# Professionalizing Small Complementors in a Heterogeneous Platform Ecosystem. A Logistics Case

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# Professionalizing Small Complementors in a Heterogeneous Platform Ecosystem. A Logistics Case

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**Abstract.** Understanding digital platform ecosystems is a central theme in information systems research. Particularly complementors' characteristics, motivations, and their heterogeneity are examined in contemporary research. However, little is known about heterogeneity across both sides of the platform market and how digital platforms enable interactions across these heterogeneous sides. With a single case study of a digital logistics platform's ecosystem, we investigate how a platform enables interactions in a market exhibiting heterogeneity in the use of technology across both sides. We find cross-market-side heterogeneity, a new dimension in the relationship between platform owner and complementor. Our results suggest that platform owners offer auxiliary services that enable complementors to interact on an equal footing with consumers. We explain how platform owners can enable complementors to overcome the resulting differences in professionalization.

**Keywords:** Digital Platform Ecosystem, Complementors, Boundary Resources, Logistics Industry, Case Study

## 1 Introduction

Digital platform business models are of significant, ever-growing importance in business, society, and the life of people around the world [1]. Complementors play a central role in such digital platform ecosystems as they ensure generativity and variance [2, 3]. Literature in information systems and management has developed concepts to understand the intra-platform relationship's aspects of value co-creation [4], governance [5], knowledge management [6], and competition [7]. Particularly, the concept of boundary resources has been used to understand promoting co-creation by complementors, particularly to foster generativity on innovation platforms [8, 9]. Yet, their appearance to extend digital platforms' scale, e.g., in transaction platforms, is not fully understood [10].

Particularly, we lack a conceptual understanding of services that business-to-business platforms provide their ecosystem of small and medium-sized businesses (SMBs) complementors so that they can interact with large enterprise clients, which have greater professionalization, more advanced use of technology, and a higher frequency, density, and size of transactions [11]. However, understanding this aspect

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of the relationship between platform owner and complementors is necessary considering the generativity of SMB complements and the potential for SMBs to join digital platforms that help them reach new consumer groups [12] as well as accompanying opportunities for digital platforms to scale [3]. Even though cross-market-side heterogeneity of organizations involved in a transaction is a frequent and much-researched phenomenon in business-to-business relations [13–16], its occurrence on digital platforms is little researched. Particularly, apart from the observation of the existence of services that platforms may provide their complementors to overcome cross-market-side heterogeneity's challenges [11, 17], scholars lack understanding of these services.

To address this research gap, we address the following research question: *How can a digital platform enable interactions in a market exhibiting cross-market-side heterogeneity?*

We conduct a single case study of a digital business-to-business logistics platform in the European road freight logistics market, which exhibits a particularly fragmented supply-side of SMB-carriers and severe cross-market-side heterogeneity in the use of technology. Our results show that platform owners can professionalize complementors to enable them to interact on an equal footing with consumers. Our results illustrate a new dimension in the relationship between platform owner and complementor, cross-market-side heterogeneity. We explain how platform owners can enable complementors to overcome the resulting differences in professionalization.

The structure of this paper is as follows. The next section provides background knowledge on the components of digital platform ecosystems, complementor boundary resources, and the specifics and challenges of the logistics industry. The subsequent section explains the research method. Afterward, the results are presented, followed by a discussion of implications, limitations, and suggestions for future research.

## 2 Background

### 2.1 Components of Digital Platform Ecosystems

Digital platforms are organizations at the boundary between market and hierarchy [18] that enable and mediate direct interactions between two or multiple distinct groups that are all affiliated with the platform [19]. Subject of interactions on these two- or multi-sided markets can be transactions, innovations, or both [20]. Innovation platforms allow complementors to offer complements to the platform's offering [21], while transaction platforms may make it easier and quicker to facilitate transactions between complementors and consumers by matching supply and demand, preselecting, providing easy-to-use search functions, creating trust, and increasing transparency in markets. As a result, digital platforms reduce transaction costs [20, 22].

Most digital platforms are operated by a platform owner that cultivates a unique relationship to complementors on the provisioning side of the platform and consumers on the demand side [23]. Together, platform owner, complementor, and consumer constitute a digital platform ecosystem [22]. A key aspect of the relationships in a

platform ecosystem is that the platform owner defines a strategy on the platform's openness, which is determined by the conditions (rights, privileges, and duties) to participate on the platform [24, 25]. This openness of digital platforms is the precondition that complementors co-create value by contributing offerings that make digital platforms more useful, innovative, and scalable than traditional pipeline businesses [4, 22].

Recognizing complementors' paramount role in platform ecosystems deriving from this, lately, research has increasingly focused on platform complementors' perspectives on research issues and the heterogeneity of complementors [7, 26]. Regarding the latter, scholars differentiate complementors, e.g., by size [27–29], their incentive to participate [22, 30], or organizational form [7, 27, 31]. In contrast to this same-market-side heterogeneity, cross-market-side heterogeneity is under-researched. Information systems researchers only begin to understand the heterogeneity of any actor in ecosystems, and the manifestations and causes of it are still unknown [32]. The difference between these two forms of heterogeneity is illustrated in Figure 1. Heterogeneity is symbolized with different geometric shapes. As indicated, cross-market-side heterogeneity does not contradict the occurrence of same-market-side heterogeneity.

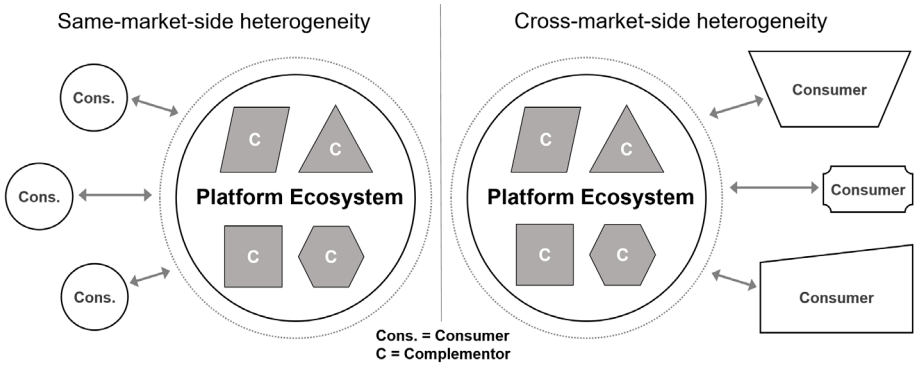


**Figure 1.** Same- and cross-market-side heterogeneity in a platform ecosystem

## 2.2 Complementor Boundary Resources

For the operationalization of the relationship between platform owner and complementors in terms of platform openness, research developed the concept of boundary resources (BR) [8, 10, 33]. Examples of BR are software development kits (SDKs), application programming interfaces (APIs), help desks, app stores, partner programs, forums, blogs, and workshops. Platform owners provide such BR to complementors or end-users of any size [34].

BR have been studied primarily in the context of innovation platforms as a tool to simplify integration and control of contributions from complementors to extend the platform's functional scope [6, 9, 10, 33–36]. Studies have, for instance, identified their impact on digital platforms' success [10] or complementors' satisfaction [37].

However, their appearance to extend platforms' scale, e.g., in transaction platforms, is under-researched [10]. Overall, scholars have recognized BR based on four aspects: Governance and control, enablement and knowledge transfer, value co-creation, and competition.

The aspect to govern and control third-party development has been conceptualized based on the boundary objects theory [8]. Accordingly, to reach the seemingly conflicting goals of maintaining platform control while transferring design capability to complementors, a platform owner may open its platform through BR as they allow to control and govern the platform [8, 9]. Furthermore, researchers have investigated that BR, which the consumer-side utilizes, can increase the value provided to them [10].

Concerning the enablement and knowledge transfer aspect, researchers have ascribed BR the capability to attract contributions from heterogeneous complementors [6]. Under this aspect, BR may be differentiated between technical BR, which enable third parties to create and evolve applications and allow applications to interact with the platform, and social BR that enable the coordination of development and transfer of knowledge [33].

The value co-creation aspect addresses that BR simplify market access of independent companies as they enable them to cultivate co-created offerings on a platform [38] by providing interfaces to the platform or including clear and understandable rules [39]. Together with the stability of the platform, BR ensure that complementors can develop and integrate their offerings without extensive knowledge of the details of the platform [40].

Regarding the competition aspect, BR impose commitment to the platform on complementors as BR demand complementors to make asset-specific investments [7].

### 2.3 Specifics and Challenges of the Logistics Industry

The road freight logistics services industry is characterized by fragmentation and heterogeneity. Actors range from one-person companies to large organizations that all compete for transporting clients' goods [41]. The market's relevance grows as logistics activities are increasingly outsourced and organized via (online) markets due to information technology reducing external transaction costs [42].

Challenges in the industry are that its fragmentation results in low transparency in terms of pricing [43], quality, and trust [41], as well as difficulties to gain economies of scale [41]. Furthermore, as carriers and clients are strongly mutually dependent on one another to positively impact their relationship-specific performance by sharing and receiving supply-chain related strategic information flows [44], the carriers' lack of digitalization [45] harms carriers and clients to profit financially and operationally [44, 46]. Specifically, many carriers perform even core processes such as management of assignments [45], invoicing [43], and load consultation manually. This may lead to loss of information [41], puts a burden on clients [43, 47], and limits the potential for improvement because of the inability to profit from analytics, machine learning, or artificial intelligence [48]. Even when carriers use digital tools, they are often self-developed, which obstructs the compatibility and integration in clients' systems [47].

A further challenge in the industry are relatively long payment targets, especially for SMB-carriers [47].

Traditionally, clients directly or indirectly through freight exchanges assign carriers or freight forwarders to transport goods. Latter, in turn, might subcontract a part of the assignments to carriers. An alternative procedure is to assign a digital logistics platform. Researchers have been discussing business-to-business logistics platforms intensively in the past years, partly as a solution to the abovementioned challenges [43, 45, 49]. Recognizing that, in the logistics industry, information technology (a) enables a shift from hierarchies to markets and (b) allows the efficiency of outsourced logistics to exceed that of hierarchies [42], logistics platforms are IT-savvy. Thereby they provide market access to carriers and clients and reduce transaction costs by mediating supply (carriers) and demand (clients) of logistics services more efficiently.

## 3 Method

We conduct a single case study of the ecosystem of the logistic platform "FreightBroker,"[1] which is a two-sided marketplace with an in-between digital solution. The two-sided marketplace exhibits cross-market-side heterogeneity in the use of technology. We examine the platform by collecting data through interviews with ecosystem members while considering that the collected data are a construct of our interviewees' perspectives and perceptions. Considering theoretical sampling [50], we selected FreightBroker's ecosystem as the subject of the study because FreightBroker (a) is an emerging platform that currently leads the dynamic German market, (b) offers a broad portfolio of services to their ecosystem, and (c) has market coverage across Europe. To later discuss the generalizability of the result, we take into account the context of the phenomenon studied [51, 52] by describing the case before presenting the findings and discussing the contributions.

The case data consist of primary data collected in twelve semi-structured interviews from November 2020 to February 2021. Three of the interviews were with FreightBroker employees and eight with ecosystem members. Two interviews were conducted with representatives of industry associations representing a broad range of FreightBroker's ecosystem members to get a wider, more representative, cross-sectional view. Since competition is a factor that shapes the market, one interview was conducted with an employee of a competitor of FreightBroker. Across the groups, the employees differed in their position (see Table 1). The interviews lasted 40 minutes on average. All interviews were conducted in German to avoid language barriers. Quotes we included in this article were translated. The interview questions covered reasons to participate in FreightBroker's ecosystem and the utility and advantages of the platform. All interviews were recorded and transcribed. We performed the study as an outside researcher [53]. The best option for us to critically reflect the interpretations and biases was to conduct the interviews with participants with different perspectives on FreightBroker's ecosystem, including a competitor.

[1] Name changed to ensure anonymity.

**Table 1.** Interview partners

| Interviewee | Role, experience in years | Org. size | Duration |
|---|---|---|---|
| FreightBroker manager 1 | Operations manager, ~1,5 | large | 54 min |
| FreightBroker manager 2 | Operations manager, ~1,5 | large | 14 min |
| FreightBroker engineer 1 | Data Scientist, ~0,5 | large | 17 min |
| Carrier manager 1 | Disposition manager, ~4 | medium | 60 min |
| Carrier manager 2 | Disposition manager, ~3 | small | 37 min |
| Carrier manager 3 | Owner, ~2,5 | small | 27 min |
| Freight exchange director 1 | Head of partner mgmt., ~1,5 | large | 61 min |
| Freight forwarder director 1 | CEO, ~6,5 | large | 53 min |
| Freight forwarder manager 1 | Business dev. manager, ~1 | medium | 47 min |
| Association employee 1 | Managing director, ~2,5 | medium | 32 min |
| Association employee 2 | Managing director, ~7 | small | 33 min |
| Competitor manager 1 | Operat. dev. manager, ~0,5 | medium | 58 min |

We analyzed the collected data iteratively by coding the data with an increasing degree of abstraction [52]. We coded 90 pages of interview transcripts with open, in vivo coding using grounded theory methodology coding procedures [54, 55]. Following, we applied selective coding [54] to identify patterns of different services offered by FreightBroker that help to overcome cross-market-side heterogeneity. We clustered the codes into seven subcategories representing different types of services and two categories, which group the services.

# 4 Results

## 4.1 The Case of a Logistics Platform Ecosystem

FreightBroker is an emerging transaction platform founded in 2015. It has raised considerable interest by investors already. Currently, it is market-leading in a dynamic market with three market players that are not so far advanced. Through organic and inorganic growth, FreightBroker has gained market coverage across Europe and intellectual property in the field of matching algorithms, truck management systems, quoting, and automated accounting.

The FreightBroker platform facilitates interactions between clients, carriers, and further partners, as illustrated in Figure 2. Clients may request a specific logistics service on the FreightBroker website using parameters such as starting point, destination, date, type, and amount of freight. Then, they immediately receive a quote that is dynamically calculated based on various parameters. If a quote is accepted, FreightBroker proposes the offer at a reward also calculated dynamically to a carrier for which the route fits as well as possible based on supply and demand, possible follow-on assignments, carrier preferences, fleet location, order book, and capacity. If a match is made, FreightBroker provides a variety of services to carriers that enhance or enable interactions between carriers and clients. These services are subject to

scrutiny in the next section. To offer some of the services, FreightBroker collaborates with financial services and technology providers. Competitors of FreightBroker are other digital logistics platforms, carriers in direct relationship to clients, freight exchanges, and freight forwarders.

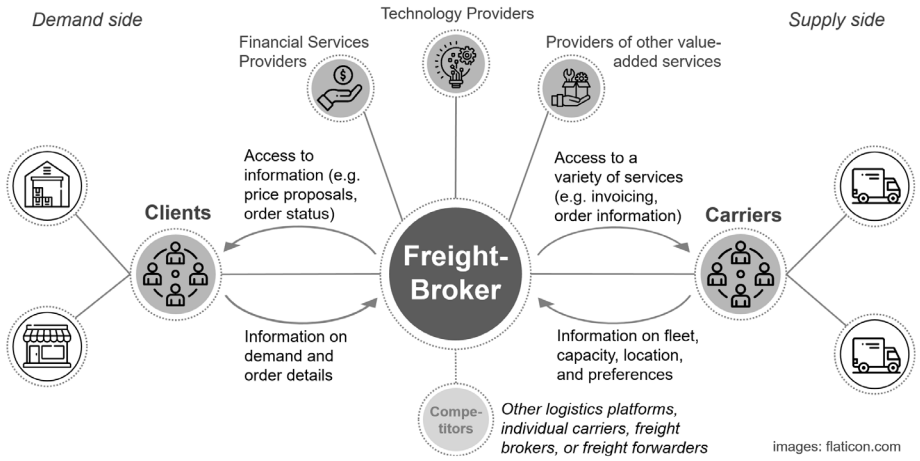


**Figure 2.** FreightBroker's ecosystem and interactions between partners

The carriers participating as complementors in the FreightBroker ecosystem are mostly SMBs with less than 20 trucks. For most carriers, information and communication technology is not the focus of their business, which leads to the situation that they are behind the curve in terms of digitization. Furthermore, their employees do not speak the clients' language for several reasons (the cross-border nature of many contracts, cost savings, and shortage of skilled workers).

The majority of FreightBroker's clients on the demand side of the platform are relatively large enterprises. Some rely entirely on FreightBroker as their lead logistics provider, while others only cover certain parts of their demand for logistics services (e.g., demand peaks or specific departments) through the FreightBroker platform. Many clients face the challenge of fulfilling service-level agreements for their customers, optimizing processes, cash flow, and working capital, and transforming their business model to be more data-driven. To address these difficulties, many clients have implemented specific compliance mechanisms, impose very high requirements on their suppliers, or offer only long payment targets.

### 4.2 Services that Enable Interactions between Carriers and Clients

The analysis of the interviews discovers seven types of services offered by FreightBroker that help overcome cross-market-side heterogeneity. They are categorized in service improvements for the carrier and integrated client services. Table 2 gives an overview of the findings, and the subsequent elaboration of the types of services provides details on the findings.

**Table 2.** Summary on how FreightBroker enables interactions between carriers and clients

| Category | Type of service | Exemplary quotes |
|---|---|---|
| Carrier service improve-ments | Fleet management & transport management system | *"You have all your information on one platform."* |
| | Invoice creation | *"less administrative work"* |
| | Fast, reliable, and standardized payment | *"pays the invoice from the carriers" "in three days"* |
| | Highly available customer service | *"customer service […] 24/7."* |
| Integrated client services | Process and system integration | *"integrated into clients' systems"* |
| | Continuous delivery of consistent data | For clients, *"optimization is only possible through data."* |
| | Ensure carriers meet compliance requirements | *"certain requirements [...] that [carriers] must meet."* |

In our data, we found four types of service improvements for carriers. The first service identified is the **fleet management and transport management system** FreightBroker provides. Once a carrier joins the platform, it needs to provide extensive information about its fleet (FreightBroker manager 1). According to FreightBroker Engineer 1, carriers can then *"completely organize all assignments in the transport management system [free of charge]. In return, [we have access to the data] and can then always offer matching assignments."* Freight exchange director 1 finds that *"an immense number of companies […] do not yet have a transport management system and that there are generally only a few transport management systems for the smallest companies".* Freight forwarder manager 1 sees the advantages of digitizing this previously analog process in the ability to *"significantly accelerate […] cargo billing"* and ensuring that a *"loss of any transport documents can no longer occur."* Carrier manager 3 appreciates that this way, she may *"no longer keep a record in a program for myself."* Carrier manager 2 states, *"you get the tours via an app[...]. You have all your information on one platform."* Carrier manager 2 reveals that following *"uploading the shipping documents after a tour"* FreightBroker makes transparent towards the clients, how long and punctual a transport was.

Secondly, automated **invoice creation** on the FreightBroker platform is of utility for carriers. Carrier manager 3 states, *"I have less administrative work. In the past, I needed someone to write invoices for us."* Carrier manager 2 agrees and adds, *"you save on invoice writing, scanning, and bookkeeping."* Carriers recognize that regular service providers already provide this service as the interview with carrier manager 1 reveals that they create digital invoices using different software.

Thirdly, in several interviews, the **fast, reliable, and standardized payment** is considered a valuable service by FreightBroker. According to carrier manager 1, an enterprise carrier leading in e-commerce always only pays after 90 days. The manager of a competing logistics platform interviewed states, *"60 days [until payment] is common in the logistics market […] which is a problem for small carriers as they have to pay in advance for 60 days."* In contrast, FreightBroker *"pays the invoice from the carriers"* (FreightBroker manager 1) no matter with whom they interact through the platform. Carrier manager 2 states, *"within five days I get a credit instruction,"* and

carrier manager 3 even reports *"in three days."* For the carriers, not only the payment schedule but also reliability matters. Accordingly, carrier manager 2 states that it was a problem that during the lockdown caused by the Covid-19 pandemic, non-platform clients took up to 90 days to pay, as their accounting department was not in the office. He adds that he sees it as a benefit *"not to chase your money anymore."* Carrier manager 3 finds that the reliability to be compensated by FreightBroker justifies the fee for the service as they once *"lost over 50,000 because a client went bankrupt."*

Fourthly, FreightBroker offers **highly available customer service** to carriers and clients. FreightBroker manager 1 believes *"what distinguishes us from all conservative freight forwarders […] is the accessibility of our customer service […] 24/7. No matter what happens, we always support the carrier."* Towards clients, the interview with carrier manager 1 revealed that a deal with a discerning client only realized because FreightBroker offers its customer services also at night.

In addition, we also identified three types of integrated client services. The first service is **process and system integration**. According to carrier manager 2, the status quo is that some clients assign very tight delivery slots to carriers on which the whole production depends. Association employee 1 states that a major benefit of FreightBroker is that *"it can be integrated into clients' systems through interfaces."* He adds that partly because of this, the platform might increasingly take over the position of traditional lead logistics providers.

The second service is the **continuous delivery of consistent data** by FreightBroker. Freight forwarder manager 1 mentions that clients constantly want to know *"where are my goods."* According to FreightBroker manager 1, this desire and the added value for the clients increase steadily. Freight exchange director 1 states the *"client expects certain standards to optimize his yard management, and this optimization is only possible through data. […] Today, it is collected manually."* According to carrier manager 2, this transparency is a *"win-win situation"* because clients can profit from the data, and carriers have proof of timely pick-up or delivery.

Finally, the third service is that FreightBroker **ensures carriers meet compliance requirements**. Freight forwarder manager 1 highlights that there are *"certain requirements [...] that [carriers] must meet."* Important are *"insurance"* and *"a valid EU license to legally perform the transport."* Furthermore, the interview with carrier manager 1 revealed that obstacles that FreightBroker helped to overcome in a past deal with a large client were specific guidelines on how to provide services.

### 4.3 Service Professionalization to Enable Platform Mechanisms

A central theme across all identified services is that they professionalize carriers: They help to bring SMB-carriers on the same level as enterprise clients, enabling interactions between actors that are heterogeneous in the use of technology. This lets both sides benefit from the mechanisms of a digital platform. Overall, we find services either professionalize by removing external or by removing internal barriers.

On the one hand, the services remove external barriers in terms of what clients that are more professional expect from carriers. Accordingly, carrier manager 1 *"used FreightBroker to handle business with [an enterprise carrier leading in e-commerce]*

*that has annoying requirements and payment terms."* Furthermore, association employee 2 brings up that a platform, which *"provides their app in 5 or 10 languages,"* removes barriers for foreign carriers.

On the other hand, the services remove internal barriers in terms of professionalizing the carriers' operating model – such as automation or simplification of processes. Freight forwarder director 1 states that FreightBroker *"takes away the administration from the company."* Carrier manager 2 highlights that savings in accounting staff are substantial enough that lower freight prices are not a disadvantage. Also, FreightBroker eases the sales process of carriers. According to FreightBroker manager 1, carriers on the platform do not need to worry about attracting business for their trucks. Carrier manager 3 describes, *"all you have to do is register trucks on their platform."*

# 5 Discussion

## 5.1 Important Role of Professionalizing Services on Logistics Platforms

We have seen empirically that professionalizing services provides benefits to the ecosystem of logistics platforms. The services FreightBroker provides professionalize carriers, which enables them to overcome cross-market-side heterogeneity. Thus, they allow carriers to interact with more clients on an equal footing. Besides, they also enable carriers to benefit from scale advantages through automation, especially when used repeatedly. This supports the potential attributed to information technology to shift supply chains from hierarchies to markets by reducing transaction costs [42].

Literature provides the concept of boundary resources to explain the relationship between platform owners and complementors [8, 10, 33]. The case study shows that there are multi-dimensional differences between BR and the services FreightBroker provides. This allows the assumption that the current definition of BR is not wide enough to explain the services FreightBroker provides. Therefore, we suggest extending the concept of BR to explain the idiosyncrasies detected in this case and to ensure that research can explain transaction platforms consistently. We suggest a new type of BR called "Auxiliary Services."

**Table 3.** The distinction of boundary resources and auxiliary services

| Aspect | Boundary Resources (BR) | Auxiliary Services |
|---|---|---|
| Advantage for platform owner | Eases integration and control of contributions that extend scope | Increase platforms' attractiveness |
| Advantage for complementors | Simplify market access and transfer of knowledge | Professionalize with low-threshold |
| Provider | Platform operator | Any service provider |
| User | Anyone in the ecosystem | SMBs |
| Platform type | Extend scope on innovation platforms | Extend scale on transaction platform |

Concretely, as depicted in Table 3, for the platform owner, the main advantage of BR is that they ease integration and control of contributions from complementors to extend the platform's functional scope [6, 9, 10, 33–36], whereas auxiliary services are found to raise the platforms' attractiveness to complementors and consumers.

The main advantage of BR for complementors is that they simplify market access by enabling to create and evolve applications [38], allowing participants to interact with the platform, and enabling to transfer knowledge [33]. Unlike this, auxiliary services are found to professionalize complementors in a large number of transactions and are accessible to SMBs with a low threshold because they already partner with the platform. For example, the case study reveals that a fleet- and transport management system is less accessible for SMB-carriers outside a logistics platform.

Considering the provider and user, BR are only offered by the platform operator [34] to anyone in the ecosystem [10, 34], whereas regular service providers could offer auxiliary services and its users are SMBs. For instance, our case reveals that two carriers use FreightBroker's invoicing service and one creates invoices outside FreightBroker.

Finally, BR, which are consistently studied from the aspect that they extend the scope of offerings on innovation platforms [6, 8, 10, 33, 35, 36], need to be extended by a perspective on scale on transaction platforms as auxiliary services are found to extend the scale of offerings on transaction platforms. Specifically, BR are limited to (integration) tools that simplify complementors to integrate and platform owners to govern diverse third-party contributions [36]. In contrast, the measures, which transaction platform owners take to increase the platform's attractiveness by improving the quality of service in a large number of transactions through the professionalization of complementors, are conceptually different. This differentiation in the platform type leads to follow-up research questions regarding the platform owners' relationship with complementors concerned with extending the platform's scale. An improved understanding of the mechanisms of transaction platforms may be of particular relevance since the Covid-19 pandemic has caused a push of companies interacting with transaction platforms [56].

### 5.2 Understanding Cross-Market-Side Heterogeneity

Our empirical results are a first step toward understanding cross-market-side heterogeneity on digital platforms by showing how a digital platform that offers auxiliary services can enable interactions across market sides between organizations that are heterogeneous in the use of technology. The left part of Figure 3 illustrates the challenges when complementors interact with consumers that are heterogeneous symbolized with different geometric shapes. The right part illustrates successful interactions between heterogeneous actors when platform owners enable complementors to overcome cross-market-side heterogeneity by providing auxiliary services that professionalize.

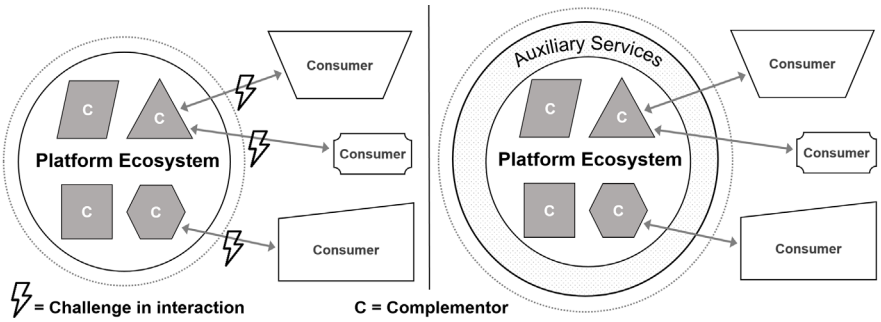


**Figure 3.** Auxiliary services professionalize and enable overcoming cross-market-side heterogeneity

Even though interactions under cross-market-side heterogeneity are not novel in business-to-business and business-to-government relationships [7, 27–31], research on digital platforms does not investigate it yet. In the light of SMBs' challenge to compete in dynamic environments [57] and to meet ever-changing requirements caused by the pace of innovation and technology, the participation of SMBs on digital platforms [58] that professionalize their complementors can be seen as an adequate coping strategy. In this context, it is reasonable to assume that complementors' benefit from auxiliary services correlates to the degree of cross-market-side heterogeneity.

Understanding this mechanism in detail and juxtaposing the transaction costs saved with the development and maintenance costs are essential elements of future research in information systems and beyond. Moreover, next to its implication on the relationship between platform owner and complementor, we assume that cross-market-side heterogeneity also makes it more challenging to implement a platform since, analog to the investment decisions related to BR [36], platform owners need to decide which auxiliary services to offer.

### 5.3 Practical Implications, Limitations, and Future Research

The study and its findings also hold practical implications. Given that cross-market-side heterogeneity likely occurs frequently between enterprise clients and SMBs, our findings may be very timely given the current challenges SMBs face [57, 58]. We believe the acknowledgment of auxiliary services by practitioners as a tool to professionalize complementors is critical to understand how to make the advantages of platforms available to more SMBs and how transaction platforms can extend their scale.

Our study is not without limitations, which also provide opportunities for future research. Firstly, the method influences the study's generalizability. This is due to the scope and scale of the case study, the decision to focus on size and professionalization as manifestations of heterogeneity, and to interview companies of different sizes. Therefore, we suggest performing follow-up explorations with varying manifestations and causes of cross-market-side heterogeneity. Secondly, future research could also consider non-existent services desired by complementors. Finally, future research could examine auxiliary service from a power dependence perspective [59].

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