INTEGRATION PLATFORM IN GLOBAL SUPPLY CHAINS - WHO IS BENEFICIARY AND WHO IS NOT

Tomasz Debicki
Capgemini Poland
E-mail: tomasz.debicki@capgemini.com

Adam Kolinski
Institute of Logistics and Warehousing, Poland
E-mail: adam.kolinski@ilim.poznan.pl

Received: May 29, 2019
Received revised: September 16, 2019
Accepted for publishing: September 17, 2019

Abstract

Being a supplier for no matter of what industry, companies have to deal with number of their customer solutions to supply or exchange information about orders, deliveries finally invoices. It often requires of adjustment to different portals, standards and sometimes additional work for customer service and extra charge. There are also the other way around situation where customers connecting to different integration platform of their suppliers and not to forget about transport and logistics sectors where LSP have to connect to different platform based solutions as their customers. The author provides different market related scenarios from different industries and branches examples (automotive, T&L, pharmacy, industry and retail) with showing who is a beneficiary and who in not these scenarios. The objective of an article is to outline what future possible solutions could be to overcome inconveniences and that all parties could get benefit from such business model. The article is based on professional experience and research on data exchange in global supply chains on Capgemini and Institute of Logistics and Warehousing.

Key words: global supply chain, integration platforms, EDI, transport, logistics, automotive, integration services

1. INTRODUCTION

Electronic data exchange is an extremely important element in the integration of information flows in the supply chain. Lack of electronic data exchange causes numerous errors which affect the logistics processes efficiency. Despite the fact that information integration brings a lot of benefits in terms of the logistics processes efficiency, there is a risk of IT systems functionality mismatch between business partners in terms of technology. The multitude of solutions for the electronic exchange of data between supply chain partners is also a serious problem.

Electronic integration EDI (Electronic Data Interchange), API (Application Programming Interface), Webedi (a WWW interface for EDI) is the key element of today's B2B sales and logistics. As for EDI which covers most of the electronic integration around the World in B2B is split mostly between x12, EDIFACT and others syntax standards, it has now in place also API which is even more shredded than EDI with two kinds of SOAP (Simple Object Access Protocol) Web services and JSON (JavaScript Object Notation) based API. There exists a common transmission protocols and API format structure like JSON but no standardization exists in this area as far as semantic model is concerned. It means JSON message format for the same purpose e.g. ordering transport can have different field names and different data model at two different transport services providers. The same situation exists for whole transport and logistics sectors but also for any other industries. On top of technical, syntaxes and semantic models in use, companies creating processes around their supply chains downstream and upstream. They very often use a third party solutions for logistics or supply management. Good examples of this are integration platforms for suppliers which optimizes their procurement processes in case they have hundreds of suppliers. In the following subchapters will be shown the examples of such integration platforms and will highlight the pros and cons of such solutions.

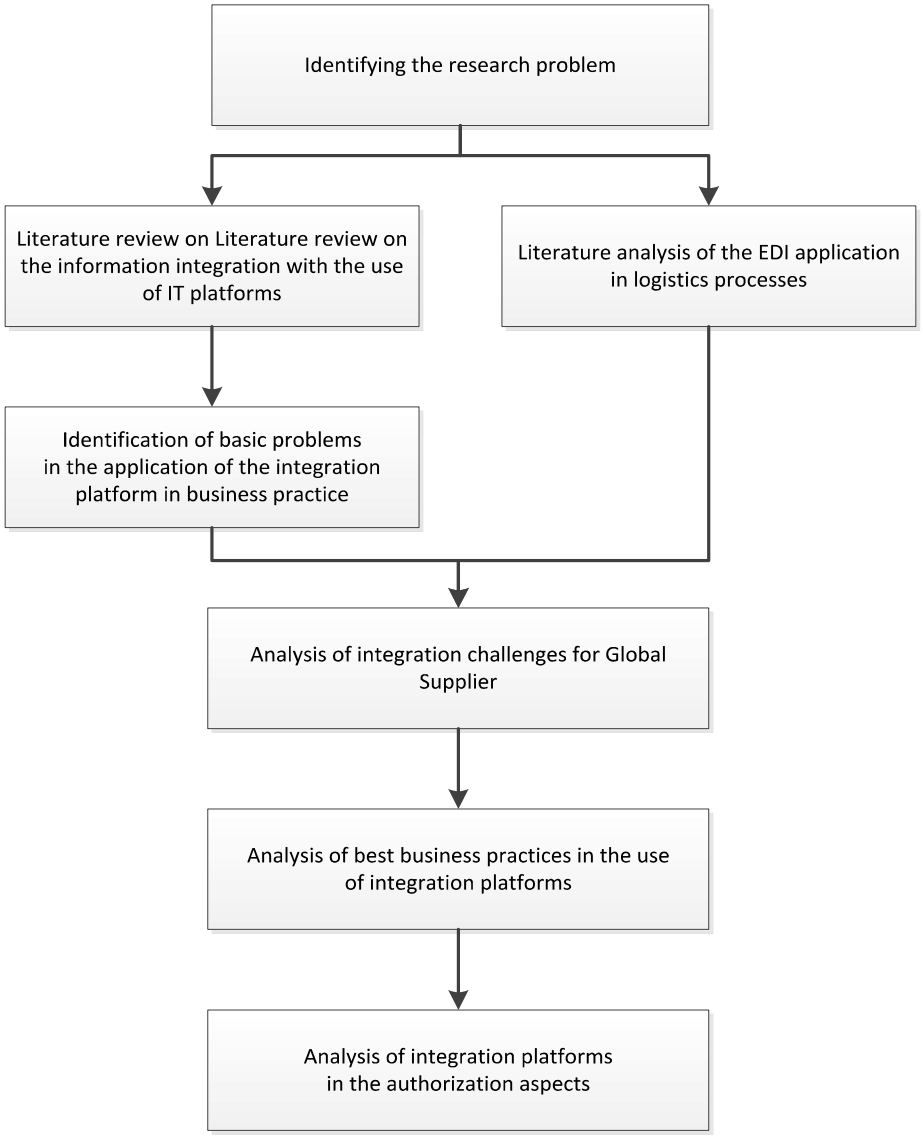
2. RESEARCH METHODOLOGY

The methodology proposed in this chapter is analogous to the previous research presented by the authors (Debicki & Kolinski, 2018). The present research should be treated as a continuation of the presented results. Figure 1 presents a general outline of the methodology of the conducted research.

The chapter is based on professional experience of integration management in global supplier from metal and mine industry. The presented business cases are the result of a literature review and interviews with companies within the framework of research projects carried out in the Institute of Logistics and Warehousing.

The research logic shown in the figure is consistent with the structure of this chapter. The specificity of the subject discussed forced to take into account mainly practical knowledge, which has not been ordered in methodological and scientific terms so far. Literature support concerns various links of the subject matter, not necessarily directly connected with the use platform integration, but based on the analysis of information integration in the supply chains. In addition, it proves that there are few references to literature and that it is necessary to organize literature in this field.

Figure 1. The research methodology



Source: own study

3. INTEGRATION PLATFORMS IN SUPPLY CHAIN

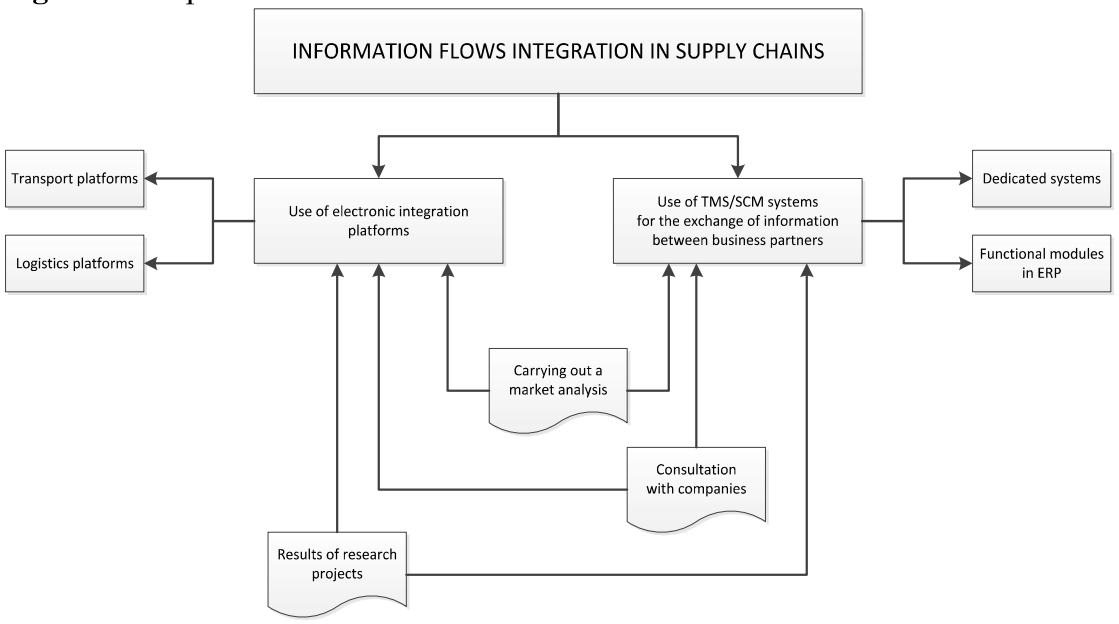
Information flow integration is a key factor in the integrated supply chain, which has a direct impact on the logistics processes efficiency. For this reason, it is necessary to analyse the supply chain integration opportunities. Literature review on the information integration in the supply chain and the application of EDI in business practice, the authors analyzed in detail in the publication (Debicki & Kolinski, 2018). This chapter focuses mainly on the use of integration platforms as a tool for the information integration in the supply chain.

The use of electronic integration platforms is a common business practice, especially in the implementation of transport processes (Kawa, 2012; Sliwczynski et al., 2012; Kawa & Zdrenka, 2016). Partners in the logistics supply chain are

increasingly paying attention to the information flow (Tseng et al., 2011; Marinagi et al., 2014), which has a direct impact on the efficiency of processes (Prajogo & Olhager, 2012; Hadas et al., 2015; Adamczak et al., 2016). The issue of conducting research in this area is therefore justified, both in terms of research and business.

Due to the focus of business practice on the information flow efficiency between business partners, the definition of integration platforms has been weakened, as in many cases the customer connects directly with a dedicated system for a given company. Considering the fact that TMS/SCM class IT systems also enable communication between business partners, which meets the basic feature of information flow integration, the authors decided to include in this study not only the identification of the electronic integration platforms themselves and their functionality, but also the identification of dedicated TMS/SCM class of IT systems that enable information flow between business partners. The scope of research is illustrated in Figure 2.

Figure 2. Scope of research works



Source: own study

TMS IT systems are used mainly in internal processes, they can be implemented in any type of company, but they work best in transport, forwarding and logistics departments. Many companies use this type of solutions, they are often characterized by a high level of personalization, which corresponds to the needs of the transport process in the company (Helo & Szekely, 2005; Jacyna & Merkisz, 2014). These IT systems provide access to a range of functionalities facilitating the basic tasks of forwarders and carriers, as well as access to analytical and reporting modules. TMS cooperate with GPS systems - possibility of integration with telematics systems and digital maps (Barreto et al., 2017). They enable control of transport processes and their costs covering e.g. the amount of purchased fuel and its consumption level, drivers' working time, technical inspections Previously, data was stored mainly on a local server, but nowadays an increasingly popular solution is to build systems

accessible via Internet platforms, which store data in the so-called cloud -software provider's server (Jun & Wei, 2011).

Data exchange between the links in the logistics supply chain is the primary responsibility of SCM (Supply Chain Management) IT systems. SCM deals with the flow of information, goods and services, supporting the management of the entire supply chain (Wong et al., 2011). The most important objectives for which SCM should be implemented in the supply chain include:

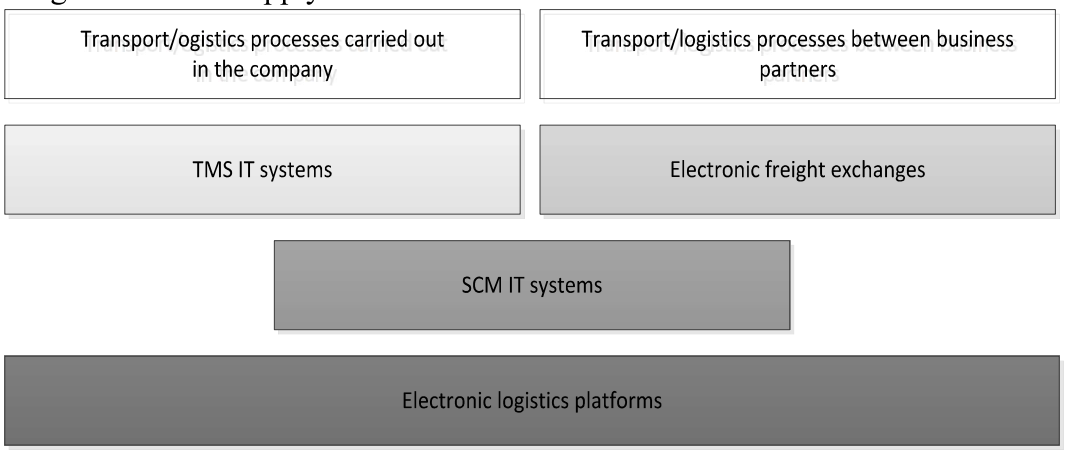
- optimization of efficiency, consisting in shortening the time of order execution, while at the same time increasing customer satisfaction,
- optimize productivity by reducing costs and capital supply chain involvement.

Electronic freight exchanges are used in the implementation of external processes, they are a tool used mainly for communication between the participants of transport processes (Fuks et al., 2015), search/order cargo, freight negotiation, conclusion of transport contracts, the user uses the tool without the need to personalize processes to the specificity of the company (Bohács et al., 2013). Increasingly, such tools offer additional functionalities typical for TMS systems, which brings them closer to logistic platforms (Robu et al., 2011). These systems do not require implementation, the user pays a subscription fee and uses the exchange via a website, or a computer installed program to operate the exchange, which connects directly to the server of the software provider.

Electronic logistic platforms cover both internal and external processes, this tool combines functionality of TMS systems and freight exchanges and their main task is not only communication between contractors but also organization of internal processes (Li et al., 2013). Most often they do not require installation of additional software or implementation, the user can use the tool after paying the subscription / purchase of a license tailored to individual needs of the enterprise.

A schematic comparison of the scope of operation of TMS, SCM, freight exchanges and logistics platforms is presented in Figure 3.

Figure 3. Scope of functionalities of analysed IT tools supporting the information integration in the supply chain



Source: own study

A detailed analysis of the functionality of the tested IT tools is presented in Table 1.

Table 1. Comparison of functionalities of analysed IT tools

Functionality/characteristics	*Freight exchanges*	*TMS*	*SCM*	*Logistics platforms*
Required Internet access	X			x
Searching, conversion, ordering of loads/vehicles	X			x
Negotiating the terms of carriage with the contractor	X		x	x
Conclusion of service contracts	X			x
Sending a transport order	X	x	x	x
Possibility of counterparty verification	X		x	x
Online communication with supply chain participants	X			x
Management of forwarding orders		x	x	x
Fleet and driver management		x		
Invoicing and payment		x	x	x
Planning and optimisation of transport routes	X	x		x
Vehicle monitoring with the use of GPS location		x		x
Analysis of transport indicators (analyses, reports)		x	x	x
Control of transport costs (working time of drivers, technical inspections)		x		

Source: own research

The presented issues are the result of research work carried out within the framework of research projects [1] carried out by the Institute of Logistics and Warehousing.

4. PROBLEMS WITH THE APPLICATION OF INTEGRATION PLATFORMS IN BUSINESS PRACTICE

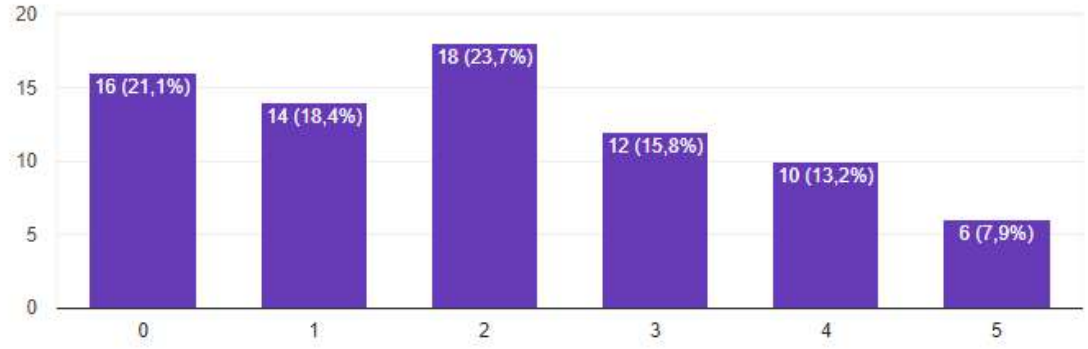
The first stage of the research was to analyze the needs of users of electronic integration platforms. Research in this area has already been initiated in 2017 within the framework of research conducted for GS1 Poland, concerning the degree of interest of enterprises in developing a new integration platform with the carrier. The study was conducted in the third quarter of 2017 in 76 logistics companies, which represented top logistic operators, carriers and manufacturers, conducting logistic

[1] e-Freight Implementation Action (e-Impact), No. 2014-EU-TM-0686-S, Institute of Logistics and Warehousing, Poznan 2015-2018; Analysis of the possibility of applying GS1 standards in the TSL industry, Institute of Logistics and Warehousing - GS1 Poland, Poznan 2017; Analysis of the possibility of applying GS1 standards in electronic transport platforms, Institute of Logistics and Warehousing - GS1 Poland, Poznan 2018-2019.

activity in Poland. The companies surveyed should be classified as medium or large. The research was conducted in the form of a questionnaire and direct research (visits in companies).

In the conducted research, the Likert scale was used, supplemented by the zero level, as a scale enabling not only a quantitative view of the use of particular tools, but also a qualitative one, determining the degree of their significance (0 - no significance; 3 - medium significance; 5 - very high significance). The basic element of the research was the identification of the needs of enterprises concerning the development of the concept of an integration platform. Figure 4 presents detailed results of the significance of implementation a new integration platform.

Figure 4. Identification of needs for the implementation of a new integration platform



Legend: 0 - no significance; 3 - medium significance; 5 - very high significance
Source: own research

When analysing the needs of enterprises, it should be stated that over 63% of enterprises do not see the need to introduce a new platform, or assess this need as very small and irrelevant. The research conducted in 2017 has been completed with the conclusion that there is no business need to develop a new integration platform, so it should be focus on the integration capabilities of the platforms already in use.

As part of the research work in this area, carried out in September 2018, it was decided to analyse the reasons for the lack of a business need for the development and implementation of a new platform aimed at integrating the flow of information within the transport processes of the supply chain. The research was carried out in the form of consultations and surveys in 24 companies, which also participated in last year's research and assessed poorly (on a scale from 0 to 2) their need for a new integration platform. The surveyed companies represented both carriers (8) and their contractors (16) - it was decided to expand the group of surveyed business roles (operator -10, manufacturer -6), as these roles are often crucial for the information integration of the supply chain.

During the consultation process, business representatives were asked to identify the problem that makes the use of electronic platforms and/or the development of a new integration platform ineffective. In addition, the degree of impact of the problem

on the lack of interest from the perspective of developing a new integration platform was identified. The table 2 presents the detailed results of the studies carried out.

Table 2. Detailed analysis of the importance degree of problems related to the effective electronic platforms implementation

Problems related to effective implementation of electronic platforms	Importance degree of the problem						Average value
	0	1	2	3	4	5	
Necessity of entering data several times (into the system and on the platform)			1	7	7	9	4,00
Use of different communication standards by business partners					13	11	4,46
Little reflection of the economic benefits of using such platforms			3	8	9	4	3,58
Small number of contractors using the same communication platform			8	8	5	3	3,13
Fear of losing sensitive/critical data for the company				5	9	10	4,21

Source: own research

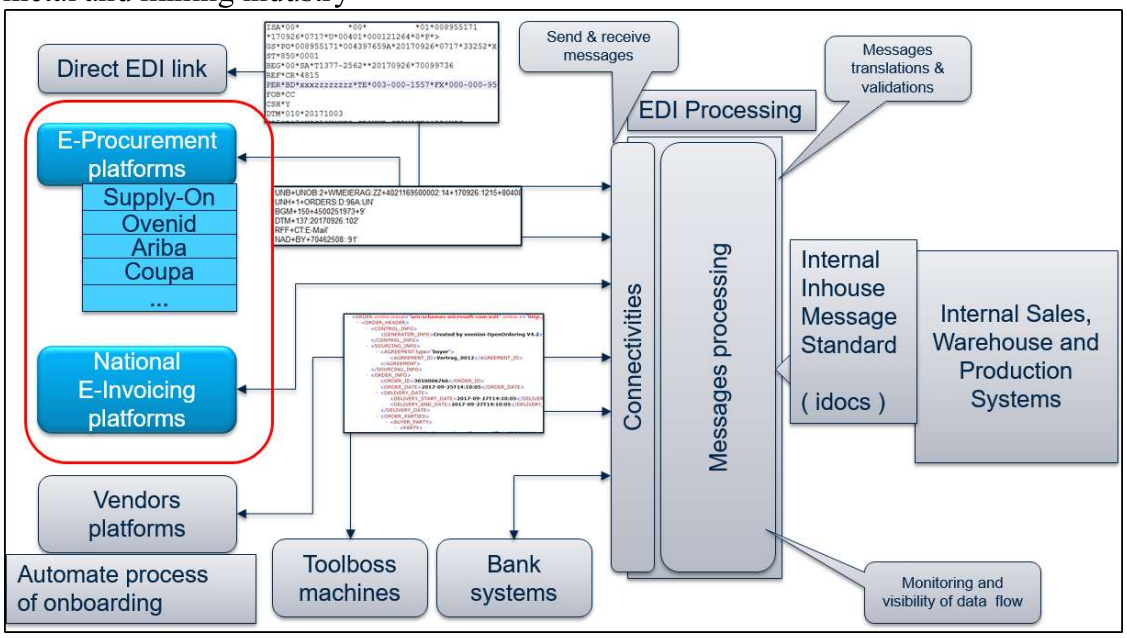
It should be noted that all of these problems are characterised by a high degree of importance in economic practice (all of them scored above 3.0 - average importance). The key problem is the incoherence of integration of platforms with IT systems of enterprises, which makes it necessary to enter data several times, data security issues and, above all, the diversity of communication standards available on the market.

5. GLOBAL SUPPLIER INTEGRATION CHALLENGES

As mentioned in the introduction, from the point of view of global suppliers that deliver their product worldwide to thousands of customers, electronic integration covering the entire flow of transactional information is an extremely important issue.

A global supplier uses not only traditional EDI, but also different purchasing platforms. It also has to comply with different invoicing rules around the world. For example, some countries require the use of national e-invoicing platforms.

Figure 5. Integration diagram in use by global supplier Kennametal Company for metal and mining industry[2]



Source: own study

When it comes to connecting to the customer's middleware platforms, it is often related again to integration with individual messages standard provided by this platform this is even not so bad for companies dealing with hundreds of standards this is not an issue. Much worse scenario is when platform which customer wish their supplier to use does not support any electronic integration towards supplier only between platform and customers. In this case the supplier is in the worst situation because sales operation needs double their activities in the ERP legacy system and customers' platform. In some cases, these platforms provide an electronic (EDI, API) integration towards suppliers but is not free of charge. Again, global supplier has to add to its integration costs other costs of dealing with such kind of platforms. From the above examples it becomes clear that one party takes benefits from integration via the platform and the other not. In case of global supplier, who is integrating with many platforms of his customers this is not an ideal situation, especially when some manual interventions are required or supplier is additionally charged for integration with such platforms. Then of course the benefits of this integration must be higher than costs. So only customers with big sales volume are considered here. For customer the suppliers' integration platforms for sure brings more benefits. They have all suppliers in one place, data flow from platform in companies' legacy system has the format. So actually inside the company only one data model is considered, all the translations are outside (in the platform).

Another important thing is the authorization as well as for automatic integration as for the users permission to perform some manual work in the platform. If suppliers, users have to deal with many different platforms of their customers, they need to provide authorization to each of this (login, passwords, SMS,…) it can become really

[2] The highlighted section is the subject for this chapter.

frustrating and annoying for all of us when on a daily basis we have to confirm the authorization. For automatic integration this process is set rather once when connectivity is being established. But we also may think that future integration would go into more automatic way of data exchange, hence the more use of common semantic model will be in place. Then switching to the new customer's platform should be also very easy without manually exchanging the certificates for authorization.

6. SUPPLIERS INTEGRATION PLATFORMS – BEST PRACTICES

In this chapter a few procurement and e-invoicing platforms examples are displayed. The key to show these platforms are differences in approach to the suppliers but also difficulties and obstacles to integration.

Amazon Vendor Central – from our experience and research on of the most advances business platform, it has a full manual operations available but includes all electronic integration aspects. Electronic integration is done via EDI messages in Europe – EDIFACT, in North America – x12. What is noticeable here the vendors get a full guide and testing tool when they can prepare their messages handlings. Only after successful test phase messages can be promoted to production environment. From business model perspective Amazon charges their vendors if they are not finish with electronic and logistics aspects (SSCC and labels) of integration.

SupplyOn connects – this for companies which would like to have all suppliers in one place, this is not a dedicated product for one company. In comparison to Amazon there is no automated way of running integration project. Each integration gets a dedicated project manager with whom the integration is being done. As for the business models it can vary here as it depends on individual agreements between the customer and Supply-ON and also customer and its supplier.

Spanish e-invoicing portal – this is a Spanish government initiative to improve and control invoices it is free to use. It supports only one standard of e-invoice an author's one, which is not a common EU e-invoice standard. The platform contains a validation tool for e-invoices, however, it is only in Spanish, which makes things complicated for foreigners.

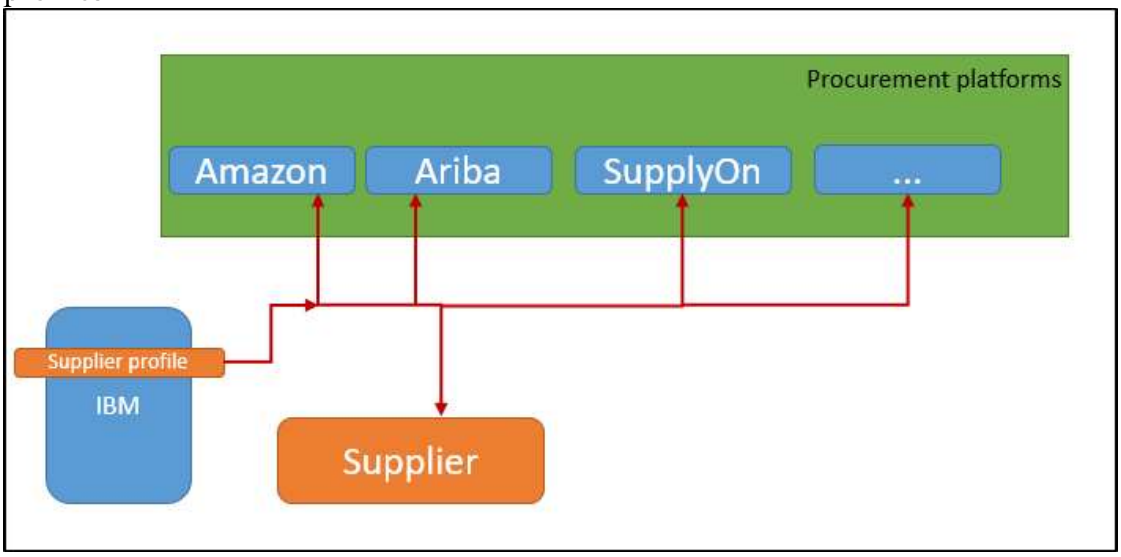
Voith Supplier Portal – this is and dedicated portal for Voith company where they want all suppliers to use one. However, this portal is nothing else than Web-EDI where there is an automation between portal and Voith legacy systems, but there is no automated way of passing data between suppliers and Voith portal. So only manual data handling in both ways is possible, which could be a potential solution for small suppliers or those for whose Voith is on customer only. From the perspective of global supplier this tool is not beneficent at all and only brings additional costs related to handling this portal.

7. INTEGRATION PLATFORMS AUTHORIZATION ASPECTS

One of the solution for users, companies authorization on business portals and platforms also procurement platforms. Could be using a third party company / user

profile for authorization. Something which is often used in e-commerce B2C, internet forums, fans zones and social media. Where often there is a possibility of using a third party profile for signing in. The same solutions should / could also be available for B2B authorization. Instead of Facebook or google profiles, the technological partners' profiles should be used, for example, if company strategic technology partner is Microsoft then there should be a Microsoft company profile in use for authorization, in other case maybe IBM, Oracle, Seaburger or any others. The only thing is these companies would need to make available the authorization services and procurement platforms and any other business platforms should have a possibility to use this third party authorization.

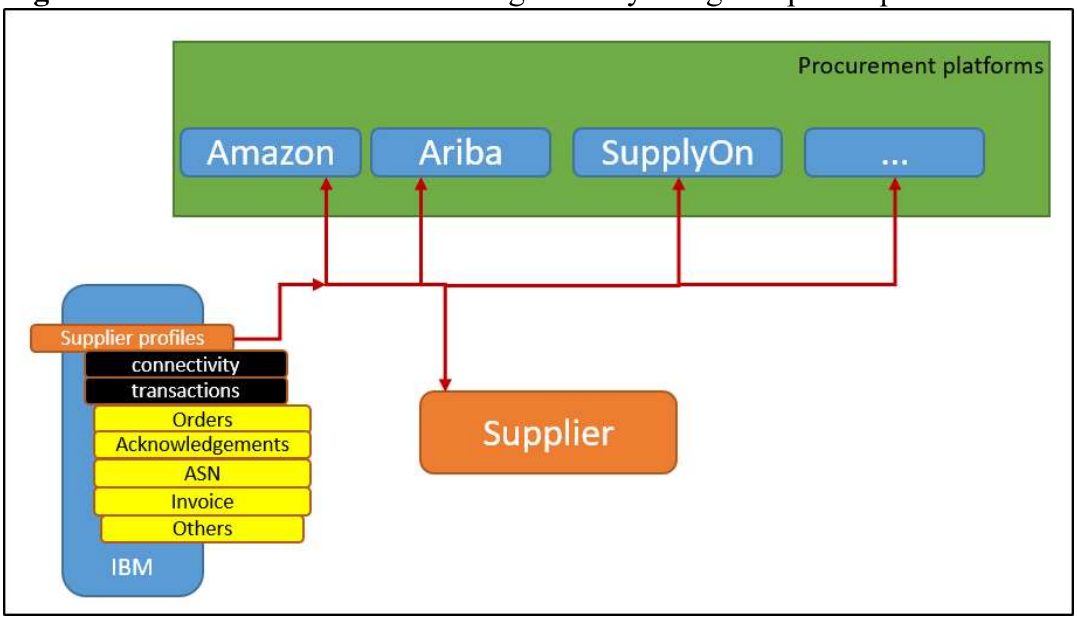
Figure 6. Users' authorization at procurement platforms using technology partner profiles



Source: own study

The same idea used for authorization of companies' users can be provided also for companies' profiles for electronic integration to other B2B users or platforms. However on certain, different level. For example when company is doing an electronic integration to a procurement platform the initial settings on both sides should be done based on companies profiles stored on the third party. These profiles should be shared when needed for integration. This will match the future idea of electronic integration based on semantic data models and process orchestration. This idea becomes more and more popular it has its application not only in transport and logistics sector, but everywhere where different standards and also different languages meet especially in transnational data exchange. This solution is also promoted in European projects related with transport and logistics and e-administration.

Figure 7. Automated transactions integration by using companies profiles



Source: own study

As far as automated B2B integration is concerned, this is not only connectivity setup with exchanging different certificates for communication protocols, but the most important things are the business transactions, which here must represented by a semantic data model which is common and understandable by every involved business partner. Only then partners can reach data elements which are crucial for executing business processes.

8. CONCLUSION

The World of integration platforms dedicated for different processes, industries is becoming bigger and bigger. In Authors opinion the authorization process would need to become more convenient as for users as for electronic integration which is going towards more automated way. The authorization is not the only problems and challenges related to integration platforms some of them were identified in this article: business models, insufficient support of messages standards, not standardized API, electronic integration not supported. The IT integration tools development as far as semantic data models and ontologies build around branches, industries should make possible very fast integration of different platforms and also changing them should be as easy as changing mobile telephony providers, it should take one or two days not three to six months.

The next step in the research will be to analyze the impact of using an integration platform on the logistics processes efficiency in the supply chain.

9. REFERENCES

Adamczak M., Domanski R., Hadas L., & Cyplik P., (2016). The integration between production-logistics system and its task environment-chosen aspects. *IFAC-PapersOnLine*, 49(12), 656-661

Barreto, L., Amaral, A., & Pereira, T. (2017). Industry 4.0 implications in logistics: an overview. *Procedia Manufacturing*, 13, 1245-1252.

Bohács, G., Frikker, I., & Kovács, G. (2013). Intermodal logistics processes supported by electronic freight and warehouse exchanges. *Transport and telecommunication*, 14(3), 206-213.

Debicki, T., & Kolinski, A. (2018). Influence Of EDI Approach For Complexity Of Information Flow in Global Supply Chains, *Business Logistics in Modern Management*, 18, 683-694

Fuks, K., Kawa, A., & Pierański, B. (2015). *Adaptation of social network analysis to electronic freight exchange*, In: *New Trends in Intelligent Information and Database Systems*, Springer, Cham, pp. 151-159

Hadas, L., Cyplik, P., Adamczak, M., & Domanski, R. (2015). Dimensions for developing supply chain integration scenarios. *Business Logistics in Modern Management*, 15, 225-239

Helo, P., & Szekely, B. (2005). Logistics information systems: an analysis of software solutions for supply chain co-ordination. *Industrial Management & Data Systems*, 105(1), 5-18.

Jacyna, M., & Merkisz, J. (2014). Proecological approach to modelling traffic organization in national transport system. *Archives of Transport*, 30, 31-41.

Jun, C., & Wei, M. Y. (2011). The research of supply chain information collaboration based on cloud computing. *Procedia Environmental Sciences*, 10, 875-880.

Kawa A., & Zdrenka W., 2016, Conception of integrator in cross-border e-commerce. *LogForum*, 12 (1), 63-73

Kawa, A. (2012). *SMART logistics chain*. In *Asian Conference on Intelligent Information and Database Systems*. Springer, Berlin-Heidelberg, pp. 432-438.

Li, W., Zhong, Y., Wang, X., & Cao, Y. (2013). Resource virtualization and service selection in cloud logistics. *Journal of Network and Computer Applications*, 36(6), 1696-1704.

Marinagi, C., Trivellas, P., & Sakas, D. P. (2014). The impact of information technology on the development of supply chain competitive advantage. *Procedia-Social and Behavioral Sciences*, 147, 586-591.

Prajogo, D., & Olhager, J. (2012). Supply chain integration and performance: The effects of longterm relationships, information technology and sharing, and logistics integration. *International Journal of Production Economics*, 135(1), 514-522.

Robu, V., Noot, H., La Poutré, H., & Van Schijndel, W. J. (2011). A multi-agent platform for auction-based allocation of loads in transportation logistics. *Expert Systems with Applications*, 38(4), 3483-3491.

Sliwczynski, B., Hajdul, M., & Golinska, P. (2012). *Standards for transport data exchange in the supply chain–pilot studies*. In *KES International Symposium on Agent and Multi-Agent Systems: Technologies and Applications*. Springer, Berlin-Heidelberg, pp. 586-594

Tseng, M. L., Wu, K. J., & Nguyen, T. T. (2011). Information technology in supply chain management: a case study. *Procedia-Social and Behavioral Sciences*, 25, 257-272.

Wong, C. W., Lai, K. H., & Cheng, T. C. E. (2011). Value of information integration to supply chain management: roles of internal and external contingencies. *Journal of Management Information Systems*, 28(3), 161-200.