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Selecting the Right Platform – The Perspective of Logistics Service Providers

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Purpose: Digital platforms provide logistics service providers (LSPs) the opportunity to increase their capacity utilization. Since there are a large number of reasonable alternatives, LSPs should be able to systematically assess different platforms. However, there is little knowledge on specific dimensions for such an assessment. Thus, the objective of this paper is to identify important dimensions to assess digital platforms from the perspective of LSPs.

Methodology: We conducted semi-structured interviews with LSPs and platform operators. Based on a qualitative content analysis we identify specific dimensions for assessment of digital platforms.

Findings: We find four specific dimensions for assessing platform potential. First, matching mechanisms that facilitate transaction processes and reduce search costs. Second, gatekeeping mechanisms that assure the quality of platform actors and increase trust. Third, pricing mechanisms that affect direct costs, and fourth, factors that lead to lock-in-effects.

Originality: There are a large number of studies on criteria to select business partners, e.g., suppliers. Although the number of platform users increases rapidly, and their disruptive potential is high, there is only little knowledge on platform-specific evaluation criteria. In this paper, we identify relevant platform-specific dimensions for the selection of suitable platforms as an extension of existing partner selection criteria.

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1 Introduction

Digitalization is rapidly changing the structure of entire industries. Within this transformation, digital platforms offer novel potential for success, but also increasingly threaten established business models with their disruptive character (Sucky and Asdecker, 2019). This development and transformation is similarly affecting the logistics industry, where the cooperation between logistics service providers (LSPs) and shippers is undergoing lasting changes (Zimmermann, 2017).

LSPs face the challenge of increasing their efficiency due to highly competitive pressure from numerous competitors and growing operating costs (Zhang, et al., 2017; Xu, Zhong and Cheng, 2019). High fuel prices and rising personnel costs continue to impose a negative impact on logistics service provider margins, which are without exception low (Xu, Zhong and Cheng, 2019). Cooperation between LSPs has long been used to optimize individual capacity utilization in the transport sector (Pan, et al., 2019). Nevertheless, in 2018, 37.1 percent of the transport kilometers of German trucks were empty runs on which no goods were transported (Kraftfahrt Bundesamt, 2018).

Digital platforms in the logistics sector offer tremendous potential for further reducing empty runs through the coordination of actors in the platform ecosystem (Sucky and Asdecker, 2019). By providing additional services, such platforms enable LSPs to optimize internal processes and provide customers with improved service quality. However, the increasing presence of digital platforms in the logistics industry is a controversial issue. Contrary to the advantages of digital platforms for some service sec-

tors, in the traditional logistics industry, there is often skepticism and uncertainty about changing conventional business models and use of the innovative structures provided by digital platforms (Hofmann and Osterwalder, 2017). For example, there is concern regarding the disclosure of sensitive company data and new forms of dependency imposed by digital platforms reinforce this effect (Grotemeier, C., Lehmacher, W., Kille, C., Meißner, M., 2016).

For LSPs, the disruptive nature of digital platforms means that, in addition to innovative potential, these new platforms also introduce new challenges and risks that can impact their existing business models (Grotemeier, C., Lehmacher, W., Kille, C., Meißner, M., 2016). Due to numerous platforms with different service offerings, LSPs need to make a precise selection of suitable platforms. The selection of partners, e.g., suppliers, in traditional business models has been a widely researched area since the 1990s. A positive influence of systematic selection processes on the efficiency of supply chains has already been demonstrated in several studies (Vonderembse and Tracey, 1999; Liu and Fong-Yuen, D., Vinol, L., 2000; Chang, Chang and Wu, 2011). While the selection criteria apply specifically to traditional business models, there are as yet no platform-specific selection criteria. Due to the growing importance of platforms in the logistics industry and platform-specific opportunities and risks for LSPs, the objective of this paper is to identify important dimensions to assess digital platforms from the perspective of LSPs.

The remainder of this paper is structured as follows. In section 2, the theoretical background of digital platforms is considered in order to analyze

platform-specific characteristics. Platforms differ from conventional business models due to their role as intermediary and platform-specific market mechanisms. To evaluate platforms in detail, a fundamental analysis of platform-specific mechanisms in the logistics sector is necessary. A literature analysis is carried out for this purpose. In section 3, we describe the literature analysis and qualitative content analysis method, which is used to evaluate and analyze interviews in this study. Additionally, our sample selection is explained. In section 4, platform-specific dimensions are identified based on the expert interviews. In section 5, the study results are discussed and a conclusion is drawn in section 6.

2 Theoretical Background

2.1 Characteristics of digital platforms

Digital platforms have been an essential part of business management research since the turn of the millennium. In the literature, there are two key research focuses for digital platforms: An economic view taking into account platform-specific market mechanisms and a technical view (Gawer, 2014). Due to the increasing presence of digital platforms in various industries, such as banking, health care, energy, manufacturing, logistics and transport, the scope and diversity of this research area is growing rapidly (de Reuver, M., Sørensen, C., Basole, R. C., 2018). However, there is no common definition of digital platforms.

In principle, digital platforms can be described as socio-technical systems of two- or multisided markets, which enable and simplify value-adding interactions between platform players by providing a digital infrastructure (Gawer, 2014; Parker, van Alstyne and Choudary, 2017; de Reuver, M., Sørensen, C., Basole, R. C., 2018). The goal of digital platforms is to create value for all players by bringing platform players together, thereby maximizing the value of the entire platform ecosystem (Parker, van Alstyne and Choudary, 2017). As intermediaries, digital platforms are detached from the ownership of physical assets, which leads to a fundamental distinction from traditional organizations (Engels, G., Plass, C., Rammig, F. J., 2017).

Platform ecosystems combine the expertise and services of numerous independent platform players that may act in different roles. A platform ecosystem comprises the platform operator, the core service providers, the demanders and the complementors (Jacobides, Cennamo and Gawer, 2018).

Suppliers and demanders are actors on a platform that functions as an intermediary which enables the main interaction (Smedlund, A., Faghankhani, H., 2015). The main interaction is the most important activity that takes place on the platform and motivates most actors to use it (Choudary, 2015; Parker, van Alstyne and Choudary, 2017). Suppliers provide the core service and create value that can be demanded and traded on the platform. Demanders consume the services offered, which are often bundles of services from providers and complementors.

Depending on platform design, the roles of the players can change from demand to supply and vice versa. However, this role change is usually dependent on various interactions, thus the role taken does not change during a specific interaction (Parker, van Alstyne and Choudary, 2017). The platform operator provides the infrastructure for interaction between the players. In addition, the platform operator controls and monitors the interactions and the actors. Appropriate design and control are key factors for a successful orchestration of platform ecosystems with all its stakeholders (Smedlund, A., Faghankhani, H., 2015). Even the platform operator is not bound to the role of a mere operator (Tiwana, 2014). In addition, the platform ecosystem includes complementors. These actors provide products and services complementary to the core service, which allows the platform offering to be expanded and optimized (Smedlund, A., Faghankhani, H., 2015).

A key characteristic of digital platforms is the multi-sidedness of the platform ecosystem, in which each actor can be assigned to a specific group of stakeholders brought together by the platform (Tiwana, 2014). Successful platforms use implemented matching mechanisms that can automate and

optimize the process of bringing together stakeholders on the platform (Sutherland and Jarrahi, 2018). Matching mechanisms use data from the stakeholders to match supply and demand according to requirements, skills and preferences (Zimmermann, 2017). The better these algorithms are designed, the more efficient the exchange and value generation via the platform (Parker, van Alstyne and Choudary, 2017). For platform actors, efficient matching mechanisms mean enormous savings in terms of search and transaction costs (Tiwana, 2014). Consequently, joining an existing platform ecosystem offers the chance to reach new markets and partners. The benefit of a group of actors in multi-sided markets increases with the growth of their own group of actors as well as of a group of actors that differ from them (de Reuver, M., Sørensen, C., Basole, R. C., 2018). These are so-called network effects.

The benefits of a digital platform depend on the number of actors actively interacting on it. Network-effects describe the change in benefit for each individual platform actor through the entry of an additional actor into the platform ecosystem (Tiwana, 2014). Each additional platform actor increases the number of actors with whom it is potentially possible to interact. Network effects can only occur effectively in a platform ecosystem if a sufficiently large number of platform actors have been reached (McIntyre and Srinivasan, 2017). The minimum number of platform actors at which network effects occur effectively is called the critical mass or tipping point (Tiwana, 2014).

2.2 Digital platforms in logistics industry

Digital platforms in the logistics industry are undergoing a process of change due to digital transformation. Traditional freight exchange platforms are increasingly threatened by digital platforms that offer additional innovative services (Zimmermann, 2017). These platforms implement digital technologies and go beyond the mere offer of a marketplace (Sucky and Asdecker, 2019). On the one hand, established freight exchange platforms are expanding their functionalities, while on the other hand, start-ups are increasingly pushing into the market. Worldwide investment in logistics start-ups increased 243 percent from $3.5 billion in 2017 to $12 billion in 2018 (Wyman 2018).

In logistics platforms, shippers act as suppliers of goods to be transported and as buyers of transport capacities. LSPs act as demanders to obtain new transport orders and as providers of free capacities (Zimmermann, 2017). In this case, free transport capacity is offered, which shippers and other LSPs can access (Pan, et al., 2019). As mentioned before, the role of platform players can change. Depending on platform design, it may be possible for LSPs to share transport orders with carriers on horizontal level (Zhang, et al., 2017). As shown in Figure 1, interaction on platforms can take place

in different ways. Both shippers and LSPs can offer freight orders. These freight orders can be requested by LSPs or carriers.

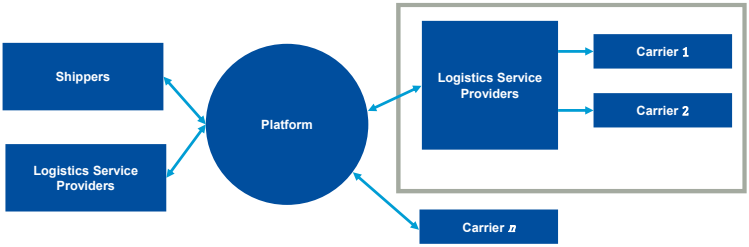

Figure 1: Structure of Logistics Platforms (own representation based on Witkowski, 2018)

Two types of logistics platforms can be distinguished: Open and closed platforms. Open platforms are available to all interested shippers, LSPs and carriers for one-off transactions on the spot-market. Transport orders can be traded by simple registration. In this way, short-term capacity fluctuations can be compensated. Closed platforms are dedicated to specific companies with long-term relationships and freight orders are tendered in a closed network (Moroz, et al., 2014). The use of these platforms has a long-term character and is often subject to contractual regulations.

In addition to trading freight orders, platforms increasingly offer additional functionalities (Fanti, et al., 2017). Additional functionalities include automatic matching mechanisms, where transport-relevant data, such as vehicle size, vehicle position, load weight, transport schedule and freight-specific requirements are analyzed using algorithms to bring together suitable platform actors (Sucky and Asdecker, 2019). High-quality matching mechanisms can reduce search costs for platform actors and enormously increase

the efficiency of cooperation (Parker, van Alstyne and Choudary, 2017; Rosano, et al., 2018). The principle of matching mechanisms is shown in Figure 2.

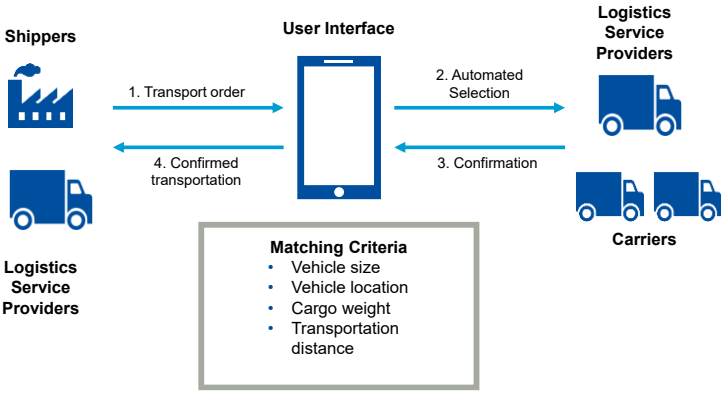

Figure 2: Automated Matching (own representation based on Zimmermann, 2017)

(1) Shippers or LSPs first enter transport orders into the platform system. (2) The algorithm then selects suitable LSPs or carriers based on vehicle size and position, load weight, transport distance and other influencing factors, and contacts them automatically. (3) Transporters can now accept or reject the order offer using order management. (4) Depending on the decision, the order is confirmed or rejected for the shipper (Zimmermann, 2017).

Platforms can also include Time Slot Management (TSM) which allows actors to agree on preferred times to load and unload trucks. This leads to reduced waiting times and optimized internal, as well as external, processes (Witkowski, 2018). In addition to matching mechanisms based on real-time data, platforms can include automated price determination. This

functionality calculates prices based on transport-specific factors such as transport route, transport volume as well as fuel and personnel costs (Zimmermann, 2017).

Tracking and tracing mechanisms enable event-based or real-time tracking during transport as well as additional data services for visibility (Möller, F., Bauhaus, H., Hoffmann, C., Niess, C., Otto, B., 2019). For platform actors, this increases process transparency and optimizes time management for loading and unloading processes (Giannopoulos, 2004). Moreover, this real-time data can be used to calculate optimal transport routes and the estimated time of arrival by adding information on traffic or weather conditions. (Grotemeier, C., Lehmacher, W., Kille, C., Meißner, M., 2016). In addition to time management functions, several platforms offer central document management. Transport documents, such as proof of delivery, can be made available via smartphone and also provide photographs (Zimmermann, 2017). This information can be viewed and shared directly via the central user interface. Further services can be provided in the form of credit checks to ensure high-quality cooperation partners on the platform. Moreover, performance ratings can be used for evaluations and to display payment behavior (Rosano, et al., 2018). These ratings help the platform operator to increase the level of trust between cooperation partners (Grotemeier, C., Lehmacher, W., Kille, C., Meißner, M., 2016).

2.3 Opportunities and risks for LSPs

Joining an existing platform ecosystem can lead to access to new markets and players that would not be possible in an independent organization or only at great expense (Tiwana, 2014). The most important advantage of

platforms for LSPs is the reduction of empty runs (Witkowski, 2018). In particular, on the way back, the consolidation of cargo with other actors of a platform can enormously reduce empty runs. Accordingly, the more actors that use the platform, the more possibilities there are to find suitable cargo. Digital platforms open up new communication and sales channels (Engels, G., Plass, C., Rammig, F. J., 2017). Central communication channels of the platform offer LSPs the potential to enormously reduce administrative costs (Witkowski, 2018). Small LSPs with few personnel can outsource sales activities to the platform. The better that the matching works on platforms, the less manual searching is required, which increases efficiency (Cambra-Fierro and Ruiz-Benitez, 2009). Moreover, platforms create transparency about market prices. This can be an advantage on the one hand, but on the other hand it increases pure price competition.

Several platforms offer vehicle insurance services, route optimization, vehicle leasing services, factoring services in pre-financing, e.g., fuel purchases to secure the liquidity of LSPs (Witkowski, 2018). These new or extended market services offer LSPs the opportunity to focus on their core competencies and to increase customer benefit by offering service bundles. The potential advantages of platform utilization, however, must be weighed against the risks that can arise from joining an existing platform ecosystem. Platform users run the risk of losing direct access to customers. Platform business models in which the interaction between LSPs and shippers takes place exclusively via the platform can have a negative impact on customer loyalty (Engels, G., Plass, C., Rammig, F. J., 2017).

The increased transparency on digital platforms also forces the interchangeability of LSPs. Especially in the logistics industry with largely homogeneous services and little potential for differentiation, this quickly leads to pure price competition. The consequence is a loss of margins (Engels, G., Plass, C., Rammig, F. J., 2017). The expense of the margins achieved depends on the cost of platform utilization. On the one hand, platforms may include subscription pricing, i.e., through regular payments independent of transactions. On the other hand, transactions can be priced by charging a transaction fee, which has a direct impact on the margin achieved. Mixed forms of these pricing models can also be found (Witkowski, 2018).

A central risk is the dependency of the platform actors. So-called lock-in effects are to be considered mainly in the form of increased switching costs. An increase in this risk results from specific investments and the outsourcing of important processes to the platform (Tiwana, 2014; Engels, G., Plass, C., Rammig, F. J., 2017). A further aspect of the dependency is the disclosure of sensitive company-specific data, which makes know-how and confidential information visible (Grotemeier, C., Lehmacher, W., Kille, C., Meißner, M., 2016). In addition, there is the risk of losing this data when leaving the platform ecosystem. This risk is particularly prevalent in closed platforms. Therefore, regulated security mechanisms that increase confidence in the use of digital platforms are of enormous importance (Choudary, 2015)

3 Method

We use an explorative nature approach. First, a literature review was done to identify actors and platform functionalities as well as opportunities and risks for LSPs. We conducted the literature review in three steps: planning, conducting and evaluate (Tranfield, et al., 2003).

The literature review was based on our guiding research question: Which platform-specific dimensions are relevant for the selection of logistics platforms from the perspective of LSPs? Therefore, the database "google scholar" was used for a preliminary overview. In addition, the search was conducted in the database "ScienceDirect". The following keywords were included: "digital platforms", "digital platforms in logistics", "digital platforms for logistics service providers", "assessment of digital platforms in logistics" and "digital platforms for freight exchange". Various combinations were used for this purpose, the number of results for every the number of results is shown in brackets: "digital platforms AND freight exchange" (651), "digital platforms AND logistics service providers" (2.544), "digital platforms AND logistics" (4.137), "digital platforms AND assessment AND logistics" (3096). Due to the large number of publications between 2009 and 2020, only papers from this period were included.

The existing literature examines digital platforms mostly in the B2C context and has only little reference to logistics-specific platforms. Due to the large number of papers investigating the functions and mechanisms of digital platforms independent of industry sectors and only few logistics-specific publications, both publications from general platform literature and logistics-specific publications were analyzed. The advantage is the transferability of generally valid functions and mechanisms of digital platforms to the

logistics-specific application. The titles and abstracts of the publications were screened in order to select thematically appropriate publications. We identified 28 Papers that served as a basis of our platform-specific literature review. Based on a systematic review of the content, the functionalities and mechanisms of platforms in the logistics context as well as opportunities and risks of platforms for LSPs could be identified. These results serve as a basis for the following interview study.

Second, a study was done using a multiple semi-structured interview methodology. The semi-structured interview design allows flexibility to adapt to specific, but initially unknown circumstances in practice, especially in topics where little comprehensive knowledge is available. The semi-structured interviews are carried out on the basis of an interview guideline focusing on the identification of relevant dimensions to assess platform potentials. A partial standardization of the interviews allows for comparison and evaluation of the interviews (Mayring, 2015). The interviews were conducted via telephone or personally in German. Every interview was audio-recorded, fully transcribed and anonymized. The disclosure of internal company information is therefore not attributable to the respective persons or companies.

We selected interview partners who represent different roles on logistics platforms. As mentioned in Section 2, LSPs can act both as suppliers and purchasers of freight orders. To this end, we interviewed LSPs who use platforms to optimize their capacity through the demand for freight orders and, which also offer excess capacity to other LSPs or carriers. Furthermore, the use of platforms is highly dependent on the size of the LSPs. Small LSPs use platforms as a central distribution channel, whereas large LSPs often use

platforms only sporadically. Accordingly, we interviewed small, medium and large LSPs. This sampling provides a comprehensive view of LSPs to identify relevant dimensions for platform evaluation. In addition, the focus was on whether LSPs use open or closed platforms in order to derive possible distinctions.

We also interviewed operators of logistics platforms, which provides an extended view of relevant aspects of digital logistics platforms from the operator's perspective. Here we interviewed providers of open and closed platforms. In addition, platforms of different sizes were included. In order to take into account the functionality of new platforms, a platform start-up was also part of the study. This enabled analysis of platforms that are new on the market and growing rapidly. The selected interview partners are shown in Table 1.

Table 1: Interview Partners

Interview	Role	Platform Type	Size/Scope	Duration
01	Managing Director LSP	Open Platform	Medium/European	60 Minutes
02	Managing Director LSP	Open and closed platform	Large/European	45 Minutes
03	Managing Director LSP	Open Platform	Medium/European	45 Minutes

Interview	Role	Platform Type	Size/Scope	Duration
04	Project Manager LSP	Open Platform	Medium/European	60 Minutes
05	Project Manager LSP	Open and closed platform	Large/Worldwide	45 Minutes
06	Platform operator	Closed platform	Medium/European	60 Minutes
07	Platform operator	Open and closed platform	Large/Worldwide	60 Minutes
08	Platform operator CEO/Founder	Platform Start-Up	Small/European	45 Minutes

In order to identify relevant dimensions for the evaluation of logistics platforms, the interviews were analyzed according to grounded theory. This is particularly suitable for the theoretical construction of previously unexplored areas and does not focus on the description of existing theories (Silverman, 2017). The interviews were examined in detail using a qualitative content analysis according to Mayring (2015). The process of identifying the dimensions comprises three main steps: first, categories are developed from the data collected and constantly compared. Therefore, the experts'

statements are reduced to their core statements, paraphrased and subsequently generalized. Second, the paraphrases are assigned to different thematic categories using a keyword analysis. These categories are then evaluated on the basis of further cases up to saturation to determine relevance. In a third step, the identified categories are generalized and the theoretical model is built (Charmaz, 2006).

4 Findings

Based on the interviews conducted, the opportunities and risks of joining platforms were first analyzed from the perspective of LSPs. This results in the fact that opportunities arise primarily through increased efficiency. LSPs can use digital platforms to optimize capacity utilization and act more efficiently. This is a key success factor, particularly in the heavily cost-driven logistics sector. Horizontal cooperation between LSPs has long been a means of avoiding empty runs. In particular, identified matching mechanisms can significantly simplify cooperation, and increase cooperative efficiency. However, there are serious differences between matching mechanisms. Some platforms do not include automated matching mechanisms, so the manual effort for cooperation remains the same. Potential arises mainly from algorithms that can be used to match suitable partners and dramatically reduce search costs. Another dimension identified to evaluate efficiency is pricing mechanisms. Different mechanisms exist, which clearly differentiate the costs of platform use. Furthermore, it became apparent that cooperation with partly unknown partners requires trust. This can be strengthened by gatekeeping mechanisms. In this case, only actors with certain quality criteria are allowed on platforms. With regard to the risks associated with joining a platform, the interviews revealed dependencies on platforms. In the area of dependencies, the dimension of lock-in effects can be identified. Through platform-specific mechanisms, LSPs are faced with the challenge of evaluating dependencies that may arise from platform use. The identification of the dimensions are shown in Figure 3 and are further explained in this section.

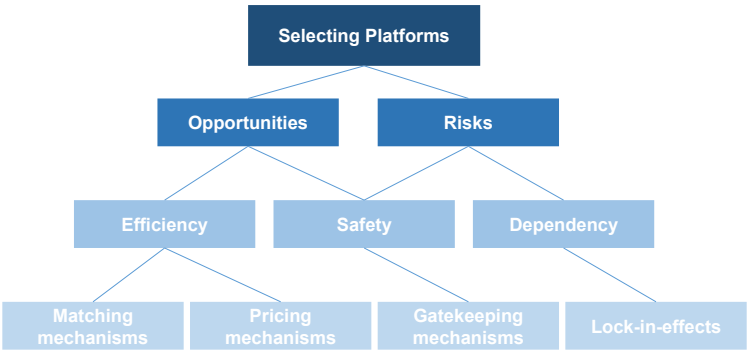

Figure 3: Theoretical Model: Dimensions to Select Platforms

4.1 Matching mechanisms

Matching mechanisms are one opportunity to optimize cooperation processes via digital platforms. The potential for efficient cooperation is increased by matching freight offers according to capacity and capability. A distinction can be made between logistics platforms where orders must be manually entered into the system and those where transportation service providers must be selected. Orders are coordinated via the platform by manual selection after a search effort. In comparison, there are platforms that offer automated matching mechanisms. These offer LSPs the potential to automatically propose freight offers and requests for cargo based on capacity, route and capability-compliant factors. This leads to more efficient cooperation processes. In addition, these mechanisms significantly increase the placement rate. It should be emphasized that the interviews identified that there are serious differences in existing logistics platforms in the area of matching mechanisms.

In practice, logistics platforms can be found in which no matching mechanisms are implemented. The input of capacities, routes and time windows for transport services is done manually. The selection of freight offers from shippers must also be carried out manually by dispatching personnel. There is no potential here to make cooperation processes more efficient. Negotiations on freight orders continue to be conducted by telephone or e-mail. In this type of platform, only a few offers lead to an actual order.

A further characteristic of matching mechanisms became apparent from other interviews. Here the input of transport orders is still partly done manually. However, the allocation of orders is based on capacity requirements, recipient location and a time window is automated. Orders are suggested to suitable LSPs, which greatly reduces the search effort. LSPs are then able to accept or reject the suggested orders. The partially-automated matching process results in increased potential for the LSPs by making cooperation processes more efficient and at reduced costs. Optimized matching mechanisms already exist which generate orders and assign such orders to suitable partners. The matching of supply and demand can be done by using real-time GPS-data based on the current locations of the LSPs and the goods to be loaded, which reduces empty runs. This feature was identified as the maximum potential of matching mechanisms. There is neither the effort to enter information about transport orders into the platform system, nor do suitable offers have to be selected manually. Orders are concluded directly via the platform. Due to stored tariffs, there is no negotiation and LSPs receive orders directly from the platform. In this case the number of orders received via the platform increases enormously.

4.2 Gatekeeping mechanisms

A further central factor in assessing potential is to ensure that the platform players are of a correspondingly high quality and reliability. Cooperation via the platforms means an exchange of information about the platform actors as well as money flows. Gatekeeping mechanisms ensure that actors only meet high-quality cooperation partners. From the perspective of LSPs, it must be ensured that potential cooperation partners are reliable for secure interactions and transactions. This is particularly important when LSPs cooperate with other carriers as providers of cargo. Therefore, security mechanisms must also be implemented by the platform operator. First, fundamental factors such as legal requirements and the necessary insurance coverage need to be identified. Second, specific criteria are necessary, e.g., for the transport of special goods such as hazardous substances. Especially for non-mass-produced goods, gatekeeping mechanisms are the prerequisite for cooperation. The assurance of these quality characteristics, which is necessary as a prerequisite for joining a platform ecosystem, increases the confidence and trust of the actors. Gatekeeping mechanisms are especially important on open platforms. Here, the cooperation between many unknown actors takes place in an open network. It is also important in closed platforms, but the cooperation takes place in a closed network with mostly well-known partners.

Gatekeeping can include user authentication and certification as well as actor verification by simple registration up to the requirement of quality certifications. Users of logistics platforms often have to undergo verifications and credit checks. The examination of the platform actor by the platform

operator ensures that potential cooperation partners are exclusively high-quality and genuine carriers.

4.3 Pricing mechanisms

Pricing models can be identified as a further influencing factor for the evaluation of platforms. From the LSPs point of view, the potential of a platform only arises if the costs of platform use are lower than the sales potential. Furthermore, this dimension is based on the enormous cost pressure in the logistics industry with decreasing margins. It became apparent that existing platforms contain different pricing models.

Pricing models can basically be divided into transaction-based costs and subscription models. Transaction-based costs are incurred proportionately to the transactions carried out. LSPs pay a percentage of the transaction sum to the platform operator. If no transaction is carried out, no costs are incurred.

Subscription costs are transaction-independent fixed costs per time interval. These fixed costs can often appear as license fees. Every employee who uses the platform must have such a license. Depending on the intensity of use, it is important for LSPs to evaluate which pricing model has the least impact on the margins achieved. Furthermore, asymmetric pricing models can offer additional potential. Especially in closed platforms it is possible for LSPs to process transactions via the platform without incurring platform usage costs. Depending on platform design, LSPs can be subsidized by shippers, who bear the costs of using the platform.

The pricing of the platform has to be in proportion to the benefits that the platform brings. These additional costs for cooperation must be recovered

through process optimization. Furthermore, the different cost models can be linked to the resulting flexibility of platform use. The loss of flexibility is a core problem of LSPs in the strategic use of platforms. A differentiation can be made between the low flexibility of platform usage through regularly fixed usage fees, which makes the inevitable use of the platform necessary for pure cost recovery. On the other hand, there is the potential of a flexible platform usage, which is given by purely transaction-dependent costs.

4.4 Lock-in-effects

In addition to dimensions that serve to increase efficiency and security, many LSPs regard logistics platforms with reservations. The usage of platforms and the role of LSPs on these platforms can lead to new dependencies. The lower the dependency on the logistics platform, the higher the potential for LSPs. There are different factors that lead to lock-in effects.
One factor is the loss of direct customer contact. Information flows are usually handled by the platform operator as the central intermediary. As the platform assumes the contact function, there is a risk of losing direct contact with customers. Different forms of customer contact on platforms were identified. Many platforms make offers visible and transparent, but contracts are concluded in personal contact between the parties. In this case the platform acts to provide a comparison function for offers. As direct customer contact continues to exist, there is no dependency on the platform.
Meanwhile, closed platforms create a high dependency. Shippers who use closed platforms lead LSPs on platforms. The contact between shipper and

LSP then remains exclusively via the platform. LSPs lose contact with existing customers who process orders exclusively via the platform when they don’t join or leave the platform ecosystem. Special attention must be paid to contractual regulations that allow interaction with customers exclusively via the platform. As a consequence of these regulations, interaction with customers is often no longer possible without using the platform. Leaving the platform ecosystem is tantamount to breaking off business relations with these customers. Often, an admission contract must be signed, binding the user to the platform's requirements. This does not only mean that you can simply enter the platform, it also means that you cannot leave it without effort.

Specific investments increase the dependency on platform actors if these investments are only suitable for one platform. Interview partners stated, that especially for closed platforms, add-ins that were developed for integration into a platform are often costly. One would not switch to another platform operator if the implemented add-in no longer has any value there. If investments are to be made in interface development, these should be compatible with other platforms. Otherwise, interfaces would have to be built up again for joining another platform. In order to analyze the potential for reducing the dependency on a specific platform, standardized interfaces are one way to avoid specific investments. Moreover, investments in the development of interfaces to connect transport management systems with the platform infrastructure could also be identified as platform-specific investments. In addition, consideration must be done when individual value-added processes of the LSPs, which are essential for their business model, are outsourced to the platform. Thus, the increasing outsourcing of

value-added processes leads to a transformation of a fully-fledged freight forwarder into a fully-dependent service provider.

5 Discussion

The dimensions identified in this study for the evaluation of logistics platforms from the perspective of LSPs represent an extension of existing evaluation dimensions in a platform-specific context. Matching mechanisms are pointed out in the literature as an important criterion for the potential of platforms. High-quality matching mechanisms can reduce search costs for platform actors and enormously increase the efficiency of cooperation (Parker, van Alstyne and Choudary, 2017). Currently, however, only a few platforms contain automated mechanisms. A distinction between different forms of matching could not be identified in the literature. It is still necessary to analyze in detail the functioning of the matching mechanisms in order to make concrete distinctions about their potential. In addition, it became clear that automated matching not only offers potential, but the required data increases transparency and that LSPs have reservations about disclosing sensitive company data. In the future, it will therefore be necessary to weigh up the disclosure of sensitive data against improvements in search effort.

A central concern that emerges from the study interviews is ensuring the trustworthiness of platform cooperation partners. Trust is a central success factor from both the user and from the operator's point of view (Shaughnessy, 2015; Evans and Schmalensee, 2016). To evaluate this, the dimension of gatekeeping was derived from the interviews. Gatekeeping mechanisms are an established function of platform operators to control platform actors (Tiwana, 2014). The logistics industry is characterized by personal relationships between LSPs and shippers, which function on a horizontal

level (Verdonck, et al., 2013; Agarwal, Jain and Karabasoglu, 2018). To ensure the security of transactions with unknown partners on platforms, these security aspects are an important factor. However, one of the benefit of platforms depends on active users on the platform. In order to attract as many users to a platform as possible, the security mechanisms have to be critically scrutinized. From the point of view of platform operators, new users are a positive, but too few security controls can lead to lower trust.

Traditional business models are concerned with developing and protecting resources that cannot be imitated in order to secure competitive advantages. Meanwhile, platform operators strive to engage players in a platform ecosystem in order to generate as many interactions as possible and thereby maximize the value of the platform ecosystem (Parker, van Alstyne and Choudary, 2017). Accordingly, the competitive strategies of platform operators also focus on securing essential skills and resources to avoid the multihoming of platform users. Multihoming is the action of platform actors participating in several existing and competing platform ecosystems with similar capabilities. In order to avoid multihoming, platform operators strive to generate switching costs for platform actors through various lock-in mechanisms (Tiwana, 2014; Parker, van Alstyne and Choudary, 2017). Switching costs arise when switching from one platform to another involves costs for the platform user. High switching costs lead to lock-in effects for the platform user (Farrell, J., & Klemperer, P., 2007). Such lock-in-effects are also a critical factor for LSPs to consider regarding logistics platforms. In particular, closed platforms must be critically weighed from the perspective of LSPs. If shippers decide to tender freight contracts exclusively via platforms, LSPs are often forced to join the platform, otherwise

the business relationship with these partners is lost. Consequently, this dimension cannot always be assessed without difficulty.

6 Conclusion

Platforms in the logistics industry are developing rapidly. Digital transformation in particular offers new functionalities that create added value for the logistics industry. In addition to the potential to optimize capacity utilization and to obtain new cooperation partners with little effort, new types of risks may arise on platforms. In order to evaluate these opportunities and risks in detail and to select a suitable platform, four dimensions serve as a systematic basis to evaluate platform-specific criteria. These dimensions go beyond existing criteria to select cooperating partners and include platform-specific factors. By assessing potential, LSPs can evaluate the possibility of joining a specific platform ecosystem and, based on this, constantly question and optimize their existing business model. For long-term application, the dimensions must be continuously optimized in order to meet the rapidly evolving range of logistics platforms offered by digital technologies.

Our study has several limitations. First, general applicability is limited with regard to the very heterogeneous range of existing logistics platforms, whose complete evaluation on the basis of all relevant factors for potential analysis is difficult to depict in single dimensions. The identified dimensions should be seen as a first approach to include platform-specific factors in the assessment of business models. Second, it should be noted, that an assessment of platforms with the identified dimensions can only be carried out using externally-visible evaluation criteria. The clear delimitation of the potential is partially problematic due to the limited knowledge of functionalities. The dimensions have to be used as decision support for the selec-

tion of suitable platforms. In order to decide on the actual entry, further detailed analyses in the identified dimensions have to be carried out, which go beyond the global character of the dimensions in this study. Therefore, it is also important to evaluate the identified dimensions based on a larger set of data. The evaluation criteria must be adapted to changes in platform service offerings. As the development of freight exchanges into digital platforms shows, digital transformation will continue to have a major influence on the future of the logistics sector.

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