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ORIGINAL PAPER

EXPLORING REAL-TIME VISIBILITY TRANSPORTATION PLATFORM DEPLOYMENT

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ABSTRACT. Background: Scholars have studied the determinants of visibility in the supply chain for years and, together with practitioners, agree that real-time visibility is beneficial to supply chain performance. However, expectations of supply chain professionals on supply chain visibility benefits do not meet reality. The purpose of this study is to explore determinants affecting real-time visibility in the transportation network where subcontracting predominates and understand the governance of digital of a platform for real-time visibility and its implications.
Material and Methods: This study utilizes action research as a methodology for pragmatism to understand supply chain professionals' standpoint regarding the operationalization of real-time visibility. A complex network of fast-moving consumer good companies was chosen for research because there is a greater need for visibility, and visibility improvement is also more challenging.
Results: The resources of freight forwarders and subcontractors, platform complementors are crucial for achieving real-time visibility. Willingness to information sharing is impacted by the asymmetry of benefits and privacy concerns. Low saturation of company-owned smartphones and technological interfaces, IT systems amongst researched enterprises a platform deployment slowdowns. The governance mechanism does not address the asymmetry of costs and benefits amongst platform partners.
Conclusions: This study is bridging the research-practice gaps in supply chain visibility. Future studies should analyze the role of tensions amongst the platform's partners from the paradox perspective. The in-depth analysis should focus on freight forwarders' strategies for building a competitive advantage to provide real-time visibility.

Keywords: supply chain visibility, transportation visibility platform, supply chain, freight forwarders, digitization

INTRODUCTION

Although scholars have discussed the determinants of visibility in the supply chain, including transportation networks, for years [Jakobs et al., 2001] it is still a call for a better understanding of how visibility within a supply chain emerges, develops, and must be implemented to succeed [Somapa et al., 2018]. There is no well-defined common understanding of visibility in a supply chain and sound approach available to effectively operationalize visibility in supply chains [Leung et al., 2017]. Following Somapa [2011], [2018] implementing real-time supply chain visibility is a challenge. The cause-effect relationship between supply chain visibility and business performance can be ambiguous [Somapa et al., 2018]. On the other hand, scholars and practitioners generally agree that real-time information about products, customers, and order fulfillment is beneficial to supply chain performance.

However, [Caridi et al., 2014] claimed research on the benefits of visibility was theoretical, and only a few benefits have been measured quantitatively for the dyadic relationships between retailers and manufacturers. Holcomb's [2011] study regards the relationship among 16 factors, and four perceived firm performance measures gave mixed results.

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Table 1. Supply chain visibility benefits literature review

Benefits	
Mitigating the effects of disruptions and enhancing resilience in the supply chain	[Brandon-Jones et al., 2014], [Dubey et al., 2018];[Mubarik et al., 2021; [Mandal et al., 2016]; Al-Talib et al., 2020], [Messina et al., 2020]; [Muñuzuri et al., 2016]; [McKinney et al., 2015]
Improving responsiveness, agility, flexibility, and customer service	[Dubey et al., 2018; Brusset, 2016], [Prajogo and Olhager, 2012]
Increasing operating efficiencies and effectiveness	[Holcomb et al., 2011], [Shamsuzzoha and Helo, 2011]
Reducing distribution and inventory costs	[Shamsuzzoha and Helo, 2011]
Enabling sustainable logistics and supply chain processes	[Sunmola and Apeji, 2020], [Luthra et al., 2020], [Junge, 2019], [de Vass et al., 2020], [Brun et al., 2020; [Kim and Shin, 2019]

[Caridi et al., 2014] prepared a value assessment model of the benefits of supply chain visibility and described the first attempt to construct a theory in the field of supply chain visibility [Caridi et al., 2014]. Lee and Rim [2016] proposed a quantitative approach regarding SCV. However, they did not conduct an empirical study of the relationship between visibility and financial performance. [Leung et al., 2017] showed the operational and tactical benefits from visibility but only from a six-month pilot.

Scholars used RBV logic, following which resources are combined to create capabilities, to conceptualize supply chain visibility as capability [Barratt and Oke, 2007]. Both supply chain connectivity and information sharing can be positioned as resources that may lead to a visibility capability through bundling these resources [Brandon-Jones et al., 2014], [Dubey et al., 2018]. Connectivity relates to the technological infrastructure through which information is conveyed to supply chain partners, and information sharing links to the quality of the information being shared [Brandon-Jones et al., 2014], [Nguyen et al., 2019]. The focus of visibility development should be on sharing information that can be used to improve performance. [Dubey et al., 2018] suggested other resources such as human skills (i.e. managerial skills and technical skills) and learning culture may also have significant effects on supply chain visibility as a desired capability of the organization. [Nguyen et al., 2019] provided empirical evidence that IT integration capability and interpersonal communication capability complement each other to attain internal information visibility. Although Somapa [2011] identified determinants of real-time visibility and categorized them into individual, organizational, technological, and environmental categories did not proceed with research to understand how identified factors affected visibility.

Studies on benefits and factors affecting visibility do not address types of SC relations in the transportation network where subcontracting predominates, though this business model gained importance. For example, Unilever, Procter & Gamble, Carlsberg, to name a few companies, transformed their transportation model to centralize in the Control Towers. Centralized Procurement contracted low-cost carriers, including, to a large extent, freight forwarders. Centralized operations managed by the Control Towers paved the way toward deploying digital platforms, a new model to combine resources to achieve real-time visibility. The leveraging of an internet-based platform to facilitate the exchange of information between supply chain partners has shown itself to be a powerful approach to avoid the complexities of integrating IT systems across the partner organizations [Schreieck et al., 2017]. Digital industrial platforms are platforms as [1] collect and integrate data from a heterogeneous set of industrial assets and devices, [2] provide this data and additional technical support to an ecosystem of third-party organizations who develop and enable complementary solutions that [3] affect the operation of industrial assets and devices, and [4] provide a marketplace to facilitate interactions between platform owner, third-parties and business customers [Pauli et al., 2021]. Technology architecture and mechanisms for governing the ecosystem of complementors make up the organizational form that is the platform [Gawer, 2014]. Platform governance concerns decisions about a platform [Tiwana et al., 2010]. Depending on

the ownership status of platforms, the platform owners establish governance mechanisms that define the ground rules for orchestrating interactions in the ecosystems [Hein et al., 2020]. Platform governance requires addressing tensions, including the need to balance platform openness and control, exerting influence over the quality and range of complements, managing simultaneous collaboration and competition with complementors, and creating ecosystem value while also capturing some of that value [Rietveld and Schilling, 2020]. The first avenue for digital platform ecosystem research is attracting complementors and ensuring they continuously engage with the platform [Hein et al., 2020]. The success of digital industrial platforms largely depends on their ability to attract an active ecosystem of actors. If complementors join a platform, they can change their role to competitors [Gawer, 2014], [Hein et al., 2020].

Theoretical contributions regard real-time visibility in a supply chain, and platform architecture can be found in the Internet of Things [de Vass et al., 2020, Fahim et al., 2021, Lee and Rim, 2016, Lee and Lee, 2015], technologies for supply chain tracking and tracing (visibility) [Shamsuzzoha and Helo, 2011, Shamsuzzoha et al., 2013, Wang and Potter, 2007, Kandel et al., 2011; Hajdul and Kawa, 2015, Papatheocharous and Gouvas, 2011], synchronized logistics [Giusti et al., 2019]. These contributions do not address the governance mechanism and factors affecting real-time visibility with the platform. Based on Wang and Potter [2007] there is an asymmetry of benefits and risks affecting the willingness of subcontractors to share information. Most research focused on platforms' technological and business aspects, taking the platform owner's viewpoint. Scholars conducted little research to understand and analyze heterogeneous complementors and customers in the platform ecosystem [Deilen and Wiesche, 2021]. Factors affecting visibility need more insightful analysis to understand the root causes of gaps between expectations and reality regarding visibility in the transportation network where subcontracting predominates.

The research question of this study for the transportation network where subcontracting is in the majority are: *What factors affect real-time visibility? What is the governance of a platform for real-time visibility?*

MATERIAL AND METHODS

Bridging knowing–doing and expectations- reality gaps regarding the deployment of a real-time visibility platform requires a research approach that contributes to understanding the complexity of socio-technical systems and change processes. Action research is the research methodology for pragmatism and change implementation [Kotzab and Westhaus, 2005]. In this sense, action research is designated to fill the gaps between practice and research [Naim, 2010]. Action research can solve the problem of balancing practical and theory-relevant research and theoretical advances and managerial usefulness for the supply chain [Elg et al., 2020], a young field of research [Kotzab and Westhaus, 2005]. Following Näslund [2002] logistics research would benefit from more case-study articles based on action research. Action research projects seem appropriate when new solutions are tested and developed with partners in the supply chain [Kotzab and Westhaus, 2005]. It is a case for real-time visibility transportation platforms deployment. Therefore, the author used the action research-oriented case study approach as a research method.

The cycle of action research begins with a pre-step that involves context and purpose. The next step is diagnosing, encompassing naming the issues, however provisionally, as a working theme. Planning is the next step of the action research cycle and follows from the analysis of the context and purpose of the project, the framing of the issue and the diagnosis, and is consistent with them. Taking action as the following step encompasses implementation plans and interventions to be made. Finally, the outcomes of the action, both intended and unintended, are examined. The second is a reflection cycle which is an action research cycle about the action research cycle. In the action research cycle, learning encompasses: experiencing, reflecting, interpreting, taking action. Attending to experience is the first step to learning. The second step is to stand back from these experiences, inquire into them, and reflect on experiences of diagnosing, planning action, taking action, and evaluating action in the project. In interpreting is to find answers to the questions posed in the reflection. Taking action encompasses what is done as a result of

reflecting and interpreting. What actions are taken is a consequence of reflection on diagnosing, planning action, taking action, and evaluating action. Reflection is the process of stepping back from experience to process what the experience means, with a view to planning further action [Coghlan, D. and Brannick, T., 2005], [Coughlan and Coghlan, 2002].

The role of the author was as an internal consultant involved in the platform deployment. The author's involvement encompassed the actions to onboard transport service providers, monitor compliance. Whenever required, the author should intervene and make changes to ensure platforms deployment. As the Logistics Research and Development center team member in the European Control Tower of the fast-moving consumer goods company, the researcher should support the projects that automate and digitize the transportation network of a complex supply chain. Logistics Control Tower acts as a focal company and coordinator from the point of view of material and information flows. Logistics Control Tower provides transport operations and service between suppliers and factories and between factories and primary warehouses. Logistics Control Tower focused on transport services provided to the focal company business partners (e.g., factories, co-packers, suppliers, and marketing and sales organizations), including transports from suppliers to factories and deliveries from factories to distribution centers. The role of the Logistics Research and Development Centre was to consult projects that should improve efficiency and reduce the negative environmental impact of transport in the European Union. One of the projects regarded the real-time visibility platform deployment. This project's scope encompassed the transportation network of 45 own factories and 260 co-packers, 60 warehouses from which Logistics Service Providers managed the vast majority. From the perspective of a platform logic, a focal company is a customer, whereas transport service providers, GPS providers, IT providers are complementors.

In the first phase, a brainstorming session with onboarding team members and the procurement team helped create the reason codes. The idea of reason codes was to simplify data collection by giving interviewees a limited choice of responses. More importantly, reason codes facilitated internal communication and reporting to ensure repeatability and reproducibility. The bot automatically sent emails containing reason codes to about 110 transport service providers weekly over 40 weeks (between months 13 and 23 as per figure number 1). In the second stage, transport service providers should attribute a reason code to each untracked shipment. The author inductively analyzed responses from Transport Service Providers. An effective response rate accounted for nearly 35%. In the third stage, during weekly compliance calls where Procurement, transport planning, internal customers service, and external stakeholders discussed the progress of the deployment, the author utilized the abductive thought process to understand the governance mechanism and its implications. The onboarding team of which the research was a member checked if the appropriate persons executed the actions and their impact on compliance the following week. The onboarding team carried it over to the following week if the responsible person did not execute the action. The researcher with the onboarding team checked the effect of agreed-upon actions on compliance in the next weeks. If no improvement in terms of compliance, the onboarding team escalated the case to senior management.

In the fourth step, during workshops, the researcher discussed actions to correct governance and manage tensions to improve compliance. A focal company workshop discussed methods to accelerate deployment was the forum to share views and perspectives from different levels of the organization and the platform owner.

Actions to understand the factors affecting real-time visibility and the governance of a real-time visibility transportation platform were parts of the action research cycle. Diagnosing used the reason code form, and planning and intervention applied weekly calls. The author coded information in a weekly tracker. Compliance, calculated as the number of tracked loads (both in the pick-up and delivery locations) divided by the total number of loads, was the indicator to measure performance. Regarding the second cycle, the author coded information on the learning in the other weekly tracker, including reflection on the content, process, premise, as well as the learning loops: single (question - how?), double (why?), triple

loop (how do we decide what is right?). Within this research approach, the author used, for the most part, abduction to develop propositions by putting the empirical material in dialogue with theory.

Table 2 Information collection

Phase	Meetings	Researcher role	Informants
Factors affecting real-time visibility identification	Face-to-face sessions	Facilitator, Observer	Onboarding team members, Procurement Specialists, Procurement Junior Manager
Factors affecting real-time visibility identification	Virtual connections	Observer Providing and presenting analysis	Transport Service Providers
The governance of a platform for real-time visibility	Weekly calls	Facilitator Observer	Platform customer (Procurement Specialists), Platform owner (Implementation Specialists)
The governance of a platform for real-time visibility	Workshops	Facilitator Observer	Platform owner (Vice President, Key Account Manager, Implementation Specialists), Platform customer (Procurement Specialists)

RESULTS

The project on deploying a real-time visibility transportation platform should enable the digitization and automation of processes and unlock numerous opportunities. The senior stakeholders called it the most critical project in the European transportation network. The project was a crucial part of a global transformation program sponsored by the European supply chain leadership team and governed by the global logistics leadership team. The assumption was to deploy a real-time visibility platform over six months using two solutions: 1) integrating information systems of focal company, transport service provider, and Global Positioning System provider, 2) smartphone application for drivers. The deployment should encompass two steps: 1) carriers onboarding, 2) achieving compliance of 60% of tracked shipments that, in senior management's view, should be sufficient to make the platform usable in practice. The steering committee set an ambitious goal to reach 60% of full truckloads tracked in real-time mode in three months and, respectively, 90% in nine months.

Steering Committee encompassed representatives of logistics and IT. Direct responsibility for the implementation should have European Business Support Manager and Technical Support Manager from the global team. The transportation operations and logistics procurement teams should support implementation. The external service company provided IT services and reported to Enterprise Technical Support Manager. The IT capabilities of the project worked from in India, whereas business support, operations, and Procurement in the Control Tower in Poland (Table 3).

Table 3. The team members

Title	Roles and responsibilities in the project, company, geography	Title	Roles and responsibilities in the project, company, geography
European Supply Chain Vice President	Steering Committee, a focal company, the Netherlands	Project Lead	Implementation team, focal company, Poland
Logistics Director Primary & Inbound Europe and Control Tower Director	Steering Committee, Key Decision maker, focal company, Poland	Senior Logistics Development Specialist	Implementation team, focal company, Poland
Procurement Director Manufacturing Partners, Logistics and Capex	Steering Committee, focal company, Switzerland,	Subject Expert	Implementation team, focal company, Poland
Global Logistics Process Excellence Director	Steering Committee, Key Decision maker, focal company, UK	Operations Specialists	Implementation, focal company, Poland
IT Director Make & Deliver	Steering Committee, focal company, India	Technical Support Manager	Implementation, focal company, Bangalore
European Business Support Manager	Leadership/Implementation, focal company, Poland	Procurement Junior Manager	Implementation, focal company, Poland
Operations Manager (Transport)	Leadership/Implementation, focal company, Poland	Finance Junior Manager	Support, focal company, Poland
Global Transport Platform Owner	Leadership/Implementation, focal company, Bangalore	Strategic Account Executive	Leadership, platform owner, US
ETS Log. Process Excellence Junior Manager	Leadership/Implementation. the focal company, Poland	Implementation Specialists	Support, platform owner, US
Procurement Manager	Leadership/Implementation, focal company, Poland	Manager Consulting Services Manager	Support for a focal company, external company

A Strategic Account Executive from the owner of the transportation visibility platform was involved in the governance structure. Implementation Specialists from the owner of the transportation visibility platform should work on the onboarding of transport service providers. Implementation teams from a focal company and the owner of the transportation visibility platform should lead onboarding. The transport service provider's obligation was to contact data suppliers and accelerate their work if necessary. Once issues occur, the procurement business team of a focal company should be involved in contact with carriers. The business transport team of a focal company with project champions should support the onboarding team to resolve potential operational issues.

The average time for onboarding a transport service provider on a transportation visibility platform was about 90 days. The median was hardly above 80 days and recorded the longest time of 250 days, whereas the shortest was about ten days. For the onboarding of transport service provider, it was required 30 emails on average, out of which almost 20% was on account of the need for further clarification and fix misunderstandings in elementary vocabulary like transport management system, GPS, fleet management system. Due to business and contractual relationships issues, transport service providers stopped sending data, which explained the decrease in the percentage of onboarded transport service providers.

Before a transportation visibility platform deployment, the steering committee ignored that freight forwarders provide 65% of all shipments, resulting in low compliance. The next complexity contributor was a fragmented group of transport service providers. The most significant transport service provider accounted only for a 5% share in the total number of shipments. The application for a smartphone was developed as a solution to track subcontracted loads.

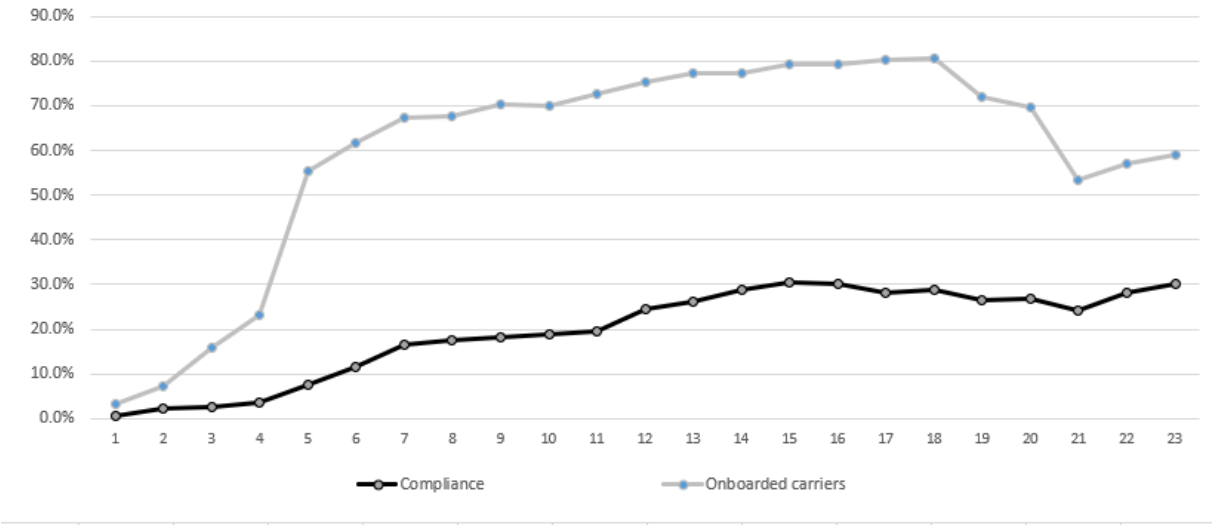

Fig. 1. The percentage of the onboarded carrier and compliance.

The respondents gave a lack of smartphones as the most common reason behind not-tracked shipments. Drivers used either personal smartphones or old-fashioned phones on which installation of applications was not doable. Because of the small number of shipments, drivers showed little willingness to use the smartphone application. Low digital skills of drivers and willingness made downloading and operating the smartphone application very time and effort-consuming. Error-prone manual data entry affected data quality and even made it impossible for real-time tracking. Low saturation of company-owned smartphones combined with disabled roaming reflected a low technological maturity level amongst transport service providers in a scope.

Table 4. Results of reason codes analysis.

Reason Code	Percentage
Drivers did not have a smartphone to use the application	35
Drivers not being able to use the application for smartphones correctly	23
Technical problems within the integration of IT systems	19
Drivers' phones had roaming disabled	12
Data privacy concerns to be resolved	8
Others	3

Freight forwarders also pointed to disabled roaming as a blocker to the usage of applications on international routes. Connectivity issues among systems of the focal company, real-time transportation visibility platform, freight forwarders, Global Positioning System service providers, was the following reason behind untracked shipments.

Because of the lack of a system for storing track and trailer plate numbers, about 15% of carriers entered the truck and trailer plate numbers manually on the real-time transportation visibility platform web page. The vast majority of carriers used file transfer protocol for sending excel files to real-time transportation visibility platforms. 15% of transport service providers used application interface programming. The focal company

frequent updates of planned pick-up time resulted in not updating accordingly trucks and trailers plate numbers in the transport service providers and focal company system.

Because of subcontracting, data needful for tracking had to be fetched either directly from the subcontractor's system for storing track and trailer plate numbers or freight forwarder that brought data from a subcontractor system. Freight forwarders realized they could build subnetworks to control over data they share with a real-time visibility transportation platform. As freight forwarders integrated subcontractors within their subnetwork, they became indirect competitors to the transportation visibility platform. Simultaneously, they collaborated by sharing data on the real-time position of loads of a focal company what resulted in coopetition tensions. Freight forwarders can be real-time transportation visibility platform owners and gain a role of a network integrator. Willingness to earn this role triggered tensions between autonomy and control. Both needs for autonomy within the network of a real-time visibility transportation platform and aspiration to be a network integrator are reasons behind competition between freight forwarders and the real-time transportation visibility platform.

Transport service providers reported privacy concerns as the following reason behind the not tracked shipment. Transport service providers claimed that application usage is against drivers' privacy and can break General Data Protection Regulation if an application follows drivers in private time. Regarding "others," issues with data quality, including incomplete, incorrect timestamps, delayed updates of pick-up time and delivery times, inefficient shipment planning processes, have been highlighted by transport service providers.

Because of low compliance, the average accuracy of the expected arrival time amounted to 40% in month number 23. The expected time of arrival of high accuracy has not been achieved in a repeated manner. The reason for that was gaps in tracking between pick and delivery locations and frequent change of drivers on subcontracted shipments with different driving patterns, making it difficult to calculate the exact time of arrival in a repeatable manner.

As per researcher interventions, the first was to propose the process to understand the low percentage of tracked shipments. The compliance process itself comprised the cycle of diagnosis, planning, taking action, and evaluation. It was the first-order change and occurred as change is identified and implemented within an existing way of thinking. Key decision-makers aimed to improve based on the same capabilities and repeated the same thought process when escalation and pressure should help fix issues.

Because of the lack of expected improvement, key decision-makers in the focal company agreed to have pilots with other transportation visibility providers. It was the subsequent intervention representing second-order change altering the core assumptions that underlie the situation. A focal company had pilots on selected lanes with four visibility providers. The global IT team supported the initial visibility provider, a default worldwide solution, and slowed down integrating chosen for pilot’s visibility providers with the global platform of a focal company. The other issue was for transport service providers. While two visibility providers delivered a performance of about 5% of tracked shipments, the one had performance better by a few percentage points from the initial visibility provider. The solution of the other visibility provider was too cost-intensive and complex though it delivered high compliance. Because of the intervention, two visibility providers (the best from competitors) and the initial one provided services simultaneously. The final decision was to choose the challenger because of the disappointing improvement of the initially chosen supplier.

The other intervention was the bonus-malus scheme to ease tensions among the platform members. Following the scheme, transport service providers could be awarded or punished depending on whether they track real-time shipments. The scheme should balance the asymmetries of benefits from being part of a real-time visibility transportation platform. Key decision-makers put a plan on hold because of prioritizing the other goals, including costs and service. Instead of the scheme, Procurement added a clause to contracts with transport service providers to obligatory track shipments.

Although some carriers ignored fulfilling this clause, a focal company applied no fines**.**

The following intervention was a change of coordination and information flow in the project. It was to increase the speed of decisions making and integrate project governance. The implementation team from the Control Tower of a focal company had direct relationships with carriers. Capabilities and carriers' willingness to cooperate were prerequisites for a project's success. Since the intervention, the implementation team from a focal company's Control Tower governed a project.

As per the outcomes of reflections, the first one was a highly complex governance structure subject to intervention. The suboptimal behaviors were because of different KPIs of the involved stakeholders. Because of that, stakeholders prioritized achieving goals in terms of costs and customer service. Although senior managers classified the project as IT, it was highly dependent on the external business partners of a focal company. The changes were IT-driven, while transport service providers should build necessary capabilities. A gap between IT requirements and the focal company's ability to enforce transport service providers to build essential capabilities made it impossible to operationalize the project. The change in assumption was also about the achievability of goals with the current visibility provider. The chosen real-time transportation visibility platform should provide the global service while they only started to build the footprint in Europe. The subsequent change in assumption was also whether the goals were achievable at all. The transportation model with the freight-forwarders in the majority did not enable achieving ambitious goals regardless of a visibility provider.

CONCLUSIONS

In managerial terms, this paper makes significant contributions. Insights can help firms assess opportunities and challenges associated with enhancing real-time visibility via platform adoption. Managers can investigate their current needs and status of supply chain visibility and invest in the parts they need to improve.

Regarding the internal governance of a focal company for strategic stakeholders of a focal company, the deployment project should not be IT-driven. A gap between IT requirements and the focal company's ability to enforce transport service providers to build essential capabilities makes it impossible to operationalize the project. Intra-company alignment is a prerequisite for inter-company integration. Thanks to action research intervention, key competencies have been attributed to the business part of a project. Getting the proper knowledge to the right people at the right time was an outcome of an intervention. Establishing new ways of working improved the compliance process. The organization experienced a steep learning curve. It resulted in a period of experimenting with new visibility providers. The focal company acquired detailed knowledge of carriers' capabilities and knew what should be done to operationalize real-time visibility.

Previous research ignored the role of complementors as a factor affecting real-time visibility. Based on the understanding of the resources of freight forwarders and subcontractors, which are platform complementors are crucial for achieving real-time visibility. The author proposes: freight forwarder develops connectivity and information sharing capabilities focused on the specific situation at hand. Freight forwarders develop their platforms to maintain autonomy and control their subcontractors. Asymmetry of benefits and risks affects the willingness of subcontractors to share information. Over time, freight forwarders gained coopetition capabilities to avoid unproductive conflict and the escalation of the tensions.

Based on the analysis, the author proposes that trade-off between transport service providers with their fleet and freight forwarders of multi-level subcontracting impacts predominantly the deployment of a platform. The deployment scope narrowed to transportation lanes where short lead time, high gross margins, and on the other hand, repeatedly occurred operational issues justify deploying a transportation visibility platform

Given the increasing role digital platforms play in the supply chain, scholars' focus should be on clarifying platform business models,

identifying their success factors, and dynamic models of platform firms' behavior. Further research should analyze relationships within the network of subcontractors, which impacts behaviors towards information sharing. The in-depth analysis should focus on freight forwarders' strategies for building a competitive advantage to provide real-time visibility. There should also be investigated the strategy of other complementors as partners of a real-time visibility transportation platform. The research agenda on platforms is at an inflection point [Gawer, 2020].

Recommendations for theory building, the relationships, and causal loops among partners of a real-time transportation visibility platform need to be investigated from a dual theoretical perspective of system approach and network theory. Therefore, future studies should analyze the context specifics of tensions and the manifestation of tensions as a paradox of digital platforms.

The issue of generalizability is because of the focal company's supply chain model, where subcontractors are in the majority. The scientific community is also skeptical about action research, questioning its rigor [Näslund, 2002], and the identification of theory is never an easy task in action research. However, the study encompassed three years of action research, a repeated weekly process, and reason codes form sent for 23 months to transport service providers to confirm the work's validity.

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