integration"; "Project team" AND "integration"; "Supply chain" AND "project team"; "Supply chain" AND "integration" AND "project team."

Since the issues related to project teams are variously considered in the literature on the subject, the authors found it necessary to search for publications in terms of the following keywords broadening the term "project team", namely: "team"; "Cross-functional" AND "team"; "Cross-organizational" AND "team"; "Cross-firm"; "Joint project"; "Joint tasks."

Figure 2. Methodological assumptions about keyword combinations



Source: Own elaboration.

Table 1. Number of analyzed papers

Category	Keywords	WoS	Scopus
A	"Supply chain" AND "integration"	8 744	9 656
	"Team" AND "integration"	10	17 721
		966	
B	"Cross-functional" AND "team" AND "integration"	226	265
	"Cross-organizational" AND "team" AND "integration"	12	282
	"Cross-functional" AND "team" AND "integration"	1	1
	"Joint project" AND "integration."	1 075	1 744
	"Joint tasks" AND "integration."	846	1 147
C	"Supply chain" AND "team."	931	1 742
	"Supply chain" AND "cross-functional" AND "team"	56	72
	"Supply chain" AND "cross-organizational" AND "team"	5	11
	"supply chain" AND "cross-firm" AND "team"	2	2
	"Supply chain" AND "joint project"	131	249
	"Supply chain" AND "joint tasks"	55	85
	"supply chain" AND "team" AND "integration"	163	257
D	"supply chain" AND "cross-functional" AND "team" AND "integration"	27	26
	"supply chain" AND "cross-organizational" AND "team" AND "integration"	0	4
	"supply chain" AND "cross-firm" AND "team" AND "integration"	1	1
	"Supply chain" AND "joint project" AND "integration"	26	49
	"supply chain" AND "joint tasks" AND "integration"	9	15

Source: Own study based on the analysis of Scopus and WoS databases.

For further, detailed analysis of publications as part of qualitative analysis, the final form of a combination of keywords in the category "D" ("supply chain" AND "integration" AND "project team") was selected, omitting the first combination of the words "supply chain" AND "Team" AND "integration," which went beyond the subject of project teams in the strict sense. The authors reviewed the remaining articles in this category in both scientific databases. The bibliographic description of

these articles was copied to Excel, where repeated publications were excluded from further processing and articles that did not deal with the topic of project teams as a tool for supply chain integration. Consequently, the final number of articles taken for analysis is 35.

3. Study Results

3.1 Literature Review

Reading selected 35 articles made it possible for the authors to assign them to common categories dealing with project teams' supply chain integration issues. On this basis, 4 areas were distinguished (see table 2). The above 35 articles were analyzed bibliometrically with the use of VOSViewer software. The authors analyzed the categories they indicated using the full counting method. It means that all occurrences of given words (items) in the title of the publication and the abstract are included in the final number (van Eck and Waltman, 2013). As a result, a map of connections and a map of clusters of research areas related to the analyzed concepts were created (Figure 3). The analysis of the coexistence of words and the attempt to define the clusters allows for selecting four research clusters regarding project teams as a tool for supply chain integration.

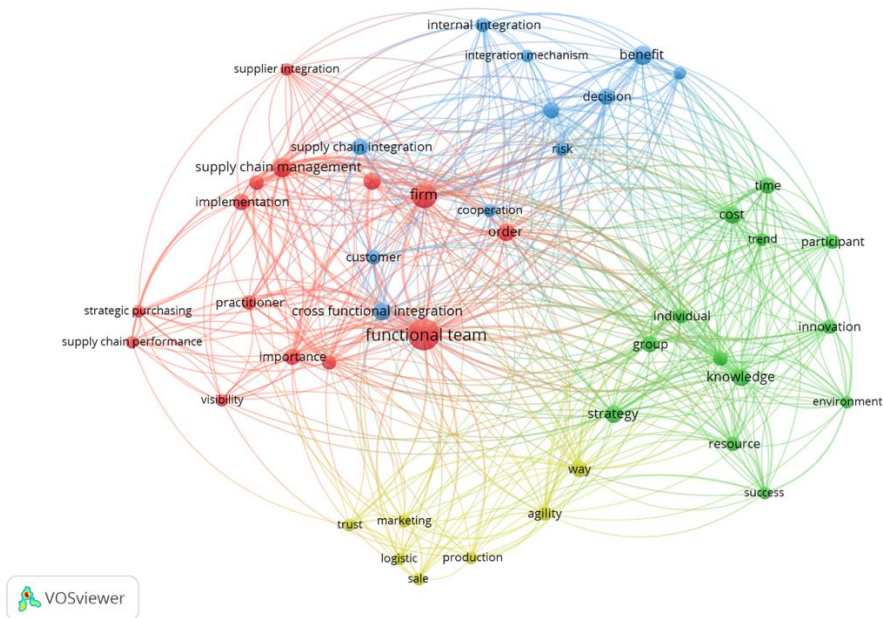
Table 2. *Thematic areas of project teams as a supply chain integration tool*

Area	Articles
1 - interfunctional teams in the development of new products, integration with third parties in the processes of product design and implementation, also with the use of new technologies	(Ragatz, Handfield, and Scannell, 1997; Camarinha-Matos, Afsarmanesh, and Ollus, 2008; Bhaskaran and Krishnan, 2009; Castaldo, Zerbini and Grosso, 2009; Jr. <i>et al.</i> , 2018)
2 - behavioral aspects in the work of an interfunctional team, the impact of the human factor on the performance of teams in supply chains, factors that motivate to work in a team	(Ambrose, Matthews, and Rutherford 2018; S. Bhaskaran and Gligorovska 2009; de Abreu and Chicarelli Alcantara 2015; de Freitas et al. 2020; Enz and Lambert 2015; Franke and Foerstl 2020a; Franke, Foerstl, and Heese 2020; Franke and Foerstl 2020b; Rahman and Kumaraswamy 2005; Stipp, Pimenta, and Jugend 2018)
3 - project teams as a supply chain integration tool, cooperation in the supply chain, general information on integrated interfunctional teams	(de Oliveira et al. 2016; Hall 2018; Hanusch, Neumann, and Schweiger 2011; Kannabiran and Bhaumik 2005; Kumar and Rodrigues 2020; Matheus, Saunders, and Chakraborty 2017; Mecham and Norris 2009; Mehmeti 2016; Murillo-Oviedo et al. 2019; Poberschnigg, Pimenta, and Hilletoth 2020; Shaikh et al. 2020; Stolze et al. 2018; Vickery and Dröge 2010; Wilding and Humphries 2006; Yu and Yang 2005)
4 - interfunctional teams as a factor of value creation in the supply chain or as a factor of strategic supply chain management	(Kasim, Rajamanoharan, and Omar 2012; Hammervoll 2009; Paulraj and Chen 2005; 2007; Paulraj, Chen, and Flynn 2006)

Source: *Own study based on the analysis of Scopus and WoS databases.*

Words have been grouped into clusters, which indicate the number of items included in the group presented in the graph. Each item can only belong to one cluster, and not all items need to belong to any cluster. Additionally, two standard weight attributes are used: links denoting the item's links with other items and total link strength, which denotes the strength of the item's relationships with other items (van Eck and Waltman, 2013). The above bibliometric analysis of the literature about project teams as a supply chain integration tool using VOSViewer software shows that 4 clusters can be distinguished - research sub-areas with a total number of 508 connections and 704 strength of connections. The association strength⁴ was chosen for normalization of results, which normalizes the strength of connections between observations. Therefore, among the selected research sub-areas, the following should be indicated:

Figure 3. Clusters and items in the topic "project teams as an integration tool of the supply chain"



Source: Own study with the use of VOSViewer software.

Cluster 1 (red), consisting of 14 elements, including issues related to the functional team, companies, supply chain (management and performance), supplier integration, implementation, practice, which can be collectively called operational issues of project teams in a supply chain. Among the items discussed, the most significant is the functional team - 19 appearances,

⁴The normalization methods available in VOSViewer include: no normalization, association strength, fractionalization, LinLog / modularity (van Eck and Waltman, 2013).

- 42 connections, connections strength 93.
- Cluster 2 (green), consisting of 13 elements, including knowledge, strategy, cost, time, group, environment, innovation, resource, etc., which can be called developmental issues of project teams within supply chains. Among the issues raised, the most significant is the strategy - 6 appearances, 29 connections, and the strength of connections 39. Nevertheless, knowledge, group, individual, cost, time, trend, and capability are also relevant bibliometrically.
- Cluster 3 (blue), consisting of 11 elements, includes cross-functional integration, supply chain integration, internal integration, integration mechanism, benefit, decision making, etc., which can be called project team integration issues within supply chains. Among the raised problems, the most significant is decision making - 5 occurrences, 28 connections, the strength of connections 40. Internal integration, supply chain integration, benefit, and cross-functional integration also play a key role in the analyzed publications.
- Cluster 4 (yellow), consisting of 7 elements, which includes agility, way, logistic, marketing, production, sale, trust, which can be called aspects of the logistics system, which can connect the functioning of project teams within the existing supply chain. Among the issues raised, the most significant is the way - 5 occurrences, 28 connections, the strength of connections 34, but agility is also important.

The next stage of the research procedure was the qualitative and substantive evaluation of the content of articles selected in cluster 3 and the third research area (Table 2), directly representing our point of interest. The scientific articles that represent it were analyzed in detail to describe how the process of supply chain integration by project teams is discussed in the literature. Two of those articles are not discussed below because the supply chain's context does not appear directly in them (de Oliveira *et al.*, 2016; Murillo-Oviedo *et al.*, 2019).

Importantly, it should be emphasized that the subject matter of any of the other selected articles does not causally relate to the issues raised by the authors, and task or project teams of an inter-functional or inter-organizational nature are discussed as one of the tools that affect the integration and efficiency of the supply chain. For example, the aim of the study of Shaikh *et al.* (2020) is to verify the role of supply chain collaboration and internal/external supply chain integration with performance. Its authors indicate after their literature review that very few papers argued the preparation headed for teamwork, and there is not any appropriate measurement system to ensure the depth of integration. Vickery and Dröge (2010) argue that the most important specific mechanisms for achieving integration in the supply chain are teams (or integration via human interaction) and IT (or information integration). In their opinion, much research in a variety of research domains has addressed cross-functional teams.

However, less work has been done on the interaction of integration mechanisms of the supply chain. Wilding and Humphries (2006) believe that cooperation in the supply chain, where firms exchanged essential information and engaged some suppliers/customers in longer-term contracts, is the "threshold" level of interaction. They postulate joint actions and the implementation of joint tasks by the supply chain enterprises, which can be achieved by establishing inter-organizational teams.

Some of the studies selected because of the bibliographic analysis concern the transition from the level of internal integration to the level of external integration of enterprises in the supply chain. For example, Hanusch, Neumann and Schweiger (2011) focus primarily on the process of internal integration with the use of the tool, which are inter-functional teams consisting of members from production, R&D, logistics, purchasing, sales and marketing and which have to be implemented for efficient supply chains. Also, Kannabiran and Bhaumik (2005), when discussing the integration process of the jewelry supply chain in India, point to inter-functional teams, indicating that practitioners must use cross-functional teams for supply chain management implementation.

Poberschnigg, Pimenta and Hilletoft (2020) analyze cross-functional integration processes and their respective impacts on an automotive supply chain's resilience capability. They present integration factors, including cross-functional meetings, the longevity of relationships, cross-functional training. In their opinion, managers should pay attention to the cross-functional teams, which may provide internal collaboration and hence collaboration in the supply chain. Also, two case studies presented by Stolze *et al.* (2018), utilizing social network and inductive qualitative methods, show that the execution of marketing and supply chain strategies is dependent on the empowerment and integration of a manufacturer's frontline employees in retail supply chains.

Cross-functional teams have become a common approach to addressing many supply chain management related activities, as noted by Yu and Yang (2005). They also point out that a cross-functional team should be established in the supply chain management activities. In turn, Hall (2018) points to four supply chain integration practices (SCIPs) for complex projects. Among them, he emphasizes the early involvement of key stakeholders, co-located project teams, multi-party contracts, and the last planner system (LPS).

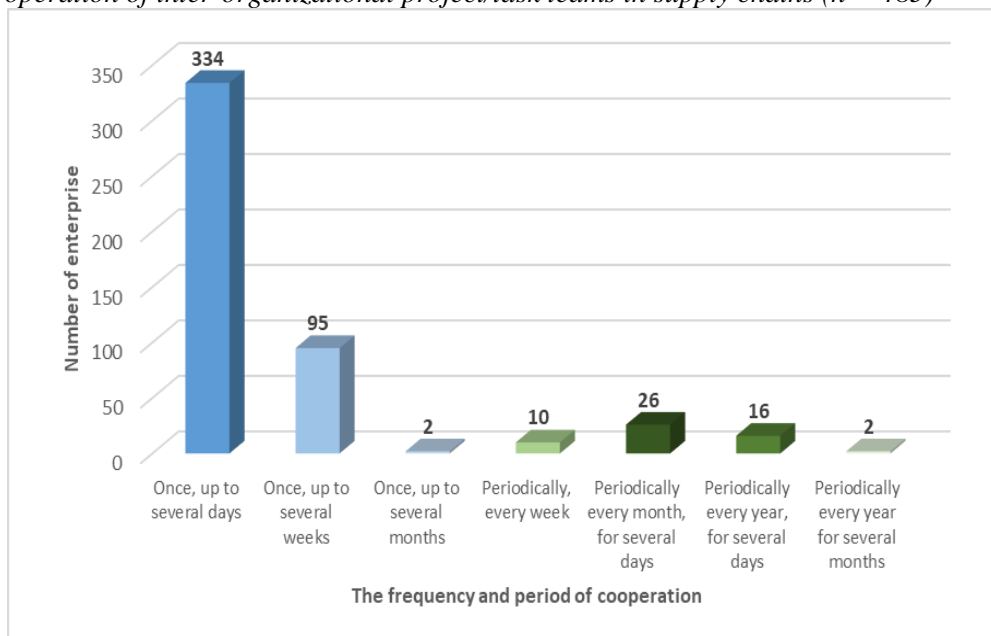
Other studies refer to the creation of innovation and the diffusion of knowledge in the supply chain (i.e., processes integrating its entities) thanks to, among other things, the use of inter-functional or inter-organizational teams (Kumar and Rodrigues, 2020; Matheus, Saunders, and Chakraborty, 2017). Mehmeti (2016), in turn, indicates the efficiency and results achieved in supply chains. He also proves that different factors may directly influence a company's performance but indirectly affect the entire chain. One of these factors is cross-functional teams. Mecham and Norris (2009) present a case study of Boeing entering service to aim provide

services to the supply chains in many countries. This service depends on a team of controllers with specialized skills who work at 27 workstations as a cross-functional team. The conducted review shows that integration factors generate cooperation between functions or companies in the supply chain. A natural mechanism that operationalizes integration in the supply chain is the appointment of inter-functional and inter-organizational teams of a task or project nature in its structures. However, current literature still presents a gap in this field, especially in cross-organizational teams.

3.2 Empirical Findings

In the economic entities presented above in the Methodology section, the frequency and period in which inter-organizational teams are most often appointed as part of jointly implemented projects or tasks in the supply chain were analyzed. From the results obtained, it can be concluded that in most cases, these situations are one-off, related to the implementation of a specific project (431 indications in total), and in this group, most often several days (334 indications). In the case of 54 entities, teams are appointed periodically, usually every month, and for a period of only a few days (26 indications). Hence, inter-organisational teams in the supply chain function for a short time (up to several days - 386 responses in total), regardless of the frequency of cooperation (see Figure 4).

Figure 4. Number of responses by the frequency of appointment and the period of operation of inter-organizational project/task teams in supply chains ($n = 485$)

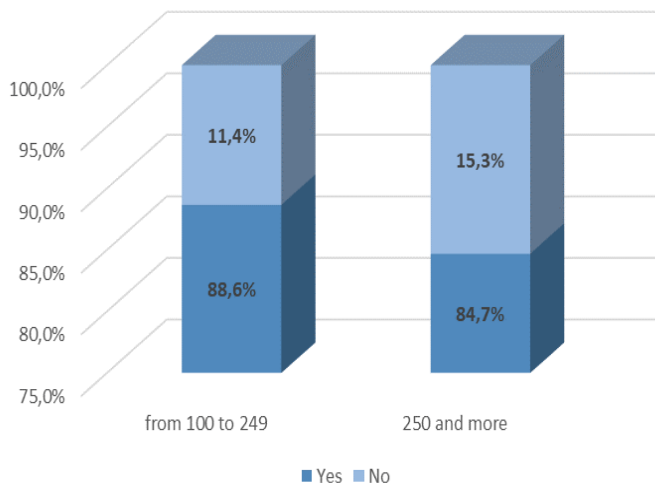


Source: Own elaboration.

Another examined area was the impact of inter-organizational teams' functioning on the integration of the supply chain (Do you think that inter-organizational task/project teams are a factor in supply chain integration?). 425 out of 485 entities answered positively to that question. Others indicated that inter-organizational teams do not contribute to supply chain integration. In addition to the total review of the results obtained within the discussed area, an attempt was also made to provide a more detailed analysis, considering such characteristics as the size of the enterprise, sector, or industry. Figures 5 and 6 below show the percentage of affirmative and negative responses by entity and sector size.

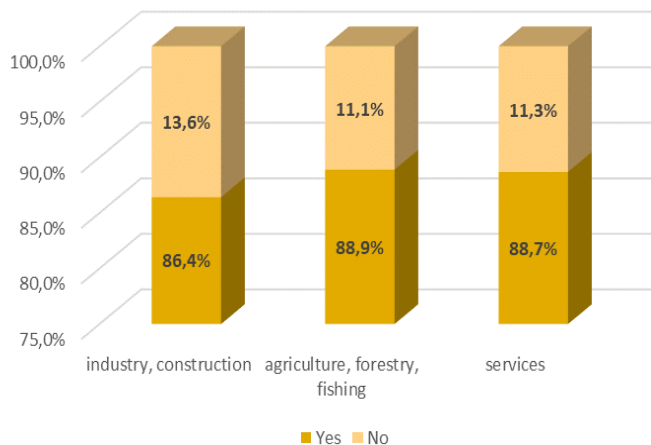
When analyzing the correlation between the size of the entity and the answers provided, it should be stated that there is a relatively similar perception of the impact of inter-organizational project teams on the integration of supply chain links. The percentage of positive answers given in particular groups is high and amounts to 88.6% (entities employing 100-249 people) and 84.7% (entities employing 250 people and more), respectively. The responses are similar, taking into account the sector that the entities represent. In any case, the percentage of positive statements exceeds 85%. Thus, it can be concluded that regardless of the size of the company and the sector of activity, inter-organizational teams are perceived as part of the integration of supply chains.

Figure 5. Are inter-organizational project/task teams in supply chains a factor in its integration? - percentage of responses given due to the size of the enterprise
 Source: own elaboration.



Source: Own elaboration.

Figure 6. Are inter-organizational project/task teams in supply chains a factor in its integration? - percentage of given responses by sector



Source: Own elaboration.

The examination of the responses from the perspective of the industry represented by the entities comprised a further step of data analysis. The vast majority of the results confirm the influence of inter-organizational teams on the integration of links in the supply chains due to the implementation of joint projects/activities - over 90% of positive responses, and in industries represented by a large number of entities. Only in two cases do these results differ from the others. They include the armaments industry (66.7% positive answers) - this result is, however, largely a consequence of a small number of representatives of the group (only 3 companies). The food industry also achieved an interesting (one of the lowest compared to other companies) result. Out of 61 companies, as many as 23% responded negatively to the question asked. A detailed summary of the results is presented in Table 3.

Table 3. Are inter-organizational project/task teams in supply chains a factor in its integration? - the percentage of answers given in a given group by industry

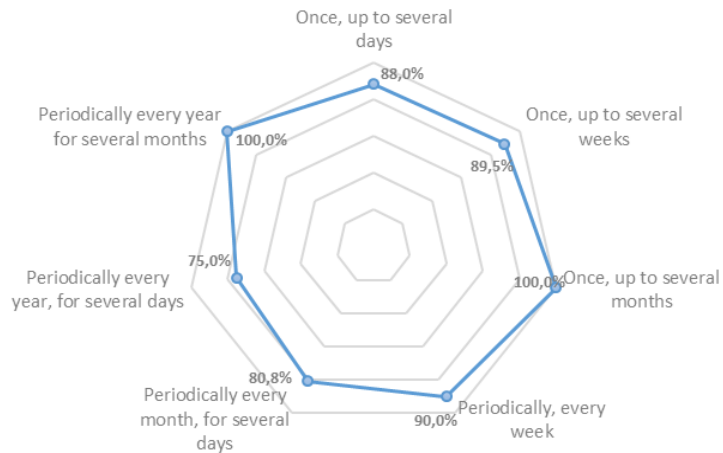
Branch	Percentage of responses		Total number of companies
	Yes	No	
Household appliances / electronics manufacturers	100,0%	0,0%	3
Construction Companies	89,3%	10,7%	28
Chemical companies	87,5%	12,5%	24
Electrotechnical enterprises	87,0%	13,0%	23
Energy companies	100,0%	0,0%	17
Retailers	90,3%	9,7%	103
Wholesale trade enterprises	84,4%	15,6%	45
Medical / pharmaceutical companies	92,3%	7,7%	39
Oil and gas enterprises	100,0%	0,0%	1

Clothing / textile / textile companies	90,9%	9,1%	11
Wood industry companies	81,5%	18,5%	27
Electrical machinery industry enterprises	90,0%	10,0%	20
Metal industry enterprises	91,4%	8,6%	35
Mining industry companies	100,0%	0,0%	4
Food businesses	77,0%	23,0%	61
Telecommunications companies	81,8%	18,2%	11
Transport / rail / logistics companies	90,0%	10,0%	30
Armaments enterprises	66,7%	33,3%	3

Source: Own elaboration.

The last of the areas analyzed in terms of the impact of inter-organizational teams on the integration of supply chain links was the frequency and length of the cooperation period. The results in this area indicate that although most of the activities are one-off, related to the implementation of a specific project, this type of cooperation is perceived as an essential integrator of individual links in the supply chain (results 88% and more). Interestingly, lower results occurred in the case of repeated appointment of the same inter-organizational teams, i.e., appointing the team cyclically every month for several days (80.8% of positive responses) and cyclically every year for several days (75%). The detailed set is presented in Figure 7.

Figure 7. Are inter-organizational project/task teams in supply chains a factor in its integration? - percentage of positive responses due to the frequency and duration of the team's operation



Source: Own elaboration.

4. Conclusions

This study aimed to confirm that project teams that are inter-functional or inter-organizational are one of the supply chain integration tools. The existing literature presents the essence and rank of integration as a success factor and supply chain performance. Relatively few items provide tangible, operational guidance on how supply chain companies should pursue this integration. Those where there are references to integration factors most often refer to internal integration and do not indicate an exact, separate list of factors. Nevertheless, their analysis allows for a thesis that a natural factor of internal and external integration in the supply chain is the appointment of task/project teams of inter-functional or inter-organizational nature in its structures. External integration will be conditioned above all by the functioning of inter-organizational teams, which is also confirmed by the authors' empirical research. The conducted analysis of the results of empirical research allows for the identification of several important conclusions:

in the vast majority of cases, the appointment of inter-organizational teams in supply chains as part of jointly implemented projects/tasks is one-off, related to the implementation of a specific project, usually several days - short-term, regardless of the frequency of cooperation.

regardless of the size of the enterprise, sector, and industry of activity, the establishment of inter-organizational teams between the supply chain links is perceived by respondents as an essential element of supply chain integration.

cyclical cooperation within teams between links of the supply chain does not increase the perception of it as an integrator; on the contrary, in some cases, the percentage of positive responses in this area is lower than in the case of one-off cooperation.

Therefore, it seems that cross-functional and cross-organizational teams' improvement may enable companies to develop stronger relationships with members of their supply chain, which will affect its integration. The presented findings and associated theoretical framework offer useful new insights regarding the process of supply chain integration and an opportunity for future research. A more in-depth analysis may also be conducted regarding supply chain integration levels.

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