Enabling Inter-Organizational Collaboration Through Platforms: The Role of Trust

A Game-Based Assessment in the Transport & Logistics Sector

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DOI
10.4233/uuid:a3bfa9cd-32f7-40a8-9aaf-baaca74fa6e0

Publication date
2025

Document Version
Final published version

Citation (APA)
Kuijpers, A. G. J. (2025). *Enabling Inter-Organizational Collaboration Through Platforms: The Role of Trust: A Game-Based Assessment in the Transport & Logistics Sector*. [Dissertation (TU Delft), Delft University of Technology]. https://doi.org/10.4233/uuid:a3bfa9cd-32f7-40a8-9aaf-baaca74fa6e0

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

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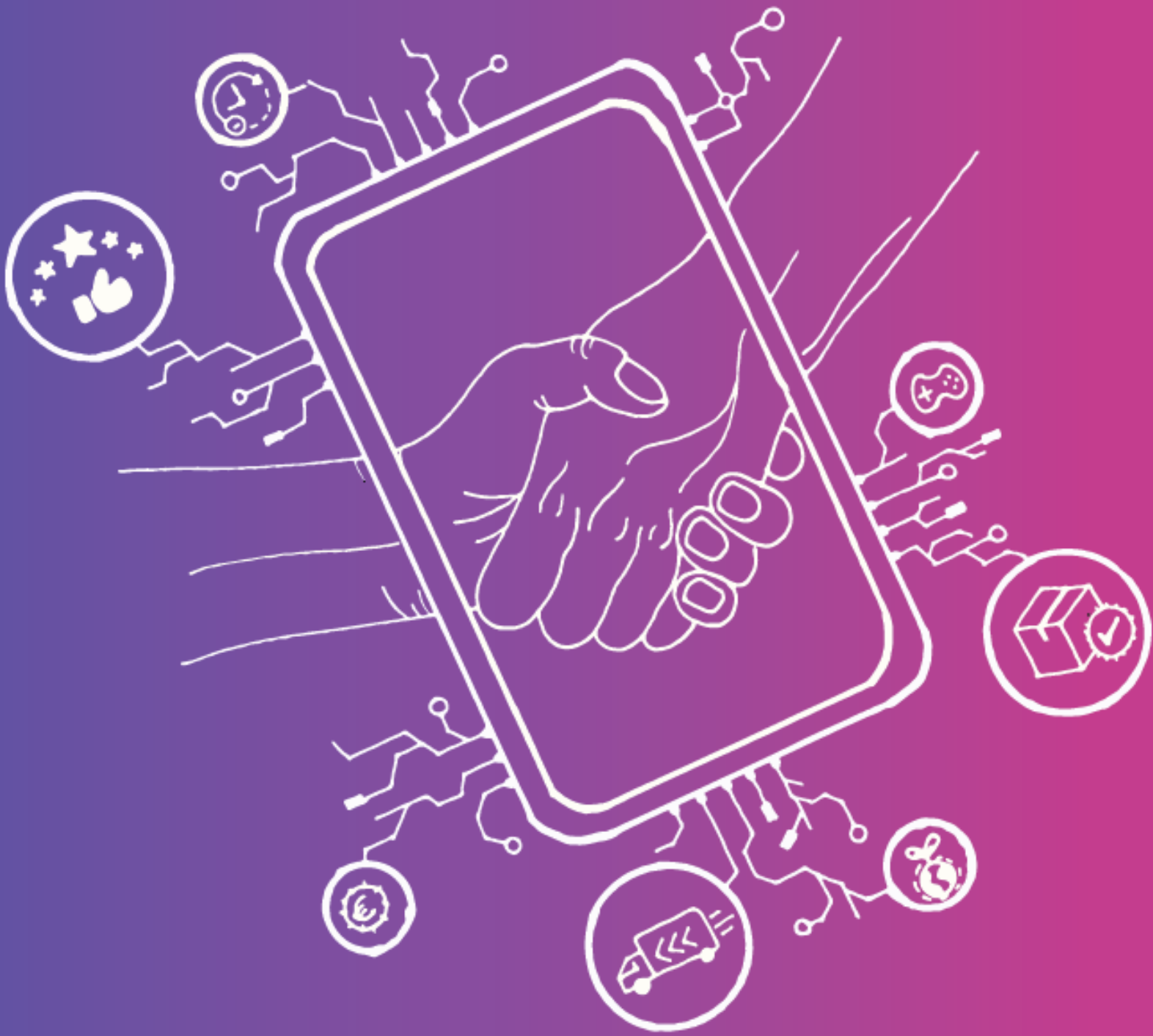

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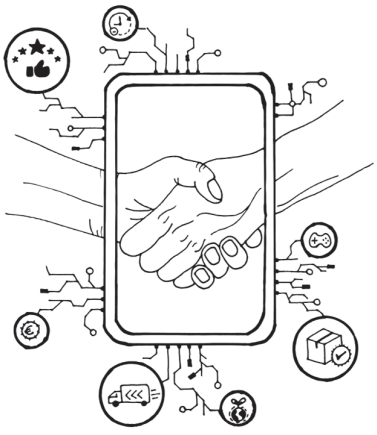

'Bridging over'

Cover illustration by Maria Galeano Galvan

Enabling Inter-Organizational Collaboration Through Platforms: The Role of Trust

A Game-Based Assessment in the Transport & Logistics Sector

Dissertation

For the purpose of obtaining the degree of doctor

at Delft University of Technology

by the authority of the Rector Magnificus Prof. dr. ir. T.H.J.J. van der Hagen,

chair of the Board of Doctorates,

to be defended publicly on

Friday 5 September 2025 at 10:00 o'clock

by

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This research has been funded by the Dutch Research Council (NWO), as part of the Trans-SONIC project (Transport Self Organization through Network Integration and Collaboration), within the research program Complexity in Transport and Logistics, file number 439.16.119.

More information can be found on transsonic.nl.

TRAIL Thesis Series no. T2025/15, the Netherlands Research School TRAIL
TRAIL
P.O. Box 5017
2600 GA Delft
The Netherlands
E-mail: info@rsTRAIL.nl

ISBN: 978-90-5584-370-1

Printed in the Netherlands by Haveka.

Pivot,
Pivot,
PIVOT!

Ross Geller

Preface

This dissertation explores the role of trust in platform-based collaboration within the transport and logistics sector, using serious games as a research instrument. While this study does not claim to provide all the answers, it aims to spark meaningful discussion, especially around the social dimensions of technology and the potential of serious games as a research instrument.

Whenever I speak to people about my dissertation topic, they are often enthusiastic, not only by the increasing use of technologies in organizational settings, such as platforms or even AI tools, but also by the idea of using serious games as a way to study social concepts, such as trust. In a world where technology is increasingly embedded in our work and communication, it becomes crucial to look beyond functionality and ask: what does this technology do to our relationships? The collaboration between organizations or people? To trust?

Technological tools may help us connect faster, but they can also unintentionally create distance. Scheduling a meeting through an AI assistant might be efficient, yet a simple phone call may build more trust.

Throughout my personal and professional life, I have always been drawn to the intersection of games and technology. Gamified approaches can make (complex) ideas more understandable and engaging, something I've experienced firsthand, even when trying to teach new things to my own children. Professionally, I have long been fascinated by how new technologies affect both organizations and the people within them.

With this dissertation, I hope to contribute to an ongoing dialogue: that in discussions about technology, we must never forget the human element. And perhaps just as importantly, that games are not merely entertainment, they can be powerful tools, capable of helping people experience and reflect on social concepts in ways traditional methods cannot.

Contents

Summary

Platforms have become part of everyday life and are also used more often in Business-to-Business (B2B) environments. In the transport and logistics sector, the applications of technological innovations are also taking off, from the use of Electronic Data Exchange to the digital CMR (i.e., Convention relative au Contrat de Transport International de Marchandises par Route). In the last decade, platforms are one of the technologies that have emerged in the transport and logistics sector. The role of platforms can be seen as fourth-party logistics service providers (4PLs)[1], connecting customers and freight forwarders (3PLs). Platforms can be seen as networks where supply and demand come together, where interactions occur, and where parties collaborate[2] in an impersonal environment. In a traditional setting, a shipper relies, for instance, on a freight forwarder that handles the transportation. With the usage of a platform,

[1] Schramm, H. J., Czaja, C. N., Dittrich, M., & Mentschel, M. (2019). Current advancements of and future developments for fourth party logistics in a digital future. *Logistics*, *3*(1), 1–17. https://doi.org/10.3390/logistics3010007

[2] Asadullah, A., Faik, I., & Kankanhalli, A. (2018). Digital platforms: A review and future directions. In *Proceedings of the 22nd Pacific Asia Conference on Information Systems - Opportunities and Challenges for the Digitized Society: Are We Ready?, PACIS 2018*.

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the shipper can choose to collaborate with many different known or unknown organizations. However, the platform is an impersonal environment where the shipper needs to rely on the information that is provided on the platform and needs to make assumptions about another organization in order to guarantee certain intended outcomes of the collaboration. In this case, trust is vital since trust can reduce the risks involved in the impersonal environment.

Motivation of the research

When using platforms, it can be difficult for an organization to obtain all the relevant information about another party, get a detailed insight into an organization's actions, and interpret the behavior and intentions. Additionally, there is a risk that organizations do not state their complete identity on a platform. Trust is a mechanism that sustains collaboration since it allows organizations to ascertain that the expectations they have about another company will be true. This information can be based on the information of another party or the experience they have with the other party. Various scholars have defined trust from a personal, organizational, and system point of view. Many of the studies agree that trust is an expectation. In this dissertation, the trust definition of Zaheer et al. (1998) is used since this trust definition is focused on an organizational point of view. According to this study, trust can be defined as an '*expectation about another organization that they will fulfill their obligations, behave predictable, and act fair when there is a chance to behave opportunistically'*[3].

The literature on trust in inter-organizational collaborations in the transport and logistics sector is limited. In recent years, there has been an increased attention on trust in the B2B context with a focus on trust in inter-organizational collaborations and trust in B2B e-commerce. With the permeation of technologies, such as platforms, organization boundaries change due to the information exchange and organizations can collaborate with any other organization. Additionally, trust in technology is important for sustaining collaboration. The functioning of the technology and the security mechanisms that are in place (e.g., does the technology do what it is expected to do? Is my information secured when using the technology?) are important factors for developing trust in the technology. Most of the studies discuss the impact of platforms on the transport and logistics sector where trust is mentioned as one of the variables that plays a role when using a platform. However, the exact role of trust is, and how it interacts with other variables when using a platform to collaborate is mentioned only to a very limited extent.

Research objective, questions, and approach

With the permeation of platforms in the transport and logistics sector, the information asymmetry that may occur when using platforms to collaborate and the option to collaborate with a multitude of (un)known organizations shows that it is important to research how trust plays a role and how it contributes to collaboration mediated by platforms. The objective of this dissertation is to better understand what the influence of trust is and to provide suggestions on how the collaboration between organizations mediated by a platform can be enhanced or supported. By providing these suggestions users of platforms can gain insight into the

[3] Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

functioning of trust (e.g., when do I need to rely on trust rather than just on information?), and into the interaction with other variables such as the information that is available on the platform.

The main research question of this dissertation is as follows:

How does inter-organizational trust influence collaborations mediated by platforms in the transport and logistics sector?

To answer the main research question, three sub-questions are formulated: (1) which variables play a role in developing trust when entering into an inter-organizational collaboration mediated by a platform?, (2) what are platform users' perspectives on trust when collaborating through a platform in the transport and logistics sector?, and (3) How do the identified variables influence the establishment of inter-organizational collaboration supported by platforms?

The first research sub-question will provide theoretical insights into the variables that play a role when organizations use a platform to collaborate. An extensive literature review is conducted to understand the concept of trust, how it is defined in the literature, and how trust relates to other variables, such as information and collaboration.

The second research sub-question provides practical insights into how stakeholders view trust and which actions they undertake to increase their trust levels when collaborating with another organization through a platform. In-depth interviews were held with stakeholders to understand the impact of platforms on the transport and logistics sector, and whether and why trust is important when collaborating with other organizations via a platform. The interviews with stakeholders provide context to the initial conceptual model and framework, and are input for the third research sub-question.

The third research sub-question is to discuss the research instrument on how to assess trust when organizations use a platform for collaboration. The literature review on trust from the first research sub-questions provides theoretical insights, and helps with the formulation of an initial conceptual model and framework. Research sub-question 2 provides practical insights to adapt the initial conceptual model and to provide input for the research instrument to asses trust in platform-mediated collaborations. To assess trust in platform-mediated collaborations, simulation gaming is used as a research instrument in this dissertation. Simulation gaming is a suitable research method since it provides a safe environment to explore and analyze the role of trust when using a platform to collaborate[4]. Subsequently, when a simulation game is combined with other research instruments, such as interviews or questionnaires, it provides a rich dataset[5]. The conceptual model and framework that have been formulated during the first research sub-question serve as a basis for the game design. Hypotheses are formulated that are tested within the game experiment. The insights retrieved from the stakeholders' interviews, especially the interview with the platform organization, provide input for the game design.

[4] Lukosch, H. K., Bekebrede, G., Kurapati, S., & Lukosch, S. G. (2018). A scientific foundation of simulation games for the analysis and design of complex systems. *Simulation & Gaming*, *49*(3), 279–314. https://doi.org/10.1177/1046878118768858

[5] Freese, M., Lukosch, H. K., Wegener, J., & König, A. (2020). Serious games as research instruments – do's and don'ts from a cross-case-analysis in transportation. *European Journal of Transport and Infrastructure Research*, *20*(4), 103–126. https://doi.org/10.18757/ejtir.2020.20.4.4205

Before the results of the game experiment are presented, first the simulation game itself, FreightBooking game, is discussed. The FreightBooking game is a single-player digital game, where players play the role of a freight forwarder that needs to transport goods for its clients by using a booking platform. Based on the clients' conditions, players need to select the best possible carrier. The game consists of 7 rounds, where in each round the player receives one or two transport orders from clients. These transport orders have different conditions. For example, an order needs to be transported sustainably or it is a short-term order or a long-term order. The players can make their decision with which carrier to collaborate based on the information on the carrier within the platform. This information is operational (e.g., reviews) or strategic (i.e., the percentage that a carrier delivers goods on time). For each transport order, the player receives profit, sustainability, and customer satisfaction points (KPIs of the game). During the game, players see whether these KPIs will increase or decrease based on the collaborations that they establish during the game. At the end of the game, the player with the highest score on the KPIs 'wins' the game.

To collect data the FreightBooking game has been played with 4 groups, consisting of game designers, students with a background in transport and logistics or simulation gaming, and semi-professionals. The set-up of the experiment consists of a short briefing session, a pre-questionnaire, the FreightBooking game, a post-questionnaire, and a short debriefing session. In the briefing session, the objective of the gaming experiment is discussed. During the briefing session, the concept of trust is not mentioned since it can bias the participants. During the pre-questionnaire, questions are asked about the background of the participant and if they use a platform regularly. During the game, all decisions and actions of players are logged. At the end of the game, participants need to fill in the post-questionnaire where questions/statements are presented about the gameplay, the set-up of the game, and about their general trust level. At the end, a short debriefing session is held to discuss certain actions of players, and what they liked and disliked about the game.

Research results

The first research sub-question focuses on gaining insights into the variables that play a role when organizations use a platform to collaborate. Trust is a concept that occurs in a social environment (i.e, between organizations or people) and in a technical environment (i.e., trust towards the technology itself). Based on the extensive literature on trust, trust in this dissertation is defined as the '*expectation that an actor can be relied on to fulfill obligations, will behave in a predictable manner, and will act and negotiate fairly when the possibility for opportunism is present*'[6]. The literature provided insights into the working of trust but also showed that another variable is important when entering into a collaboration, namely information. This is especially the case when platforms are used to collaborate since information provides organizations with input to internalize the possible behavior and actions of another organization. Based on the extensive literature base, an initial conceptual model is defined that explains the relation between trust, information, and collaboration. Additionally, a conceptual framework is formulated that deepens the relation, defined in the initial conceptual model, between trust and collaboration. Collaborations between organizations do take place in

[6] Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

a network of organizations, not in a vacuum. Therefore, when organizations want to enter into a short- or long-term collaboration they evaluate what the possible impact may be on the relations that they have with other organizations. In this dissertation, the relationship that an organization has with its suppliers is defined as the perceived value of the relationship. The interplay between the duration of the collaboration and the perceived value of the relationship is described in the conceptual framework.

The second research sub-question provides insight into how stakeholders look at trust. The findings of the interviews show that when platforms are being used to collaborate, trust occurs in three ways: (1) trust in the technology, (2) trust in the platform organization itself, and (3) trust in another organization when using the platform. It also shows how trust emerges in three ways that are strongly interconnected with each other. When there is a lack of trust towards the platform organizations, it also influences the trust towards the technology but also trust towards other organizations who use the platform (the platform community). Another insight is that experience is an important factor that provides information and knowledge about the other party. Thus, besides the information an organization will find about the other organization, experience has an important influence on building trust toward the other organization. Based on the findings of the interviews, the initial conceptual model is extended with one extra variable: experience.

The third research sub-question provides the gameplay results. Based on the conceptual model and framework, five hypotheses are defined. The hypotheses are formulated as follows:

- H1 (Conceptual model): The higher the disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer;
- H2 (Conceptual model): When more operational information is requested by players, the qualitative choice to collaborate with a specific carrier is higher;
- H3A (Conceptual model): Players with a low disposition to trust are more likely to request strategic information;
- H3B (Conceptual model): Players with a high disposition to trust are more likely to request operational information;
- H4 (Conceptual model): Players use a positive or negative (prior) experience with a carrier to choose a carrier;
- H5A (Conceptual framework): More information types are requested for the long-term clients;
- H5B (Conceptual framework): More information types are requested for the high perceived value of the relationship clients.

The FreightBooking game shows that the 4 groups of players were overall quite trusting and would choose a carrier with a low quote offer during the first round. Although we could not show that there is a significant relationship between the height of a player's disposition to trust and the selection of carrier, the results show that players with a high disposition to trust are more willing to collaborate in an initial stage with a carrier with a low quote offer. Additionally, players experience a learning effect during the game. In the first three rounds, when there is no experience with any of the carriers, players increasingly wanted to acquire more information about the carriers. This result shows that players, as the game progressed, learned that information could be of value when selecting a carrier to collaborate with. A third insight from the conceptual model is that experience is an important factor and emerges as a general

experience (i.e., what is the overall experience I have with carriers?) and a more carrier-specific experience (i.e., what was the experience with a specific carrier?). The general experience was about the positive and negative experiences that they had with a carrier. Players expressed that some carriers could be trusted more than others. This shows that players go through a learning process on how to use their general experience as information when selecting a carrier. The carrier-specific experience shows that experience helps in making better decisions.

As discussed previously, the conceptual model is extended with a conceptual framework. This conceptual framework explains the relation between the duration of the collaboration and the perceived value of the relationship (i.e., the relation an organization has with network partners). It is expected that organizations that need to transport goods for one time only, will focus on requesting operational information. It is expected that for important clients, organizations want to acquire both operational and strategic information. The game shows that the player acquired more operational information for the short-term orders. Since players did use the option to request strategic information (with a few exceptions), the relation of whether players would request more strategic information for important clients could only be partially tested. Results of the gameplay show that there is a relationship between the important clients and the amount of operational information that is acquired. Most players acquired more operational information for important clients than for non-important clients. These results show that for certain types of collaboration and perceived value of the relationship players would carry out different actions.

Conclusion

Based on the outcomes of the literature review, the interviews with stakeholders, and the game experiment the main research question can be answered. The objective of this dissertation is to formulate suggestions for users of a platform on how to deal with trust when collaborating through a platform. When using a platform to collaborate, users should be aware that trust in the other organization is strongly connected to trust in the platform, the platform organization, and the platform community. Subsequently, experience is a decisive factor that emerges in two ways: the experience an organization has with the community (i.e., is the overall community trustworthy?) and the experience with a specific organization (i.e., is the organization with whom I want to collaborate trustworthy?). Experience is also an important information or knowledge source. Therefore, the suggestions that are provided below are not only interesting for platform users but also for platform organizations. The suggestions for users of platforms and platform organizations are as follows:

- In the initial stage of the collaboration supported by platforms, trust is more important than information;
- In a new situation, such as initial use of a platform, where initial trust plays a role, information is an important factor that influences the decision-making process;
- Trust in another organization is strongly connected to trust in the technology, trust in the platform organization, and trust in the platform community;
- The experience in a platform community is strongly connected to the experience with a specific organization.

With the abovementioned suggestions, users of platforms and platform organizations can have better insights into the working of trust when using a platform, how it is developed but also how it influences their decision-making with whom to collaborate.

Discussion

The objective of this study is to better understand the influence of trust when organizations in the transport and logistics sector want to establish a collaboration through platforms. By gaining a better understanding of the role of trust when using platforms to collaborate it enables us to provide suggestions to the platform community (users and platform organization). In-depth interviews were conducted and the FreightBooking game was played to answer the main research question. This study also had some research limitations. First of all, the FreightBooking game has been played with, in total 86 students, semi-professionals in the transport and logistics sector, and game professionals. By playing the game with a larger group and with more professionals from the transport and logistics sector the game could be validated further, and it could provide more insights from a practical perspective on how trust influences collaboration when organizations use a platform.

Another limitation is the game design of the FreightBooking game. The game was based on the conceptual model and framework. Since the game focuses on trust it was important that players would have the idea that they are using a 'real' platform. The game had many nuances in the description of the carriers so it would not be obvious to the player to see which carrier is trustworthy and which is not. By having a game that strongly represents a real platform, it is challenging to retrieve data that allows testing the hypotheses of the conceptual model and framework. When a game is used as a research instrument, the reality and the representativeness of the real system strongly influence the purpose of the game.

Although the FreightBooking game has some limitations it is a contribution to the simulation and gaming field where most games focusing on trust have an underlying prisoner dilemma concept. The FreightBooking game is one of the simulation games that incorporate contextual variables, such as second-hand information and experience, in a trust game. Concluding, the FreightBooking game is one of a limited set of games that are designed around the concept of trust, when a platform is used to collaborate in the transport and logistics sector.

Samenvatting

Platformen zijn onderdeel geworden van het dagelijks leven en worden steeds vaker gebruikt in Business-to-Business (B2B) omgevingen. Ook in de transport- en logistieke sector nemen de toepassingen van technologische innovaties een hoge vlucht, van de Electronic Data Exchange tot de digitale CMR (Convention relative au Contrat de Transport International de Marchandises par Route). Platformen zijn één van de technologieën die het afgelopen decennium zijn opgekomen in de transport- en logistieke sector. De rol van platformen kan worden gezien als vierde partij logistieke dienstverleners (4PL's)[1], waar ze klanten en expediteurs (3PL's) met elkaar verbinden. Platformen kunnen worden gezien als netwerken waar vraag en aanbod samenkomen, interacties plaatsvinden en samenwerking tot stand komt[2] in een onpersoonlijke omgeving. In een traditionele omgeving vertrouwt een verlader bijvoorbeeld op een expediteur die het transport afhandelt.

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[1] Schramm, H. J., Czaja, C. N., Dittrich, M., & Mentschel, M. (2019). Current advancements of and future developments for fourth party logistics in a digital future. *Logistics*, *3*(1), 1–17. https://doi.org/10.3390/logistics3010007

[2] Asadullah, A., Faik, I., & Kankanhalli, A. (2018). Digital platforms: A review and future directions. In *Proceedings of the 22nd Pacific Asia Conference on Information Systems - Opportunities and Challenges for the Digitized Society: Are We Ready?, PACIS 2018*.

Elbert, R., & Gleser, M. (2019). Digital forwarders: a market oriented taxonomy. In *Logistics management: Strategies and Instruments for Digitalizing and decarbonizing supply chains - Proceedings of the German Academic Association for Business Research* (pp. 141–156). https://doi.org/10.1007/978-3-030-29821-0

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Met behulp van een platform kan de verlader samenwerken met veel verschillende bekende en onbekende organisaties. Het platform is echter een onpersoonlijke omgeving waar de verlader moet vertrouwen op de informatie die wordt verstrekt op het platform en aannames moet doen over een andere organisatie om mogelijk bepaalde uitkomsten van de samenwerking te overzien. In dit geval is vertrouwen van vitaal belang omdat vertrouwen de risico's en onzekerheid van de onpersoonlijke transactie kan verminderen.

Motivatie van het onderzoek

Bij het gebruik van platformen kan het moeilijk zijn voor een organisatie om alle relevante informatie over een andere partij te verkrijgen, een gedetailleerd inzicht te krijgen in de acties van een organisatie en het gedrag en de intenties te interpreteren. Daarnaast bestaat het risico dat organisaties niet hun volledige identiteit kenbaar maken op een platform. Vertrouwen is een mechanisme dat samenwerking in stand houdt omdat het organisaties in staat stelt dat de verwachting die ze hebben over een ander bedrijf waar zal zijn. Deze informatie kan gebaseerd zijn op de informatie van een andere partij of de ervaring die ze hebben met de andere partij. Verschillende onderzoekers hebben vertrouwen gedefinieerd vanuit een persoonlijk, organisatorisch en systeemperspectief. Veel van de studies zijn het erover eens dat vertrouwen een verwachting is. In dit proefschrift wordt de definitie van vertrouwen van Zaheer et al. (1998) gebruikt omdat deze definitie zich richt op een organisatorisch oogpunt. Volgens deze studie kan vertrouwen worden gedefinieerd als '*een verwachting over een andere organisatie dat zij hun verplichtingen zullen nakomen, zich voorspelbaar zullen gedragen, en eerlijk zullen handelen wanneer er een kans is om zich opportunistisch te gedragen*'[3].

De literatuur over vertrouwen in inter-organisationele samenwerkingen in de transport- en logistieke sector is beperkt. De laatste jaren is er meer aandacht voor vertrouwen in de B2B-context, waar de focus ligt op vertrouwen in inter-organisationele samenwerkingen en vertrouwen in B2B e-commerce. Met het doordringen van technologieën, zoals platformen, veranderen organisatiegrenzen door de informatie-uitwisseling en kunnen organisaties met elk andere organisatie samenwerken. Daarnaast is vertrouwen in technologie belangrijk om samenwerking in stand te houden. De werking van de technologie en de beveiligingsmechanismen die aanwezig zijn (d.w.z., doet de technologie wat er van verwacht wordt? Is mijn informatie beveiligd als ik de technologie gebruik?) zijn belangrijke factoren voor het ontwikkelen van vertrouwen in de technologie. De meeste studies bespreken de impact van platformen op de transport- en logistieke sector, waarbij vertrouwen wordt genoemd als één van de variabelen die optreden bij het gebruik van een platform. Maar wat de rol is van vertrouwen en hoe het interacteert met andere variabelen bij het gebruik van een platform om samen te werken, wordt slechts zeer beperkte mate genoemd.

Onderzoeksdoelstelling, vragen en aanpak

Met de doordringing van platformen in de transport- en logistieke sector, de informatieasymmetrie die kan optreden bij het gebruik van platformen om samen te werken en de mogelijkheid om samen te werken met een veelheid aan (on)bekende organisaties is het

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[3] Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

belangrijk om onderzoek te doen hoe vertrouwen een rol speelt en hoe het bijdraagt aan samenwerking bemiddeld door platformen.

Het doel van dit proefschrift is om beter te begrijpen wat de invloed van vertrouwen is en om suggesties te geven over hoe de samenwerking tussen organisaties bemiddeld door een platform kan worden verbeterd of ondersteund. Door deze suggesties kunnen gebruikers van platformen inzicht krijgen in de werking van vertrouwen (bijv. wanneer moet ik vertrouwen hebben in plaats van alleen op informatie?) en in de interactie met andere variabelen zoals de informatie die beschikbaar is op het platform.

De hoofdvraag van dit proefschrift luidt als volgt:

Hoe beïnvloedt inter-organisationeel vertrouwen samenwerkingen die worden gemedieerd door platforms in de transport- en logistieke sector?

Om de hoofdonderzoeksvraag te beantwoorden worden drie deelvragen geformuleerd: (1) welke variabelen spelen een rol bij het ontwikkelen van vertrouwen bij het aangaan van een inter-organisationele samenwerking bemiddeld door een platform?, (2) wat zijn de perspectieven van platformgebruikers op vertrouwen bij het samenwerken via een platform in de transport- en logistieke sector?, en (3) hoe beïnvloeden de geïdentificeerde variabelen de totstandkoming van inter-organisationele samenwerking ondersteund door platforms?

De eerste onderzoeksdeelvraag geeft theoretische inzichten over de variabelen die een rol spelen wanneer organisaties een platform gebruiken om samen te werken. Er wordt een uitgebreid literatuuronderzoek uitgevoerd om inzicht te krijgen in het begrip vertrouwen, hoe het in de literatuur wordt gedefinieerd en hoe vertrouwen samenhangt met andere variabelen, zoals informatie en samenwerking.

De tweede onderzoeksdeelvraag geeft praktische inzichten in hoe stakeholders tegen vertrouwen aankijken en welke acties ze ondernemen om hun vertrouwensniveau te verhogen wanneer ze via een platform samenwerken met een andere organisatie. Er zijn diepte-interviews gehouden met stakeholders om inzicht te krijgen in de impact van platforms in de transport- en logistieke sector en of en waarom vertrouwen belangrijk is bij het samenwerken met andere organisaties via een platform. De interviews met stakeholders bieden context voor het initiële conceptuele model en raamwerk en input voor de derde onderzoeksdeelvraag.

De derde onderzoeksdeelvraag is het bespreken van het onderzoeksinstrument voor het beoordelen van vertrouwen wanneer organisaties een platform voor samenwerking gebruiken. Het literatuuronderzoek naar vertrouwen uit de eerste onderzoeksdeelvragen biedt theoretische inzichten en helpt bij het formuleren van een initiële conceptueel model en raamwerk. De onderzoeksdeelvraag 2 levert praktische inzichten om het initiële conceptuele model aan te passen en input te leveren voor het onderzoeksinstrument om vertrouwen in platform-gemedieerde samenwerkingen te beoordelen. Om vertrouwen in platform-gemedieerde samenwerkingen te beoordelen, wordt in dit proefschrift een simulation game gebruikt als onderzoeksinstrument. Simulation gaming is een geschikte onderzoeksmethode omdat het een veilige omgeving biedt om de rol van vertrouwen bij het gebruik van een platform om samen te werken te onderzoeken en te analyseren[4]. Wanneer een simulation game vervolgens wordt gecombineerd met andere onderzoeksinstrumenten, zoals interviews of vragenlijsten, levert het een rijke dataset op[5]. Het initiële conceptuele model en raamwerk dat bij de eerste onderzoeksdeelvraag is geformuleerd, dienen als basis voor het spelontwerp. Er worden

hypotheses geformuleerd die worden getoetst binnen het game experiment. Vervolgens vormen de inzichten uit de interviews met stakeholders, met name het interview met de platformorganisatie, input op voor het spelontwerp.

Voordat de resultaten van het spelexperiment worden besproken, wordt eerst het simulation game zelf, FreightBooking game, besproken. Het FreightBooking game is een digitaal spel voor één speler, waarin spelers de rol spelen van een expediteur spelen die goederen moet vervoeren voor zijn klanten door gebruik te maken van een boekingsplatform. Op basis van de voorwaarden van de klant moeten de spelers de best mogelijke vervoerder selecteren. Het spel bestaat uit 7 rondes, waarbij de speler in elke ronde één of twee transportorders van klanten ontvangt. Deze transportorders hebben verschillende voorwaarden.

Een order moet bijvoorbeeld duurzaam vervoerd worden of het is een korte termijnorder of een lange termijnorder. De spelers kunnen beslissen met welke vervoerder ze gaan samenwerken op basis van de informatie van de vervoerder op het platform. Deze informatie is operationeel (bijv. beoordelingen) of strategisch (bijv. het percentage dat een vervoerder goederen op tijd aflevert). Voor elke transportopdracht ontvangt de speler winst-, duurzaamheids- en klanttevredenheidspunten (KPI's van het spel). Tijdens het spel zien spelers of deze KPI's zullen stijgen of dalen op basis van de samenwerkingen die ze tijdens het spel aangaan. Aan het einde van het spel 'wint' de speler met de hoogste score op de KPI's het spel.

Om data te verzamelen wordt het FreightBooking game gespeeld met 4 groepen: game ontwerpers, studenten met een achtergrond in transport en logistiek of simulation games, en semi-professionals. De opzet van het experiment bestaat uit een korte briefingsessie, een pre-game vragenlijst, het FreightBooking game, een post-game vragenlijst en een korte debriefingsessie. In de briefingsessie wordt het doel van het experiment besproken. Tijdens de briefing wordt het begrip vertrouwen niet genoemd omdat dit de deelnemers kan beïnvloeden. Tijdens de pre-game vragenlijst worden vragen gesteld over de achtergrond van de deelnemer en of ze regelmatig een platform gebruiken. Tijdens het spel worden alle beslissingen en acties van de spelers gelogd. Aan het einde van het spel moeten de deelnemers de post-game vragenlijst invullen met vragen/stellingen over de gameplay, de opzet van het game en hoe hun vertrouwensniveau in het algemeen is. Aan het einde wordt een korte debriefing gehouden om bepaalde acties van spelers te bespreken en wat ze wel en niet leuk vonden aan het spel.

Onderzoeksresultaten

De eerste onderzoeksdeelvraag is gericht op het verkrijgen van inzicht in de variabelen die een rol spelen wanneer organisaties een platform gebruiken om samen te werken. Vertrouwen is een concept dat voorkomt in een sociale omgeving (d.w.z. tussen organisaties of mensen) en in een technische omgeving (d.w.z. vertrouwen in de technologie).

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[4] Lukosch, H. K., Bekebrede, G., Kurapati, S., & Lukosch, S. G. (2018). A scientific foundation of simulation games for the analysis and design of complex systems. *Simulation & Gaming*, *49*(3), 279–314. https://doi.org/10.1177/1046878118768858

[5] Freese, M., Lukosch, H. K., Wegener, J., & König, A. (2020). Serious games as research instruments – do's and don'ts from a cross-case-analysis in transportation. *European Journal of Transport and Infrastructure Research*, *20*(4), 103–126. https://doi.org/10.18757/ejtir.2020.20.4.4205

Gebaseerd op de uitgebreide literatuur over vertrouwen, wordt vertrouwen in dit proefschrift gedefinieerd als de *'verwachting dat men erop kan vertrouwen dat een actor zijn verplichtingen nakomt, zich op een voorspelbare manier zal gedragen, en eerlijk zal handelen en onderhandelen wanneer de mogelijkheid voor opportunisme aanwezig is'*[6].

De literatuur geeft inzicht in de werking van vertrouwen, maar ook welke andere variabele belangrijk is bij het aangaan van een samenwerking, namelijk informatie. Dit is vooral het geval wanneer platforms worden gebruikt om samen te werken, aangezien informatie organisaties input geeft om het mogelijke gedrag en de acties van een andere organisatie te internaliseren. Op basis van de uitgebreide literatuur wordt een eerste conceptueel model gedefinieerd dat de relatie tussen vertrouwen, informatie en samenwerking verklaart. Daarnaast wordt een conceptueel raamwerk geformuleerd dat de relatie, gedefinieerd in het initiële conceptuele model, tussen vertrouwen en samenwerking uitdiept. Samenwerking tussen organisaties vindt plaats in een netwerk van organisaties, niet in een vacuüm. Wanneer organisaties een korte- of lange termijn samenwerking willen aangaan, evalueren ze daarom wat de mogelijke impact kan zijn op de relaties die ze hebben met andere organisaties. In dit proefschrift wordt de relatie die een organisatie heeft met haar leveranciers gedefinieerd als de waargenomen waarde van de relatie. De wisselwerking tussen de duur van de samenwerking en de waargenomen waarde van de relatie wordt beschreven in het conceptuele raamwerk.

De tweede onderzoeksdeelvraag gaf inzicht in hoe stakeholders tegen vertrouwen aankijken. De bevindingen van de interviews laten zien dat wanneer platforms worden gebruikt om samen te werken, er op drie manieren vertrouwen ontstaat: (1) vertrouwen in de technologie, (2) vertrouwen in de platformorganisatie zelf, en (3) vertrouwen in een andere organisatie bij het gebruik van het platform.

Het laat ook zien hoe vertrouwen op drie manieren ontstaat die sterk met elkaar verbonden zijn. Wanneer er een gebrek aan vertrouwen is in de platformorganisaties, beïnvloedt dit ook het vertrouwen in de technologie, maar ook het vertrouwen in andere organisaties die het platform gebruiken (platformgemeenschap). Een ander inzicht is dat ervaring een belangrijke factor is die informatie en kennis verschaft over de andere partij. Dus naast de informatie die een organisatie vindt over de andere organisatie, heeft ervaring een belangrijke invloed op het opbouwen van vertrouwen in de andere organisatie. Op basis van de bevindingen van de interviews is het oorspronkelijke conceptuele model uitgebreid met één extra variabele: ervaring.

De derde onderzoeksdeelvraag leverde de spelresultaten op. Op basis van het conceptuele model en het raamwerk werden vijf hypothesen gedefinieerd. De hypotheses zijn als volgt geformuleerd:

- H1 (Conceptueel model): Hoe hoger de dispositie om te vertrouwen, hoe meer een speler bereid is om samen te werken met een vervoerder die een lage quote aanbiedt;
- H2 (Conceptueel model): Naarmate spelers meer operationele informatie opvragen, is de kwalitatieve keuze om samen te werken met een specifieke vervoerder hoger;

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[6] Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

- H3A (Conceptueel model): Spelers met een lage dispositie tot vertrouwen vragen eerder strategische informatie op;
- H3B (Conceptueel model): Spelers met een hoge dispositie om te vertrouwen zijn meer geneigd om operationele informatie op te vragen;
- H4 (Conceptueel model): Spelers gebruiken een positieve of negatieve (eerdere) ervaring met een vervoerder om een vervoerder te kiezen;
- H5A (Conceptueel raamwerk): Meer informatie types worden opgevraagd voor langdurige klanten;
- H5B (Conceptueel raamwerk): Meer informatie types worden opgevraagd voor klanten met een hogere ervaren relatiewaarde.

Het FreightBooking game toonde aan dat de 4 groepen van spelers in het algemeen vrij goed van vertrouwen waren en tijdens de eerste ronde een vervoerder met een lage quote kozen. Hoewel we niet konden aantonen dat er een significant verband bestaat tussen de mate van vertrouwen van een speler en de keuze van een vervoerder, tonen de resultaten aan dat spelers in een eerste fase, met een hoge mate van vertrouwen, meer bereid zijn om samen te werken met een vervoerder met een lage quote. Daarnaast hebben spelers een leereffect tijdens het spel. In de eerste drie rondes, wanneer er nog geen ervaring is met één van de vervoerders, vroegen spelers meer informatie. Dit resultaat laat zien dat spelers, naarmate het spel vorderde, leerden dat informatie van waarde kon zijn bij het selecteren van een vervoerder om mee samen te werken. Een derde inzicht uit het conceptuele model was dat ervaring een belangrijke factor is en naar voren komt als een algemene ervaring (d.w.z., wat is de algemene ervaring die ik heb met vervoerders?) en een meer vervoerder-specifieke ervaring (d.w.z., wat was de ervaring met een specifieke vervoerder?). De algemene ervaring ging over de positieve en negatieve ervaringen die ze hadden met een vervoerder. Spelers gaven aan dat sommige vervoerders meer te vertrouwen waren dan andere. Dit toont aan dat spelers een leerproces doorlopen over hoe ze hun algemene ervaring kunnen gebruiken als informatie bij het kiezen van een vervoerder. De specifieke ervaring met de vervoerder toonde aan dat ervaring helpt bij het maken van betere beslissingen.

Zoals eerder besproken, is het conceptuele model uitgebreid met een conceptueel raamwerk. Dit conceptuele raamwerk verklaart de relatie tussen de duur van de samenwerking en de waargenomen waarde van de relatie (d.w.z. de relatie die een organisatie heeft met netwerkpartners). Verwacht wordt dat organisaties die eenmalig goederen moeten vervoeren, meer operationele informatie opvragen. Verwacht wordt dat organisaties voor belangrijke klanten operationele en strategische informatie over een andere organisatie willen verkrijgen. Het game toonde aan dat de speler meer operationele informatie op vragen voor de kortlopende orders. Aangezien spelers een beperkte hoeveelheid strategische informatie vroegen, kon de relatie of spelers meer operationele en strategische informatie zouden vragen gedeeltelijk worden getest. De resultaten van het game toonden aan dat er een relatie is tussen de belangrijke klanten en de hoeveelheid operationele informatie die wordt opgevraagd. De meeste spelers verkregen meer operationele informatie voor belangrijke klanten dan voor niet-belangrijke klanten. Deze resultaten laten zien dat spelers voor bepaalde soorten samenwerking en waargenomen waarde van de relatie verschillende acties ondernemen.

Conclusie

Op basis van de uitkomsten van het literatuuronderzoek, de interviews met stakeholders en het game experiment kon de hoofdonderzoeksvraag worden beantwoord. Het doel van dit onderzoek is om de invloed van vertrouwen beter te begrijpen wanneer organisaties in de transport- en logistieke sector een samenwerking willen opzetten via platformen. Door een beter begrip te krijgen van de rol van vertrouwen bij het gebruik van platformen om samen te werken, kunnen we suggesties doen aan de platformgemeenschap (gebruikers en platformorganisatie). Wanneer gebruikers een platform gebruiken om samen te werken, moeten ze zich ervan bewust zijn dat vertrouwen in de andere organisatie sterk samenhangt met vertrouwen in het platform, de platformorganisatie en de platformgemeenschap. Vervolgens is ervaring een beslissende factor die op twee manieren naar voren komt: de ervaring die een organisatie heeft met de community (d.w.z., is de algehele community betrouwbaar?) en de ervaring met een specifieke organisatie (d.w.z., is de organisatie waarmee ik wil samenwerken betrouwbaar?). Ervaring is ook een belangrijke informatie- of kennisbron. Daarom zijn de onderstaande suggesties niet alleen interessant voor platformgebruikers, maar ook voor platformorganisaties. De suggesties voor gebruikers van platformen en platformorganisaties zijn als volgt:

- In de beginfase van de samenwerking ondersteund door platforms is vertrouwen belangrijker dan informatie;
- In een nieuwe situatie, zoals het eerste gebruik van een platform, waar initieel vertrouwen een rol speelt, is informatie een belangrijke factor die het besluitvormingsproces beïnvloedt;
- Vertrouwen in een andere organisatie is sterk verbonden met vertrouwen in de technologie, vertrouwen in de platformorganisatie en vertrouwen in de platformgemeenschap;
- De ervaring binnen een platformgemeenschap is sterk verbonden met de ervaring met een specifieke organisatie.

Met bovenstaande suggesties kunnen gebruikers van platformen en platformorganisaties beter inzicht krijgen in de werking van vertrouwen bij het gebruik van een platform, hoe het wordt ontwikkeld maar ook hoe het hun besluitvorming beïnvloedt met wie ze willen samenwerken.

Discussie

Het doel van deze studie is om beter inzicht te krijgen in de invloed van vertrouwen wanneer organisaties in de transport- en logistieke sector willen samenwerken via platforms. Door beter te begrijpen welke rol vertrouwen speelt bij samenwerking via platformen, kunnen we aanbevelingen doen aan de platformgemeenschap (gebruikers en platformorganisaties). Om de algemene onderzoeksvraag te beantwoorden, zijn er interviews afgenomen en is het FreightBooking game gespeeld.

Deze studie kent ook enkele beperkingen. Allereerst is het FreightBooking game gespeeld door in totaal 86 deelnemers: studenten, semiprofessionals uit de transport- en logistieke sector, en game professionals. Door het spel met een grotere groep en met meer professionals uit de sector te spelen, kan het spel verder gevalideerd worden en kunnen er meer praktijkgerichte inzichten worden verkregen over hoe vertrouwen samenwerking beïnvloedt bij het gebruik van een platform.

Een andere beperking betreft het ontwerp van het FreightBooking game. Het spel is gebaseerd op het conceptuele model en raamwerk. Omdat het spel zich richt op vertrouwen, was het belangrijk dat spelers het gevoel hadden dat zij een ‘echt’ platform gebruikten. Het spel bevatte veel nuances in de beschrijvingen van de vervoerders, zodat het voor de spelers niet direct duidelijk zou zijn welke vervoerder betrouwbaar is en welke niet. Omdat het spel sterk moest lijken op een echt platform, was het een uitdaging om gegevens te verzamelen die het testen van de hypothesen uit het conceptuele model en raamwerk mogelijk maken. Wanneer een spel wordt ingezet als onderzoeksinstrument, beïnvloeden de realiteit en representativiteit van het echte systeem in sterke mate het doel van het spel.

Hoewel het FreightBooking game enkele beperkingen kent, vormt het een bijdrage aan het vakgebied van simulatie en serious gaming, waar de meeste games over vertrouwen gebaseerd zijn op het ‘prisoner’s dilemma’. Het FreightBooking game is een van de simulatiespellen waarin contextuele variabelen, zoals tweedehands informatie en ervaring, worden geïntegreerd in een vertrouwensspel. Kortom, het FreightBooking-spel is één van de weinige games die specifiek zijn ontworpen rondom het concept vertrouwen, in de context van samenwerking via een platform in de transport- en logistieke sector.

1

Introduction

The transport and logistics sector is being digitally transformed. In the 1960's containerization started with Electronic Data Interchange facilitating communication and decision-making in the transport and logistics sector (Garstone, 1995). Over time, more and more digital innovations, such as digital CMR (i.e., Convention relative au Contrat de Transport International de Marchandises par Route) and blockchain technology, were introduced to support operations and processes. The digital CMR, for example, has reduced the administration burden associated with paper documents. Platforms are one of the technological innovations that are part of this digital transformation. Platforms can be described as dedicated networks that facilitate interactions between interdependent actors, such as shippers and carriers (Asadullah et al., 2018). Digital platforms can be viewed from a technical perspective, i.e., a set of IT components/subsystems, and from a social perspective, i.e., the interaction of a group of interdependent users (Asadullah et al., 2018; Rossotto et al., 2018). In this study, we use the latter conceptualization of a platform, where platforms allow independent organizations, both on the supply and demand side, to collaborate and interact (Asadullah et al., 2018; Elbert & Gleser, 2019; Mikl, Herold, Ćwiklicki, & Kummer, 2021).

Platforms are rapidly emerging in the transport and logistics sector (Song and Regan, 2001; Zomer and Zuidwijk, 2021). For example, in the freight forwarding industry, traditional freight forwarders are utilizing digital tools on a large scale to operate the network. In addition, new entrants, such as digital freight forwarders, are also emerging (Song and Regan, 2001; Elbert and Gleser, 2019; Zomer & Zuidwijk, 2021). Where in the beginning organizations mainly did their own transportation (1PL), it evolved into outsourcing the transportation to a transport company (2PL), such as a carrier, and eventually to a freight forwarder that organizes and chooses the transport company (3PL). Platforms can be seen as fourth-party logistics providers (4PL) since they serve as integrator between clients and 3PL's (Schramm, Czaja, Dittrich, & Mentschel, 2019).

Platforms provide various opportunities for organizations, such as reducing costs and developing new business models and new services (Asadullah et al., 2018; Mikl et al., 2021; Rossotto et al., 2018; Song & Regan, 2001). Operational costs can be lowered through process optimization and cost-efficient resource allocation (Gruchmann, Pratt, Eiten, & Melkonyan, 2020). While platforms provide advantages for organizations, we also see that platforms may disrupt how organizations collaborate. To illustrate, in a traditional 3PL collaboration, a shipper requests the services of a freight forwarder to handle the transportation. In this traditional setting, the shipper relies on the freight forwarders' knowledge and expertise to arrange the transport. The platform provides a list of carriers with which to potentially collaborate. Since the collaboration is mediated through technological innovations, and not through personal contacts, the shipper can collaborate with a multitude of (unknown) organizations. In this case, the shipper needs to make assumptions about the performance and trustworthiness of carriers based on information provided on the platform. In the abovementioned example, certain risks (e.g., the shipper does not know whether the carrier will meet the contractual obligations) may emerge but also uncertainties (e.g., it is unclear whether a new carrier will act consistently and professionally in the absence of prior collaboration or an established reputation). In this thesis, risk and uncertainties can be discussed alongside each other, as situations involving risk may also give rise to uncertainties (Yates & Stone, 1992). This impersonal nature of doing business in these online environments leads to lots of uncertainties in a buyer-seller relationship (Pavlou, 2002). Examples are uncertainty about the technology itself (Pavlou, 2002) and uncertainty about the party with whom an organization is collaborating (Riegelsberger, Sasse, & McCarthy, 2005). For example, when clients want to transport their goods and use a platform for it, uncertainty about the credibility and predictability of the carrier may arise. When collaborating through a platform, it is challenging for an organization to oversee all possible outcomes of the collaboration. In this case, trust is vital. Trust is especially important when using a platform to support a common goal of the actors (Spagnoletti, Resca, & Lee, 2015) since platforms coordinate the interaction using peer-based trust relationships (Rossotto et al., 2018). Hofacker et al. (2020) mention that it is important to research the role inter-organizational trust plays when using technological innovations, such as platforms.

1.1. Trust and platformization

Trust is critical in collaborative relationships, and it is an alternative to reduce complexity, risk, and uncertainty (Lewis & Weigert, 1985; Zaheer, McEvily, & Perrone, 1998). Numerous scholars have addressed the importance of trust in relationships, alliances (Das & Teng, 1998b), organizations (R. C. Mayer, Davis, & Schoorman, 1995), and innovations (Pavlou, 2003) from various research fields (e.g., sociology, psychology, economics) (Lewicki & Bunker, 1995; Mcknight & Chervany, 1996). Trust is a vital requisite for collaboration (Nooteboom, 2008) and innovation (Hattori & Lapidus, 2004). Trust can evolve in different stages; not every relationship requires the same amount of trust (Hattori & Lapidus, 2004), for example, buying a cheap charger for your phone on a platform might involve a low trust level compared to buying an iPad.

While the majority of literature on the role of trust in technology-mediated collaborations discusses trust development, its attributes, and how it relates to other variables (e.g., structural assurances) (Cummings & Bromiley, 1996; Lewicki & Bunker, 1995; McKnight, Cummings,

& Chervany, 1998; Pavlou, 2002) there is only a limited number of studies that aim to explore the role of trust in technology-mediated collaborations, especially focusing on platforms. Over the past few years, scholars have paid increased attention to digital platforms (Asadullah, Faik, & Kankanhalli, 2018). However, studies on the effect of trust on collaborations supported by platforms are limited.

With the use of platforms in the transport and logistics sector, it is important to examine how platforms mediate collaboration and how trust plays a role. Often in the transport and logistics sector, relationships were built between organizations and people. With the permeation of technology, trust needs to go in the platform, by using structural assurances and information. Internalizing the intentions of another party may be difficult (Riegelsberger et al., 2005). When organizations are willing to collaborate with another party through platforms, they may seek assurances. One such assurance is the reputation mechanism of an organization's accreditation that is issued by an accreditation authority (Pavlou, 2002), such as the Chamber of Commerce number or VAT number. Overseeing all possible outcomes of collaboration is rather challenging for organizations. In non-digital collaborations, organizations could try to identify and interpret the motives and behavior of the other party through meetings and personal contacts. However, in digital collaborations, the interpretation of behavior is challenging, and organizations need to assess the outcome of the collaboration based on provided information instead of human observation. In an impersonal environment, such as an online environment, an organization may not state its true identity. Platforms may have a screening process in place to check and validate an organization that wants to join the platform (through Chamber of Commerce registration), however, it may be difficult to assess the ‘behavior’ and values of a company. With the rise of platforms and the advantages and challenges discussed above, technology-mediated collaborations also rely on trust and the need to incorporate processes to build and maintain trust.

With the increasing permeation of technological innovations in inter-organizational collaborations, it is crucial to research the influence of trust in inter-organizational collaborations supported by platforms.

1.2. Literature on trust and platforms

This section provides an insight into the existing literature on the topic of trust concerning platforms in a Business-to-Business online environment. Empirical studies and grey literature were collected to review the literature on the concepts of trust and platforms in transport and logistics sector. The empirical studies were retrieved from SCOPUS and Google Scholar. A set of keywords were used in the search query to collect relevant studies. The keywords, strings, and Boolean operators used but were not limited to Trust, Collaboration, Platform, Digital platform, Load broker, Logistics, and Transport. Since various studies use different words for the term platform or digital platform, we also included multi-sided, two-sided, and Business-to-Business platforms. Subsequently, the forward and backward approaches have been applied in the structured literature review to increase the amount of relevant studies (Figure 1.1). The literature search was done in the period from March until June 2021 and June until July 2022.

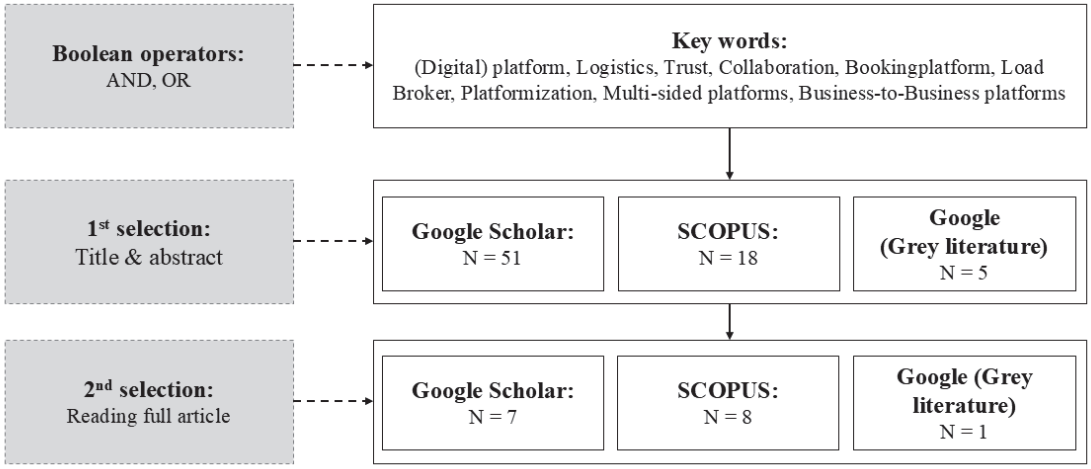


Figure 1.1. Literature review approach.

Trust is receiving much attention in the Peer-to-Peer literature due to the rise of platforms such as Airbnb and Uber. A Peer-to-Peer (P2P) platform, such as Airbnb, has some similarities but also differences in features compared to a Business-to-Consumer (B2C) and a Business-to-Business (B2B) platform (Derave, Prince Sales, Gailly, & Poels, 2021). In a B2C or B2B environment, users connect differently to the platform. For instance, every person can download the Uber or Airbnb app and start using it. Yet, in a B2B environment, organizations that want to join a platform often have to deal with a screening or onboarding process. For example, organizations within the Port of Rotterdam can use Portbase to share information between different port stakeholders. Before organizations can start using the services of Portbase, they need to request the service and provide information, such as chamber of commerce number for identification (Portbase, 2022). Moreover, how users can connect with each other differs also in a P2P compared to a B2B environment (Derave et al., 2021). In a B2B environment, users on one side can look for services before requesting a service. For instance, on a transport booking platform, a shipper who wants to transport goods via road can look for a carrier on the platform. In a P2P environment, users can be connected automatically. Uber users automatically receive a match with a driver who is close to the users' location. While these studies provide valuable insight into the relationship between trust and platforms, we do not incorporate these studies in the literature review and will focus in the next section on platforms in a B2B environment.

Based on the literature, we see that the role of trust in a B2B context (Cummings & Bromiley, 1996; Doney & Cannon, 1996; Zaheer et al., 1998) and a B2B e-commerce environment (Hart & Saunders, 1997; Nadler & Kros, 2010; Pavlou, 2002) has received a lot of attention. However, these studies analyzed trust between organizations or trust between an organization and a technology. Trust between organizations that use technology to establish a collaboration is researched very limited. According to Koh et al. (2012), trust is critical in a B2B e-commerce environment. In B2B e-commerce, where buyers and suppliers are separated in time and space, risk may emerge, such as non-payments by buyers, and information asymmetry exists, such as incomplete information about suppliers (Koh et al., 2012). This is also emphasized by the study of Hart and Saunders (1997). The study by Hart & Saunders (1997) focuses on the role of trust and power when organizations use EDI (i.e., Exchange of Document Interchange). With the introduction of EDI, organizations may face more interdependence and vulnerability. Other

organizations have greater access to information, causing organizational boundaries to become more fluid, allowing for greater interaction and exchange across traditional boundaries. Shared technologies, such as EDI, can enhance collaboration but also introduce new challenges. One concern is the lack of clarity around how the information that is shared is being used, as it often falls outside the direct control of the organization. A vulnerability or risk may arise when an organization does not know what a partner might do with the available information. In this context, trust becomes a critical factor in inter-organizational collaborations by mitigating potential risks. Having trust encourages information sharing and discourages opportunistic behavior. Moreover, trust is increased when an organization demonstrates that it has competence (i.e., has knowledge and expertise to interpret information), is open (i.e., willing to listen to new ideas), cares (i.e., not taking advantage), and is reliable (i.e., deliver what is promised)(Hart & Saunders, 1997). Thus, trust enables technology usage, sustains inter-organizational relations over time, and is important when inter-organizational collaboration becomes more fluid with the introduction of a technology.

Besides inter-organizational trust, trust in technology is also important (Ratnasingam, 2005). A study by Ratnasingam (2005) shows that the underlying technological infrastructure can help to build trust in another party. Through the more impersonal dimensions of trust, such as structural assurances and security mechanisms, trust in another organization can be built based on an organization's competence, predictability, and goodwill of the other party. Moreover, trust in technology can be a basis for developing inter-organizational trust (Ratnasingam, 2005). The study by McKnight et al. (2002) shows that, in a B2C e-commerce context, trusting beliefs can influence consumer perception of the vendor. Moreover, trust in a vendor can also affect the longer-term relationship. In other words, when a vendor emphasizes and manages consumers' trust, a consumer's intention for future interactions with the digital platform increases (Kim, Ferrin, & Raghav Rao, 2008). Whether or not an individual or an organization will interact in the future with a platform is also influenced by the knowledge and experience someone or an organization has with the technology itself (Zavolokina, Zani, & Schwabe, 2023). The study by Zavolokina et al. (2020) suggests that a platform's trustworthiness should be communicated straightforwardly to build trust. Information about the purpose of the platform and its functionality should be provided. Sharing of information, positive or negative, is important for fostering trust (Hansen, Samuelsen, & Silseth, 2008). Having a trusting relationship between the platform users and the platform organization is important. Structural assurances are needed to ensure the viability and reliability of digital platforms (Vize, Coughlan, Kennedy, & Ellis-Chadwick, 2013). Buyers and sellers with a higher trust relationship towards the platform are more likely to use the platform (Chien, Chen, & Hsu, 2012). Furthermore, having a positive reputation as a platform organization is also critical since it contributes to an organization's trustworthiness (Hansen et al., 2008).

Besides the B2B and B2C literature, the concept of trust also receives attention from blockchain literature in the supply chain domain. Brookbanks and Parry (2022) discuss the implementation of blockchain on trust relationships in an established end-to-end supply chain. Their paper shows that the introduction of blockchain affects institutional trust and structural assurances. The sharing of information and the visibility of certain information by blockchain technology can support trust building. Safeguards, such as contracts and agreements, can assure an organization that other users behave in a trustworthy manner (Pavlou, 2002). Yet, a blockchain implementation does not affect other trust-building processes (Brookbanks & Parry, 2022).

In recent years, digital platforms and their impact on the transport and logistics sector have received increased attention from academics (Gruchmann et al., 2020; Hesse, 2002; Scott, 2018) and in grey literature (Arthur D. Little 2017; Deloitte, 2019). The study by Elbert and Gleser (2019) provides a first insight into the field of digital freight forwarders. A taxonomy is provided to discuss the developments that occur in the freight forwarding industry, such as what type of digital freight forwarders emerge in the sector. The report by Zomer & Zuidwijk (2021) discusses the emergence of digital platforms, as well as the implications and possible opportunities, are discussed. Trust between a freight forwarder and a client is said to be important. However, the question of what the role of trust is when collaborating through platforms is not elaborated on.

One of the studies that address the role of trust in the transport and logistics field is the research by Bernaer et al. (2006). This study examines the role of trust in software agents applied in a multimodal transport context. Bernaer et al. (2006) viewed trust from a technological perspective, and more specifically, trust in a software agent when communicating through a platform. This study elaborates on the importance of trust in technology and the importance of trust when interconnections between parties are mediated through technology (Bernaer, Meganck, Vanden Berghe, & De Causmaecker, 2006). According to this study, the environment can become more impersonal when a system behaves more autonomously. In an impersonal environment, having trust is important, and acquiring information about another organization is vital. In a B2B e-commerce environment, face-to-face communication is lacking, and publishing third-party references to acknowledge a company's reputation is preferred (Canavari, Fritz, Hofstede, Matopoulos, & Vlachopoulou, 2010).

Although the concept of trust in a B2B e-commerce is well established, based on the literature search platform and trust has not been studied extensively in the transport and logistics sector. Most of the work focused on the impact of platforms on the sector itself (see, for example, Elbert and Gleser 2019; Zomer & Zuidwijk, 2021). However, there has not been much focus on trust when organizations use platforms to collaborate. Therefore, this study is carried out to better understand trust in inter-organizational collaboration supported by platforms.

1.3. Research objective and research questions

This research aims to better understand trust's influence when actors in the transport and logistics sector want to collaborate based on mediation by digital platforms. By providing a better understanding, users of platforms can

- gain insight into how trust works in a platform environment; and
- how trust is influenced by other variables, such as information, on a platform.

An understanding of the influence of trust will enable recommendations to be provided on how the collaboration between organizations can be enhanced or supported through trust. When using a platform to collaborate, people or organizations can collaborate with a large pool of people or organizations. However, it is also easier for people or organizations to maliciously impersonating others on the platform. The increased opportunity for collaboration comes with an increased risk, for example, organizations might get scammed. With a better insight into the role of trust, organizations may be able to formulate normative factors for technological innovations that encourage organizations to collaborate. For instance, a possible outcome of

the research could be that transparency is important for organizations to collaborate through a platform. The normative factors that are formulated are social or organizational guidelines on inter-organization collaboration and how technology can play a role. The abovementioned research gap and objective initiate the following research questions and sub-questions:

How does inter-organizational trust influence collaborations, mediated by platforms in the transport and logistics sector?

To answer the main research question, several sub-questions are formulated:

1. *Which variables play a role in developing trust when entering an inter-organizational collaboration, mediated by a platform?*

   This research sub-question gives insights into which variables play a role when organizations want to collaborate through platforms. This sub-question complements the main research question by providing a literature review on trust, how it develops, and what the important factors are in a social environment (i.e., organization – organization) and technological environment (organization – technology).

2. *What are platform users' perspectives on trust when collaborating through a platform in the transport & logistics sector?*

   This question provides insights into how trust emerges in a real setting when organizations collaborate through a platform. Additionally, it provides more background information what the impact of platforms on the transport and logistics sector and how stakeholders view trust issues when collaborating through a platform.

3. *How do the identified variables influence the establishment of inter-organizational collaboration supported by platforms?*

   This question gives insight into how the variables are related and how the variables play a role when organizations are collaborating through a platform. The first research sub-question provides theoretical insights into the key variables when collaboration is established and supported by platforms. The second research sub-question provides a practical understanding of stakeholders' perspectives on the influence of trust when using a platform to collaborate. The third research sub-question provides insights into the design, development, and employment of a realistic, laboratory setting where the interplay of the variables can be tested when organizations collaborate through a platform.

A combination of a deductive and an inductive approach was chosen to answer the research sub-questions and, in the end, the main research question. Each chapter is a combination of a deductive and an inductive approach. To understand the concept of trust and which variables play a role when organizations want to collaborate through a platform, a deductive approach was chosen. The relationship between the variables is inductive. Using the inductive approach allows us to analyze and evaluate patterns in raw data and develop these into a model or theory (Thomas, 2006).

1.4. A mixed method research approach: literature review, interviews, and simulation games

The research question proposed in the previous section focuses on trust and platforms in the transport and logistics sector. Figure 1.2 shows the approach for answering the dissertation's research questions. To understand the role of trust when platforms are being used in inter-organizational collaboration, it is important to subjectively understand the social context of trust, such as perceptions. For example, how do stakeholders view trust? Besides a subjective understanding of trust, an objective understanding is also important. For example, how do stakeholders of the transport and logistics sector define trust? Which variables play a role when organizations collaborate supported by platforms?

To answer the main research questions, three sub-questions are defined. To answer the first sub-question a literature review on the concept of trust is carried out to identify the main variables and create an understanding of how trust is defined. The second sub-question is on creating a subjective understanding of the concept of trust by stakeholders' perceptions. To gather stakeholders' perspectives on this matter, in-depth interviews are held. The answers to these questions enable the development of a model of the influence of trust on collaboration in answer to the third research question. This model also has been tested. Testing the influence of trust on inter-organizational collaborations can be challenging to research. Researching this subject with a real-life platform is challenging since it can hamper current operations. Moreover, it is not a safe environment and users of the platform can be hindered by the fact that they are using a real-life platform. Simulation gaming can be used as a research instrument to create a safe environment to test the influence of trust on inter-organizational collaboration supported by platforms (Lukosch, Bekebrede, Kurapati, & Lukosch, 2018). Additionally, using a simulation game in combination with other tools, such as interviews or questionnaires, provides a rich data set (Freese, Lukosch, Wegener, & König, 2020). Research sub-question 3 will use the results derived from sub-question 1 and partially from sub-question 2 in the game design.

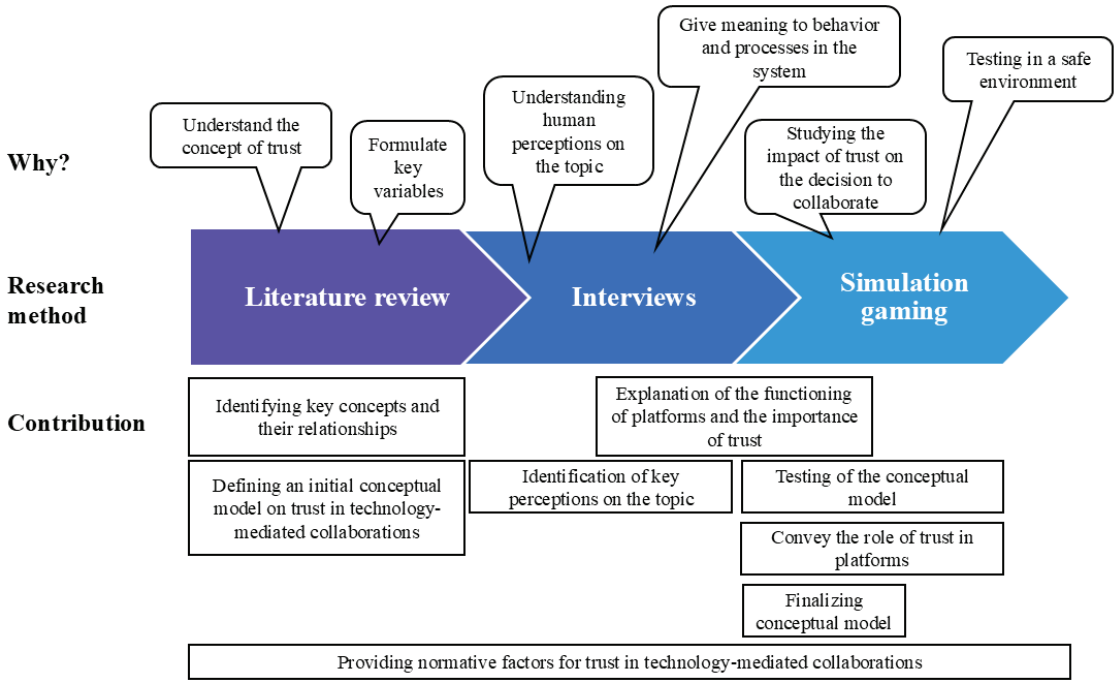


Figure 1.2. A mixed-method research approach. The figure is derived from Szajnfarber & Gralla (2017).

1.5. Simulation gaming as a research instrument

The platform environment can be described as a complex system where different organizations with their interests interact in an impersonal environment. Simulation games are a suitable method to obtain data within a near-realistic environment, represent a complex system, for replication of the experimental set-up, and are engaging (Deterding et al., 2015; Klabbers, 2009; Lukosch & Comes, 2019; Lukosch et al., 2018). It allows researchers to test (social) phenomena in a safe environment (Lukosch et al., 2018) where real processes and actions are translated into realistic variables in a simulation gaming environment (de Caluwé, Geurts, & Kleinlugtenbelt, 2012). Moreover, a game allows users to gain an understanding of the system and find new ways to explain the characteristics of behavior in a system (Klabbers, 2009; Lukosch, Groen, Kurapati, Klemke, & Verbraeck, 2016). Innovations can be explored, and simulation games can convey the changing dynamics within the system (Geurts, Duke, & Vermeulen, 2007); it allows real people with tacit knowledge, stakes, and intuitions to be a part of a computer model (Mayer, 2009). It enables researchers to observe the behavior of players and the decisions that they make (Freese et al., 2020; van den Hoogen, Lo, & Meijer, 2016).

The concept of trust is hard to grasp and to observe since it is embedded in a person and is built and developed over time through experience and interactions. A simulation game makes a difficult and complex concept, such as trust, measurable and recordable in a real-life setting (Duke & Geurts, 2004). Unlike a questionnaire, which captures self-reported attitude, a simulation game captures a far richer type of data (Duke & Geurts, 2004). In a game, players' decisions and actions can be logged (providing a behavioral trace), there is time for reflection

and is repeatable because conditions can be held the same across different groups. However, Duke & Geurts (2004) note that a game can also feel 'artificial', so behavior in the game may not map perfectly into practice. Developing a game can be approached from different paradigms, such as Triadic Game Design (Harteveld, 2011), the craftsmanship methodology (Peters & Van de Westelaken, 2014), or the nine steps proposed by Duke (1980). The simulation gaming approach used in this research is the Triadic Game Design philosophy of Harteveld (2011), addressing the game design 'worlds' of reality meaning, and play. To study trust, balancing these worlds is important. If the game is too simplified and does not meet reality, then the role of trust can be difficult to study. For example, exaggerating trust issues could influence the behavior of players. If the game is too complex, then maybe players do not find the game fun to play, and this can also affect the results. Therefore, to develop a game around trust, it is important that during the design process, the reality, meaning, and playfulness of the game need to be carefully analyzed to have, in the end, a well-balanced game that can be used as a research method.

In the transport and logistics sector, serious games have been frequently used to study various phenomena and their implications (Kurapati, Kourounioti, Lukosch, Tavasszy, & Verbraeck, 2018; Mayer & Bekebrede, 2006; Ningrum & van Schuylenburg, 2020). Simulation games on trust related to technology-mediated collaborations in this field are lacking. In other fields, such as psychology or sociology, trust is tested mainly by questionnaires (see, for example, Pavlou (2003), Kwon & Suh (2005)) or games based on the prisoner's dilemma (Berg, Dickhaut, & McCabe, 1995). While games based on the prisoner's dilemma test the role of trust, they do not consider the contextual variables (e.g., reputation, first-hand information, second-hand information, and the role of technology) that occur in a real-life system. Subsequently, these studies do not specifically look into the role of trust in technology-mediated collaborations. By adding contextual variables, it is possible to analyze the influence of trust in platforms in a more realistic setting. Based on certain decisions a player makes, the impact of trust on those decisions can be analyzed. For example, players need to base a decision on certain information they receive but is that information trustworthy, and how does that information influence the decisions to make?

1.6. Outline of dissertation

Various research methods are used to conduct this study to understand the concept of trust in inter-organizational collaborations supported by platforms. Analogous to Figure 1.2, the three research methods used to answer the main research question are (1) literature study on trust and related concepts, (2) interviews with stakeholders, and (3) a serious game.

As discussed in section 1.3. the dissertation uses a mixed method research approach to answer the main research question. This section will discuss the outline of the dissertation according to the thesis outline presented in Figure 1.3.

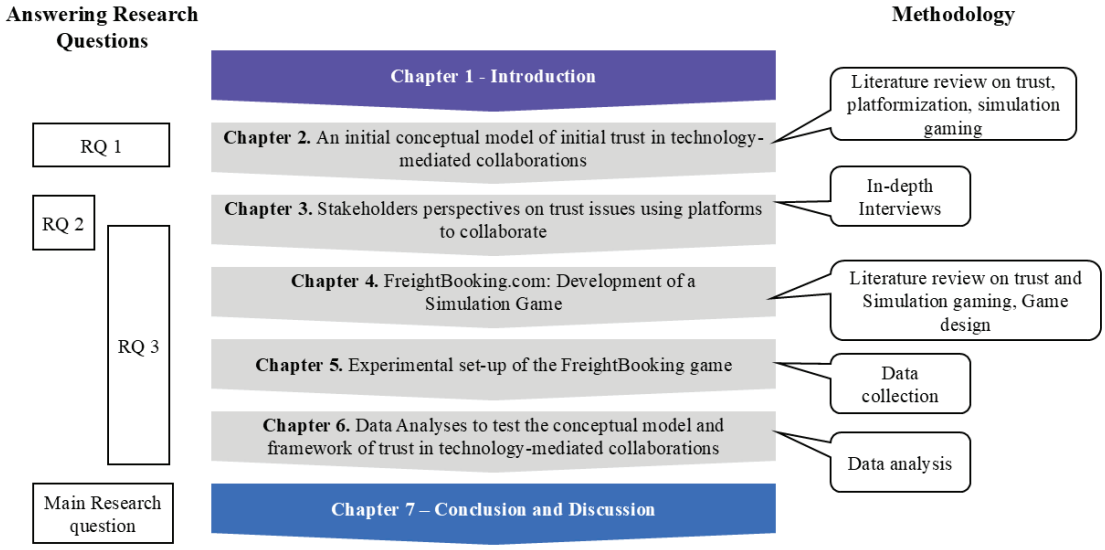


Figure 1.3. Thesis outline.

To gain an understanding of how trust can be defined, what elements of trust are, and how trust develops, a literature review is performed. Chapter 2 provides a general overview of trust, the definitions, the elements of trust, and which variables play a role when trust takes place in a collaboration. Based on the findings a conceptual model and framework are proposed to describe the relationship between trust and collaboration when platforms are used. The conceptual model and the framework developed in this chapter serve as a basis for developing the simulation game.

To back up insights from theory and to extend the limited amount of literature that is available on this topic, interviews are held with stakeholders, presented in Chapter 3. First, the interview protocol is discussed. After that, the results of the interviews are discussed. The chapter concludes with a summary of stakeholders' perspectives on trust issues when using platforms to collaborate.

Chapter 4 provides an elaboration on the use of simulation games as a research method. First, the theoretical background of simulation gaming is discussed. Subsequently, the design process is presented, where the variables included in the conceptual model and framework are translated to game mechanisms. The chapter concludes with the final design of the serious game FreightBooking.com that is used in this research.

Chapter 5 presents the experimental set-up. This chapter discusses how data is collected and the hypotheses that are defined based on the conceptual model and framework.

Chapter 6 presents the results obtained when using a simulation game as a research instrument. The analysis and results of each hypothesis are discussed. Additionally, a conclusion is given on every hypothesis of the conceptual model and framework.

Finally, Chapter 7 provides the discussion, conclusion, research limitations, and suggestion of an agenda for future research.

2

An initial conceptual model of initial trust in technology-mediated collaborations

This dissertation aims to provide insight into the role of trust when organizations use platforms to collaborate. As discussed in the introduction, the role of trust in technology-mediated collaborations is not explored extensively. A shift in collaboration may occur, where in a traditional setting, organizations have a one-to-one collaboration, and with platforms, this can be one-to-many. The main goal of this chapter is to define trust, to understand how trust is built, and under which circumstances trust is built in technology-mediated collaborations.

The chapter is structured as follows. Section 2.1. sketches the background of trust in technology-mediated collaborations. Subsequently, a systematic literature review is conducted to provide a better insight into this complex construct and to discuss how trust is developed in inter-organizational collaborations from a social perspective and a technological perspective (section 2.2.). In section 2.3., we propose a conceptual model, grounded on previous studies, that explains the relation between initial trust, information, and inter-organizational collaboration. Since organizations in the transport and logistics sector operate in a supply chain, contextual factors, such as the duration of the collaboration and the relationship that an organization has with another organization, are also important. In section 2.4. a conceptual framework is presented that supports the conceptual model. Finally, in section 2.5. a synthesis is given.

2.1. Background

When organizations are new to a market, aim at increasing their business reach, or are forced to look for new partners because of terminated contracts, new inter-organizational

collaborations have to be established. Developing trust is critical in these inter-organizational collaborations (Child, 2001; Cummings & Bromiley, 1996; Lewicki & Bunker, 1995; Ring & de Ven, 1994). Interorganizational collaboration is a process where organizations act together with a common goal, and share resources and know-how (Graham & Barter, 1999; Hardy, Phillips, & Lawrence, 2003). In the initial stages of inter-organizational collaborations, trust enables organizations to exchange information and ideas (Child, 2001) and to reduce uncertainties and risks (R. C. Mayer et al., 1995; Ring & Van De Ven, 1992). When establishing a new collaboration, an organization likely has very little to no information about the other party. Predicting the performance of a new partner and defining what to expect from the collaboration can be challenging.

Generally, trust in inter-organizational collaboration reduces transaction costs (Cummings & Bromiley, 1996; Ring & Van De Ven, 1992) and increases flexibility (Jeffries & Reed, 2000), for example, in reacting or adjusting to new circumstances. Building trust is an intricate process (Lewicki & Bunker, 1995), and with the increasing embedding of technological innovations in inter-organizational collaborations (Gal, Blegind Jensen, & Lyytinen, 2014; Zand, 1972), the development of initial trust is essential (McKnight et al., 1998).

Technology plays an increasing role in inter-organizational collaboration and can positively and negatively affect collaboration. An example of a technological innovation that mediates collaboration is the smart contract. Smart contracts resemble traditional contracts. However, they automatically execute an established agreement, cutting out an intermediate organization such as a bank in the traditional setting (Tapscott & Tapscott, 2017). While such an innovative form of contracting comes with certain advantages, a trusted mediator such as a bank does not exist in this inter-organizational collaboration anymore, and organizations have to make their assumptions about the other party's reputation and financial status. Technological innovations such as smart contracts allow an organization to collaborate with a large pool of potential (new) parties remotely (Kaplan & Sawhney, 2000; McKnight et al., 1998; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007), but in an impersonal environment (Pavlou, 2002). Organizations may seek other assurances to understand another party's intentions, such as reputation mechanisms or institutional arrangements (Child, 2001; Gulati & Nickerson, 2008). Assurances are designed for specific settings, and an organization needs to know how to make use of these (Riegelsberger et al., 2005). Through these assurances, a trusted online environment is created, but assurances can also be used to, for instance, remove organizations or deny access to the online environment (Pavlou, 2002). For organizations, overseeing all possible outcomes, uncertainties, and risks involved is challenging, i.e., predicting the expected gains and losses when entering a collaboration. In the initial stage, no information is available based on prior experience (Jarvenpaa, Knoll, & Leidner, 1998; Riegelsberger et al., 2005). Trust is vital because, in this stage, uncertainties and risks emerge (Riegelsberger et al., 2005), e.g., an organization may not state its true identity. In non-digital collaborations, organizations could identify and interpret the motives and behavior of the other party, while in collaborations that are established digitally, the interpretation of behavior is challenging, and organizations need to identify based on given information instead of human observation. Therefore, the "leap of faith" (Lewis & Weigert, 1985) plays a role when an organization has the intention to collaborate. This "leap of faith', or the willingness to take a risk, requires trust (Bachmann &

Zaheer, 2008; Lewis & Weigert, 1985). With the abovementioned developments, establishing new collaborations through technological innovations comes with advantages and new challenges, making initial trust in technology-mediated collaboration a vital asset.

When looking into literature on the role of trust in new inter-organizational collaborations, the majority of studies discuss how initial trust in collaborations is developed, what the attributes are, and how it relates to structural assurances (Cummings & Bromiley, 1996; Lewicki & Bunker, 1995; McKnight et al., 1998; Pavlou, 2002). There is only a limited number of studies that aim to explore the role of trust in technology-mediated collaborations. Yet, with the increasing permeation of technological innovations in inter-organizational collaborations, it is crucial to identify the relations between trust, information, and the inter-organizational collaboration itself. To address the role of trust in the initial time frame of interorganizational collaboration supported by technological innovations, we define the following research question (a) *Which concepts play an important role in developing trust when entering an interorganizational collaboration with another organization*? Since we look at the initial time frame of collaboration, it is also important to better understand which actions related to building trust need to be undertaken by an organization in the initial phase. Therefore, the second research question is defined as (b*) Which actions should organizations undertake, under which circumstances, to increase their trust level in other organizations when they are intending to collaborate?*

2.2. Initial trust formation in inter-organizational collaborations

Trust is a multidimensional, context-dependent phenomenon that occurs in different interactions and evolves over time (Bachmann, 2001; Lewicki & Bunker, 1995; Lewis & Weigert, 1985; R. C. Mayer et al., 1995). In interorganizational collaborations supported by technological innovations, multiple types of trust can be distinguished. For example, on a personal level (Deutsch, 1958; Rotter, 1967; Williams, 2001), organizational level (Cummings & Bromiley, 1996; Mcallister, 1995; McEvily, Perrone, & Zaheer, 2003; Zaheer et al., 1998), institutional level (Zucker, 1986) and system level (Luhmann, 1979). These studies define trust from different theoretical backgrounds and consider expectancy or belief as a vital value related to trust (see Appendix A, Table A1, and Table A2). To give a few examples of trust definitions: "an individual's belief or a common belief among a group of individuals that another individual or group (a) makes good-faith efforts to behave in accordance with any commitments both explicit or implicit, (b) is honest in whatever negotiations preceded such commitments and (c) does not take excessive advantage of another even when the opportunity is available" (Cummings & Bromiley, 1996, p. 303), "*the perceived credibility and benevolence of a target of trust*" (Doney & Cannon, 1996, p. 36), "*confident positive expectations regarding another's conduct*" (Lewicki, McAllister & Bies, 1998, p. 439), "*a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another*" (Rousseau, Sitkin, Burt & Camerer, 1998 p. 395), "*expectation that an actor can be relied on to fulfill obligations, will behave in a predictable manner, and will act and negotiate fairly when the possibility for opportunism is present*" (Zaheer et al., 1998, p. 143). Derived from these definitions, the expectancy or belief of actors is mostly based on

components such as motives, reliability, and fairness, and commonly center around the future behavior of another party. However, there are several nuances between the different definitions. For example, Rousseau et al. (1998) approaches trust from a psychological perspective, referring to trust as a '*psychological state*', whereas Zaheer et al. (1998) adopts a more collective view on trust. Table A3 and Table A4 (Appendix A) illustrate how the components, aspects, and values of expectancy or belief are conceptualized in related literature from a social perspective (Table A3) and a technological perspective (Table A4). Trust in a technological environment is mostly based on behavioral and cognitive components, whereas in a social environment trust is also based on emotional components. In technology-mediated collaborations, personal contact is present to a lesser extent or is even completely absent (Ratnasingam, 2005). Because face-to-face contact in digital collaboration is almost non-existent, organizations have a challenge in identifying the behavior and motives of another actor. In this paper, we use the trust definition proposed by (Zaheer et al., 1998) who define trust as "t*he expectation that an actor can be relied on to fulfill obligations, will behave in a predictable manner, and will act and negotiate fairly when the possibility for opportunism is present*" (Zaheer et al., 1998, p. 143). This definition provides a clear conceptualization of trust that recognizes the opportunity of deceit.

Initial trust is built through several processes. One important process to develop initial trust is the calculative process (Child, 2001; Doney & Cannon, 1996; Lewicki & Bunker, 1995). Calculations allow an organization to make a trade-off between the gains and losses of entering a collaboration (Child, 2001; Lewicki & Bunker, 1995). For example, on a freight exchange platform, a logistics company (the trustor) considers collaboration with a transport provider (the trustee) for a shipment. The logistics company (the trustor) must make a trade-off between the expected quality of service, such as reliability, and the associated costs. This evaluation involves comparing multiple organizations and is influenced by perceived risks. In this context, trust plays a critical role in determining with which organization to collaborate. In addition to the calculative process, trust is also developed through an actor's interpretation and prediction of the other party's behavior or ability to fulfill the agreements (Doney & Cannon, 1996). Technological innovations often create an impersonal environment where it is more difficult for an organization to assess the risks and uncertainties when starting a collaboration (McKnight, Choudhury, & Kacmar, 2002). For instance, when engaging in a contract via a freight exchange platform, the other party's behavior is unobservable, which causes perceived risks for the organization. The technological platform can include safeguards, such as reputation scoring, to reduce these risks and get a better understanding of the intentions of the other party (Child, 2001; Gulati & Nickerson, 2008; McKnight et al., 1998; Zucker, 1986). For this to work, the actor must have trust in the functioning of the technological infrastructure (McKnight et al., 2002; Riegelsberger et al., 2005), asking for institutional structures so organizations know-how, for instance, a reputation score is calculated. These safeguards and institutional structures will be beneficial for the predictability of another party (Doney & Cannon, 1996; Lewicki & Bunker, 1995) since information on prior experience is non-existent or limited. Still, information from an organization's experiences is considered more valuable than second-hand information (Lewicki & Bunker, 1995). In technology-mediated collaborations, it is difficult for organizations to verify the digitally provided information. This

is exacerbated by opportunistic behavior such as adjusted informationn, e.g., buying positive feedback or incentivizing others to provide positive ratings. This demonstrates the importance of trust in the initial stage of collaboration and the value of the provided information and the institutional structures within technological innovation.

2.3. A model of initial trust in technology-mediated collaborations

Collaborating through technological innovations poses certain risks and uncertainties. For example, when collaborating through a freight exchange platform, organizations must establish mutual trust using the platform itself rather than the traditional way where, for example, intermediaries are hired to build trust between parties. Organizations may need to share information in an impersonal environment that is accessible to multiple organizations. This allows other parties to use this information unintendedly, such as trying to get price information from competitors. Additionally, an organization may face the risk that another organization misrepresents itself or provides outdated information. Organizations need to rely on the system to support the interactions in the way that was intended. In the face of risks and uncertainties that arise with technological innovations, trust is especially important. There is a risk that an actor takes advantage of or abuses an actor's expectation because the platform hides the actual behavior. Trusting another organization is also causing risk (Luhmann, 1979). For instance, an organization, when using a platform, cannot oversee and incorporate all future outcomes when trusting another party. Since technological innovations make it more difficult to assess an organization's behavior and motives "in person," acquiring information on the other party is important for organizations to form a realistic expectation of their behavior. The choice and willingness of an organization to collaborate with another organization are, therefore, mainly influenced by information, such as expertise to fulfill a certain task, to provide reliable services, or the quality of the service. Through information, an organization is not only able to find out more about the other party, but it also provides the ability to assess the other party (Child, 2001). Against this background, a conceptual model is constructed that clarifies the relationship between trust, collaboration, and information (Figure 2.4).

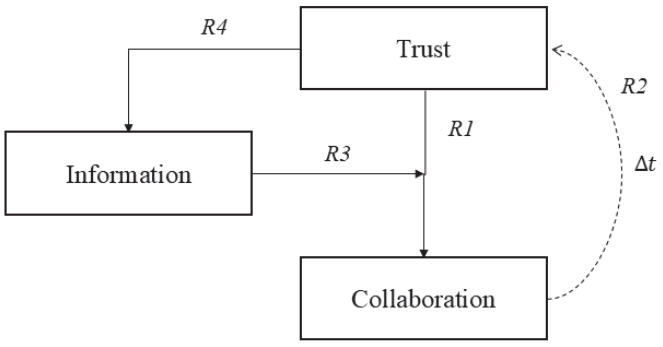


Figure 2.4. A conceptual model of inter-organizational trust in a complex, socio-technical system, from the viewpoint of the trustor.

2.3.1. Trust

Trust is an important social mechanism for dealing with complexity (Bachmann, 2001; Luhmann, 1979). In the case of establishing new collaborations through technological innovations, uncertainties and risks arise that cannot be fully predicted or calculated. Although contracts as governance mechanisms can reduce complexity, trust, in the sense of a relational mechanism, is also important (Lumineau, 2017). Contracts allow organizations to establish, in advance, agreements that provide organizations a safeguard for possible opportunistic behavior (Lumineau, 2017). Yet, predicting the actions of other organizations is challenging because organizations have interdependencies (Bachmann & Zaheer, 2008). Developing contracts that constitute all possible future actions and contingencies is impossible (Gulati & Nickerson, 2008; Lewis & Weigert, 1985). It is rather difficult to "proceduralize operations" (Rouse, Cannon-Bowers, & Salas, 1992). Trust allows organizations to make quick calculations (Riegelsberger et al., 2005) and come to agreements because organizations that trust each other are more likely to reach a consensus (Zaheer et al., 1998). Organizations can underpin their expectations with cognitive and behavioral aspects, which allows them to require fewer details in contract negotiations.

Against this background, trust is an important mechanism for reducing complexity and to foster collaboration when using technological innovations (Dodgson, 1994; Hardwick, Anderson, & Cruickshank, 2013; Hattori & Lapidus, 2004; Powell, Koput, & Smith-doerr, 1996). This explains the first relation in Figure 2.4, the one between trust and collaboration, which we formulate as:

R1 (Relation 1): In a given context, the higher the trust in another actor, the higher the willingness to collaborate.

2.3.2. Collaboration

Collaboration is beneficial for organizations since it enables organizations to (1) improve services and products, (2) reduce costs and risk (e.g., organization pool resources), and (3) deal with complexity (Dodgson, 1994). Subsequently, collaboration benefits the innovation process (Teece, 1992), improves decision-making (Patel, Pettitt, & Wilson, 2012)and creates a competitive advantage (Barney & Hansen, 1994). An example of a collaboration is when two organizations agree that one will transport goods on behalf of the other under the agreed conditions. The exchange of services may be short-term and can be defined as a transaction, but it can also be interpreted as a form of collaboration, given that it still entails certain risks. Although collaboration benefits organizations, it is also challenging since each organization has its own objectives and interests. Trust and information are needed in the initial stage of a collaboration to align the different objectives and interests.

When collaborating, information is transferred, and experiences are gathered. As trust evolves over time (Lewis & Weigert, 1985; Spekman & Davis, 2004), repeated interactions allow organizations to establish their trust based on the acts of the other organization. These direct experiences are valuable for an organization. Using past experiences, organizations can evaluate other organizations on their reliability, fulfillment of obligations, and opportunistic behavior. Information based on past experiences is considered more valuable than receiving

information from other (trusted) parties (Granovetter, 1985; Vanneste, Puranam, & Kretschmer, 2014). Interacting, i.e., getting experience with another organization, allows organizations to identify with others (Lewicki & Bunker, 1995; Vanneste et al., 2014). Organization A knows what organization B needs and prefers, and vice versa. Thus, utilizing experience, organizations can verify the expectations that they had for the collaboration.

In summary, the relationship between inter-organizational trust and collaboration is bilateral; trust is key for successful inter-organizational collaboration (Connelly, Crook, Combs, Ketchen Jr., & Aguinis, 2015; Woolthuis, Hillebrand, & Nooteboom, 2005), and organizations built their trust on the experience (Bachmann & Zaheer, 2008). Relation 2 in Figure 2.4 shows how collaboration affects trust, which can be formulated as:

R2 (Relation 2): Repeated collaboration influences the trust level of an actor.

2.3.3. Information

Information is important for organizations in the initial stage of a collaboration supported by technological innovations, especially when there is no prior experience with the other organization. Acquiring information on another organization is beneficial as it creates a competitive advantage (Dyer & Singh, 1998). Information is also important for an organization's coordination (Lee, Padmanabhan, & Whang, 1997). It enables organizations to formalize their internal procedures and react to system changes. Finally, information allows organizations to predict possible outcomes of actions in a collaboration. This predictability contributes to the trust level (Doney & Cannon, 1996) since information is needed to get realistic expectations about the other organization and the collaboration itself (McKnight et al., 2002). Based on the studies above, information can be used for coordination and to gain more insight into the other party. For example, when using a platform to buy services or goods, an organization can not only check the price of the service or goods but also learn more about the organization behind the services or offered goods.

In the conceptual model in Figure 2.4, information plays a dual role: (1) information that moderates the choice for the party to collaborate with is based on operational information (e.g., ability to produce or deliver a product or service). This information moderates trust on a cognitive level. It will influence an organization's cognitive trust (*R3*). (2) The trust level of an actor influences the request of strategic information about the other organization (e.g., the other organizations' credibility) (*R4*). Here, information represents an organization's credibility, including whether an organization has the institutional arrangements to collaborate. Strategic information is important for an organization because it will give insights into the reputation of the other organization (Lewicki & Bunker, 1995) and what reputation is based on (Fombrun & Shanley, 1990). These relations can be formulated as:

R3 (Relation 3): having more information influences the willingness to collaborate.

And

R4 (Relation 4): The lower the level of trust, the higher the request for information of an actor is.

2.4. Initial trust, information, and technology-mediated collaboration: A conceptual framework

Technological innovations can provide organizations with a broad landscape of potential partners to collaborate in the long or short term. For instance, with the increasing use of the spot-buy market, organizations tend to rely more on short-term collaboration nowadays (Kaplan & Sawhney, 2000), where goods or services are bought on an ad-hoc or immediate basis rather than long-term contracts.

An aspect that plays a role in the information needed for establishing initial trust is the expected duration of the collaboration. A higher level of trust is usually required to commit to a longer-term collaboration. In contrast, an ad hoc collaboration, e.g., in an exceptional or emergency situation, could be set up without going through a lengthy information-gathering process. Organizations trading on the spot-buy market through a trading platform need some assurances on the delivery of the right goods or services (as a buyer) or timely payment (as a seller) but do not need to make a complete strategic profile of the partner they are trading with. When deciding whether to establish a short or long-term collaboration, it is also important for an organization to assess the possible risks of initiating a (short- or long-term) collaboration. These can be risks that can harm the organization itself, such as not being paid for services. Still, it can also damage a relationship with a stakeholder, for example, not being able to deliver your service to your customer when the collaboration with the hired subcontractor fails. In this case, trust plays a role between two organizations and between an organization and its stakeholders (Pirson & Malhotra, 2011).

Pirson & Malhotra (2011) discussed that a stakeholder's relationship with an organization (e.g., employee or other organization) is based on the strength of the ties and the stakeholder's position or power. When an organization wants to engage in a collaboration, the relationship that the organization has with its stakeholders plays a role (Graham & Barter, 1999). Stakeholders have different traits, e.g., they vary in power, provided information, and available resources, influencing the collaboration. In other words, the perceived value of the relationship between an organization and its stakeholders is also present in technology-mediated collaborations. For instance, if an organization cannot meet the delivery conditions due to a disruption in the network, this can not only cause a low reputation score but also result in losing a client. We define the value of the relationship as the value of the transaction plus the risk of failure or damage that influences an organization's relationship with its stakeholders. To illustrate this, assume that manufacturer M provides a product to one of its most important customer C. When M engages in a collaboration with a new supplier S of raw materials, two aspects influence the value of the collaboration with supplier S: (1) the value of the collaboration with S itself, e.g., high when S is unique or very cheap; and (2) the influence that (non) performance of the collaboration with S has on the ability to deliver products within the agreed contractual obligations to the important customer C. When S does, for instance, not supply materials with the required quality to M, M is not able to fulfill the requirements of its relation with customer C. This, in turn, increases the value of M's collaboration with supplier S. The collaboration may harm the organization itself or even the relation that the organization has with its stakeholders.

The value of the relationship plus the expected duration of the collaboration serves as a basis for an organization to determine whether or not to put extra effort into obtaining more operational or strategic information. When an organization seeks a long-term collaboration with a new partner, it tends to prioritize strategic information that helps build trust, such as the partner's reputation, creditworthiness, or reliability. In contrast, for a short-term collaboration, the emphasis often shifts toward operational information, for instance, payment terms or delivery schedules. That said, some degree of strategic insight remains relevant even in short-term collaborations, as organizations still want to know whom they are dealing with.

A framework has been constructed to understand the relationship between the expected duration of the collaboration and the perceived value of the relationship (Figure 2.5). In this framework, we assume that the trust level in the initial phase, when an organization wants to start a collaboration, depends on the actions an organization is willing to take when starting the collaboration. In the early phase of collaboration, actors base their trust on calculations, which is called calculative-based trust (Lewicki & Bunker, 1995). The expectation for the outcome of the collaboration can already be based on a limited amount of information. The option of no information is almost impossible (Lewicki, 2006), as by communicating, information and behaviors are exchanged (Watzlawick, Beavin, & Jackson, 1967). Even when an organization has a calculative-based trust towards another organization, the value of the relationship is still important. When an organization is willing to collaborate, only a limited amount of information and trust is available, i.e., a low information level and a low trust level (Figure 2.5, cell 1). At the initial stage of collaboration, the commitment is still loose, and it is not very risky to breach this commitment (Vanneste, 2016), i.e., there is no need for a high trust level or a large amount of information.

The value of the relationship is important when deciding with whom to collaborate. If the value of the relationship is low and the duration of the collaboration is short, an organization does not need to undertake additional effort to acquire information (Figure 2.5, cell 1). Yet, when the value of the relationship is important or the collaboration is intended to be long-term, actions are required. For instance, if it is a short-term collaboration with a high value in the relationship, increasing an organization's trust level (cell 2) is more important than increasing the information level. on the other hand, with the possibility of repeated collaboration and a high value of the relationship, the trust level is important, and organizations need to acquire information that increases their trust level (cell 3 in Figure 2.5; R4 in Figure 2.4).

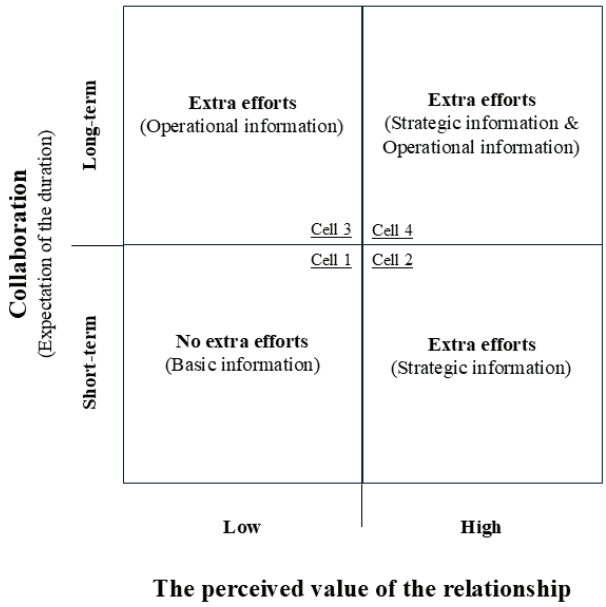


Figure 2.5. Types of information to gather that assure the right level of inter-organizational trust are dependent on the expected length of the collaboration and the perceived value of the relationship (R3 and R4 are explained in Figure 2.4).

To illustrate Figure 2.5 with an example, consider organization X which wants to ship goods to a hinterland location using trucks. Organization X does not have any experience in this sector and is faced with choosing among a multitude of trucking organizations to establish a collaboration with. The decision with whom to collaborate is influenced by the duration of the collaboration plus the value of the relationship. For example, suppose organization X has a less important client for which it needs to establish a short-term collaboration. In that case, organization X may decide that no further actions are required (cell 1). The information acquired through technological innovation, such as a freight exchange platform, will then be sufficient to establish a collaboration. Yet, suppose an organization has a strong tie with its client and does not want to face the risk of losing the client. In that case, an organization may decide to invest in acquiring more information to increase the trust level in a party providing a service for that client. Against this background, organization X determines, based on the value of the relationship and the type of collaboration, which extra efforts need to be taken. Thus, it will try to improve the information level by obtaining strategic, operational, or both information types before the actual collaboration is effectuated. While the conceptual model in Figure 2.4 shows the relations between inter-organizational trust, information, and collaboration, the framework in Figure 2.5 provides insights into which actions organizations need to take in the initial phase of a collaboration based on two important contextual factors.

2.5. Conclusion

Organizations implement technological innovations to gain competitive advantages (Thatcher, McKnight, Baker, Erg, & Roberts, 2011; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007). To understand which role trust plays in collaborations mediated by technological innovations, we defined two research questions at the beginning of this paper: (a) *Which concepts play an important role in developing trust when entering an inter-organizational collaboration with another organization*? And (b) *Under which circumstances should organizations undertake which actions to increase their trust level in other organizations when they intend to collaborate?*

The initial conceptual model explains the role of initial trust in inter-organizational collaborations enabled by technological innovations. The relation between information provided through technological innovations and initial trust is central to this model. While initiating new collaborations, information influences (1) the willingness to collaborate and (2) the initial trust in the other party. The information allows organizations to form their expectations of the other party (McKnight et al., 2002) and serves as a predictor for the success of a newly established collaboration (Doney & Cannon, 1996; Lewicki & Bunker, 1995). Yet, the information provided by technological innovations also steers organizations' intention to collaborate. For example, based on search criteria, a trading platform can offer alternative (new) partners with whom to work.

Additionally, in the initial stage, there is no or limited prior experience with an organization. In this case, the information provided through the platform is likely to be second-hand information (McKnight et al., 1998), e.g., reputation scoring or quality of service. Although the information provides insights for an organization, it also creates a risk and uncertainty regarding whether or not this information is valid. The rise of technological innovations changes the way businesses collaborate, such as cutting out a trusted third-party (Tapscott & Tapscott, 2017). Therefore, in the initial phase of collaboration, organizations need to establish mutual trust based on information quickly. The relationship between trust and information is vital in the initial collaboration stage supported by technological innovations.

The initial conceptual model explains the relation between initial trust, information, and collaboration supported by technological innovations. Whether to undertake extra efforts to acquire additional information is based on (1) the perceived value of the relationship and (2) the duration of the collaboration. Therefore, the initial conceptual model has been extended with a framework where the trade-off between operational information and strategic information is made more explicit. This initial framework helps organizations consider which efforts need to be made when an organization intends to collaborate with another party. These considerations are important since organizations are becoming increasingly interconnected and operate in socio-technical systems (Melese, Stikkelman, & Herder, 2016).

Additionally, technological innovations allow organizations to establish collaborations on short notice (Kaplan & Sawhney, 2000). The proposed framework explains the relation of two factors that play a vital role in the initial stage of technology-mediated collaboration. The combination of these factors (i.e., the perceived value of the relationship and the duration of

the collaboration) informs an organization of the information it needs to start acquiring to support the trust-building process.

This chapter presents an initial conceptual model and framework to integrate different aspects related to trust in the initial stage of technology-mediated collaborations supported by technological innovations. The conceptual model helps scholars and practitioners understand how strategic or operational information influences trust in the initial stage of inter-organizational collaborations. Additionally, the framework brings together two factors, the duration of the collaboration and the perceived value of the relationship, that play a major role during the initial phase of collaboration. By combining these two variables, the framework clarifies which efforts organizations need to make during the initial stages of technology-mediated collaboration.

Digital platforms are on the rise in the transport and logistics sector. This chapter approached trust from a broad field of disciplines to better grasp the concept concerning technological innovations. Together with the in-depth interviews, the initial conceptual model and framework provide context about trust, information, and collaboration in relation to platforms. The literature review and interviews provide a system analysis of trust issues arising when organizations use platforms to collaborate. Chapter 3 will give insights into the stakeholder perceptions of trust in platforms. The combination of a literature review and stakeholder interviews provides rich system information. A systems analysis is helpful since information is collected and relevant models and concepts are found that can be of input for the game design process (Geurts et al., 2007).

3

Stakeholders perspectives on trust issues using platforms to collaborate

Interviews are held to understand the relations of trust, collaboration, and information while using platforms in the transport and logistics sector context. Interviews are a useful method to get insights into stakeholders' perspectives on platformization in the transport and logistics sector. This chapter's main goal is to understand the stakeholders' perspectives on trust issues when using platforms such as bookings platforms. To understand what trust issues may arise when organizations collaborate through a platform, we define the following research question central in this chapter: *What are platform users' perspectives on trust when collaborating through a platform in the transport & logistics sector?*

This research explores trust issues when organizations collaborate through technological innovations such as platforms. In this research, platforms are viewed from a non-technical perspective, yet we do take into account the relationship between trust in technology and trust in the other organizations on the platform. Section 3.1. describes the interview approach and methodological analysis. The results of the interviews are discussed in section 3.2. Concluding with a discussion of the findings in section 3.3. and 3.4.

3.1. Methodology

To explore trust issues in inter-organizational collaboration using platforms, in-depth interviews with platform organizations and users are held within the context of increased usage of platforms in logistics. In-depth interviews are a valuable method to explore a topic in more depth and provide insights into the thoughts and behaviors of stakeholders (Boyce & Neale, 2006). While in-depth interviews provide valuable detailed information, there are also a few limitations. Interviews give insight into the thoughts and behavior of stakeholders on a specific

topic, yet the response of the interviewee can be biased (Boyce & Neale, 2006). For instance, with the rise of platforms in the transport and logistics sector, specific stakeholders can have negative feelings towards these technologies since they can impact their businesses. Besides the stakeholder biases, results from the in-depth interviews are hard to generalize since small sample sizes are used (Boyce & Neale, 2006). However, conducting interviews is a suitable methodology to study a phenomenon in its empirical context (Szajnfarber & Gralla, 2017) and to capture all mechanisms of the impact of platforms and the role of trust in the transport and logistics sector.

The in-depth interviews were held between November 2020 – January 2021 and November 2021 – January 2022, with three representatives from the platform sector, one from the barge industry, two from the carrier industry, and two from the shipper industry. The representatives were approached based on the criteria that they needed to use, whether they had used a platform in their businesses or whether they had a vision of the rise of platforms in the transport and logistics sector. Four of the interviews were drawn on a case that illustrates a platform where carriers and shippers can collaborate to ship goods to the hinterland via road transportation. The other five interviews were drawn on the broad development of platforms in the transport and logistics sector. Table 3.1 gives an overview of the respondents and their industry affiliation.

Table 3.1. List of respondents.

Interviewee no.	Type of Stakeholder	Position respondents
I1	Platform organization	CEO
I2	Platform organization	CEO
I3	Platform organization	Innovation consultant
I4	Barge industry	Supply chain engineer
I5	Carrier industry	CEO
I6	Carrier industry	CEO
I7	Shipper	Transport supervisor
I8	Shipper association	Project manager supply chain management
I9	Logistic service provider (multimodal)	Regional sales manager

The interviews were held by one author, through teams or via telephone, and lasted for at least 1 hour. The semi-structured interviews consisted of general and more in-depth questions based on the dimensions of trust, collaboration, and information (Table 3.2). One part of the interviews is focused on a specific platform, and the other is focused on the general development of platforms. The cases (i.e., example of platforms) underlying the interviews were related to the design of the game. Two interview guides were set up. The interview questions in both interview guides are aligned with each other. Yet, some questions were added based on the initial results of the first four interviews. See Appendix B for the interview guides.

Table 3.2. Interview topics and a selection of questions.

Topic	Question
General question	*What are the advantages of using a platform/platform X?*
General question	*What threats or disadvantages are associated with using a platform/platform X?*
Trust	*What does platform X do to be a trustworthy platform?*
Trust	*How do you search for a trusted party on platform X?*
Trust	*How does the trust a user has in a platform contribute to the trustworthiness of another user on the platform?*
Information	*What information are you prepared to share with platform X or with another organization?*
Collaboration	*What are the biggest threats and/or drawbacks when partnering with another party through a platform?*

The methodology used to analyze the interviews was based on the thematic analysis approach (Braun & Clarke, 2006). A thematic analysis is a suitable approach to identify, analyze, and report patterns within the dataset (Braun & Clarke, 2006). A thematic analysis was used since the interviews were the first step in exploring trust issues in technology-mediated collaborations. With 8 of the 9 representatives, it was agreed that the interviews would be recorded and transcribed. With one representative, no agreements were made. However, the representative agreed that the conversation was transcribed during the interview. The interviews were done via transcribing software. Transcribing the interviews is crucial since it familiarizes the researchers with the data (Braun & Clarke, 2006). For this reason, the transcripts were checked with the original audio recordings on accuracy and punctuation.

The interviews aim to retrieve insights into the stakeholders' perspectives on the role of trust when using a platform to collaborate. An inductive approach is used since it will provide rich details of the small sample size to which the coding is applied (Braun & Clarke, 2006). Of course, the analysis is not done in a vacuum since the interview questions were formulated around specific topics. To analyze the data, we used the coding software Atlas.ti (Atlas.ti, 2021). Before coding, the transcripts were re-read again in order to familiarize ourselves with the content. Coding was an iterative process where the first initial codes were applied to the data set. After generating the codes, the codes were re-read, evaluated, and adjusted. Subsequently, the final codes were grouped into themes. After generating the first themes, the themes were evaluated according to the coded data extracts. The process of analyzing the interviews is represented in Table 3.3. We know the sample size is limited, and possible themes may emerge based on one stakeholder perspective. Besides the in-depth interviews, we also draw on publicly available information.

Table 3.3. Phases of a thematic analysis.

Phase	Description
1	*Familiarizing with the data*
2	*Generating initial codes*
3	*Searching for themes*
4	*Reviewing themes*
5	*Defining and naming themes*
6	*Producing the report*

3.2. Results and findings

The results discussed in the following section address stakeholder perspectives on the role of trust when using a platform to collaborate. During the interviews, the respondents gave their perspectives on various platforms used or used in the transport and logistics sector. As discussed previously, part of the interviews was focused on (1) the general development of platforms in the transport and logistics sector and (2) a specific platform, *Platform P1*. During the interviews, interviewees discussed various platforms. Table 3.4 gives an overview of the platforms that were discussed with the interviewees and the characteristics of the different platforms. The tables shows with platforms (*Px*) are discussed with the different interviewees (*Ix*) and the last column shows the interviewees who use the platform in their business or operate the platform.

Table 3.4. Classifications of platforms discussed during the interviews.

Platform no.	**Classification***	**Focus***	***Discussed with interviewee***	***Users of a platform/Operate a platform***
P1	Transport management platform	Road transport	*I1, I2, I4, I5, I6, I7, I9*	*I1, I5, I6, I7, I9*
P2	Tool to enhance shipper cooperation	Container transport booking	*I8*	*I8*
P3	Transaction data exchange in port community	Port	*I3*	*I3*
P4	Platform for haulier collaboration for container reloads	Road transport	*I6*	*I6*
P5	Information sharing and collaboration across supply chain supported by blockhain	Port	*I2, I3, I9,I5*	
P6	Bookingplatform for container hinterland and interterminal transport	Port	*I4, I2*	
P7	Cloud-based software tool to enhance information and data sharing between supply chain partners	Port	*I2*	*I2*
P8	Marketplace for the European barge industry		*I4*	*I4*
P9	Platform for visualizing, measuring of CO2 performance		*I4*	
P10	Transport management platform for shippers, forwarders, carriers and retailers		*I4*	*I4*

**The classification of platforms is partially grounded on the classification described in Zomer & Zuidwijk, 2021*

From the thematic analysis of the interviews, certain themes could be defined: advantages/disadvantages and threats of platforms; collaboration; trust in the IT artifact and platform organization; trust in another company; distrust towards another organization and platform; and information and data sharing. To understand the context of platforms in the transport and logistics sector, first the development of platforms is discussed.

3.2.1. Platform development in the transport and logistic sector

When discussing the impact of platforms on the transport and logistics sector, the respondents gave valuable insights into digital developments, such as platforms. Various respondents discussed anticipating further digitization by applying API connections (i.e., a technical interface that enables different software applications to communicate and exchange data) with partners, implementing track and trace, and digitizing their services. *Respondent I4* and *Respondent I9* explained that the transport and logistics sector is moving. However, '*the conservative character is a disadvantage but offers many opportunities*. As illustrated by *Respondent I6,* platforms provide the opportunity, for instance, to improve terminal efficiency by coordinating time slots for carriers, which was in line with the perspective of *Respondent I2*. The rise of platforms also goes hand in hand with a certain distrust. According to *Respondent I9* and *Respondent I10,* the transport and logistics sector views the rise of platforms with some suspicion. According to the respondents, this is because organizations partially fear the rise of platforms. Organizations (e.g., terminals, carriers, shippers) are part of the supply chain. These organizations have a specific role and want to maintain their added value. An example of a platform where market organizations were hesitant was *Platform P6. Platform P6* can be seen, according to *Respondent I2,* as the booking.com of intermodal transport. *Respondent I2* explained that *Platform P6* was introduced too early in the market and that organizations were hesitant to use the platform. Organizations were afraid that *Platform P6* would take over their business. Stressed by *Respondent I2*: '*it is important that you respect each other's roles*'. As explained by *Respondent I5,* platforms have an impact on the carrier industry. Platforms take out certain links in the chain, benefiting the buying and selling parties. Every organization that is between the buying and selling party can experience disadvantages. However, *Respondent I5* commented that this is not new; the rise of the internet was also accompanied by change. Another part of the fear lies with the employees. *Respondent I4* explained that '*employees are afraid to lose their jobs.'* It is important to inform and educate people about technological developments, such as platforms. Although there is an increase in digitization and usage of platforms, employees will always be an important part of further digitization and platformization (*Respondent I4* and *Respondent I2*). This perspective was also in line with the perspective of *Respondent I9*: '*once employees start working with a platform, they get enthusiastic*'. Maintaining the human aspects was seen as an essential element by *Respondent I2*. For the use and further development of a platform, the human aspect is important since humans can oversee the data used, for example, in *Platform P11*.

According to *Respondent I3, 'storytelling towards platforms is not done well'*. Some organizations also benefit from fueling the distrust towards platforms (*Respondent I3*). Many organizations have their own interest in further digitization and platformization in the transport and logistics sector. Moreover, what *Respondent I3* sees is that *'people aggregate not against platforms, but the winner-takes-all principle*.' The term platform is contaminated by developments taking place in the B2C (e.g., Amazon). Subsequently, *Respondent I3* explained that it is interesting to see that there is fear towards platforms and organizations prefer to have on-plant software. Yet, as *Respondent I3* explained, *'maybe an on-plant software right now will be in the future a platform'.* This was also stressed by *Respondent I2.*

A commonly shared perspective among respondents was the future development of a platform ecosystem. One of the issues that *Respondent I9* raised was the fact that some platforms, such as *Platform P5,* more or less force parties to use their platform. This is viewed with certain

hesitation since (a) there is a commercial rationale for the platform organization, (b) the platform is not open for the entire market, and (c) it has no added value for the client since you only see options that are specifically from the organizations behind the platform. According to *Respondent I9,* you need to look at which large organizations are pushing which platform. The question then arises, *'Which platform will win?'*. However, according to two respondents from a platform organization (*Respondents I2 & I3*), there will be no situation where '*one platform to rule them all'.* Platforms that operate globally need to interact with a local platform: '*With the current and future technological developments, there will be multiple platforms that, at some point, will operate together' (Respondent I2)*. *'Local platforms know the local complexity and dynamics' (Respondent I3)*. According to *Respondent I6*, platforms in a future platform ecosystem will not change the entire market, such as the transport industry. This perspective is also in line with the views of *Respondents I4* and *I9*. These respondents explained that they have long-term relationships with specific customers supported by contracts. For them, customer relationships are still important. According to *Respondent I9,* the collaboration between some clients will change. In the future, smaller clients will not call every carrier to see if they have a spot available. These clients want to arrange their transport in a short amount of time. In this case, '*platform are there for the future' (Respondent I9)*.

3.2.2. Advantages and disadvantages of a booking platform

Several advantages, disadvantages, and threats emerged from the interviews. Partially, the stakeholders' perspectives were about the platforms' general pros, cons, and threats. An overview of the advantages, disadvantages, and threats is given in Table 3.5.

As explained above, some respondents saw the opportunities that platforms can offer. According to *Respondent I9,* platforms provide the possibility to increase the optimization of assets, and there is an increase in transparency. From the platform organization's perspective (*Respondent I1*), transparency is achieved since '*the contact is one-to-one, as a client you cannot accept orders, and as a carrier, you cannot move an order. Because of this, you leave out the intermediate parties.'* However, in some sectors of the transport and logistics sector, creating transparency can also be a disadvantage. *Respondent I4* explained that some parties, for instance, the barge industry, benefit from less transparency. Organizations are then afraid to share data because this can benefit the optimization of the supply chain. '*Some organizations benefit from certain inefficiencies'.*

When we look closely at *Platform P1,* the platform's advantages are mostly related to flexibility and collaboration possibilities. Flexibility refers to the way the platform can be used in a company's business processes. From a shipper perspective (*Respondent I7*), the platform provides opportunities to adjust processes based on market conditions (e.g., available capacity) where the shipper can find the right balance. The advantage of flexibility for the carrier lies in the ability to adjust to the company's requirements. Carriers can offer a quote to a shipper based on their available capacity (i.e., does the work fit me?) and can propose new tariffs on the platform (i.e., how much will it cost me to transport the goods?). One common shared advantage among all respondents (*Respondents I5, I6, I7*) was the no cure, no pay condition with *Platform P1*. Shippers and carriers do not need to pay if the platform does not provide a solution. For example, a shipper publishes a transport request. Based on the reactions from carriers, a shipper can choose whether or not they want to collaborate with one of these carriers. If there is no match, no payment is involved. *Platform P1* enables carriers and shippers to work with a lot of different companies. One of the carriers addressed that it allows a small company

to compete in the market and work with a large company where he would otherwise be too small. From the shipper's perspective (*Respondent I7*), it provides the advantage of communicating with many different parties at once; '*it allows for the simplification of contacting parties.'* While the platform offers advantages, the respondents also mentioned that the platform is mainly used to complement their existing work.

Besides the platform's advantages, the respondents also mentioned some disadvantages and threats. The platform's disadvantages are mainly related to possible uncertainties, tariff structures, and difficulties when collaborating. When using platforms, the respondents explained that uncertainties arise. From a shipper perspective (*Respondent I7*), the uncertainty is related to the available capacity of carriers on *Platform P1*. For example, when a deep-sea vessel arrives late in the port, the number of available carriers may be limited, resulting in a possibility that you cannot request services from a carrier or that the transport price goes up. From a carrier perspective (*Respondents I5 & I6*), the uncertainty is mainly related to a lack of transport certainty on *Platform P1*. One of the examples given by *Respondent I5* is that in a traditional setting, you, as a carrier know that you always need to transport the goods for your client on Friday because you have a long-term collaboration. However, when using a platform that can be used for short-term collaborations, this can change, and you are not sure that you will have work on Friday. As a result, you need to search for work, while in a traditional setting, you are confident that you have work. Another disadvantage that was shared from a carrier perspective was the tariff structure. On *Platform P1*, the shipper establishes the tariff. Carriers could react to this by accepting the tariff or proposing something else. From a carrier perspective *(Respondents I5 & I6*), this is a disadvantage because sometimes shippers suggest a low price to request transport, influencing the already low transport margins. Platforms allow and encourage organizations to collaborate and make relations more efficient (Song & Regan, 2001). However, *Respondents I5* and *I6* expressed that collaboration can also be hampered using *Platform P1*.

Communication with the other party can become more '*cumbersome*.' The respondents explained that in a traditional collaboration, you could communicate with your (long-term) client beforehand about how to fit the transport into the operational processes (i.e., does it fit in the carrier and client schedules?). *Respondent I6* explained that the relationship with a client is valuable. When using *Platform P1*, communication can become more difficult. You do not know with whom you are collaborating. For instance, in a traditional collaboration, you have one point of contact when there are transport issues. However, when using a platform, '*you will have to wait and see what type of company is behind the transport.'*

Table 3.5. Advantages, disadvantages, threats and added value when using a platform, seen from the trustor.

Advantages	Disadvantages/Threats*	Added value	Respondents
Optimalisation of assets			*I9*
Increasing transparency			*I9*
Decrease administrative burden	Creating a certain dependency	Supporting planners in decision-making	*I2*
		Increasing efficiency	*I1, I2, I3*
	Commerciality		*I9*
	Creating more transparency		*I4*
	Missing out on income		*I4*
Streamlining of information			*I3, I9*
		Bringing organizations together Increasing transparency	*I1*
Adjust processes based on market conditions (e.g., available capacity)	Uncertainty of available capacity of carriers	Reduction of the number of operation	*I7*
Simplification of contracting parties		Reduction of administrative burden	
Unburdening of transport			*I9, I1*
Offering services to the client			*I9*
Increasing returns			*I2, I6*
Ability to adjust to the company's requirements	Lack of transport capacity		*I5, I6*
	Tarrif structure		*I5, I6*
	Communication can become more cumbersome		*I5, I6*
	Do not know with whom you collaborating		*I6*
Small company to compete in the market and the ability to work with a large company			*I5, I9*
No cure, no pay principle	Customer expectations may change*		*I5, I6*
	Losing business		*I2, I5*
	Market breakdown*		*I5, I6*
Easy to work with the platform			*I7, I9*

Besides the disadvantages of *Platform P1*, the *Respondents I5* and *I6* also identified some *threats*. From the carrier perspective (*Respondent I6*), the rise of platforms in the transport and logistics sector poses the threat that customers' expectations may change. Customers' expectations might change because they notice that transport can be done for a lower price. Based on their experience, carriers will take up transport for an even lower price, a snowball effect can occur, and tariffs will become even lower, resulting in a market breakdown.

3.2.3. Technology-mediated collaborations by using platforms

Digital technologies are increasingly supporting collaboration between organizations. As illustrated by *Respondents I4* and *I9*, more and more digital links are being established between companies, slowly eliminating the traditional way of collaborating, such as the need for a call. With the rise of platforms, the way how organizations collaborate may shift. The traditional way of collaborating differs in some aspects from the digital way of collaborating. As explained by *Respondent I5*, in a traditional way of collaborating, you have more open communication with another organization. As an organization, you can make agreements on time slots and prices. For example, if a time slot does not fit in the operations, you can discuss other possible time slots with your client.

Another example is the discussion on price agreements. One trip may have a low margin, but another trip may have a higher margin. In a traditional way of collaborating, as an organization, you can discuss how organizations can bear the differences. '*With this kind of collaboration, it is possible, but not with a platform'.* However, as noted by *Respondent I5,* it depends also on the type of collaboration you have with your clients. This is also in line with the perspective of *Respondent I9*. There is a difference between large and small/ medium-sized companies. '*With large companies who are your clients, you have bilateral agreements.* As an organization, you will always deal with them bilaterally. However, for smaller companies, using a platform to collaborate can be beneficial. According to *Respondent I9*, smaller companies will not call every carrier to check whether or not they have capacity available. These companies want to see in a short amount of time which carrier is available for which price.

Using a platform to collaborate can be challenging. As illustrated by *Respondent I2,* the collaboration between organizations is challenging when using *Platform P11.* Collaboration is difficult to establish because organizations are afraid that other organizations can have a glimpse of their business operations or customer data can be accessed. Moreover, in technology-mediated collaborations, there is a risk of losing work. As explained by *Respondent I6*, collaboration can be challenging when using a platform, for instance, when organizations are using *Platform P4. Platform P4* enables carrier collaboration for container reloads. For example, a carrier needs to unload a Maersk container in Groningen, while another carrier must load a Maersk container in Zwolle. This platform suggests that the carriers connect with each other and 'reload' the Maersk container. Since two carriers need to collaborate: '*Carriers need to dare to exchange work*' (*Respondent I6*), certain risks are involved, such as the opportunity for carriers to go after each other's work because of the similarities between companies. According to *Respondent I6*, trust is especially important. This perspective is also shared by *Respondent I8* with an example of *Platform P2. Platform P2* is a matching platform where horizontal collaboration between shippers is encouraged.

3.2.4. The role of trust

Trust can play a role in a social environment (Lewis & Weigert, 1985; Zaheer et al., 1998) (e.g., shipper-carrier or shipper-platform organization) and in a technological environment (Pavlou, 2002; Ratnasingam, 2005) (e.g., shipper-IT artifact). *Respondent I4* explained that trust needs to be built. One way to do it is to *'to think along with your client and provide solutions'*. It is important to take into mind the interests of your client. This view was also in line with the perspective of *Respondent I2*. *Respondent I8* explained that having the same values as organizations helps to establish a certain level of trust between organizations. According to *Respondent I8,* conflicting interests can hamper a trusting relationship. For instance, with *Platform P2,* horizontal collaboration is supported. However, it would help if you had a certain level of trust through the same values and knowing the other parties who are part of the community.

As expressed by *Respondent I6* and *Respondent I8*, trust is important when you want to collaborate. If there is no trust, then collaboration between organizations will not happen. *Respondent I4* explained that in a traditional collaboration, building trust could be a long process where you have dinners to get to know each other and *'to see who is on the other side of the table'*. *Respondent I4* also shared the perspective that collaboration may change a bit because technologies will support future collaborations. However, as an organization, you still want supply reliability, especially for your contract work and, to some extent, spot work. Trust is a multidimensional concept. First, to understand how the stakeholders view trust in a technological and sociological environment, they provided insights into how they define trust. Table 3.6 gives an overview of the components of trust, as the results of the thematic analysis, in a technological and social environment expressed by the respondents.

Table 3.6. Components of trust in a technological and social environment.

Components of trust	**Components of trust in another organization**	**Components of trust in IT artifact (platform)**	**Components of trust in platform organization**
Normal payment behavior	The commitment of the stakeholder community	Proven services	Asking questions to a client
Honesty	Stakeholders that are part of the community	Connection with systems	Open for questions
Openness	Knowing each other	Data security	Knowledge about the market/sector
Transparency	Having the same values	Neutrality	No tampering with agreements
Transport security	Honesty	(Knowing) Community of users	Fulfill promises
Helping each other	Experience	Screening process	Clear storyline
Thinking along with the client	Knowledge about the market	(neutral) Payment structure (e.g., No cure, no pay)	Not creating a lock-in
Handle your clients' interests with care	Having business operations/processes in order	Privacy	Taking into account the interests of the stakeholders
Not behaving opportunistically	Intentions of other organizations	Goal of the platform	Neutrality
Supply reliability	Sensitivity checks	Anonymized data*	Professionalism**
	Information on background company	Working with established standards	Undertake action
	Second-hand information	Market functioning (i.e., platform does not have a steering function)	Provide support
	Aligns with other work	Equal conditions for stakeholders	Personal connection
	Predictability	Ownership of data	Behavior
		Way of using (i.e., functioning of system) Information provided on the platform	
		Experience	
		Provide solutions	

Components of a lack of trust towards the organization	Components of distrust toward the platform
Focus on costs and not on service	Malfunctions
Commercial talk	No tampering with agreements
Inadequate information sharing	Not having business operations in order
Problems with payment	Tariff
Cultural background of organization	
The role of the company in the supply chain (e.g., competitor,	

Based on thematic analysis, trust can be divided into trust in the IT artifact and platform organization and trust in the other organization that also uses the platform (see next two subsections).

Trust in the IT artifact and organization behind platform P1

According to *Respondent I1*, '*everything has to do with trust, especially the trust in the platform that it will provide a solution.'* During the interview, *Respondent I1* explained that trust regarding *Platform P1* is twofold: trust in the system, who we are, and how we act as an organization. The former trust is about the system's functioning, i.e., how does the platform work? What types of companies are part of the platform community? One of the comments made by a carrier was that the screening process is essential for *Platform P1*'s trustworthiness. Before a company can join *Platform P1*, the company is screened according to certain conditions. According to *Respondent I1*, it is '*to ensure that it runs smoothly, that the trust is there in platform P1.' Respondent I9* sees this as an essential condition, '*if there is a good thorough screening, then it is more likely that we will share data with that platform'.* A platform community can consist of organizations that are already an organization's clients. For instance, *Respondent I4* explained that they are now using *Platform P10* because one of their clients suggested it. Since this is a long-term client, the organization was willing to check out the platform. However, *Respondent I4* also noted that this was done since it was a long-term client.

Besides the screening process and user community, the experience that a respondent has with a system is also an important factor. A shared comment of the respondents on *Platform P1* was that they did not have any issues yet, the system is relatively easy to use, and the financial structure (payments are received on time) is in place. According to most of the respondents, having trust in the platform starts with having (a) neutrality, (b) (knowing) the community of users, and (c) a screening process. Neutrality is seen here as how the platform operates in the market. For example, *Respondent I9* sees *Platform P1* as a platform that is marketed neutrally. The market can still function, and the platform does not have a steering function. *Respondent I2* and *Respondent I3* also expressed that neutrality is essential for a platform: '*You need to let the customer-supplier relationship at work*'.

The latter trust (i.e., trust in the platform organization) describes the background of the platform organization and how the platform organization acts. *Respondent I1* explained that '*our background in logistics is very important for the trust aspect.'* The comparison was made between other sectors where the introduction of a platform can be quite disruptive, and the primary goal of a platform organization is to gain financially. First, however, you need to know what the problems are and which solutions you can offer. Understanding the sector is, therefore, essential.

Additionally, what *Platform P1* can offer (i.e., does it provide a solution to the problem?) and fulfillment of promises you made as a platform are also decisive for trust. *Respondent I1* explained that *'if you can only offer a solution once in ten times, then companies do not trust it, and they are not going to use it.'* Trust, in this case, has to deal with what you can offer and promise as a company, and it needs to be clear for companies that potentially will use the platform. Most respondents expressed that (a) openness and (b) knowledge about the market are important elements for having trust in the platform organization. As discussed previously, *Respondent I4* said they are working with *Platform P10*. An essential element to start working

with the platform was the fact that they understood the barge industry. The knowledge about the market was also important for users, *Respondent I7*, *I5*, and *I6*, of *Platform P1*.

Moreover, *Respondents I5*, *I6*, and *I7* also shared that behavior is important for trust in the platform organization of *Platform P1*. One of the shared comments of the interviewees was that they had a good personal connection with the people of the organization. This personal connection also contributed to the trustworthiness of the platform and the organization behind it. However, although there was a general trust towards the platform and the organization, one respondent also expressed a feeling of distrust toward the platform regarding the tariff structure (already discussed in the previous subsection).

Besides knowledge about the sector and behavior, the open character of the platform organization is important. According to *Respondent I4*, '*You can ask questions, but they also ask questions back. If they do that, you really have a feeling that they are working on it, that really gives you a bit of trust*'. As expressed by *Respondent I8*, when setting up a platform or adjusting your platform, starting that process with stakeholders who will use it is important. This open character was also seen as an important aspect by respondents of the platform organizations.

Subsequently, neutrality is also related to the organization behind the platform. *Respondent I9* explained that as soon as a commercial party is behind the platform, this could potentially damage the trust relationship. *Respondents I4* and *I8* also shared this perspective. Related to this is the sharing of information/data with the platform. As illustrated by *Respondent I2*, a trust issue may arise when a commercial party requests data. A large, international, commercial party is behind *Platform P5. S*haring specific data with this platform could provide an advantage for the organization behind the platform, for example, data about certain parts of the chain to adapt or expand their services. Moreover, with the introduction of *Platform P7,* there were certain challenges related to trust. *Platform P7* is a software tool that can be seen as a platform that uses cloud services to establish collaboration and increase data sharing between organizations. Trust issues emerge since data on the cloud can be stored in any location. As illustrated by *Respondent I2*, companies from Germany prefer the data to be stored on-site instead of on a server off-site. Primarily, there was a strong preference for the cloud provider not to be an American-based company. The underlying reason was that there was a fear that American authorities could request data. Data security was also crucial for building trust by *Respondent* I9.

Trust in another company

Besides the trust in the technology, trust from a social perspective was also discussed with the respondents. Different trust components are important when collaborating with another organization when using a platform. As expressed by *Respondent I6* and *Respondent I8*, trust is important when you want to collaborate. If there is no trust, then collaboration between organizations will not happen. *Respondent I4* explained that collaboration might change a bit because technologies will support future collaborations. Trust when collaborating with another organization supported by a platform is endorsed partly by the stakeholder community of the platform and stakeholder commitment. *Respondent I9* explained that they would base their decision on which organization is trustworthy on the platform on the stakeholder commitment. In other words, they would ask: who is part of the community? The stakeholder community of the platform is also a vital trust component. As expressed by *Respondent I4*, they use *Platform*

P8 because other organizations in the sector are using the platform. Besides the stakeholder commitment, the knowledge that an organization has about the market is also a decisive factor. If you do not know the organization, then you need to research the other organization as an organization. Besides knowing who is part of the community, shared values within the community can be helpful for the trust relation between organizations (*Respondent I8).* This view is in line with the perspective of *Respondent I2*. *Respondent I2* expressed that with *Platform P7*, companies who are '*natural friends'* can use the platform together. This helps the platform to be trustworthy. In the end, the client decides with whom to collaborate.

From a carrier perspective (*Respondents I5* & *I6*), trust in the other party, when using *Platform P1*, is predominantly based on operational aspects next to the feeling a person has towards a company or information on the platform. In other words, does the work fit into the carrier's processes? What is the tariff? And are the other party's processes and administration in order? Next to the operational aspects, the carriers discussed different factors that play a role when trusting another company. *Respondent I5* stated that sometimes the feeling you have towards a party does play a role, i.e., *'Do I feel comfortable collaborating with that party?*' *Respondent I6* expressed that trust is placed in another company because the platform screens companies that want to join the platform.

On *Platform P1*, certain information is provided by the shipper when publishing an order. This information describes, for instance, the location where to pick up and drop off the goods and the type of goods. A shared perspective of *Respondents I5* & *I6* was that limited information available on *Platform P1* (e.g., cargo description, loading location) already allows an organization to predict the company behind the transport request. However, it was also shared that you are never sure what the identity of a company is. The information that is visible to the shipper is the name of the carriers and a quality rating. From a shipper's perspective (*Respondent I7*), establishing trust in another organization on *Platform P1* is mainly based on personal knowledge or knowledge from the team with experience with a particular company. Trust issues arise when there is a '*gut feeling that something is not right*' based on the name of a carrier. For instance, through a Google search and personal knowledge of the carrier industry, the shipper lacked trust in a particular carrier. *Respondent I6* explained that untrustworthy organizations could be active on a platform, but this can also happen if you work with another company one-on-one. As an organization, you expect that another company has the right intentions. However, an employee may have bad intentions. One shared remark from respondents was the importance of experience when collaborating and trusting another party. When the experience left a negative feeling or expectations that weren't met, all respondents expressed that they most likely would not collaborate with that company again.

3.2.5. Distrust towards another organization and platform

Besides the trust components, several interviewees also expressed components of a lack of trust towards platforms or other organizations. A lack of trust in the platform can occur because of system failures. As expressed by *Respondent I3*, a lack of trust in a platform may arise when there are a lot of failures, and as a platform, you do not have your business operations in order. Then, you first need to win the organization's trust back and solve these failures. Besides platform failures, tariff structure can also raise the lack of trust in the platform. *Respondent I6* illustrated that, for instance, on *Platform P1*, a shipper can propose a tariff, knowing that the tariff is quite low and carriers cannot transport the goods for that amount of money. This has a negative impact on the transport sector.

The lack of trust in another organization is mostly based on the organization's behavior and role in the supply chain. An organization's behavior, such as commercial talk, payment failures, and a lack of information sharing, can raise the lack of trust in the organization. As explained by *Respondent I4*, if organizations have a commercial talk that is based on money, then the lack of trust towards that company will arise: '*The company is here to make money, not to help the sector, by for instance, optimizing the supply chain'*. Another important component of the lack of trust towards another company is the role of the specific organization; for example, is the company a freight forwarder or carrier? As explained by *Respondent I2*, there is a natural suspicion towards freight forwarders. As an organization, you must be aware of another organization's role. *Respondent I2* illustrated that *Platform P6* had issues because this platform wanted to take over the whole market. Then, hesitation arises because organizations fear a platform will take over their business.

3.2.6. Information and data sharing

When organizations use platforms, information and data sharing will also happen to establish a collaboration with another organization or even to use a platform. With the rise of technologies, such as platforms, the possibility of sharing data has arisen. Data sharing is not a new phenomenon. As explained by *Respondent I9*, organizations are already sharing data when sending an e-mail or through already established bilateral agreements. However, you must know with whom you share the data. As illustrated by *Respondent I2*, trust is vital in sharing data, which initiatives in the transport and logistics sector can support. However, it is important how data is secured. *Respondent I2* explained that companies are afraid that they may lose business.

For example, if the trustworthiness increases among organizations, it can have advantages for platforms. However, *Respondent I2* and *Respondent I3* noted that it is important that ownership of the data still lies with the customer. According to *Respondent I3*, *Platform P3* is very straightforward about this. They don't do anything with the client's data, which is one of the important elements for trust building in the platform. *Respondent I8* expressed that *Platform P2* secures data through the GDPR. With data sharing, tension arises where new services can be built with the data. For example, data for one manifest can also be used for a follow-up document. *Respondent I3* expressed that as a platform organization, you do not want to interfere in the client-supplier relationship, but with data sharing, new paradigms emerge.

3.3. Discussion

The interviews outlined the respondents' perspectives on the role of trust when using platforms to collaborate on a more general level and specifically for *Platform P1*. The findings reveal an interesting perspective on how stakeholders view the rise of platforms in the transport and logistics sector. Before the main findings are discussed, some remarks need to be made. The findings from the interviews focused on the situation in the Port of Rotterdam. Although the rise of platforms in the transport and logistics sector is a worldwide development, the role of trust is situation-specific. The study by Zaheer & Zaheer (2006) shows that trust's institutional and cultural bases differ among countries. The stakeholders who were interviewed were affiliated with companies located in the Netherlands. How these stakeholders view trust and its importance may differ from stakeholders from different countries.

The findings show insight into the multidimensionality of perspectives on platforms and the role of trust in the transportation and logistics domain. Below, the main observations from the interviews are highlighted that the respondents found important when collaborating with another party through a platform or with a platform:

- **Impact of platforms on the transport and logistics sector.** An interesting observation from the interviews is how the stakeholders view the rise of platforms and what a future platform ecosystem will look like. Although respondents also saw opportunities related to the platform rise, some concerns were raised. For example, the term platform is contaminated, and with some platforms, there is a commercial rationale from companies. Most respondents expressed that the rise of platforms will have an impact on the transport and logistics sector, but they do not foresee that it will impact contract work. It will mostly have an impact on the spot work.
- **Trust in the IT artifact and platform organization.** From the literature, we can understand that trust arises in both a technical environment and a social environment that is based on different components. From a technical perspective, trust is mainly about institutional structures and IT artifacts. The study of Ratnasingam (2005) shows that institutional structures help to build trust in another party. The respondents also expressed that the platform should be easy to use and that the data should be secured. However, in addition to the technological infrastructure, other components also help to build trust in the platform. An interesting finding is that trust in the platform organizations helps to establish trust in the IT artifact. The characteristics of how a platform organization behaves, e.g., asking questions, personal connection, and openness, can help to build trustworthiness in the IT artifact. The study by Zavolinka et al. (2020) discusses that information about the platform should be told in the right way. Besides telling the story right, platforms also have a coordinating function (Spagnoletti et al., 2015). According to the respondents, the platform's goal and the market's functioning are important to build trust. Therefore, it is important to be neutral as a platform.
- **Role of platform community.** A third interesting observation is the role of the platform community. The platform community can help to build trust in the platform. Organizations that are part of a company's network and already part of a platform community can also increase the platform's trustworthiness. As Lewicki and Bunker (1995) discussed, second-hand information and an organization's experience can be helpful for trust building. The platform community also helps build trust with other organizations on the platform. For the respondents, it gave information on which company is part of the community (i.e., is it a competitor? Do the organizations have the same values?).
- **Experience.** Finally, experience is important when collaborations are established through a platform. Repeated interactions allow organizations to build up information about another party. For example, is the organization reliable, and does the other party have the same values? Experience will provide an organization with valuable information about another party (Lewicki & Bunker, 1995; Vanneste et al., 2014). Stakeholders mentioned that experience is an important factor since it provides gut-feeling information on whether expectations can be met.

3.4. Conclusion

The stakeholder interviews provided valuable insights into the role of trust in technology-mediated collaborations, such as platforms. The abovementioned observations show that when using a platform to collaborate with another organization, trust emerges in three ways: trust in the technology, trust in the platform organization, and trust in another organization when using a platform. Based on the stakeholder interviews, we can conclude the following:

- Trust from a technological perspective cannot be separated from trust from a social perspective in technology-mediated collaborations;
- Experience will provide an organization with valuable (first-hand) information about another party since an organization knows what to expect from the other organization;
- Trust in another organization is not only influenced by the intentions and behavior of other organizations but also by the platform community.

The findings of the interviews also have several managerial implications. The interviews provide an overview of how stakeholders view trust and why it is important when using platforms. Several respondents indicated that trust is one of the principles for working with a platform organization and collaborating through a platform. With the increasing technologies in the sector, specific collaborations between organizations may change. A better understanding of the role of trust (towards technology and other organizations) may help understand these relational developments due to the rise of technologies between organizations. Combining the insights from the interviews and the structured literature review presented in Chapter 2 provides valuable input for the game design discussed in Chapter 4.

4

FreightBooking.com: Development of a simulation game

The stakeholder perspectives discussed in Chapter 3 gave an in-depth insight into the trust issues when using platforms to collaborate. In Chapter 2, a new conceptual model and framework were presented focused on trust in technology-mediated collaborations. Both these research results provide input for developing the serious game FreightBooking. Moreover, the simulation game is used as a research instrument to test the relations defined in the conceptual model and framework. Chapter 1 discusses simulation games as a research tool to study a social phenomenon. This chapter first provides a literature review on trust games to understand which game mechanisms can be used to create a trusted or distrust environment in a serious game. Subsequently, design choices are presented that serve as a starting point for the design of the FreightBooking game. This chapter's main goal is to better understand how the concept of trust is translated into a serious game. In this chapter, the research question is: *How can the conceptual model of trust in technology-mediated collaborations be assessed by using gaming simulation?* is answered.

First, the background on simulation games and trust is outlined (section 4.1.). As shown in Chapter 2, the concept of trust is a multidimensional concept that is described by components such as honesty and fulfilling obligations. How such components can be translated into game mechanisms is described in section 4.2. The game concept of the serious game FreightBooking.com is elaborated in section 4.3. In this section, we describe the functioning of FreightBooking.com and the most important game mechanisms. We conclude with the design of the game experiment in section 4.5.

Please find the set-up of the FreightBooking game here: 10.4121/f8fad6c0-86de-4e22-9214-0887e7314230

4.1. Simulation games and trust

How transport and logistics organizations collaborate supported by a platform can be complex. Each organization has its own interests. As discussed in Chapter 1, a platform environment where organizations interact can be described as a socio-technical system. The role of trust in collaboration in such systems can be challenging to assess and measure via a questionnaire or case study. Using novel technologies, simulation gaming can be used as a research instrument to understand how trust influences collaboration. Simulation games allow researchers to study social and dynamic phenomena in complex systems (Lukosch et al., 2018). Subsequently, simulation games enable researchers to study a complex phenomenon (Lukosch et al., 2018), such as trust. With a simulation game, a safe environment can be created where an experiment can be designed (Duke & Geurts, 2004), and trust issues may arise when players are collaborating mediated by a platform. For example, low or highly-trusted environments can be created where players must decide with whom to collaborate. Processes, actions, and decision-making processes can be translated into simulation games, which demonstrate consequences in the system (Kriz, 2003).

Trust has received attention from different disciplines, including the field of simulation gaming. To gain insight into different trust games, empirical studies, and grey literature are collected through SCOPUS and Google Scholar. Keywords were used in the search query to collect relevant studies. The keywords and Boolean operators used are: Trust, Serious game, Simulation game, and Trust game(s). The forward and backward approaches were applied to increase the number of relevant studies. The literature review was done in January – March 2019 and August – September 2022. In Table 4.7 an overview is given of different simulation games that study trust.

Most studies use the prisoner's dilemma as a gaming concept (See Table 4.7). The prisoner's dilemma is a game theory concept where a trusted and distrusted environment can be created. However, game theory differs from simulation gaming. According to Klabbers (2009), game-theoretic games are independent of the players who play them. The outcomes always lead to the same pay-off. Additionally, in simulation games, roles are used to enhance a player's creativity and imagination (Geurts et al., 2007). It reminds players that they are playing a game. Trust, as explained in Chapter 2, is quite complex when organizations collaborate through technology. It is influenced not only by information but also by the experience someone has when collaborating or the trust level of an individual. The prisoner's dilemma is about studying the lack of communication between individuals (Shubik, 1970). Moreover, according to Axelrod (1980), it is about the tensions between individual rationality and group rationality. For example, an individual can be selfish and get a higher pay-off or cooperate and have a lower pay-off. It is a simplification of human behavior. Therefore, to study the influence of trust on technology-mediated collaboration, the prisoner's dilemma is not a suitable theory.

Table 4.7. Overview of simulation games that address trust.

Study	Goal of the game	Theory/concepts	Mechanisms for an environment of trust-distrust
Berg et al., (1995)*	The investment game: to study trust and reciprocity in an investment settings	Prisoner's dilemma game	• Non-cooperative environment • Anonymity
Meijer et al., (2006)	Trust and Tracing game: Learn about the influence of social structures on transactions in a trade network	Netchains, governance mechanisms, value creation, social structure	• Cheating behavior is rewarded • Non-visible transactions • Misaligned information • Reputation
Ebner & Winkler (2008)	PASTA WARS: players can experience the key obstacles while cooperating	Four-way Prisoner's dilemma	• Role descriptions • No communication between participants • Single-player strategy
Oertig (2010)	Knowledge-sharing simulation game: players can experience the fragility of trust when sharing knowledge in a global virtual team	Prisoner's dilemma game	• Non-cooperative game • Company description • Conflicting goals • Reward system
Chetty et al. (2021)	The Trust game: to study the risk trust confound	Prisoner's dilemma game based on the trust game by Berg et al. (1995)	• Two environments, anonymity and recognition • Partially access to information (recognition environment) • Single player strategy

However, in the table above, the mechanisms for creating a trusting and distrusting environment are interesting. These studies provide insights into gaming mechanisms where trust issues may arise. From these studies, it can be learned that the information component is important in creating a trusted and distrusted environment. Misaligning information or limited communication can influence the trust level of players. As discussed in Chapter 2, information is an important variable since it can enhance the predictability and intentions of other actors (Doney & Cannon, 1996). When designing a serious game around trust, the information variable is important. Another important variable for designing a serious game around trust is reputation. The study by Meijer et al. (2006) uses reputation mechanisms to influence the trust level of players, for example, the identity labels that show the player's behavior. Reputation can be used as a mechanism to interpret the intentions of others (Child, 2001; Gulati & Nickerson, 2008). Another person's intentions can influence an individual's trust level towards the other person. Therefore, it is important to incorporate certain reputation mechanisms that give insight into another organization's behavioral actions. These abovementioned design choices from previous studies can be used in the design of the serious game FreightBooking.

4.2. Design process of the FreightBooking game

As discussed in Chapter 1, the game FreightBooking is used as a research instrument to study the influence of trust when organizations want to collaborate mediated through a platform. Simulation games are a suitable method to obtain data within a near realistic environment, represent a complex system, for replication of the experimental set-up, and are engaging (Deterding et al., 2015; Klabbers, 2009; Lukosch & Comes, 2019; Lukosch et al., 2018). Moreover, a game allows users to gain an understanding of the system and find new ways to explain the characteristics of behavior in a system (Klabbers, 2009; Lukosch et al., 2016). A simulation game as a research instrument must meet the purposes of the study (Klabbers, 2018). The game is a means to retrieve output to understand the influence of trust on technology-mediated collaborations.

To create a game that represents reality and meets the purpose of the research, the Triadic Game Design Approach is used. The Triadic Game Design approach comprises reality, meaning, and play. According to Harteveld (2011), the three components need to be well-balanced to develop a game. The reality component refers to the game's reference system in the real world and could represent the container transportation network. The component meaning refers to the purpose and strategy of the game and how it will be achieved (Harteveld, 2011). The aspects that need to be incorporated are communication, learning and rhetoric, and opinions (Kortmann & Harteveld, 2009). The third component of the triadic game design is play, which refers to the interactive and engaging character of simulation games and the challenges the players face during the game (Harteveld, 2011).

To use the simulation game as a research instrument, the FreightBooking game is developed as a one-player digital game. The in-game objective for the players is to match supply (i.e. client orders) and demand (i.e., quote offers of carriers). As explained earlier in Chapter 2, an impersonal environment can emerge when collaborating through technological innovations. It can be difficult for organizations to oversee all the risks and uncertainties. To develop trust, they must rely on institutional structures, safeguards, and information provided by technological innovation. Using a digital game allows the researchers to create already an impersonal environment where the players need to operate. Although its development is time-consuming and involves costs (Lukosch & Comes, 2019), it also provides opportunities to collect a rich data set. The players' decisions, for example, clicking on buttons in the game, can be registered. This allows us to analyze how the players behave and the decisions they make in the game. Moreover, developing a digital game ensures that the influence of the facilitator is limited and hampers the experimental biases.

To have a high level of fidelity, the gaming context represents a booking platform where players need to match demand with supply. As discussed in Chapter 3, platforms are rising in the transport and logistics sector. Moreover, platforms are also being used in everyday life, providing a recognizable element for the players. It is important that a game is recognizable and that players can relate to it, or else it is hard for meaning-making and for players to play the game (Harteveld, 2011). According to Klabbers (2018), when a game is used as a research instrument, it is important that the correct game mechanics are used to answer the research questions. To enhance the play element in the simulation game, the game is designed as a round-based game where the players need to match every transport demand, with different characteristics, with the most suitable option. For example, characteristics can be that a player

needs to transport goods for an important client. Based on the quotes a carrier receives, the player can choose the carrier most suitable to the transport demand. In other words, the most suitable option for the transport demand. The players must keep in mind the in-game objective because the player with the highest score is the winner because the player fulfills the transport demand the best. The player knows if it is doing a good job because per KPI (3 in total), a goal per KPI is set.

4.3. Design choices

Certain criteria must be considered to translate the world of reality, play, and meaning into a simulation game (Harteveld, 2011). The conceptual framework and model serve as the game's design basis. Table 4.8 gives an overview of the main variables of the conceptual framework and model translated into different game design choices.

The game represents a booking platform in the field of transport and logistics. Chapter 3 gave an overview of what transport and logistics sector stakeholders thought about platforms. During these interviews, stakeholders discussed different platforms. The stakeholders' explanation of how these platforms function provides great insights and inspiration for developing a simulation game. As *Respondent I1* discussed in Chapter 3, on platform P1, carriers can provide quotes based on the transport demands published on the platform. Based on the reactions of the carriers to the transport request, the shipper can decide with whom to collaborate. Figure 4.6 gives a simplified overview of a platform currently used in the transport and logistics field. This working principle is also translated, in a simplified way, into the FreightBooking game. Through this working principle, the players feel that it represents a realistic situation. However, the play element is added by adding scoring mechanisms, rules, and character descriptions.

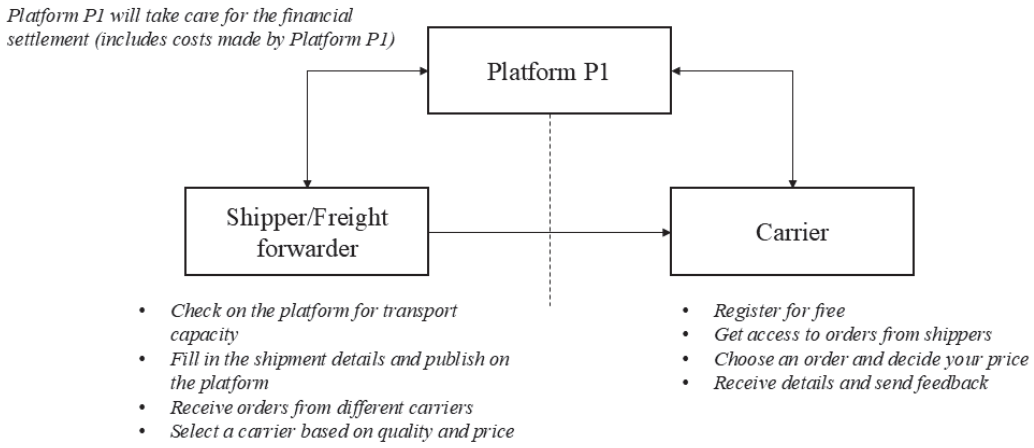


Figure 4.6. Working of the *Platform P1*.

Various platforms have different safeguards and institutional structures implemented to reduce uncertainty and create a better understanding of other intentions. Reputation is such a safeguard that is incorporated in various platforms. For example, Uber has a star rating to show the users the experience of other users with this driver. Such mechanisms can provide insights into the predictability of the other party and add to the trustworthiness of another organization.

The conceptual model explains the relationship between initial trust, information, and collaboration. The development of initial **trust** is important, and organizations are using more technological innovations to establish a collaboration. In Chapter 3, *Respondent I7* explained that on a platform, you can encounter new organizations with whom you do not have any collaborative experience. In that case, you need to search for information or other reassurances that you are dealing with a trustworthy organization. Therefore, in the game, in the first three rounds with the first three orders, 8 carriers will be introduced. After the third order, the carriers will re-appear again in the game. Moreover, information about the carrier is given via different information channels, such as the carrier's information page. Initial trust is translated through introducing new 'actors' in the game and the calculative process, such as the trade-off between gains and losses. In the game, a trade-off is designed between the price of the carrier and the profit a player can earn by a transport demand.

Information is another important variable in the conceptual model when organizations want to collaborate via technology. In the initial phase of a collaboration, information is limited when there is no prior experience. As discussed in Chapter 2, information has a dual role and can refer to operational information and strategic information. In the game, both these types of information are used. The strategic information, such as an organization's credibility, is incorporated in a report that players can buy. Clear ratings, such as sustainability ratings, visualize this type of information. In other words, how well is a specific carrier performing on sustainable transport? Operational information is translated in multiple ways, for example, by information that players can access on a fictitious Google page or the carrier website. Second-hand information, such as reviews, can provide insights into the predictability of an organization.

Subsequently, as expressed by *Respondent I7* in Chapter 3, looking for additional information, such as search hits on Google, is an effective way to acquire more information about another party. Moreover, this type of information is also incorporated in the transport outcome, i.e., are the goods delivered according to the conditions? Throughout the game, players also gain experience when collaborating with different carriers. This will also provide strategic information on the behavior of a carrier. Therefore, the carrier re-occur in the game. The more opportunistic carriers will occur a bit more than the trustworthy carriers. The assessment of the experience with the carriers is also given to the players. This is done so the players can have a logbook of their experience and provide first-hand information to the players.

The variable **collaboration** is a part of the conceptual model and framework. During a collaboration, information is transferred. In the game, during a collaboration, information is transferred through communication with the carrier. For example, communication is done via a transport message from the carrier, such as *'the transport order has been received'* or the experience a player will have with a carrier. Collaboration can also be characterized by long-term collaboration and short-term collaboration. As expressed by different respondents in Chapter 3, there are various types of collaborations with different types of clients. These types of collaborations are incorporated into the game through repeated and non-repeated orders. The difference in collaboration duration provides a certain weight to the transport order. The type of client also influences this behind the order. In other words, the perceived value of the relationship. Certain clients have many transport conditions and even pay fines if transport conditions are not met, while other clients have almost no transport conditions. The type of clients and the type of collaboration (e.g., short-term or long-term orders) are meant to ensure

players will behave and make different choices when transporting goods for a long-term or short-term order, depending on the type of client.

Table 4.8 shows how the variables from the conceptual model and framework were incorporated into the study. These variables are based on the literature reviewed in Chapter 2. In addition, insights from interviews with respondents were also taken into account. For example, the design of the game, a booking platform, was inspired by suggestions from the interviews. The same applies to specific variables, such as an information feature where players can view a Google-like page containing positive or negative reviews about a carrier.

Table 4.8. Translation of the variables of the conceptual model and framework in the FreightBooking game.

Based on	Variable	Game Design choice	Description
Interviews with stakeholders		Platform as the context of the game	Designed as a booking platform where players need to match demand and supply in a round-base game.
Interviews/Literature review on trust	Reputation	Star rating	In the game, a star rating is used to define the trustworthiness of a carrier. Besides the observed star rating of a carrier, a perceived star rating is also used in the game. After every round (i.e., Transport Day) a player gives a star rating to the chosen carrier.
Conceptual model/Interviews/Literature review on trust	Initial trust	Introduction of all 8 carriers in the first 3 rounds (First half of the game)	To introduce all the carriers, the carriers occur in the first three rounds, just one time.
		Information provision	Information that is given to the players is spread across various pages and through different channels.
		Trade-off price-profit to match supply and demand	Calculative processes are an important part of developing initial trust. To translate this process into the game, a trade-off between the profit and price of different carriers is incorporated.
	(operational) Information	Different types of operational information (first-hand and second-hand information)	In the game, players can retrieve information about the carriers via: - Company description - Carrier Website - Google search - Reviews
	(Strategical) Information	FreightBooking report	Players can buy (for 5 tokens) a FreightBooking report that provides information on the carrier's sustainability, predictability (on time), and Customer satisfaction.
	Experience	Re-occurrence of carriers (Second half of the game)	Carriers who are trustworthy occur more regularly in the game than others.
		Overview of experience with carriers	During the game, players can always check with whom they collaborated. Subsequently, players can check the transport outcome and the stars given to the carrier
	Collaboration	Long-term and short-term orders	Long-term and short-term orders add a certain 'weight' to the order. The type of order can influence the player's decision.
Conceptual framework		The choice between 8 carriers	A variety of carriers are described that have different characteristics (e.g., high/low rating). Based on these descriptions, the carriers are

			defined as trustworthy and untrustworthy. However, the players do not know which carrier is trustworthy or untrustworthy.
		Communication	Players receive information about the carriers during the game through different channels. For example, the outcome of transport and a personal message from the carrier
	Perceived value of the relationship	Client types	Different types of clients are used in the game to express the perceived value of the relationship. These clients can be: - 'Important' client: a client who requests transport with many conditions. Moreover, players can even have a fine - 'non-important' clients: clients who do not have any transport conditions.

The abovementioned design choices provide input into the game flow and design elements.

To best capture the elements of realism, meaning, and play, multiple versions of the game were developed, both physical and digital. The physical versions primarily focused on translating the reality of the transport and logistics sector into a game environment, and on exploring how trust, and distrust, could be represented in gameplay. For example, some role descriptions were designed to create a sense of distrust or suggest that relationships between players were under pressure. However, this approach led to negative experiences: players reported feeling uncomfortable during the game. As a result, the decision was made to shift to a digital version of the game for three main reasons:

a) To eliminate direct personal contact between players;
b) To facilitate the experimental set-up; and
c) To better stimulate reality in a controlled environment.

The digital version also went through several iterations before reaching its final form. The FreightBooking game was tested by three game designers and three professionals from the transport and logistics sector. They were asked questions such as: What did you like most about playing the game? What did you like least? What improvements would you suggest? Their feedback provided valuable insights, which were used to refine the game design. For example, the number of orders players received was adjusted based on their input.

In the next sections, the game's content design is discussed. Subsequently, a description of the game's visualization and set-up is given.

4.4. The content design of the FreightBooking game

The design choices discussed in previous sections provided a guideline for developing the content of the FreightBooking game. The in-game objective is to arrange transport for their clients. As freight forwarders, the players need to match the transport demand of their clients with the transport services offered by carriers. As a player, your goal is to book the best possible carrier based on the clients' orders, leading to profit, higher customer satisfaction, and green transportation when the client demands it. Figure 4.7 gives an overview of the game flow. The game consists of 7 transport days (i.e., rounds). Players receive a transport demand from a client at the start of each transport day. Only during the first two transport days do players receive 1 transport demand. This allows players to get to know the game and the process. The following sections elaborate on the different content elements (e.g., transport order, clients, carriers) of the FreightBooking game. Appendix C gives a detailed overview of the scenario of the FreightBooking game.

The decision with which carrier to collaborate during the transport days is based not only on clients' transport requests but also on the player's in-game objective. The player receives a character description. Within the game, the player plays the role of a freight forwarder. The goal is to collaborate with the best possible carrier, leading to profit, higher customer satisfaction, and green transportation. These three KPIs are chosen based on the input provided by the different respondents in Chapter 3. The player needs to score on these three KPIs, and the minimum scoring is set, as shown in Table 4.9.

Table 4.9. Scoring on KPIs.

KPI	Minimum goal	Maximum goal
Profit	105	135
Customer satisfaction level	19	32
sustainability	19	48

The number of the maximum goal is based on the maximum score a player can have in the game. This is the case if they choose a specific carrier in a specific round based on the transport order and client conditions. The is calculated based on the average and lowest scores a player can have in the game. The minimal goal is the lower bound of the KPI.

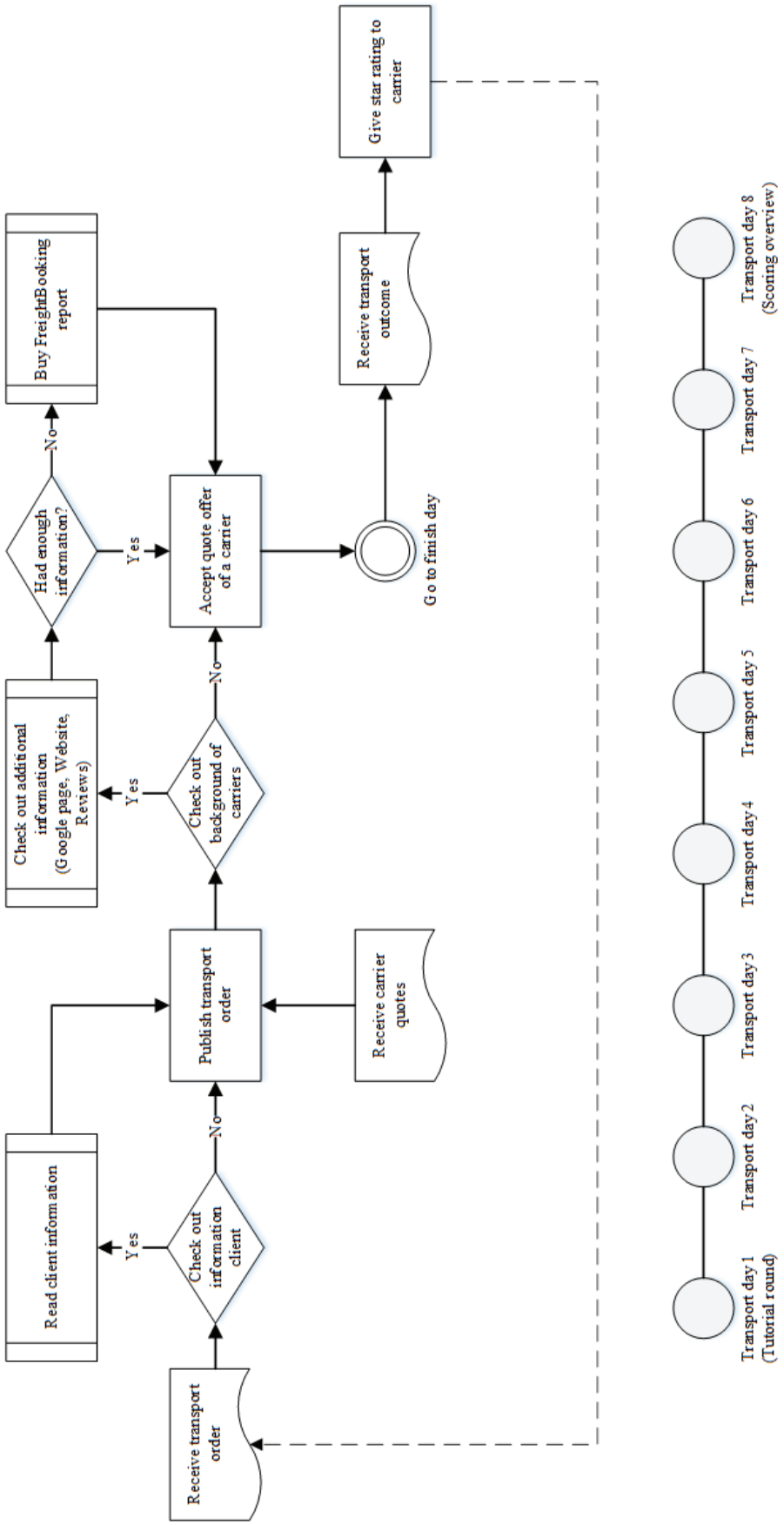


Figure 4.7. The game of the FreightBooking game.

Transport orders

The transport orders that players receive are from different types of clients. As mentioned, the player receives only one transport order on Transport Day 1 (tutorial round) and Transport Day 2. The player receives 2 transport orders per round for the rest of the game. The transport order can be a completely new order or a repeated order (Table 4.10). For example, orders 4 and 6 re-occur in the game. This is done to give a certain importance to certain clients and is derived from the conceptual framework. The expectation is that players who receive such an order will put more effort into matching the most suitable carrier to this transport demand. The transport orders are received at the start of a new Transport Day.

Table 4.10. Overview of transport orders.

Transport day	Order number	Client
1	#1	Re-action
2	#2	KRAFT
3	#3	Muggenheuvel technologies
	#4	Smycken
4	#41	Smycken
	#5	Lagom
5	#42	Smycken
	#6	Concept FURNTR
6	#61	Concept FURNTR
	#7	Porslin
7	#62	Concept FURNTR
	#7	Muggenheuvel Technologies

Clients

Connected to these transport orders are clients since specific clients place the transport orders. In the game, 7 different clients appear, defined by the following characteristics.

- Type of client (long-term, new, irregular client);
- High/low-value goods;
- Price offered for the transport;
- Re-occurring transport demand;
- Fines.

As shown in Table 4.8 in section 4.2, the characteristics of clients are derived from the conceptual framework. Specific clients are long-term clients with many demands and are fined if the transport is not done well (Table 4.11). Other clients do not have many transport conditions and can be a short-term order. In the table below, the characteristics of each client are shown. See Table C2, Appendix C for a more detailed description.

Table 4.11. Overview of the different carriers.

Client name + logo	Characterization
Re-action	• Irregular client • Low-value goods • Short term order • Non-sustainable
KRAFT	• Irregular client • Low-value goods • Not sustainable • Short term order
Muggenheuvel Technologies	• Long-term client • High-value goods • Short-term order • Sustainable • Fine
Smycken	• Long-term client • High-value goods • Long-term order • Sustainable transport • Fine
Lagom	• New client • Low-value goods • Short-term order • Non-sustainable
CONCEPT FURNTR	• Irregular client • Low-value goods • Sustainable transport • Long-term order
Porslin	• Irregular client • High-value goods • Sustainable transport • Short-term order

Carriers

Based on the transport conditions of the client and the type of order (long-term order, short-term order), players in the game receive quote offers from carriers. After publishing the transport orders of the clients, the players receive a quote offer from different carriers. In the game, players receive quote offers from 8 different carriers. These carriers each have their characteristics based on trustworthy and untrustworthy behavior. Table 4.12 provides an overview of the different carriers and their ranking from trustworthy (no. 1) to untrustworthy (no. 8). The ranking of the carriers is not published anywhere. During the game, the players are unaware of a carrier's (objective) trustworthiness. They learn more about this as the game progresses, through information they can access freely and buy, and experience with the carriers. Which carrier is trustworthy and untrustworthy is based on:

- Average star rating;
- The amount of positive or negative transport outcomes;
- Sustainable transportation;
- Service quality (on-time delivery + satisfaction of client).

See Appendix C, Table C5 for a detailed description of each carrier.

Table 4.12. Carrier descriptions.

Ranking no.	Carrier	Logo	Average star rating	Description
1	Logistics Group Kleiman		4,5	Logistics Group Kleiman has been active for over 40 years in the field of freight transportation. Besides years of experience and versatility, our services are characterized by their sustainability and flexibility. Since its establishment in 1977, the mission of Logistics Group Kleiman has not changed. Logistics Group Kleiman has the aim to provide the best services to support its customers.
2	Transport & Logistiek Ponjier		4	Transport & Logistiek Ponjier operates internationally. We have specialized in contract distribution and network transport. We value great service quality, and we offer extra services for sustainable transportation.
3	De Rouw Transport		3	De Rouw Transport is happy to take care of your logistics process. We have grown into a leading carrier with a great deal of knowledge and expertise. Together with our 250 colleagues, we take care of the logistics for many excellent companies. We find it important to go the extra mile when it comes to arranging transportation for our clients. To ensure that your goods will be delivered based on your company's preferences we offer additional services, such as sustainable transportation.
4	Eeden logistics		4	Eeden logistics is a family-owned company. With our colleagues we develop expertise and knowledge in freight transportation, especially in sustainable trucking.

5	VDL International transport	VDL International transport	3,5	We are an innovative and progressive company. Transport is usually seen as something complex. Yet, it is not; it is, in fact, easy. Our vision is to make transport as easy as possible in the most sustainable way. We will help your company to achieve sustainable entrepreneurship by our self-employed truck drivers with whom we work with.
6	Transport Group Galvan	Transport Group Galvan	3	For 80 years we have transported goods all over Europe. Transport Group Galvan is an international company. With a network of 25 owned branches, Transport Group Galvan operates throughout Europe. With 1,000 employees, the company operates a modern fleet of 400 Euro 5 and Euro 6 vehicles. Moreover, in the last couple of years, Transport Group Galvan invested in new trucks that drive on hydrogen.
7	De Bont & Dochters	DB	2	We are a young, dynamic company, and we do business differently. Established 10 years ago, we transport for well-known companies. We provide your company with the most optimal services and believe in green transportation.
8	Van Beers Logistics	Van Beers Logistics	2,5	Van Beers Logistics is an international company; We provide transport all around Europe. With our international network we offer good services and value the client's wishes. For the customer, sustainable transport is becoming increasingly important. We want the best service for our customers. In recent years, Van Beers Logistics has invested in energy-efficient vehicles.

The trustworthiness or untrustworthiness of a carrier is not made completely explicit, but incorporated in the information which is communicated through different channels:

- FreightBooking report: consists of (1) Percentage of green trucking, (2) Percentage of goods delivered on time, and (3) Satisfaction of clients);
- Reviews;
- Google page;
- Carrier website.

Based on information on the platform (e.g., reviews, star rating, company website) and the client demands, the players need to decide which carrier they want to collaborate with. After players accept the quote offer, they receive the transport outcome (this is only the case when players go the next day). The transport outcome relates to the three KPIs (i.e., income tokens, sustainability tokens, and customer satisfaction level tokens). The transport outcome can be positive or negative, depending on the client's request and the player's chosen carrier. A transport outcome can be negative if the carrier cannot meet the client's requests. For example, the client wanted to transport the goods sustainably, and the player selected a carrier that, in the end, could not deliver the goods in a green way. Some clients even give a fine when transport demands cannot be met. Appendix C, Table C1 shows the scenario of which carrier will offer a quote and the specific transport outcome.

Transport messages & outcome

After a player accepts a quote from a specific carrier, the player receives a transport message (Table 4.13). This transport message is the same in every round. It provides the player with a confirmation of the order. In the game, it is chosen that the less trustworthy carriers also give a transport message to the player. This can be a relatively long or short message. To not give too much direction to the players which carrier is trustworthy or not, it has been a game choice to have transport messages that specific untrustworthy carriers have the same message as a trustworthy carrier.

Table 4.13. Overview of transport messages per carrier.

Carrier	Transport message
logistics Group Kleiman	Thank you for choosing logistics Group Kleiman. We received your order and will arrange the required transportation
De Rouw Transport	We received your order
Van Beers Logistics	We received your order. Thank you for choosing Van Beers Logistics
VDL International Transport	Thank you for trusting us. We will make the transport happen!
Eeden logistics	Dear relation, thank you for requesting our services. We will arrange the transport. Kind regards, Anne
Transport Group Galvan	We will make the transport happen!
De Bont & Dochters	We received your order.
Transport & Logsitiek Ponjier	Thank you for requesting the services of Transport & Logistiek Ponjier

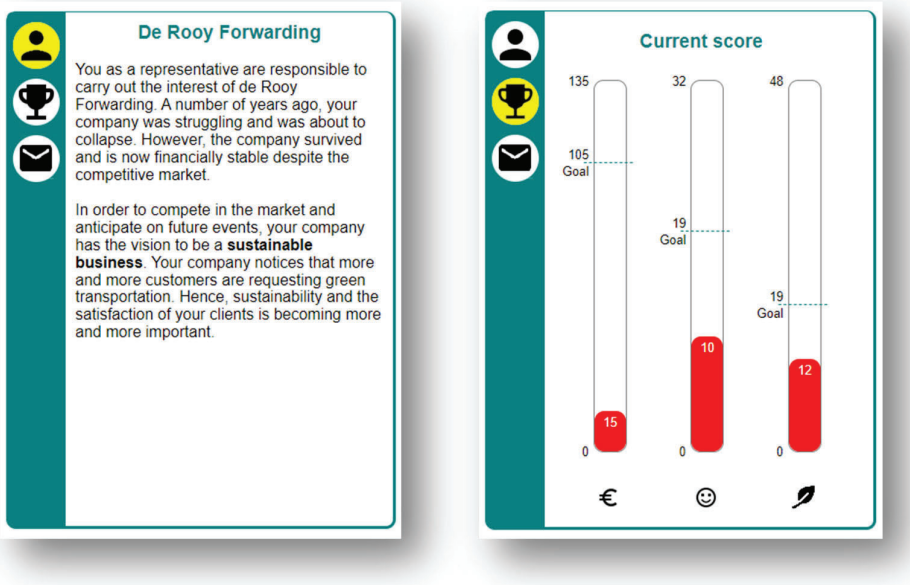
At the end of each day, the players receive a transport outcome. These transport outcomes are based on the behavior of the carrier and are expressed through the different KPIs, i.e., profit, customer satisfaction level, and sustainability. There are more negative transport outcomes for the less trustworthy carriers than for the trustworthy carriers (See Appendix C, Table C3).

4.5. The FreightBooking game set-up

The serious game FreightBooking is designed to investigate how trust influences technology-mediated collaborations. The FreightBooking game can be accessed on a tablet or computer with a login code. The FreightBooking game is part of an experimental set-up visualized in Figure 4.8. Before players start playing the game, they first receive information on the game context through a presentation on the rise of platforms in the transport and logistics sector. The concept of trust was not mentioned to avoid creating any bias before the gameplay. The briefing phase consists of a presentation and pre-questionnaire. As mentioned, the concept of trust is not explicitly mentioned in the game or the briefing phase. Therefore, after the game, a debriefing phase is held to discuss trust issues that may arise in the game. The debriefing phase is important since players can share their perspectives on the topic and transfer the gaming experience (Peters, Vissers, van de Meer, 1998). How the briefing, pre- and post-questionnaire, game experiment, and debriefing are set up is further discussed in Chapter 5. Based on this set-up, a walkthrough of the game will be provided in the next sections. A more detailed game description is given in Appendix D.

Figure 4.8. Experimental set-up of the FreightBooking game.

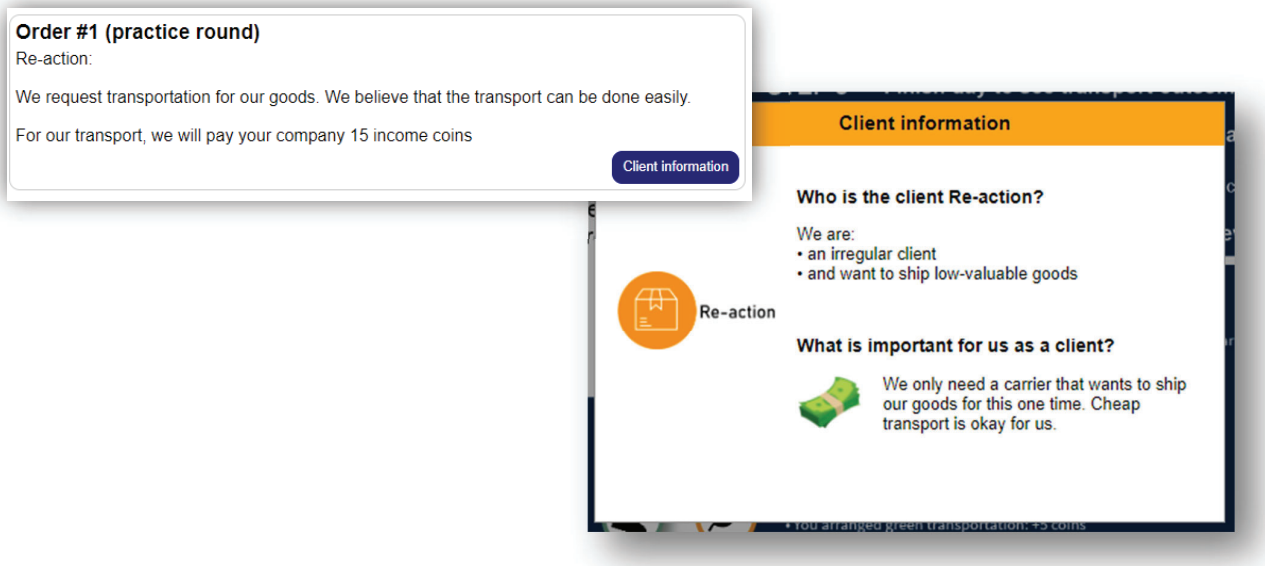
Before the game starts, the players receive a screen with important information for the gameplay. See Figure 4.10 for an impression. Within the FreightBooking game, players have the role of freight forwarder. As a freight forwarder, the player must match transport and demand, leading to higher profit, higher customer satisfaction, and greater sustainability. Bar charts are used to visualize players' performance in the game on these three KPIs (Figure 4.9).



(a) (b)

Figure 4.9. (a) Character description and (b) Visualization of KPI's.

On the first transport day, round 1, players can explore the platform, by clicking on the different buttons. As shown in the game flow, Figure 4.7, Players also receive a transport demand from one of the clients (Figure 4.11). By clicking on the client information, the player can read more background information about the client.



(a) (b)

Figure 4.11. (a) Client request for the transport demand and (b) client information.

Based on the client information, players receive quote offers from carriers. Players can decide which carrier to collaborate with based on the quote offers. At the beginning of the game, players can base this decision on different types of information about a carrier. See Figure 4.12 for an overview of the different information types included on the FreightBooking game.

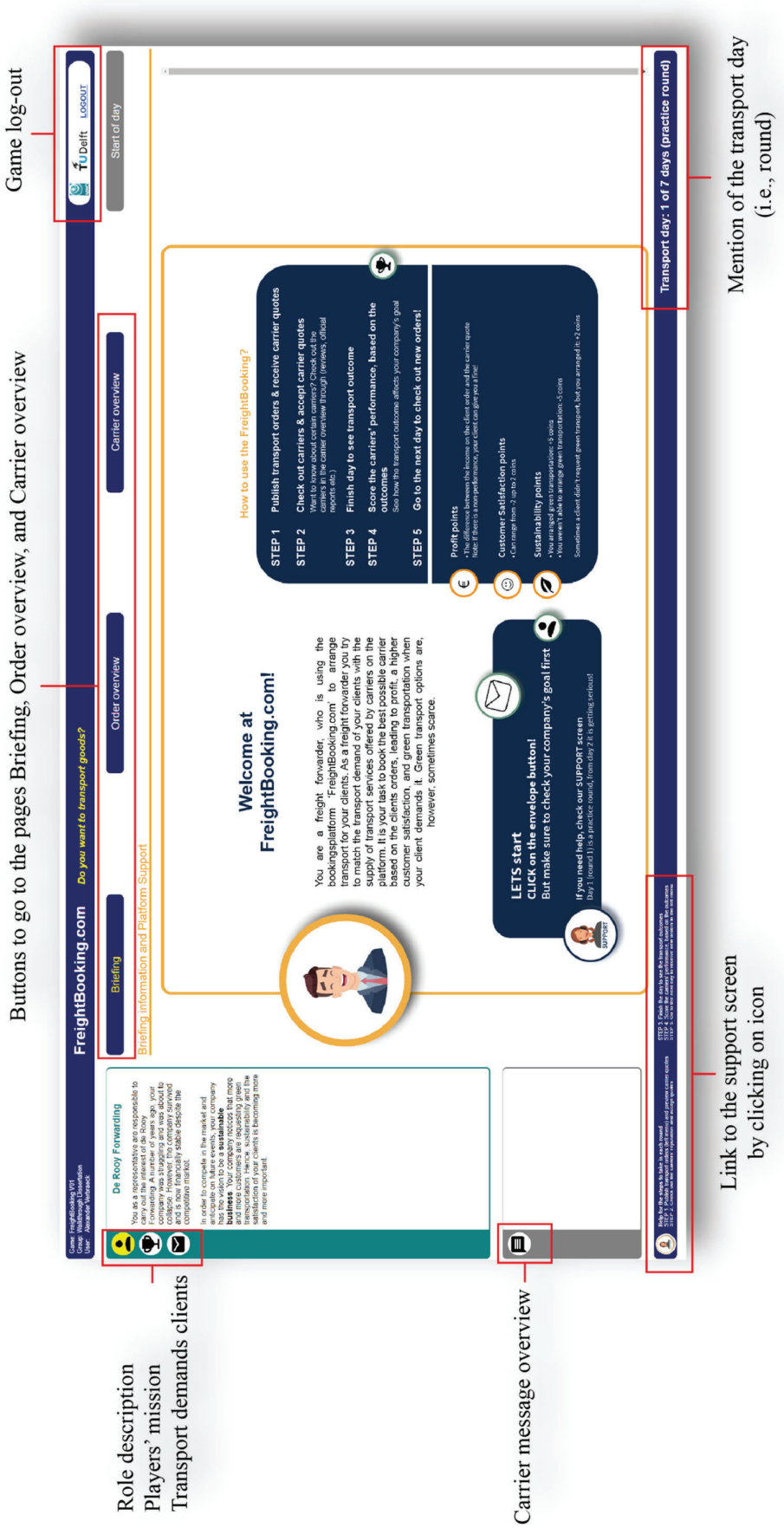


Figure 4.10. General overview of the welcome screen of the FreightBooking game.

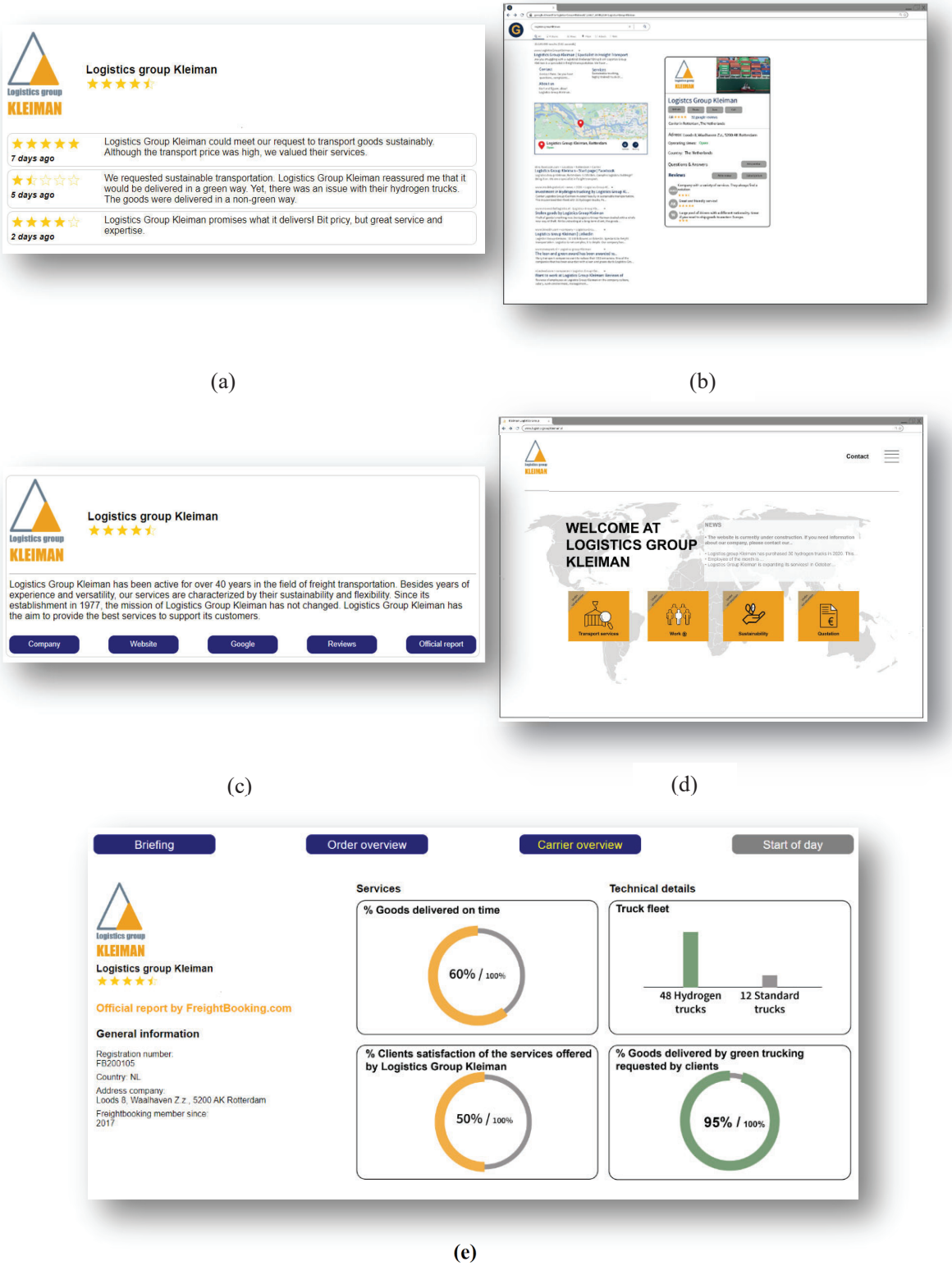


Figure 4.12. Different types of information pages, (a) review page, (b) google search page, (c) general information page, (d) carrier website, and (e) the FreightBooking report.

When the game progresses, the players can eventually base their decisions on their experience with a carrier. The carrier transports the cargo after the player decides which carrier to collaborate with. At this stage, the player receives a message from the carrier about the transport. When the player enters the next transport day, the transport outcome is received. The transport outcome shows the players how the carrier performed and what the earnings are (Figure 4.13). Based on the transport outcome, i.e., the experience with a carrier, the players can give a star rating to the carriers (1 through 5 stars). A new transport order is received after the players give a carrier a star rating. Appendix D gives a more detailed game description, supported by screenshots of the game.

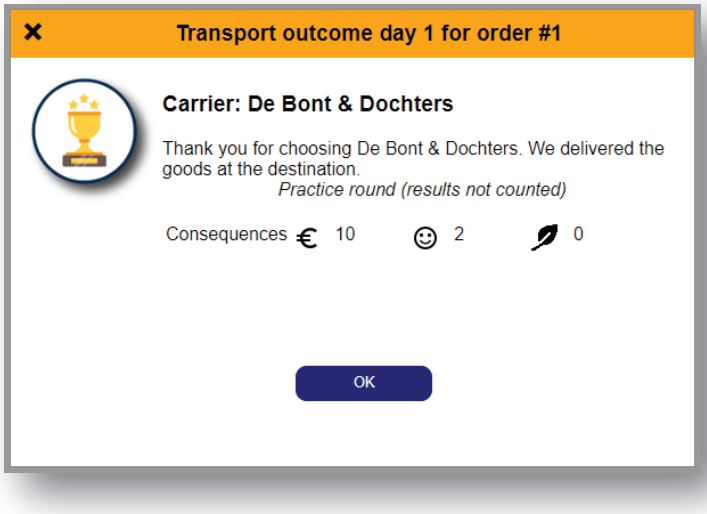


Figure 4.13. Transport outcome Transport day 1 of order #1.

At the end of the game, the players receive an overview of their game performance. Players see how they scored on the three KPIs: profit, sustainability, and customer satisfaction level. Subsequently, a link to the post-questionnaire is given on the screen. After the players fill out the post-questionnaire, a debriefing session is held. The debriefing session aims to cool down from the gameplay and, on the other hand, to hear from the players how they experienced the game and made decisions during gameplay. In Chapter 5, an elaboration is given on the set-up of the debriefing phase. Appendix D gives a more detailed walkthrough of the FreightBooking game.

4.6. Conclusion

The FreightBooking game was designed based on interviews with stakeholders, a literature review, and the conceptual model and framework to study the influence of trust in technology-mediated collaborations. In this chapter, the most important game design choices are discussed. Through specific game design choices such as (1) introducing the carriers for the first time one-by-one, (2) different carrier characteristics and additional information, (3) the importance of clients (e.g., long-term vs. short-term), and (4) the trade-off between profit and margin, a situation is created where trust could occur. Moreover, through questions in the pre-and post-questionnaire, questions related to trust are incorporated to measure the disposition of trust of

players and which carriers they trust the most. Through the game design choices discussed in this chapter, a translation can be made to measure items to research the relationship between trust, collaboration, and information. The measurement items and the experimental set-up are presented in Chapter 5

5

Experimental set-up of the FreightBooking game

Chapter 4 provides an overview and in-depth elaboration on the decisions made to design the game FreightBooking.com. Moreover, it provides a game description. The design decisions presented in Chapter 4 are translated into measurement items in Chapter 5. Chapter 5 builds further on the conceptual model and framework in Chapter 2. Chapter 4 translates the conceptual model and framework into the FreightBooking game. This chapter will provide insights into the experimental set-up and the design of the various research instruments used to collect data.

5.1. Conceptual model: hypotheses

As discussed in Chapter 4, the simulation game is used as a research instrument. The design choices presented in Chapter 4 are based on the conceptual model and framework presented in Chapter 2 and the insights from the stakeholder interviews in Chapter 3. The stakeholder interviews, discussed in Chapter 3, clearly showed that experience plays an important role when establishing a collaboration. It provides information of another party about their behavior and intentions which allows an organization to evaluate if certain expectations will be met by the other party. The conceptual model presented in Chapter 2 did not have the experience variable in the model yet. Based on the theoretical insights from Chapter 2 and the practical insights from Chapter 3, the conceptual model is adjusted where the experience variable is included (Figure 5.14). Figure 5.14 gives an overview of the relations between the different variables. Hypotheses are defined to test the relations between the variables (Table 5.14).

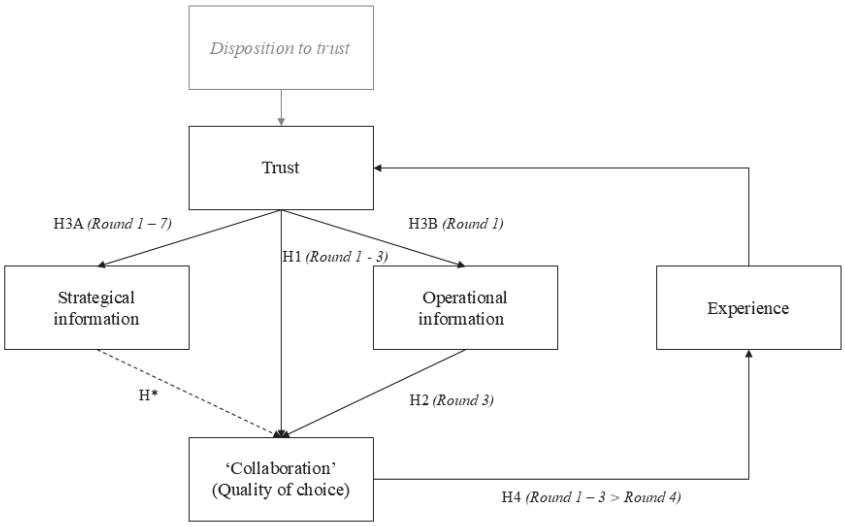


Figure 5.14. Hypotheses of the conceptual model for testing. In Figure 5.14, hypothesis H* cannot be tested with the FreightBooking game since the request for strategic information is limited (see Chapter 6, Hypothesis H3A).

Table 5.14. Hypotheses of conceptual model.

No.	Hypothesis
H1	The higher the Disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer
H2	When more operational information is requested by players, the qualitative choice to collaborate with a specific carrier is higher
H3A	Players with a low disposition to trust are more likely to request strategic information
H3B	Players with a high disposition to trust are more likely to request operational information
H4	Players use a positive or negative (prior) experience with a carrier to choose a carrier

Three control variables are included besides the main variables, such as trust, collaboration, and information. These control variables are defined since they can influence variables in the conceptual model. The following control variables are included:

- **Disposition to trust.** The study by McKnight et al. (1998) discussed that trust is partially formed through a person's disposition to trust, i.e., *a tendency to be willing to depend on others* (p. 474). As illustrated by McKnight et al. (1998), a child develops trust since, in the early years, the child seeks and receives help from the parents. This tendency is not based on experience, situation, or knowledge about a trusted person (Gefen, 2000). In other words, people already developed a certain level of trust in their daily life. This type of trust can be defined as the '*Disposition to trust*' influencing trust towards another party. When players start playing the game, a trust level is already embedded in the person. Therefore, disposition to trust is defined as a control variable.
- **Experience with platforms.** Another control variable is players' experience with platforms. In daily life, people use platforms, for example, to communicate (e.g.,

Facebook) or to buy or sell products (e.g., eBay). Since people have experience using platforms, this can influence gameplay and how familiar they are with using a platform.

- **Seller risk.** Certain risks can emerge when collaborating with another individual or organization through a platform. For example, buying a product online entails a risk that the product will not meet expectations, and this risk is becoming more common. Therefore, seller risk is defined as a control variable.

These three variables are important since it is embedded or experienced by the player itself. The other variables will be incorporated into the game FreightBooking.com.

As discussed in Chapter 2, organizations do not collaborate in a vacuum. In other words, although they have a one-to-one collaboration with an organization on a platform, they are still part of the supply chain. When establishing a collaboration through a platform, an organization does not want to harm a relationship with a partner that the organization has in the supply chain. Therefore, the conceptual model is extended with a conceptual framework that describes the trade-offs that an organization makes when establishing a collaboration with another party supported by a platform (Figure 5.15). Based on the conceptual model, two hypotheses (Table 5.15).

Table 5.15. Hypotheses conceptual framework.

No.	Hypothesis
H5A	More information types are requested for the long-term clients
H5B	More information types are requested for the high perceived value of the relationship clients

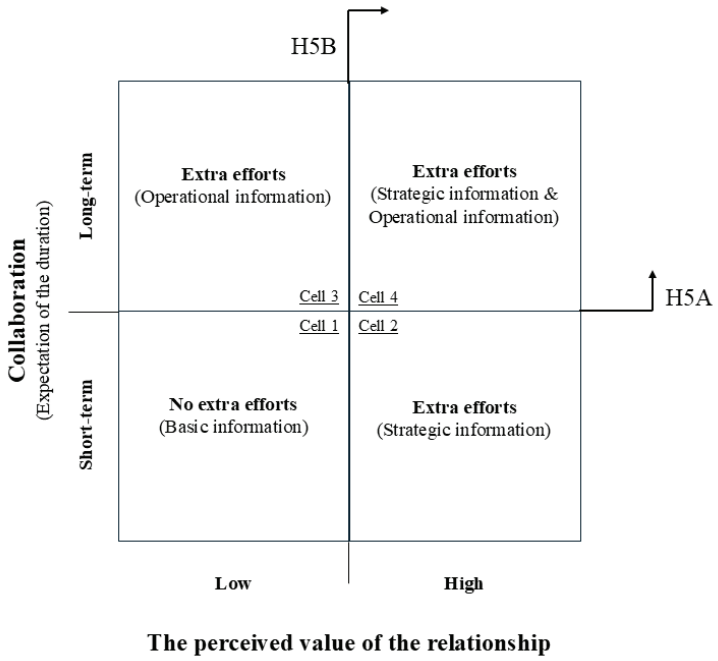


Figure 5.15. The hypotheses of the conceptual framework for testing.

5.2. Measurement of variables

In Chapter 4, the variables and the design choices of the FreightBooking game are described. Within the experimental set-up, each of these variables is measured with different or multiple research instruments. Data is collected through a pre- and a post-game questionnaire and the serious game FreightBooking itself. An overview of the variables and the measurement within the experiment is shown in Table 5.16.

Pre- and post-questionnaires are suitable methods for the assessment of a game. Questionnaires are informative and allow researchers to study human behavior, such as understanding or motivation (Seaman, 1999). Using questionnaires beside the in-game data collection allows researchers to ask questions related to actions or scenarios in the game. This provides extra information instead of only using in-game data collection or just a questionnaire. In the game, all actions that a player does, for example, clicking on a button, are logged. Besides the logged information, in the pre- and post-questionnaires, questions are also asked to receive more information on certain decisions players make in the game.

The variables from the conceptual model and framework, are mostly measured through in-game logging. In some cases, additional questions in the post-questionnaire are asked to retrieve extra information from the player. For example, the variable information provision about initial trust is measured through in-game logging and a question in the post-questionnaire. Players can click on different information pages of each carrier within the game. The clicks tell something about what type of information they want to see. However, they do not provide extra information if players find the information trustworthy. Therefore, an extra question is asked during the post-questionnaire to better understand the variable information.

Table 5.16. Overview of the variables and how these are measured in the experiment.

Based on	Variable	Game Design choice	Assessment type			Specifications
			Pre-Quest.	In-game	Post-Quest.	
Interviews with stakeholders		Platform as the context of the game	x**			Pre-questionnaire, question 3: "*How often do you use a platform (e.g., e-Bay/Amazon) to buy a service/product)?"*
						Pre-questionnaire, question 4: *"How is your overall experience when purchasing a service/product through an online platform?"*
						Pre-questionnaire, question 5: *"How often have you had a negative experience with a seller on a platform when buying a product/service via the platform?"*
						Pre-questionnaire, question 6: *"How often have you had a positive experience with a seller on a platform when buying a product/service via the platform?"*
Interviews/Literature review on trust	Reputation	Star rating		x		Logging of star rating given by players [1 -5 stars] through '*GiveStars*'
Conceptual model	Initial trust	Introduction of all 8 carriers in the first 3 rounds (First half of the game)		x	x	Post-Questionnaire, question 1: *'Throughout the game, the carriers kept the promise they made to me'*
						Post-questionnaire, question 2: *'The carriers weren't always honest with me'*
						Post-questionnaire, question 4: *'The carriers were trustworthy'*
						Post-questionnaire, question 5: *'I found it necessary to be cautious with the carriers'*
						Post-questionnaire, question 6: *'Which carrier did you trust the most'*
						Logging of star rating given by players [1 -5 stars] through '*GiveStars*'

		Information provision		x	x	Post-questionnaire, question 3: *'I believed the information the carriers provided me'*
		Trade-off price-profit to match supply and demand		x		Logging of the quote a carrier and the clients' transport order tariff
	(operational) Information	Different types of operational information (first-hand and second-hand information)		x		Logging by clicking on buttons '*CarrierDetailsWebsite*', '*CarrierDetailsReviews*', '*CarrierDetailsGoogle*',
	(Strategical) Information	FreightBooking report		x	x	Logging by clicking on the button '*CarrierDetailsReport*' and the game button *'Buy FreightBooking report'*
						Post-Questionnaire 8: *'What information did you use to decide a carrier is trustworthiness?'*
	Experience	Re-occurrence of carriers (Second half of the game)		x	x	Post-questionnaire question 7: *'Throughout the game, previous experience with a carrier played an important role in the trustworthiness of the carrier'*
						Post-questionnaire, question 13: *'A previous negative experience with a carrier was a decisive factor when choosing to collaborate again with a carrier'*
						Post-questionnaire, question 14: *'A previous positive experience with a carrier was a decisive factor when choosing to collaborate again with that carrier'*
		Overview of experience with carriers		x	x	Post-questionnaire, question 11: *'I received excellent services from the carriers in FreightBooking.com'*
						Post-questionnaire, question 12: *'Carriers In FreightBooking, com did a good job'*
						Logging of star rating through '*GiveStars*'

	Collaboration	Long-term and short-term orders			x	Post-questionnaire, question 10: *'Throughout the game, the willingness to collaborate with a particular carrier changed through the transport outcome I received from the carrier'*
Conceptual framework		The choice between 8 carriers		x		Logging of decision with which carrier the player collaborates through '*AcceptQuoteYes*'
		Communication			x	Post-questionnaire, question 9: *'Throughout the game, the willingness to collaborate with a particular carrier changed through the information I could find of that carrier'*
	Perceived value of the relationship	Client types		x		Logging of opening client information through '*ClientInformationOpen*'

**The experience that a player has with using platforms in daily life is also measured in the experiment.

5.3. Experimental set-up

To test the conceptual model and framework, an experimental design was set up. The experiment consisted of 5 consecutive steps with different research-gathering methods. Figure 5.16 visualizes the experiment. As shown in Figure 5.16, different instruments were used to perform this research.

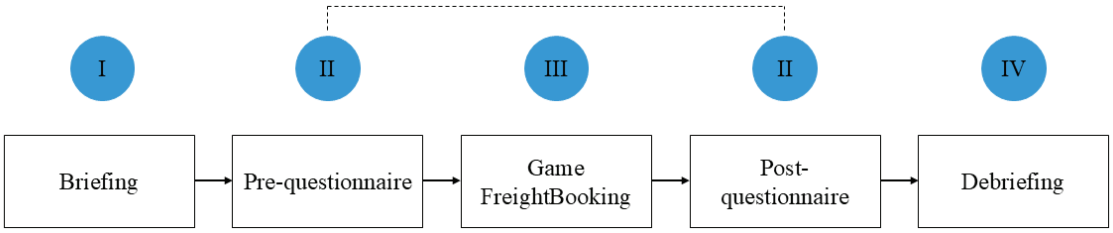


Figure 5.16. Experimental set-up.

In the next couple of sections, the set-up of the pre-and post-questionnaire and the in-game logging are explained in more detail.

5.3.1. Briefing

The experiment started with a presentation on platformization in logistics. The presentation gave insights into the rise of logistics platforms and the possible impact on collaboration. First, general information was given on the trends, such as the rise of platforms, that can impact ports. We also delved deeper into the impact of platforms on collaboration between parties (see Figure 5.17 for an impression). At the end of the presentation, the game's goal was discussed. During the briefing phase, the concept of trust was not mentioned. This was done to avoid a bias with the players.

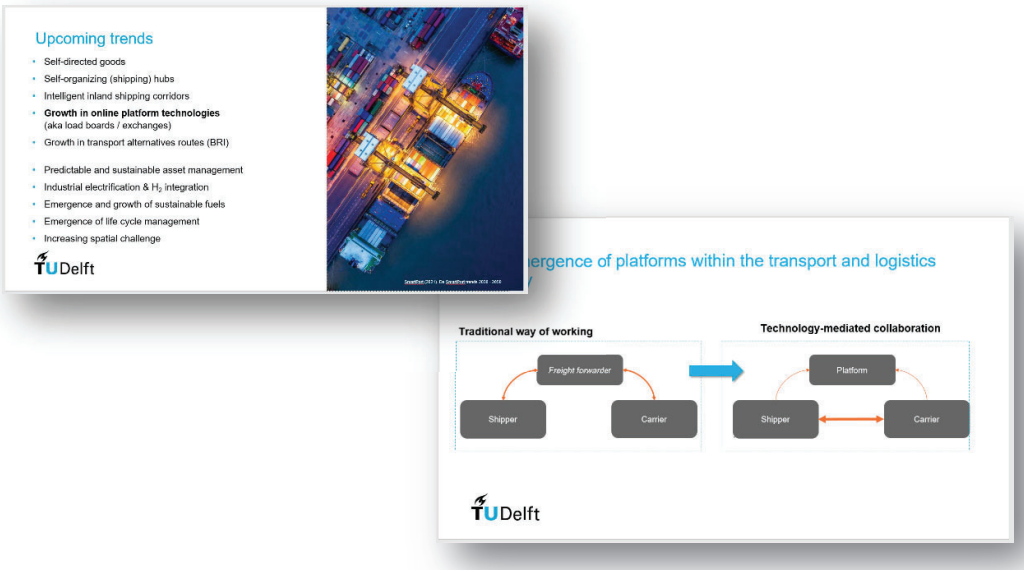


Figure 5.17. Impression of the presentation during the briefing phase.

Before the players could start the experiment, they received a link. Via this link, they received a code, which they could use to start the game. In addition to the code, the students were directed to the page where they could fill in the pre-questionnaire. The generated codes were used to represent the different players. These codes guarantee anonymity, and the gameplay could be connected to the pre- and post-questionnaire.

5.3.2. Design of Pre- & Post questionnaire

A pre-and post-questionnaire is designed to collect data on the variables that cannot be measured in the game or to collect additional data related to in-game data collection. The pre-questionnaire consists of 9 questions and is filled in before the players start playing the game FreightBooking.com. The post-questionnaire consisted of 21 questions. Both questionnaires consist of open questions, closed questions, and statements on a five or seven-point Likert scale. Subsequently, the pre-questionnaire consisted of questions related to data management. The pre- and post-questionnaire were held online. The software tool that is used is Qualtrics.

Pre-questionnaire

The pre-questionnaire is used to collect data not included in the game. The pre-questionnaire consists of questions and statements. Before the players could fill in the pre-questionnaire, the first questions related to data management were asked. For example, that player voluntarily consents to participate in the experiment—the in-depth questions followed immediately after the data management section. The first part of the pre-questionnaire focuses on the background of the players. The questions were related to the experience players have within the field of transport and logistics, their working experience, and their education level. These measurement items are mainly focused on the description of the players.

The second part of the pre-questionnaire consists of questions and statements about experience with a platform and risk. When collaborating in an online environment, certain risks may emerge. For example, the product or services do not meet the seller's expectations. According to the study of Verhagen, Meents, and Tan (2006), risk can occur between the seller and the intermediary. Whereas the intermediary risk refers to the risk toward the operating system, the seller risk refers to the uncertainty that arises around the seller's offers. In this study, we are especially interested in the seller risks. As discussed in Chapter 2, when trusting another party, risk may emerge. Since risk requires trust (Bachmann & Zaheer, 2008; Lewis & Weigert, 1985). Various studies studied risk within an online environment through a questionnaire (Bélanger & Carter, 2008; McKnight et al., 2002; Verhagen, Meents, & Tan, 2006). See Appendix E, Table E1 for a complete overview of measurement items related to risk. The measurement items in the pre-questionnaire were adapted from the study of Verhagen, Meents, and Tan (2006). In this study, risk is defined as seller's risk, which is '*the belief of a probability of suffering a loss when engaging in a transaction with members of the population of sellers at a particular electronic marketplace'* (Verhagen, Meents, Tan, 2006, p544). These questions focus on the risk that may emerge when an individual wants to collaborate with another party in an online marketplace. This is in line with the objective of our experiment, where we are interested in how trust influences technology-mediated collaboration. Risks related to another party's services in an online environment are part of this. Therefore, the measurement items related to seller risk were adapted from the study of Verhagen et al. (2006).

Table 5.17 provides an overview of the measurement items in the pre-questionnaire, which is included in Appendix E. Appendix F provides the final pre- and post-questionnaire used in the FreightBooking game.

Table 5.17. Items and measures of pre-questionnaire.

Item	Code	Measures	Adapted from
Background respondent	GI_01	Are you a PhD or Master's student?	New item
	GI_02	Which bachelor's degree did you take?	New item
	GI_03	What master's degree are you currently pursuing?	New item
	GI_04	Which master's degree did you take?	New item
	GI_05	What is the field of study of your PhD (e.g., transport & logistics, gaming, healthcare)	New item
	GI_06	What is your background? (e.g., assistant professor, researcher)	New item
	WE_01	Do you have work experience in the field of transport & logistics?	New item
	WE_02	How many years of work experience do you have in the transport and logistics field?	New item
	WE_03	If you have work experience in the field of transport and logistics, which function(s) did you fulfill?	New item
Experience with platforms	PE_01	How often do you use a platform (e.g., eBay/Amazon) to buy a service/product)?	New item
	PE_02	What is your overall experience when purchasing a service/product through an online platform?	New item
	PE_03	How often have you had a negative experience with a seller on a platform when buying a product/service via the platform?	New item
	PE_04	How often have you had a positive experience with a seller on a platform when buying a product/service via the platform?	New item
Seller risk	Ri_01	As I consider purchasing a service/product through an online platform, I become concerned about whether sellers offer services/products that will not perform as expected	*Verhagen, Meents, Tan (2006)*
	Ri_02	As I consider purchasing a service/product through an online platform, I become concerned about whether sellers will behave opportunistically	*Verhagen, Meents, Tan (2006)*

Post-questionnaire

The post-questionnaire consists of 21 questions and statements that collect data on the items: (1) inter-organizational trust, (2) information, (3) experience, (4) collaboration, (5) gameplay, and (6) disposition to trust. The questions focusing on disposition to trust are asked at the end of the questionnaire. This is to prevent players from being biased when filling in the post-questionnaire. For example, information, experience, and collaboration are also measured during gameplay. Additional questions were asked to gather more information on these variables. As discussed in the pre-questionnaire, some measurement items in the post-

questionnaire are adapted from previous studies. Below an explanation is given on with previous studies different measurement items are adapted from.

- **Interorganizational trust.** The items used in the post-questionnaire for inter-organizational trust are adapted from the study by Doney and Cannon (1997). The study by Doney and Cannon (1997) defined measurement items for trust between a buyer and supplier. The measurement items defined by this study are suitable since they incorporate global trust measures. For example, is the supplier trustworthy?
- **Experience.** Pavlou & Gefen (2004) researched trust from an institutional perspective where the community of sellers is a central part of the study. In this study measurement items are defined for past experiences. When players are using the FreightBooking platform to book transport for their clients, the community of carriers and their experience with the carriers are important measurements. In the game, the carrier with which a player collaborates most frequently is logged. However, it is also valuable to understand a player has experience with the carrier community. Therefore, the measurement items of the study by Pavlou and Gefen (2004) on experience are used to retrieve additional information on the in-game experience.
- **Gameplay.** How the players perceived the game, e.g., fun to play, and satisfaction, is not of main interest. However, it is interesting to test how the players perceived the game since it can provide context to the answers that are given in the pre- and post-questionnaire as well as how the game is played. The measurement items are adapted from The Game Experience Questionnaire by Ijstelsteijn & de Kort (2013). These measurement items provide insights into how engaging it was to play the FreightBooking game.
- **Disposition to trust.** The items and measures are based on the study by Belanger & Carter (2008). Belanger & Carter (2000) define disposition to trust as '*one's general propensity to trust others*' (p. 137). This study defined items and measures for trust from a general point of view. The questions related to disposition to trust were asked at the end of the post-questionnaire. This is to avoid a bias that players know the game is about trust. In Table 5.18, an overview of the measurement items in the post-questionnaire is given.

The table below provides an overview of the measurement items per variable adapted from previous studies or newly defined items.

Table 5.18. Items and measures of post-questionnaire.

Item	Code	Variables in post-questionnaire	Adapted from
Interorganizational trust	IOT_01	Throughout the game, the carriers kept the promises they made to me	Doney & Cannon (1997)
	IOT_02	The carriers weren't always honest with me.	
	IOT_03	I believed the information the carriers provided me.	
	IOT_04	The carriers were trustworthy.	
	IOT_05	I found it necessary to be cautious with the carriers	
	IOT_06	Which carrier did you trust most?	
	IOT_07	Throughout the game, previous experience with carriers played an important role in the trustworthiness of the carrier	New items
Information	In_01	What information did you use to decide a carrier is trustworthiness?	New item
Collaboration	Co_01	Throughout the game, my willingness to collaborate with a particular carrier changed through the information I could find about that carrier.	New items
	Co_02	Throughout the game, my willingness to collaborate with a particular carrier changed through the transport outcome I received from the carrier.	
Experience	Ex_01	I received excellent services from the carriers in FreightBooking.com	Pavlou & Gefen (2004)
	Ex_02	Carriers in FreightBooking.com did a good job	
	Ex_03	A previous negative experience with a carrier was a decisive factor when choosing to collaborate again with that carrier.	
	Ex_04	A previous positive experience with a carrier was a decisive factor when choosing to collaborate again with that carrier.	New items
Gameplay	GP_01	I was engaged in the gameplay.	Gameplay
	GP_02	It was easy to understand the rules of the game.	
	GP_03	The game is sufficiently complex to represent the collaboration process among organizations when using a platform	
Disposition to trust	DT_01	I generally do not trust other people	Belanger & Carter (2008)
	DT_02	I generally have faith in humanity	
	DT_03	I feel that people are generally reliable	
	DT_04	I generally trust other people unless they give me a reason not to	

5.3.3. Game experiment

As shown in Table 5.16, many variables are collected through in-game data collection. To receive an overview of the logging information, a separate administrator environment is built (Figure 5.19). In this 'Trustgame-admin' (i.e., administration environment), the game administrator can make adjustments, for example, quote a carrier's offer, but the end score of every player in a particular experiment can be checked as well (Figure 5.19). Moreover, the logging information of every game experiment can be retrieved.

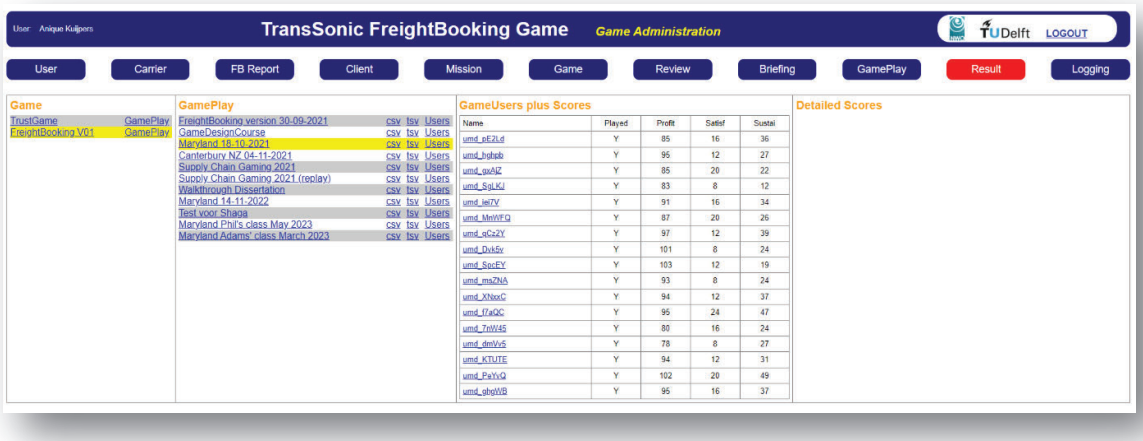


Figure 5.19. The Trust Game administration environment, 'Trustgame-admin'.

The trust administrator environment has a separate page where the logging information can be seen. Figure 5.20 gives an overview of the logging data of player XNxxC. In this example, the player XNxxC checks a lot of information from different carriers during the first round. As shown in Figure 5.21, every click a player makes in the game is logged. From the administrator environment, a CSV. file can be downloaded per player as well as per experiment. Figure 5.21 gives an overview of the output of the logging data. In this example, the player with the code 'XNxxC' (round 4) publishes the order Smycken. The player also opens the client information window to check the client's requirements. Based on the client information, the player searches for a suitable carrier. For the carriers Logistic Group Kleiman and VDL International Transport, the player checks the information on the carriers' website page and the reviews that they received. After the search for the carrier, the player accepts the quote offered by van Beers Logistics. Although the player did not search for extra information on this carrier, the information on van Beers Logistics can be checked in one of the previous rounds. At any time, a player can check information about a carrier even if the carrier is not giving a quote on an order in a round.

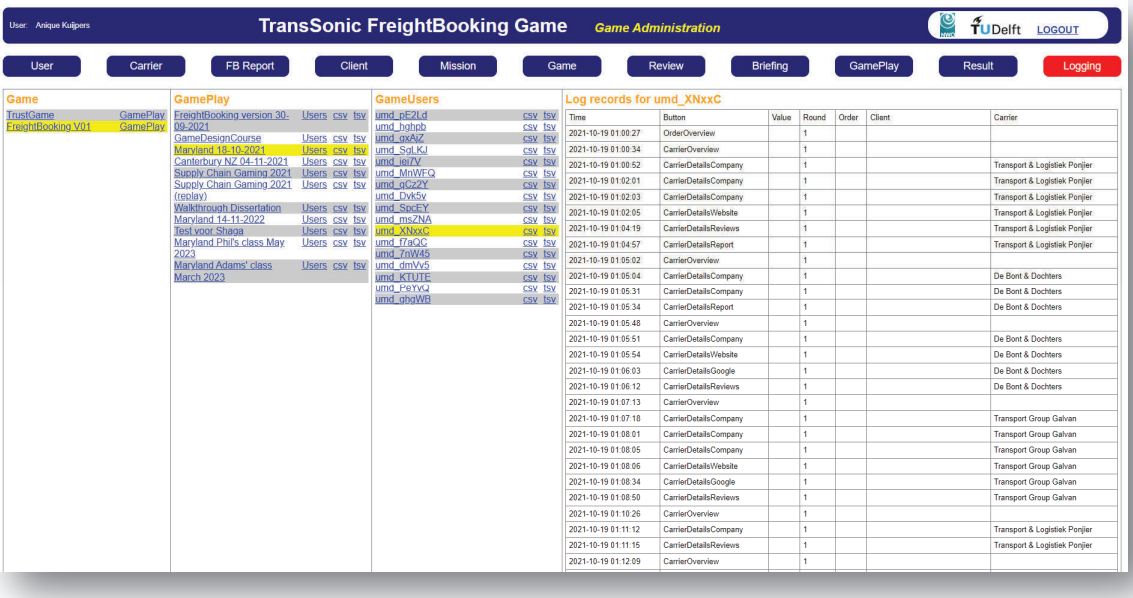
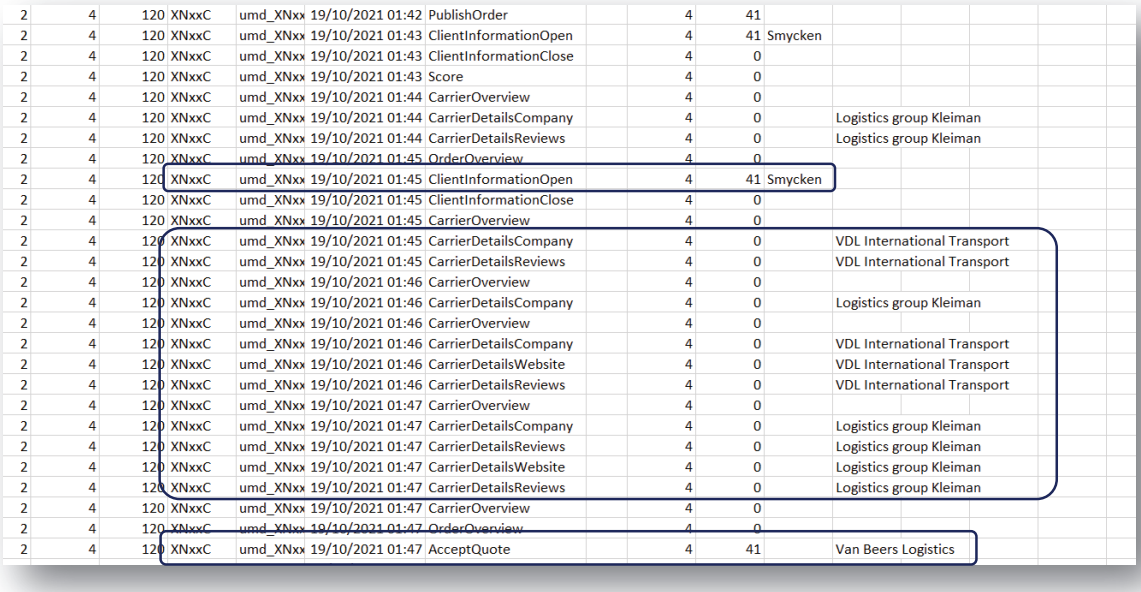


Figure 5.20. Logging of the players' data.



2	4	120	XNxxC	umd_XNxx	19/10/2021 01:42	PublishOrder	4	41			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:43	ClientInformationOpen	4	41	Smycken		
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:43	ClientInformationClose	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:43	Score	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:44	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:44	CarrierDetailsCompany	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:44	CarrierDetailsReviews	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	OrderOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	ClientInformationOpen	4	41	Smycken		
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	ClientInformationClose	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	CarrierDetailsCompany	4	0		VDL International Transport	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:45	CarrierDetailsReviews	4	0		VDL International Transport	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierDetailsCompany	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierDetailsCompany	4	0		VDL International Transport	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierDetailsWebsite	4	0		VDL International Transport	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:46	CarrierDetailsReviews	4	0		VDL International Transport	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierDetailsCompany	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierDetailsReviews	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierDetailsWebsite	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierDetailsReviews	4	0		Logistics group Kleiman	
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	CarrierOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	OrderOverview	4	0			
2	4	120	XNxxC	umd_XNxx	19/10/2021 01:47	AcceptQuote	4	41		Van Beers Logistics	

Figure 5.21. Example of logging data in round 4.

As discussed in Table 5.16, data is collected through in-game data collection. The following variables are measured by logging the gameplay of players:

- Experience;
- Collaboration;
- Information.

For the variables reputation, information, and collaboration, the players' clicks are logged. For example, a player's number of stars in a certain career. Collaboration is logged by the clicks on the choice of a carrier with whom the player wants to collaborate. Information is logged by the clicks on the different information pages. When analyzing this data, a better understanding of collaboration, reputation, and information can be created. The variables of initial trust, experience, and perceived value of the relationship are logged based on design mechanisms discussed in Chapter 4. These variables all contribute to the analysis of the different hypotheses.

5.3.4. Debriefing

After the gameplay and the post-questionnaire, a debriefing session was held. While data is collected through the pre-, gameplay, and post-questionnaire, a debriefing session is still held. A debriefing session is valuable since it provides the opportunity to gather players' behavior and choices in the game. Moreover, a debriefing phase allows the researchers to inform the players about the subject of the game (Peters, Vissers, van der Meer, 1998).

During the debriefing phase, specific questions were asked to the players. Before the debriefing questions were asked, the researchers could check each player's scoring on the trust game administration page (Figure 5.22).

GameUsers plus Scores

Name	Played	Profit	Satisf	Sustai
NZ2021_e2Exa	Y	75	24	46
NZ2021_9ghUC	Y	97	16	44
NZ2021_sjp2z	Y	95	16	31
NZ2021_k5ENP	Y	86	0	14
NZ2021_YgWut	Y	73	16	29
NZ2021_xB5wv	Y	88	20	27
NZ2021_FBeth	Y	88	16	36
NZ2021_9FcNA	Y	88	16	29
NZ2021_ruHRs	Y	81	16	17
NZ2021_FhXER	Y	93	20	39
NZ2021_Z2Yig	Y	110	16	19
NZ2021_jCwQv	Y	94	16	32
NZ2021_27Q9h	Y	113	16	9
NZ2021_vSjcd	Y	53	12	9

Figure 5.22. Overall game score of each player

The scoring of the players gives the occasion and a starting point to ask the players some questions. Below is an example of the questions which were asked during the debriefing phase.

1. Did players enjoy playing the game?
2. Who met the goals of the 3, 2, or 1 KPIs on sustainability, profit, or customer satisfaction level?
3. Which strategy did they apply to choose a carrier?

4. Which information did a player use to decide with which carrier to collaborate?
    a. Which players bought a FreightBooking report?
    b. Who checked out the reviews of the carriers?
5. Did trust play a role when choosing a carrier?

5.4. Experimental set-up of the conceptual model

The conceptual model is tested through different hypotheses. As discussed in Chapter 4, the game is specially designed to test the conceptual model and framework. In the next sections, an explanation is given of how the different hypotheses and their variables are implemented in the game and how they can be used to test the different hypotheses.

Hypothesis 1: The higher the disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer

To test this hypothesis, three variables are important: (1) Disposition of trust of players, (2) quote offer, and (3) Star rating of carriers. The disposition of players' trust is measured through statements in the post-questionnaire. These statements can calculate the mean and median of the disposition to trust. The quoted offer and star rating are given in the game. The average of the quote offer and star rating is calculated to test the correlation between these variables. This is done based on the star rating and quote offer of the first three rounds since the carriers are introduced in the first three rounds and the players do not have any experience with any of the carriers.

Hypothesis 2: When more operational information is requested by players, the quality of choice to collaborate with a specific carrier is higher

Different information types are included in the game (see Table 5.19). The operational information consists of 4 types, such as the details of the company and the reviews other clients gave to this company. During gameplay, a player can click on the information logged in the background. Subsequently, it is logged which information is requested from which carrier.

Table 5.19. Overview of information types in the FreightBooking game.

Operational information	**Strategical information**
Company details [CarrierDetailsCompany]	Carrier report [CarrierDetailsBuyReport/CarrierDetailsReport]
Google search company [CarrierDetailsGoogle]	
Carrier Website [CarrierDetailsWebsite]	
Carrier reviews [CarrierDetailsReviews]	

The logging of the clicks and the choice with whom the player collaborated can be used to test this hypothesis. Every click on every information type of every carrier is logged. This provides a rich data set on the behavior of players. However, only 1 click on 1 information type per carrier is used because some players click a lot of the same information type and other players just one time. Therefore, the amount of clicks on the information type is normalized.

The choice with whom the player wants to collaborate for which order is also logged. The first four rounds of the game are used since this provides information on which information is requested by the players in the first three rounds, and in the fourth round, which choice the

players made. This hypothesis can be tested with the information of the clicks on the information type and the choice of carrier.

Hypothesis 3A: Players with a low Disposition to trust are more likely to request strategic information

Hypothesis 3B: Players with a high disposition to trust are more likely to request operational information

Different information types, strategic and operational, can be requested during the game (see Table 5.18). The operational information is expected to be mostly requested at the beginning of the game since the carriers are introduced in the first three orders. Therefore, the first 3 rounds are used to test whether the disposition to trust influences how often a player requests operational information. The data on how often a player requests strategic information is used for all 7 rounds. As discussed in Chapter 4, players need to buy strategic information in the FreightBooking game. During the game, players have different experiences with carriers, and this can influence the decision whether or not they want to collaborate with a certain carrier. Therefore, the data from all rounds is used for strategic information.

Hypothesis 4: Players who have relation with a carrier are more likely to choose that carrier again

The FreightBooking game consists of 7 rounds, where in the first 3 orders, the carriers are introduced one by one. From the 4th order, carriers are reoccurring and can be chosen again. In each round, 6 scenarios can occur where players choose a carrier with whom they collaborated with, not collaborated with, and their experience (positive or negative) with that carrier (Figure 5.23). To test this hypothesis, the logging of the choice of carrier can be used in the first 4 rounds.

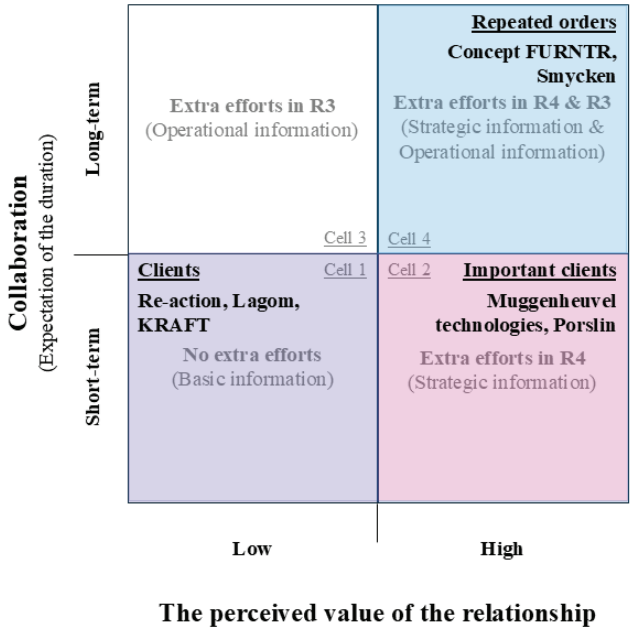
Neutral experience > Carrier chosen	Positive experience > Carrier not chosen	Positive experience > Carrier chosen
Neutral experience > Carrier not chosen	Negative experience > Carrier not chosen	Negative experience > Carrier chosen

Figure 5.23. Choices a player can make to decide with which carrier to collaborate.

The variable '*experience*' is measured by the star rating a player gives to a carrier and by the logging with which carrier the player collaborates in the game. For example, player A chooses carrier X in round 2, and this carrier reoccurs in round 5. Based on the positive or negative outcome of the collaboration in round 2, the player can decide whether or not to collaborate again with this player. Based on the choices a player made, the relationship between experience and the quality of choice of a carrier can be tested.

5.5. Experimental set-up of the conceptual framework

Besides the conceptual model, the conceptual framework also served as a basis for the game design. The conceptual framework explains the relation between the perceived value of the relationship and the type of collaboration, long or short-term. To analyze how the perceived value of the relationship and the type of collaboration influence a player's decision-making process, the client type is designed according to the conceptual framework. The 7 clients incorporated in the game have different characteristics (See Figure 5.24). For instance, in cell 4 in Figure, the client Smycken is a long-term client with many transportation requirements. Additionally, fines are involved if transport requirements are not met. In cell 1 the client Lagom is a client with much less transport requirements and no fines are involved. In the case of arranging transportation for the client Smycken, it is expected that the player searches for more information (strategic and operational) to decide which carrier to collaborate.



5.24. Type of clients based on the conceptual framework.

5.6. Conclusion

Chapter 5 discussed the experimental set-up of the FreightBooking game. The gameplay consists of three parts, where data is collected through a pre-and post-questionnaire and the gameplay. The hypotheses underlying the conceptual model and the framework can be tested with this data. Table 5.20 shows the variables that are used for testing the hypotheses. Chapter 6 will discuss the results of the hypotheses.

Table 5.20. Overview of the variables that are used per hypotheses

Hypothesis	Variables	Relation to game experiment
1	Disposition to trust	Post-questionnaire
	Average Star rating	Game
	Average Quote offer	Game
2	Requested operational information from players	Game
	Choice carrier by players	Game
3A	Requesting strategical information	Game
	Disposition to trust	Post-questionnaire
3B	Disposition to trust	Post-questionnaire
	Request operational information from players	Game
4	Choice carrier by players	Game
	Qualitative choice of carrier	Game
5	Short-term/long-term order of clients	Game
	Request for operational information	Game

6

Data analyses to test the conceptual model and framework of trust in technology-mediated collaborations

The previous chapters discuss the conceptual model, framework, and serious game FreightBooking.com. Chapter 5 explains the analysis set-up for testing the conceptual model and framework using data gathered during gameplay. Chapter 6 will discuss the data analysis of the FreightBooking game. The analysis aims to study trust's role when organizations use technological innovations, such as platforms, to collaborate.

Chapter 6 is structured as follows: first, an introduction is provided about the background of the participants, including information such as how many players have played the FreightBooking game and their work experience in the transport and logistics sector (Section 6.1). The overall descriptives of the gathered gameplay data are discussed in Section 6.2. For example, what is the initial trust level of players? Do players often use platforms to collaborate in their personal life? After the general insights into the gameplay, the findings of the different hypotheses of the conceptual model are discussed in section 6.3, based on the gameplay data and pre- and post-questionnaires. First the variables are discussed that are used to test the hypothesis, after that an example is given of how the operationalization is done. Following this, the outcome of the hypothesis is discussed finishing with a conclusion on the hypothesis.

After the discussion of the results for the conceptual model, the hypotheses of the conceptual framework are discussed in Section 6.4. Section 6.5 provides an overall conclusion for the conceptual model and framework.

Please find the raw datasets and questionnaires of the FreightBooking game: 10.4221/7fcf9365-8a02-49cf-a67c-2999acd0636

The FreightBooking game has been played with 101 players divided into four groups. Chapter 6 will only discuss the overall findings. Appendix G discusses the findings of the hypotheses for each group.

6.1. Introduction

The game FreightBooking.com is a digital game that is played with participants in an online or offline setting. The set-up of the experiment is discussed in Chapter 5. The participants were from 3 different countries: the United States of America, New Zealand, and the Netherlands. Table 6.21 gives an overview of how often the serious game was played and which experiments were complete and incomplete. Complete experiments are experiments where players fill in all questions in the pre-and post-questionnaire and play all rounds in the game. Incomplete experiments are experiments where players did not fill in the post-questionnaire because they still needed to finish the game. The incomplete questionnaires are left out of the further analysis.

Table 6.21. Overview of experiments the FreightBooking game.

	Group A (NZ)	**Group B (USA)**	**Group C (SCG)**	**Group D (GDC)**
Complete experiments	10	15	20	41
Incomplete experiments	3	1	3	8
Total experiments per group	13	16	23	49
Overall Complete experiments/Overall experiments	**86**/101			

As previously explained, the players are from different countries and backgrounds. Table 6.22 gives an overview of the backgrounds of each group. None of the players are professionals in the transport and logistics sector. However, group 1 and group 2 have work experience in understanding complex systems, such as the transport and logistics sector.

Table 6.22. Overview of backgrounds of players.

Group No.	**Country**	**Background**
1	Group A	PhD, Postdocs, (assistant) professors with expertise in serious games
2	Group B	Master students. MBA students with expertise in logistics, transport, and supply chain networks. Some of the students have work experience in transport and logistics.
3	Group C	Master students with expertise in supply chain networks and serious games
4	Group D	Master students with expertise in game design.

Before the results of the various hypotheses are discussed, the overall findings are presented that give insight into the players' experience with platforms or the answers provided on the statements about their disposition to trust in the pre-and post-questionnaire. In the post-questionnaire, 3 statements were included that evaluate players' game experience. In Appendix G, the responses of the overall group are presented.

In the next section, the descriptives of the overall group are presented. The descriptives will provide an understanding of the profile of players in this group. Subsequently, the conceptual model and related hypotheses are presented.

6.2. Descriptives overall group

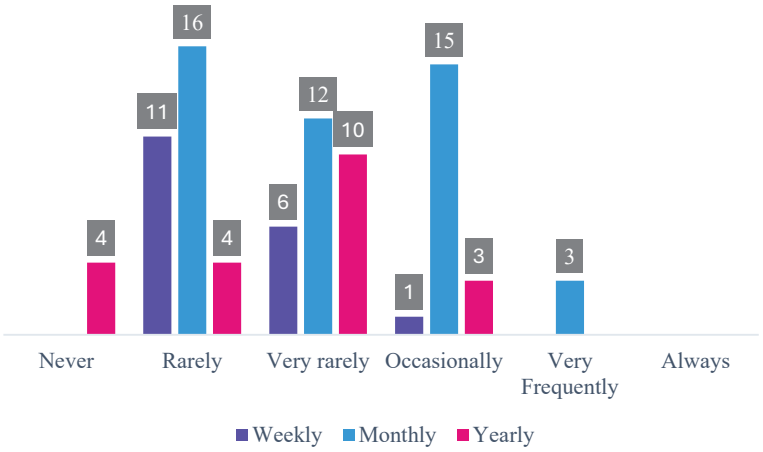
The FreightBooking game and the pre- and post-questionnaire are played and filled in by 86 players. As discussed previously, these players have different backgrounds and nationalities. First, the descriptive data is analyzed for better insight into the group's composition. In the pre- and post-questionnaire, questions are asked to gather background information on the players. Questions such as, *What is your experience with buying a product or service in an online environment? Do you have negative or positive experiences when purchasing products or services online? And were you engaged in the gameplay?*

As explained in Chapter 4, the FreightBooking game is designed as an online platform where players can collaborate with carriers to transport goods. Table 6.23 shows how frequently players use a platform to buy products or services online and their overall experience with this. Half of the players (46) use a platform on a monthly basis. Moreover, most players also express that their overall experience is good when purchasing products or services online. Only two players out of 86 buying a product or service online monthly expressed poor experience.

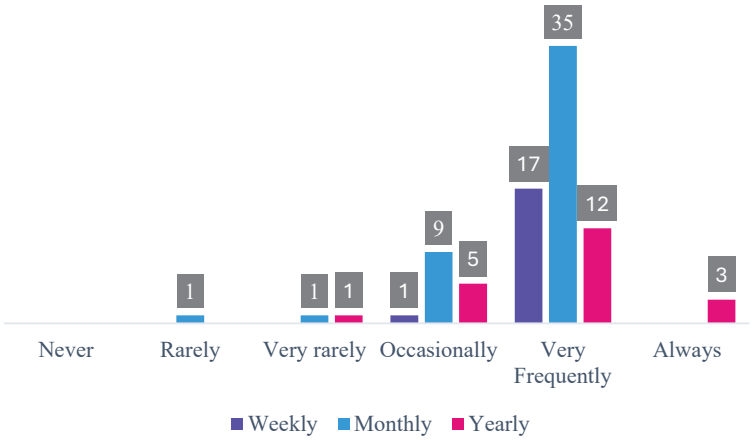
Table 6.23. Usage of a platform by respondents and their experience when buying products/services online.

Frequency	**Amount**	**Overall Experience purchasing products/services online (n)**			
		Poor	Acceptable	Good	Very good
Weekly	18		1	8	9
Monthly	46	2	8	28	8
Yearly	21		5	12	4
Never	1			1	

In the pre-questionnaire, besides the question on overall experience, questions were asked on how often they had a negative or positive experience. Figure 6.25 gives an overview of the responses of the players. Most of the players who use a platform weekly, monthly, or yearly usually have a positive experience. If a closer look is given at the negative experience, it shows that players who have a negative experience respond that they have it rarely or occasionally. These results show that besides the overall good experience, some players have negative experiences when using a platform. This experience may also play a role in the game since the game represents an online platform.



(a)



(b)

Figure 6.25. Responses of players whether they had a negative (a) or positive (b) experience when purchasing a product or service online.

Besides the statements on the use of platforms, the players also filled in statements on their trust level, i.e., their Disposition to trust. Figure 6.26 shows the players' responses to the statements related to trust. For the statement *'I generally do not trust other people*', most respondents (59 out of 86) expressed that they slightly disagreed, disagreed, or strongly disagreed with it. This implies that most respondents do trust other people. The other three figures also show this positive view towards other people where there is faith, general trust, and reliability. Most respondents can be classified on the positive side on the scale from Strongly disagree to Strongly agree.

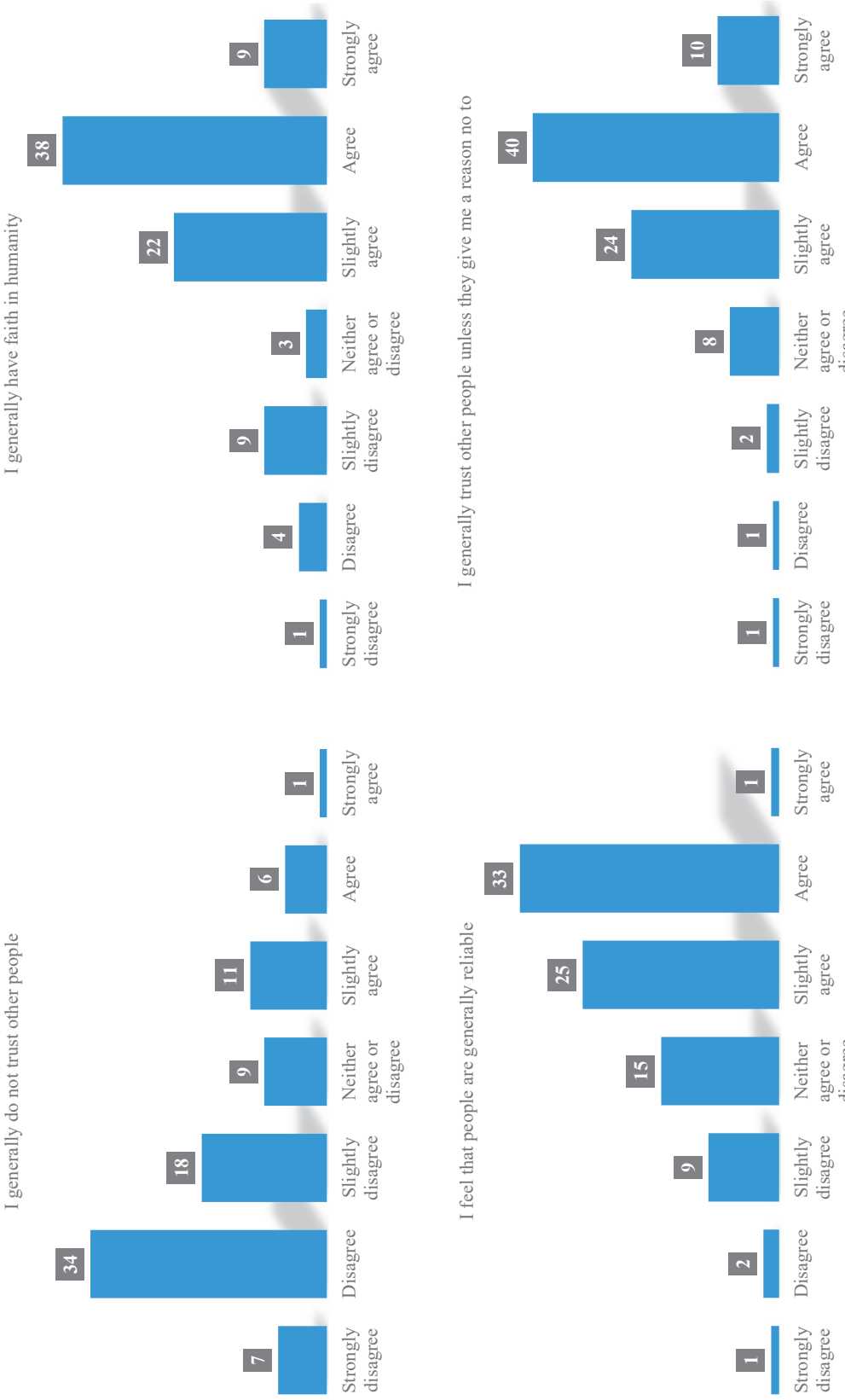


Figure 6.26. Overview of the response to the 4 different statements on '*Disposition to trust*' in the post-questionnaire.

Before the analysis of the gameplay data is done and the findings on the different hypotheses are shared, first, the responses to the game are discussed. According to Harteveld (2011), there needs to be a balance between the three worlds of meaning, reality, and play. Most respondents said they were engaged in the gameplay, 72 players out of 86 (Figure 6.27). Engagement during gameplay is an important part of the world of 'Play.' The FreightBooking game represents a somewhat simplified situation to enhance the playfulness and purpose of the game. When players are engaged, they are willing to spend time and energy in the game, which results in players gaining new insights and indirectly contributing to the research (Harteveld, 2011).

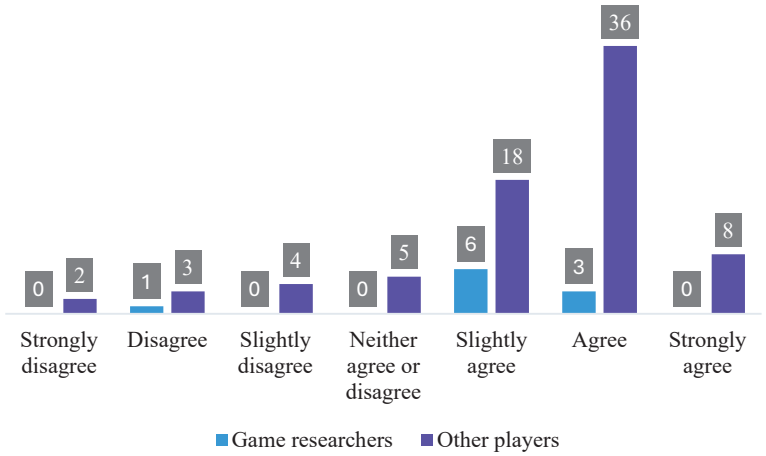


Figure 6.27. Overview of the responses to the statement: *'I was engaged in the gameplay'.*

Although the game is simplified, most players (57 out of 86) expressed that the game was sufficiently complex to represent reality (Figure 6.28). This will also contribute to the gameplay results.

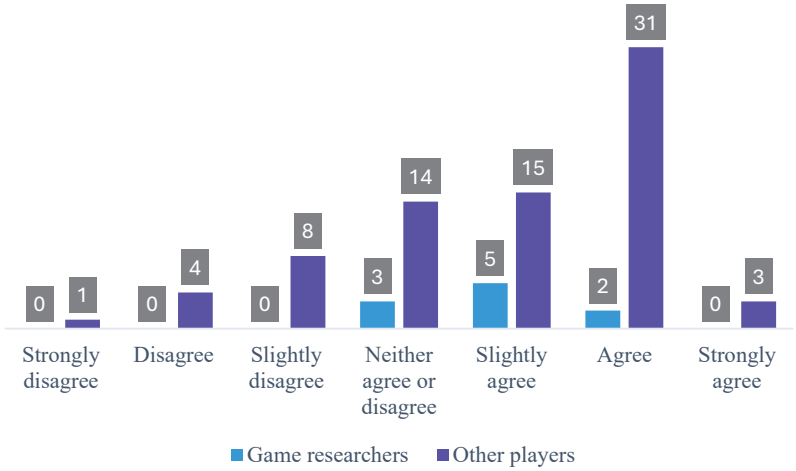


Figure 6.28. Overview of the responses to the statement: *'The game is sufficiently complex to represent the collaboration process among organizations when using a platform'.*

When players start the game, they first see a pop-up explaining the main processes. This pop-up can be accessed at any time during the gameplay. Explaining the processes and rules of the game can enhance the players' understanding of the game when they start playing. According

to the results of the post-questionnaire on gameplay, the game rules were also easy to understand (Figure 6.29).

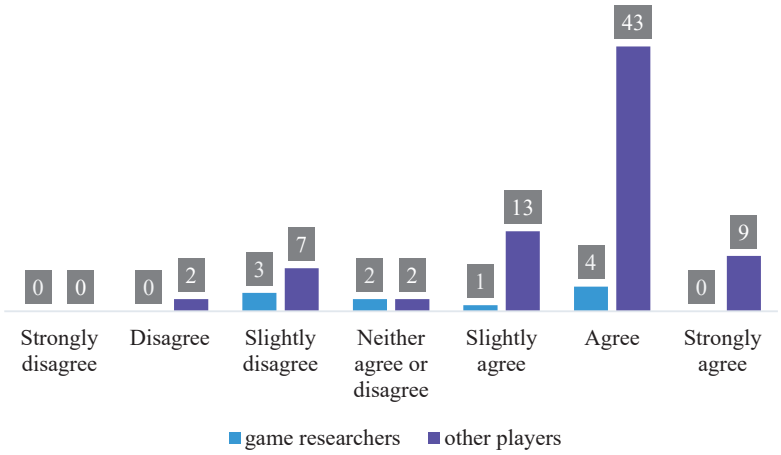


Figure 6.29. Overview of the responses to the statement: *'It was easy to understand the rules of the game'.*

6.3. Hypothesis formulation and discussion of findings

In Chapter 5 the hypotheses of the conceptual model to be tested with the game and pre- and post-questionnaire were formulated. Figure 6.30 gives an overview of the hypotheses. The hypotheses and findings are discussed in the next couple of sections.

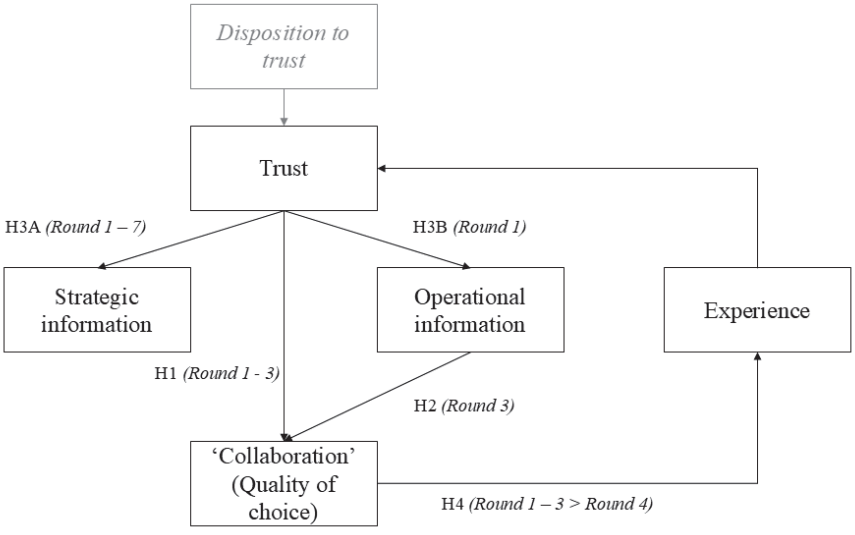


Figure 6.30. The conceptual model with the formulation of the hypotheses.

In the conceptual model, the variable *'Trust'* is substituted by *'Disposition to trust'*. This construct is measured through statements in the post-questionnaire. As discussed in Chapter 2, trust is a complex variable that is influenced by a person's environment, upbringing, and

experiences (personal life and work life). This research looks at the role of initial trust in technology-mediated collaborations. This means the role of trust when collaborations are established. In this case, the Disposition of trust, i.e., trust embedded in a person, can be used to measure trust.

To start with an analysis of the hypotheses, first, the internal consistency needs to be determined for the construct *'Disposition to trust*'. The latent variable of '*Disposition to trust*' must be transferred to a construct to analyze this variable. The first step is to recode the variables in SPSS to check the internal consistency. First, the Likert scale needs to be recorded to calculate the internal consistency. Three out of 4 questions are formulated in a positive way; only 1 question is formulated in a negative way. Table 6.24 gives an overview of the operationalization used in SPSS.

Table 6.24. Operationalization of constructs' *Disposition to trust*'.

Likert scale items	Operationalization for positive question	Operationalization for negative question
Strongly disagree	1	7
Disagree	2	6
Slightly disagree	3	5
Neither agree or disagree	4	4
Slightly agree	5	3
Agree	6	2
Strongly agree	7	1

After the recording, the internal consistency is checked. Using SPSS version 28.0.0.1 allows for testing the internal consistency of the construct '*Disposition to trust*'. Table 6.25 gives an overview of the analysis in SPSS. To be internally consistent, the Cronbach Alpha should be above 0.7. Based on the outcome of the analysis, it can be concluded that the items are internally consistent since Cronbach's alpha is above 0.7 (Field, 2018).

Table 6.25. Reliability analysis of construct *'Disposition to trust'* of the overall group.

Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
.774	.785	4

The following sections discuss the results of each hypothesis. First, general information is presented on the important variables to test the hypotheses. Second, the outcome of the hypothesis testing is discussed. The sections conclude with a discussion of the support for the hypothesis's outcome by insights retrieved from the pre- and post-questionnaire.

6.3.1. Hypothesis 1: The higher the Disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer

As previously explained, the variables used to test this hypothesis are discussed first. Additionally, an example of the operationalization is presented in grey boxes. The operationalization provides more insight into how the correlation between the variables is

calculated. After the operationalization, the outcome of the analysis is presented. Finishing with a conclusion on the hypothesis.

A. Discussion of variables and operationalization

During round 1, players do not yet have any experience with the carriers. Therefore, it is a good measure to test initial trust and the decision with which carrier to collaborate.

To test the correlation between the variables '*Disposition to trust*' and *'Quality of choice of a carrier*'. The '*Quality of choice of a carrier'* is defined as a carrier that has a high or low star rating and a high or low quote offer in the FreightBooking game. First, the Mean and Median of Disposition to trust need to be calculated for the overall group. The mean and median Disposition to trust are calculated using IBM SPSS 28.0.0.1. Although the construct *'Disposition to trust'* is measured through a Likert scale and is on an ordinal scale, the mean is chosen to do calculations with instead of the median. The advantage of using the mean is that it provides a more fine-grained distribution. The median does not show the variety of values with the *'Disposition to trust'*. In the following sections, '*Disposition to trust'* will be called DT.

In the overall group, player 14Z2a has a mean of 1.50 (lowest meanDT), and player 5H2nW has a meanDT of 6.75 (highest meanDT). Based on the meanDT, the group can be split into a group with a Low Disposition to trust and a group with a High Disposition to trust.

Example operationalization: To test the relationship between the 'meanDT', 'Average Star rating', and 'Average quote offer', the 'Average Star rating' and 'Average Quote offer' of the carriers chosen by a player need to be calculated. The average star rating and quote offer are calculated by adding the star rating and quote offers of all three rounds and divided by three (See Table 6.26).

Table 6.26. Operationalization of the variables to test hypothesis 1.

User	***MeanDT***	***Round 1***		***Round 2***		***Round 3***		***Average star rating Round (1-3)***	***Average quote offer Round (1-3)***
		Star rating	*Quote offer*	*Star rating*	*Quote offer*	*Star rating*	*Quote offer*		
14Z2a	1.50	2	5	3.5	3	4	13	3.17	7.00
IffAq	5.50	3	8	4.5	8	4	13	3.83	9.67

B. Outcome of the analysis Hypothesis 1

To test the hypothesis, the correlation coefficient is calculated between the variable *'Disposition to trust'*, *'Average Star rating*,' and *'Average Quote offer*.' The Spearman Rho test or Kendall Tau-b correlation can be used to test this hypothesis. According to Field (2018), the Kendall Tau-b correlation is a suitable test for the correlation between this variable since the Star rating, Quote offer, and Disposition to trust are measured on a scale (from 1 to 7). Moreover, there is no monotonic relationship between the variables meanDT and, for example, *'Average Star Rating'*. Therefore, the Spearman-Rho Test is not suitable for this analysis. In SPSS, the correlation coefficient is calculated between the '*MeanDT"* of players (e.g., 14Z2a MeanDT = 1.50) and the '*Average Star rating*' (e.g. 14Z2a Average star rating = 3.17).

Based on the outcome of the Kendall Tau-b correlation (Table 6.27), the correlation coefficient between '*MeanDT*' and '*Average Star rating*' is -0.079 with a significance of 0.332. The correlation coefficient between '*MeanDT*' and '*Average Quote Offer*' is -0.079 with a significance of 0.325 ($p < 0.05$). Therefore, it cannot be concluded that there is a relationship between these variables.

Table 6.27. (a) Correlation between '*MeanDT*' and '*Average Star rating*', and (b) Correlation between '*MeanDT*' and '*Average Quote offer*'.

			meanDT
Kendall's tau-B	**Average star rating**	Correlation coefficient	-.079
		Sig. (2-tailed)	.332
		N	86

(a)

			meanDT
Kendall's tau-B	**Average Quote offer**	Correlation coefficient	-.079
		Sig. (2-tailed)	.325
		N	86

(b)

Based on these outcomes, it can be concluded that a relationship between '*MeanDT*' and '*Average Star Rating*' and '*Average Quote offer'* cannot be proven based on the gameplay data. What we do see is that in the first round players choose to collaborate with a carrier that has a low quote offer. Table 6.28 gives an overview of the count of the various carriers per round. Most players collaborate with De Bont & Dochters in round 1. This carrier has a lower star rating and quote offer than De Rouw Transport.

Table 6.28. Overview of how many times a carrier is chosen in the first round in the overall group.

Carrier	**Star rating**	**Quote offer**	**Frequency choice Round 1**	**Frequency low group DT**	**Frequency high group DT**
De Rouw Transport	3	8	29	13	16
De Bont & Dochters	2	5	57	29	28

To test whether the difference in frequencies between the carriers in the first round is significant a Chi-square test is used (see Table 6.30 for the outcome). A Chi-square likelihood ratio test is suitable for testing the hypothesis since it tests the frequency between two categories (Field, 2018).

Example Operationalization: To test if the choice of players is significant in round 1, the relation between the frequencies of 2 carriers can be tested with a Chi-square. Table 6.29 shows the operationalization of the test.

Table 6.29. *Frequency of choice carrier in round 1.*

Star rating	*Quote offer*	*Frequency*
High	*High*	*29*
Low	*Low*	*57*

Table 6.30. The outcome of the Chi-square test to test the difference in frequencies between carriers in the first round.

	Value	Df	Asymptotic significance (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-square	86.000[1]	1	<.001		
Continuity Correction	81.584[2]	1	<.001		
Likelihood ratio	109.937	1	<.001		
Fisher exact test				<.001	<.001
N of valid cases	86				

[1] 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 9.78
[2] Computed only for a 2x2 table

		Value	Approximate Significance
Nominal by Nominal	Phi	1.000	<.001
	Cramer'S V	1.000	<.001
N of valid cases		86	

C. Conclusion Hypothesis 1

Derived from the analysis the relationship between the player's '*MeanDT*' and the '*Average Star Rating*' and '*Average Quote offer'* cannot be shown to be statistically significant. An explanation for this can be that the average player's '*MeanDT*' is quite high. For example, only 6 out of 86 players have a '*MeanDT*' lower than 3.75, where 45 players have a meanDT between 3.75 – 5.50, and 35 players have a '*MeanDT*' higher than 5.75. Based on the '*MeanDT*' it can be assumed that the group is quite trusting.

What we do see during the gameplay is that in the first round players select the carrier with a low quote offer/star rating compared to a high quote offer/star rating. Possible reasons for this can be that the group is that the group has a high trust level and most players of the group are more willing to collaborate with a carrier with a low quote offer/star rating. In the first round players are still exploring the game and do not have an infinite amount of profit tokens. A possibility is that players may want to avoid the risk of losing profit tokens and maybe also a learned behavior from other games plays a role where sometimes income/score is the most important factor to make a choice. However, players do get enough profit tokens not to be hampered by their choices in the first rounds.

6.3.2. Hypothesis 2: When more operational information is requested by players, the qualitative choice to collaborate with a specific carrier is higher

A. Discussion of variables and operationalization

It is expected that if players request more operational information, they will be better informed about the carriers and can make a better choice as to which carrier they want to collaborate with. To test this hypothesis, round 3 is used since, in this round, players have some experience with the game, and new carriers are introduced that can fill this order. In round 3, order #3 players can request information on three carriers (Van Beers Logistics, Eeden Logistics, and Transport Group Galvan). To test this relationship, first, the total amount of operational information requested in round 3 needs to be operationalized (see the grey box).

Example of operationalization: Table 6.31 shows how the different carriers that can be chosen in round 3 are operationalized. The operationalized qualitative choice is based on the carriers' grade during the game design (Appendix C). For example, Eeden Logistics has a grade of 5 in the game (not visible for players), and Van Beer Logistics has a grade of 1. Based on the grades, the carriers are operationalized from 1 to 3, with Eeden Logistics having the highest score.

Table 6.31. *Operationalization of carriers round 3, order #3.*

Carrier	*Qualitative choice operationalized*
Eeden logistics	*3*
Transport Group Galvan	*2*
Van Beers Logistics	*1*

The 'Operationalized Qualitative Choice' is correlated with the 'Amount of requested operational information' by the players. The 'Amount of requested operational information' by the players is operationalized according to the following scheme.

- *Requested no information 0*
- *Requested information of 1 carrier +1*
- *Requested information of 2 carriers +2*
- *Requested information of 3 carriers +3*

B. The outcome of the analysis of Hypothesis 2

Based on the outcome of the Kendall Tau-b test, there is an unexpected weak negative relationship between the '*Qualitative choice*' and '*Amount of requested operational information'.*

Table 6.32. (a) Correlation between *'Qualitative choice carrier'* and *'Amount of requested operational information'.*

			Amount of requested operational information
Kendall's tau-B	**Qualitative choice carrier**	Correlation coefficient	-.310
		Sig. (2-tailed)	.02
		N	86

It is interesting to look at the frequency of the type of carrier players (i.e., highest = 3, medium = 2, lowest = 1 type of quality) that have been chosen and the amount of requested operational information during round 3, order #3. As shown in Table 6.33. Most of the players decide to collaborate with a high-quality carrier, 58 out of 86 players. Where 30 players requested information, and 28 players decided to collaborate with a carrier without requesting operational information. An explanation is that order #3 is from an important client, Muggenheuvel Technologies, and a player can be fined if the transport is not carried out according to the specifications. The star rating and quote offer define the quality of a carrier. For example, Van Beers Logistics has a low star rating of 2.5 and puts a quote offer of 9. It could be that players in this round thought that they would always go for the most expensive carrier with the highest star rating because profit coins were at stake.

Table 6.33. Frequency table of Qualitative choice of carrier and the amount of requested operational information.

Type of Qualitative choice of carrier	**Requested operational information**	**Frequency**	**Total per Qualitative choice carrier**
1	0 carriers	1	11
	1 carrier	1	
	2 carriers	2	
	3 carriers	7	
2	0 carriers	3	17
	1 carrier	0	
	2 carriers	4	
	3 carriers	10	
3	0 carriers	28	58
	1 carrier	7	
	2 carriers	4	
	3 carriers	19	
	Total	*86*	*86*

C. Conclusion Hypothesis 2

Based on the outcome of the analysis, a weak negative relationship can be found between the '*Amount of requested operational information*' and the '*Qualitative choice of carrier*'. It was expected that players who requested more operational information would make a better qualitative choice of carrier. In the game, many factors play a role in choosing a carrier. The qualitative choice of carrier can be based not only on the operational information players read about a carrier but also on the players' experience they have, and the conditions of a client that need to be met.

6.3.3. Hypothesis 3A: Players with a low disposition to trust are more likely to request strategic information

Hypothesis 3A concerns the relationship, in the conceptual model, between a person's trust and the amount of strategic information the person requests. Based on the literature review in Chapter 2 and the interviews with the stakeholders, it is expected that players will request more strategic information when they have a low disposition to trust.

A. Discussion of variables and operationalization

In the game, different information types are designed so that players can retrieve more information about a carrier. The information can be operational, meaning information that you need to fulfill the transport, or strategic, meaning information that is more about the carrier's background. Table 6.34 gives an overview of the information types that belong to either strategic or operational information.

Table 6.34. Overview of information types in the FreightBooking game.

Operational information	Strategical information
Company details	Carrier report
Google search company	
Carrier Website	
Carrier reviews	

First rounds 1 – 7 need to be operationalized to calculate the correlation coefficient. In each round, the amount of strategic information differs since it depends on how many carriers provide a quote offer to the player. For example, in round 1, 2 carriers put a quote offer in compared to round 2 where 3 carriers put a quote offer in. Players who have a low meanDT request more strategic information compared to the group with a High meanDT (Table 6.35). However, the request for strategic information by the low MeanDT group is still very limited.

Table 6.35. Overview of requested strategic information for the two different groups.

Group MeanDT	0 request for strategic information	≥ 1 request for strategic information
Low	36	7
High	41	2

Before the correlation coefficient can be calculated between the *'the total count of Strategic information'* and *'MeanDT'*, first the count of the strategic information needs to be

operationalized. Different players requested a different amount of information. For example, one player requested strategic information 8 times during the game compared to players who requested no strategic information. To calculate the correlation coefficient, the 8 times of requested strategic information is recoded into 1. The operationalization is as follows (see example in the grey box below):

- Requests strategic information 1
- Requests no strategic information 0

Example operationalization: To test this hypothesis the variables 'Strategic information' and 'meanDT' are correlated with each other. As explained during the game play not many players requested strategical information. Therefore, the total count of all 7 rounds is used. In the table below the operationalization is shown. To test the correlation the variables 'MeanDT' and 'Operationalization Total Count SI' are used. If a player requested strategical information then this is operationalization as 1, yes requested 1 or more strategical information, or 0, requested no strategical information.

Table 6.36. *Operationalization of the variable 'Total Count SI'*

User	***MeanDT***	***Total count SI (round 1 – 7)***	***Operationalization Total Count SI***
14Z2a	*1.50*	*0*	*0*
xB5wv	*5*	*3*	*1*

B. The outcome of the analysis of hypothesis 3A

In this relationship, the variable *'Disposition to trust'* is the independent variable, and the variable '*Strategic information*' is the dependent variable. Moreover, the variable '*Disposition to trust*' is an ordinal variable measured on an interval level (Field, 2018). For calculating the correlation coefficient between '*Total count of SI*' and '*MeanDT*', the Kendall Tau-B test was selected since it is suitable for small datasets. Moreover, this test can be used for correlation coefficients between ordinal variables.

Table 6.37. Outcome of the Kendall Tau-b between the variables' *MeanDT'* and *'Total Count of SI'.*

			Requested Strategic information
Kendall's tau-B	MeanDT	Correlation coefficient	-.093
		Sig. (2-tailed)	.314
		N	86

C. Conclusion Hypothesis 3A

Derived from the analysis, the relationship between '*Requested strategic information*' and '*MeanDT*' is not statistically significant. An explanation for this is that very few players requested strategic information during gameplay. This is also supported by questions on information in the post-questionnaire. Eight players out of 86 stated that the FreightBooking report was useful for analyzing whether a carrier is trustworthy (Figure 6.31). However, a lot of players did not buy the strategic information during gameplay and therefore could not have known what the benefits were of such a report. Most players indicated that different types of operational information are useful for deciding whether a carrier is trustworthy.

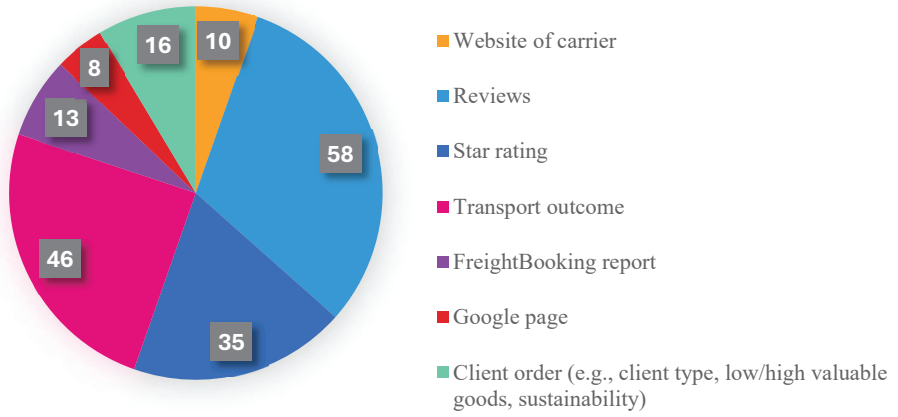


Figure 6.31. Overview of information types that were used to decide whether a carrier is trustworthy.

6.3.4. Hypothesis 3B: Players with a high disposition to trust are more likely to request operational information

The conceptual model splits information into operational and strategic information requests. Hypothesis 3B focuses on operational information, where it is expected that players with a lower disposition to trust request more operational information than players with a higher disposition to trust. Since the players with a low disposition to trust may be more likely to need the information to decide which carrier they want to collaborate.

A. Discussion of variables and operationalization

As shown in the previous section, players can request 4 different types of operational information. The variables '*MeanDT*' and *'Request operational information*' are used to test this hypothesis. The *'MeanDT'* for every player has already been calculated for the other hypotheses. The requested operational information of every player is calculated for the first three rounds. The first round differs from the second and third rounds since only 2 carriers offer a quote in the first round. For example, in round 1, players can request a maximum of 8 operational information types compared to round 2, where players can request 12 operational types since 3 carriers are putting in a quote offer. Therefore, the data needs to be normalized before it can be used. The normalization is done according to the following scheme:

- 0% 0
- >0 – 25% +1
- *>25% - 50% +2*
- *>50% - 75% +3*
- *>75% - 100% +4*

Example operationalization: To test this hypothesis the 'MeanDT' is used of every player. The 'Request of operational information' is operationalized as explained above. Table 6.38 shows the operationalized constructs of the data of round 1. To calculate the correlation coefficient, the values of the 'MeanDT' is used (e.g., gxAjZ = 4.25 and msZNA = 5.50), and the 'Operationalized request of operational information round 1 - 3' is used. To have the overall count, the percentual count per round is calculated and added up. In the table below, the percentual count of round 1 for player gxAjZ is 50%. This player requested four information items from a total of 8 information items. Player msZNA did not request any operational information during the first round and had a percentual count of 0%. For each of the four rounds, the overall percentual count is calculated by adding up all the percentual counts of the first three rounds divided by three.

***Table 6.38.** Operationalization of data set to calculate the correlation coefficient*

User	***MeanDT***	***Group***	***Request information of carriers***				***Percentual count round 1***	***Percentual count round 1 - 3***
			Company	*Google*	*Website*	*Reviews*		
gxAjZ	*4.25*	*Low*	*1*	*1*	*1*	*1*	*50%*	*42,78%*
msZNA	*5.50*	*High*	*0*	*0*	*0*	*0*	*0%*	*8,33%*

B. The outcome of the analysis of hypothesis 3B

The variable '*MeanDT*' is an ordinal variable, and the variable' *Request operational information*' is a nominal variable. Therefore, the Kendall Tau-b test can be used to calculate the correlation coefficient. As shown in Table 6.39, it can be concluded that no relation can be shown between the mean disposition of players' trust and the request for operational information in the rounds.

Table 6.39. The outcome of the Kendall Tau-b between the variables '*MeanDT*' and '*Request operational information*' in (a) round 1, (b) round 2, and (c) round 3.

			Requested Operational information
Kendall's tau-B	MeanDT	Correlation coefficient	-.116
		Sig. (2-tailed)	.182
		N	86

(a)

			Requested Operational information
Kendall's tau-B	MeanDT	Correlation coefficient	.022
		Sig. (2-tailed)	.230
		N	86

(b)

			Requested Operational information
Kendall's tau-B	MeanDT	Correlation coefficient	.050
		Sig. (2-tailed)	.793
		N	86

(c)

Besides the calculation of the correlation coefficient per round, the correlation coefficient for '*MeanDT*' and '*Operationalization Request overall percentual count OI*' is calculated (Table 6.40).

Table 6.40. The outcome of the Kendall Tau-b between the variables' *MeanDT*' and '*Request operational information*' for rounds 1 – 3.

			Requested Operational information
Kendall's tau-B	MeanDT	Correlation coefficient	.009
		Sig. (2-tailed)	.935
		N	86

The results mentioned above do not show a significant relationship between the '*MeanDT*' of players and the '*Request of operational information*'. During the gameplay, the players request a lot of information (see Table 6.41). In the first round, the group with Low DT requests more information than the group with high DT (60 compared to 35). The amount of information requested in round 2 is lower for the low DT group. It is not clear why the group with High DT requests more information. An explanation can be that in round 2 most players have some experience with the game and are curious how requesting information can benefit their choice of carrier. In round 3, the low DT group again request more information than the high DT group.

Table 6.41. Overview of operational information request rounds 1 – 4.

Information types	Round 1		Round 2		Round 3		Round 4		Overall	
	Low	High	Low	High	Low	High	Low	High	Low	High
Company Details	27	20	49	70	60	79	32	26	**119**	**195**
Google page	8	4	25	49	65	35	26	28	**218**	**208**
Carrier website	9	2	14	8	31	12	23	14	**77**	**22**
Reviews	16	9	10	6	34	34	39	52	**99**	**101**
Total per round per group	*60*	*35*	*98*	*133*	*190*	*160*	*120*	*120*	***513***	***526***
Total requested information	*95*		*231*		*350*		*240*		***1039***	
Procentual count	*63,2*	*36,8*	*42,4*	*57,6*	*54,3*	*45,7*	*50*	*50*		

However, if a closer look is given at Table 6.41, over the course of the game there is a change in the amount of operational information that players request. For example, in round 1, players can choose between 2 carriers and a total amount of 95 operational information is requested, compared to round 3 where players could choose between 3 carriers and a total amount of 350 operational information is requested (for 3 carriers). However, 233 (2/3 of 350) is still almost 2.5 times more requested operational information in round 3 compared to round 1. From Table 6.41, it can be derived that there is a player's learning effect with regard to requesting operational information.

Example of operationalization: To test the relationship between the amount of requested operational information in round 1 compared to round 2 and round 3. In the first round, only 2 carriers could be chosen to collaborate with. In round 2 and round 3, 3 carriers could be chosen. In order to test the relationship between the different rounds, first round 1 and round 3 need to be normalized.

Table 6.42. *Frequencies of the amount of requested operational information round 1 – 3.*

Round	*Group DT*	*Frequency*	*Normalized frequency*	*Total*	*Normalized total frequency*
1	*Low*	*60*	*60*	*95*	*95*
	High	*35*	*35*		
3	*Low*	*190*	*126,6*	*350*	*233.33*
	High	*160*	*106,66*		
Total		***445***	***329***	***445***	***328.3***

Table 6.41 also shows that there is a difference in the group Low DT and High DT in requesting operational information in round 1. Based on this table it would be interesting to check if this difference is significant: does initial trust play a role when requesting operational information? To test the significance a Chi-square test on frequency distribution on the frequency in round 1 is done.

The results of the Chi-square test on frequency distribution show that there is a significant difference in frequencies of requesting operational information for the Low and High DT group with a Chi-square of 6.579 with a *p*-value of .010 ($p < 0.05$). It can be concluded that players with a low DT in the first round are more willing to request operational information compared to the group with a high DT. In the third round, the effect of the initial trust of players and requesting operational information does not play a role anymore (Chi-square: 2.571, *p*-value: .109).

C. Conclusion Hypothesis 3B

The data do not show a significant relationship between the '*MeanDT*' of players and the '*Request of operational information'*. A reason for this is that there is a limited variation in players' meanDT.

However, what is remarkable is that in the first round, when there is initial contact, more information is requested by players with a low meanDT compared to the player in the high meanDT group. In the first round, where initial trust plays a role there is a significant difference between the Low meanDT and High meanDT groups, where players with a Low DT request more information. In round 3, the effect of initial trust is not visible anymore. The reason for this is that players have some experience in the game; experiences with carriers that are also important information.

Requesting information is not only measured during the gameplay but statements related to this were also incorporated into the post-questionnaire. One of the statements was about whether players would change their minds about a carrier based on the information they received. Most players expressed that they slightly agree or agree with this statement (Figure 6.32). In addition, a statement was incorporated in the post-questionnaire about whether players believed the information they received. Most players expressed that they slightly agree or agree with this (48 out of 86) (Figure 6.33). However, 28 players expressed that they (slightly to strongly) disagreed with this. The statements in the post-questionnaire were about the whole gameplay and it shows that players did use the information to some extent.

Although we cannot prove that the '*MeanDT*' of players has a relationship with the request for operational information, from the gameplay and the post-questionnaire it can be concluded that when initial trust plays a role, players with a Low DT do request more operational information compared to the HighDT group (round 1). A reason for this may be that limited strategic information was, in general, requested. In addition, if you as a player have a low meanDT then you are more likely to request more information in general.

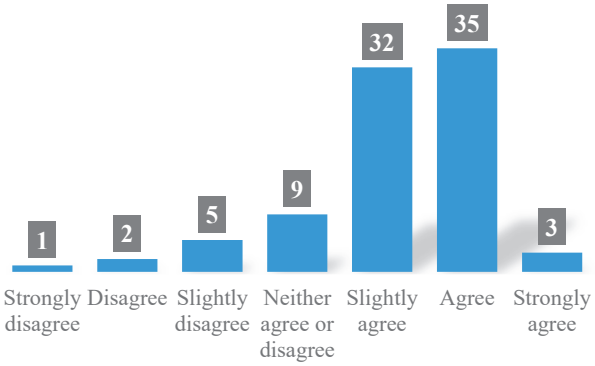


Figure 6.32. The responses of players to the statement,, "*Throughout the game, my willingness to collaborate with a particular carrier changed through the information I received*".

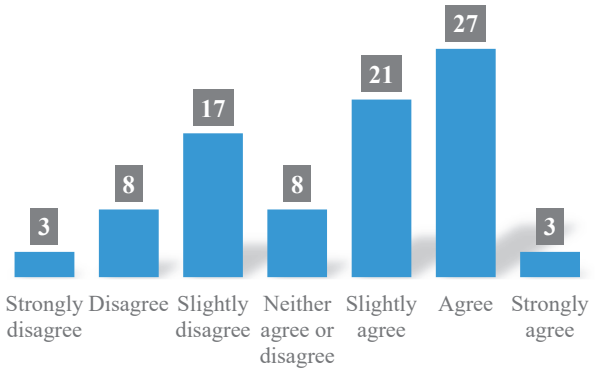


Figure 6.33. The response of players to the statement "*I believed the information carriers provided me*".

6.3.4. Hypothesis 4: Players use a positive or negative (prior) experience with a carrier to choose a carrier

As discussed in Chapter 2 and highlighted by the stakeholders in Chapter 3, experience is an important information source for organizations to decide the trustworthiness of carriers. This information gives organizations first-hand information about reliability and whether carriers deliver what they promise. With a quick look at the gameplay dataset, it was shown that the experience occurred from a carrier-specific experience and a general gameplay experience. Therefore, to analyze this hypothesis first the carrier-specific experience is discussed. Additionally, the general game experience is discussed. Concluding with a conclusion of hypothesis 4.

A. Usage of variables and operationalization – carrier-specific experience

To test the hypothesis, the players' experience must first be operationalized. During gameplay, each player has the opportunity to collaborate with each carrier. In the dataset, the choice with whom a player collaborated is logged. Players can have three different experiences with a specific carrier during the first three rounds of the game:

- No experience 0
- Positive +
- Negative -

In round 4, players can choose a carrier based on the information they read on the platform and their experience in the first rounds. In the grey box, an example is provided of the operationalization of the experience with a carrier.

Example operationalization: Table 6.43 shows the possible combinations that a player can have in the first three rounds, and what the exact operationalization is when they choose one of the options. For example, player 14Z2a can have no experience with carrier A, a negative experience with carrier B, and a positive experience with carrier C. In the fourth round this player chooses carrier B. Which is in fact a wrong decision because the player could also choose the carrier he or she has a positive experience with. The operationalization of the experience choice carrier is -2 since he or she already had information from a positive experience. In the next section an example is given of how the operationalization is done.

Table 6.43. *Operationalization of experience.*

Combination	***Choice***	***Operationalization***
No experience		*0*
1 positive experience, 2 no experience	*Positive experience*	*+1*
1 negative experience, 2 no experience	*Negative experience*	*-1*
1 Positive experience, 2 no experience	*No experience*	*-1*
1 Negative experience, 2 no experience	*No experience*	*+1*
Positive experience, negative experience, no experience	*Positive experience*	*+2*
Positive experience, negative experience, no experience	*Negative experience*	*-2*
Positive experience, negative experience, no experience	*No experience*	*-1*

In the first three rounds, players can choose between all carriers to transport the goods because a different set of carriers gives quote offers. In Table 6.44 below, at the top, it is shown which carriers the players can choose from. Subsequently, an overview is shown of which players choose to collaborate with and what the possible transport outcome is.

Table 6.44. *Overview of collaborations of a set of players during the first 4 rounds of the FreightBooking game*

User	Round 1	Round 2	Round 3		Round 4	
	#1	#2	#33	#34	#4	#5
	De Rouw Transport De Bont & Dochters	*Logistics group Kleiman VDL International Transport Transport & Logistiek Ponjier*	*Van Beers Logistics Eeden logistics Transport Group Galvan*	*De Rouw Transport Eeden logistics Transport & Logistiek Ponjier*	*Logistics group Kleiman Van Beers Logistics VDL International Transport*	*De Rouw Transport De Bont & Dochters*
14Z2a	De Bont & Dochters	VDL International Transport	Eeden logistics	Eeden logistics	**VDL international Transport**	**De Bont & Dochters**
Ex6E8	De Rouw Transport	Logistics group Kleiman	Eeden logistics	Eeden logistics	**Logistics Group Kleiman**	**De Rouw Transport**
CA5RA	De Bont & Dochters	Transport & Logistiek Ponjier	Van Beers Logistics	Transport & Logistiek Ponjier	**Van Beers Logistics**	**De Bont & Dochters**
yjsZo	De Rouw Transport	Transport & Logistiek Ponjier	Eeden logistics	Eeden logistics	**VDL International Transport**	**De Bont & Dochters**
fwpjb	De Bont & Dochters	VDL International Transport	Eeden logistics	Transport & Logistiek Ponjier	**Logistics Group Kleiman**	**De Bont & Dochters**
Z2Yig	De Rouw Transport	VDL International Transport	Transport Group Galvan	Transport & Logistiek Ponjier	**Van Beers Logistics**	**De Bont & Dochters**
Itn7D	De Rouw Transport	Logistics group Kleiman	Transport Group Galvan	Transport & Logistiek Ponjier	**Logistics group Kleiman**	**De Rouw Transport**

Positive transport outcome

Negative transport outcome

The abovementioned experience of the players is operationalized according to the operationalization scheme mentioned above. Table 6.43 shows the operationalization of the experience that players had during gameplay shown in Table 6.44. for round 4, order #4, player 14Z2a chooses to collaborate with VDL International transport.

In round 2, this player had the option to collaborate with this carrier and did so. With Van Beers Logistics (option in round 3) and Logistics group Kleiman (round 2), player 14Z2a did have the option to choose these carriers but did not select them (i.e., having 0 experience). Based on this combination, the experience in round 4 for order #4 can be operationalized as +1.

Table 6.45. *Operationalization of the experiences of the 7 players into the variable 'Operationalization experience choice of carrier'*

User		Round 1		Round 2		Round 3		Round 4	
		#1		#2		#33	#34	#4	#5
14Z2a	#4			0	+	0		+1	
	#5	+	0				0		+1
Ex6E8	#4			-	0	0		-1	
	#5	+	0				0		+1
CA5RA	#4			0	0	-		-1	
	#5	+	0			0	0		+1
yjsZo	#4			0	0	0		+1	
	#5	0	+				0		-1
fwpjb	#4			0	+	0		-1	
	#5	+	0				0		+1
Z2Yig	#4			0	+	0		-1	
	#5	+	0				0		-1
Itn7D	#4			-	0	0		-1	
	#5	+	0				0		+1

Based on the operationalization of players' experiences, the frequencies of the operationalization of experiences can be counted. Table 6.46 shows the frequencies of order 4 and order 5.

***Table* 6.46.** *Frequencies of the operationalization of players' experiences in Round 4, order 4, and order 5.*

Operationalization	*Frequency round 4 'Experience Choice of carrier'*		*Overall frequency round 4 'Experience Choice of carrier'*	
	Order #4	*Order #5*	*Order #4*	*Order #5*
-2	*1*	*0*	*19*	*21*
-1	*18*	*21*		
+1	*63*	*65*	*67*	*65*
+2	*4*	*0*		
Total	*86*	*86*	*86*	*86*

B. The outcome of the analysis of hypothesis 4 – carrier-specific experience

To test if the difference between the frequencies is significant the overall frequency of order 4 and order 5 are used. For order 4, a Chi-square test on frequency distribution is done. The test shows a Chi-square of 26.791 with a p-value of <.001. The Chi-square test for order 5 shows a Chi-square of 22.512 with a p-value of <.001.

C. Conclusion Hypothesis 4 – carrier-specific experience

Hypothesis 4 was about testing if there is a relationship between the experience a player has with carriers in the game and if the player would use this experience to make the best choice of carrier. Based on the first insights on the game data we notice that two experiences played a role during the gameplay: (a) carrier-specific experience and (b) general experience. This

conclusion is about the carrier-specific experience. As shown by the data, players do use their experience when selecting a carrier. Meaning, that if they had a positive or negative experience players learned from it and took it into account when deciding with which carrier to collaborate. In the post-questionnaire, players also expressed the carriers that were trustworthy. How players assessed the trustworthiness of carriers is in line with the design of the trustworthiness of the carrier. For example, Van Beers logistics is designed in such a way that it is least trustworthy. Most players expressed that they trusted the carriers who were designed to perform well in the game (38%). 29% expressed that they trusted the carriers that have an average performance in the game. Only 17% expressed that they trusted a carrier who not perform well. 9% of the players expressed that it was not possible to answer the question and 7% of the players expressed that they trusted none of the players.

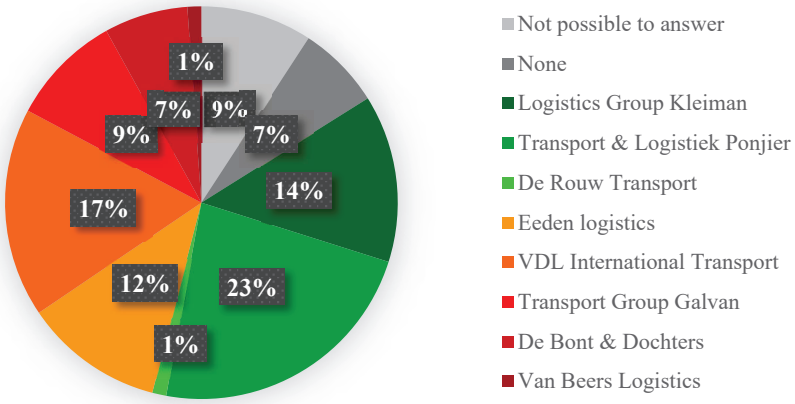


Figure 6.34. Response to the question, "*Which carrier did you trust the most?*".

D. Discussion of variables and operationalization – general experience

The abovementioned hypothesis relates to the experience a player has with a specific carrier. However, in the game, players also have a general experience, the experience a player has during the gameplay. The gameplay shows that players learn when choosing a carrier. This can be described as the general gameplay. In the first round, a lot of players choose the carrier with the low quote offer (i.e., De Bont & Dochters, quote offer 5, chosen 57 times) compared to the third round (Table 6.47), where players choose the carrier with the high quote offer and which is designed in the game as more trustworthy. So it would be interesting to see if experience is important when deciding with which carrier to collaborate? Do users use this information during the gameplay to make the best decision?

Table 6.47. Overview of how many times a carrier is chosen in the first 3 rounds in the overall group.

Carrier	Star rating	Quote offer	Round 1, order 1	Round 2, order 2	Round 3, order 3
De Rouw Transport	3	8	29		
De Bont & Dochters	2	5	57		
logistics group Kleiman	4.5	8		11	
Transport & Logistiek Ponjier	4	5		41	
VDL International Transport	3.5	3		34	
Eeden logistics	4	13			58
Transport Group Galvan	3	12			17
Van Beers Logistics	2.5	9			11

Therefore, the relationship between the choice of carrier in the first round is tested in the second and third rounds to check if the difference is significant. To test the difference between '*Choice of carrier round 1*', '*Choice of carrier, round 2*', and '*Choice of carrier round 3*', first, the choice needs to be operationalized. The operationalization of these variables is shown in the grey box.

Example of operationalization: To test the difference between choice of carrier in the different rounds, the choice needs to be operationalized. During the first three orders, carriers are introduced with which players do not have any experience. As explained in Chapter 4, the trustworthiness of carriers is different and is indicated by information but also partially by the star rating and quote offer. For example, logistics Group Kleiman is a trustworthy carrier and this is also shown by the star rating(4,5) and Quote offer (8) while Van Beers Logistics is the least trustworthy carrier with a star rating of 2,5 and a quote offer of 9. In the first round, only 2 carriers can be chosen compared to the second and third rounds. Therefore, the comparison is made using the carrier with the highest star rating and quote offer and the lowest star rating and quote offer (table 6.48).

Table 6.48. *Frequency table of the choices players make for the carrier with a high or low star rating.*

Type of carrier (star rating)	*Frequency round 1*	*Frequency round 2*	*Frequency round 3*	*Total*
Lowest	*57*	*34*	*11*	*102*
Highest	*29*	*11*	*58*	*98*
Total	*86*	*45*	*69*	*200*

To test the change in choice of carrier in the first and third rounds, the variables 'Frequency players round 1', and 'frequency players round 3' are used if there is a significant difference.

Based on Table 6.48, it is interesting to see whether players learn from their experience in the game by analyzing if a carrier is trustworthy. How players learn is viewed as the experience a player has during the first three rounds and what decisions they make. In these first three rounds, with the first three orders, the information of the carriers stays the same, the only difference is which carriers put a quote offer in.

E. The outcome of the analysis of hypothesis 4 – general experience

The Chi-square test is used to test the abovementioned hypothesis. The Chi-square test is a suitable method to find a correlation between the frequency of choice of the lowest carrier and the highest carrier. The choice between carriers in each round is nominal. The frequencies round 1, round 2, and round 3 are tested with each other. Subsequently, the group of carriers in each round can be divided into the lowest group and the highest group. The main question is, is there a correlation between the choice of carrier in round 1 and the choice of carrier in round 3?

Table 6.49. The outcome of the analysis of the relation between frequency choice of carrier round 1 with round 2 and round 2 with round 3.

Comparison round 1 - 3

	Value	**Df**	**Asymptotic significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sog. (1-sided)**
Pearson Chi-Square	39.394[1]	1	<.001		
Continuity correction	37.376[2]	1	<.001		
Likelihood ratio	42.062	1	<.001		
Fisher's Exact Test				<.001	<.001
N of valid cases	155				

[1] 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 13.74
[2] Computed only for a 2x2 table

		Value	**Approximate Significance**
Nominal by Nominal	Phi	.504	<.001
	Cramer's V	.504	<.001
N valid of case		155	

Comparison round 2 - 3

	Value	**Df**	**Asymptotic significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sog. (1-sided)**
Pearson Chi-Square	40.513[1]	1	<.001		
Continuity correction	38.056[2]	1	<.001		
Likelihood ratio	42.352	1	<.001		
Fisher's Exact Test				<.001	<.001
N of valid cases	114				

[1] 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 17.76
[2] Computed only for a 2x2 table

		Value	Approximate Significance
Nominal by Nominal	Phi	.596	<.001
	Cramer's V	.596	<.001
N valid of case		114	

The Chi-square likelihood ratio test outcome is 39.394 with a *p*-value of <.001. Based on the outcome it can be concluded that there is a learning experience with the players of analyzing the trustworthiness of the other organization.

F. Conclusion Hypothesis 4 – general experience

The general experience is about the experience a player has during the overall gameplay. The results show that players do learn from their experiences and take this into account when deciding with which carrier to collaborate. Instead of choosing the cheapest option, players learn from their experiences in the game and choose a carrier based on it.

G. Conclusion Hypothesis 4

The hypothesis that players use (prior) negative or positive experiences is significant. The players have a learning effect when analyzing the trustworthiness of a carrier. The result of this hypothesis also corresponds to the response to the statement in the post-questionnaire on positive and negative experiences (Figure 6.35 and Figure 6.36).

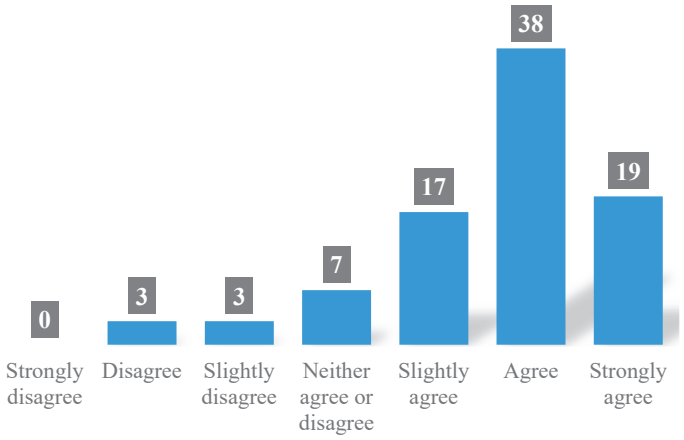


Figure 6.35. Response to the statement "*A previous negative experience with a carrier was a decisive factor when choosing not to collaborate again with that carrier*".

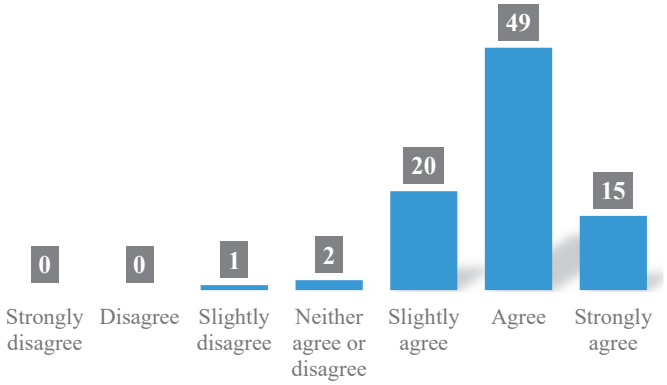


Figure 6.36. Response to the statement "*A previous positive experience was a decisive factor when choosing to collaborate again with that carrier".*

Most players expressed that a negative or positive experience with a carrier was a decisive factor in evaluating if a player wants to collaborate with that specific carrier again. However, the choice of carrier is not only influenced by the experience a player had with a carrier but also by the amount of profit tokens a player could receive for a specific transport. The amount of profit tokens that influence players *is also* shown in response to the statement in the post-questionnaire. Most of the players stated that they agree that the willingness to collaborate with a particular carrier changed because of the transport outcome, such as the transport outcome (Figure 6.37). The transport outcome in the game is based on the three KPIs: profit tokens, sustainability tokens, and customer satisfaction level tokens.

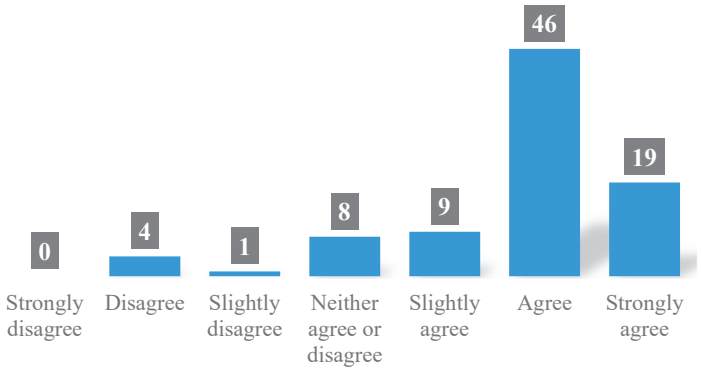


Figure 6.37. The responses of players on the statement, "*Throughout the game, my willingness to collaborate with a particular carrier changed through the performance (i.e., transport outcome) of the carrier".*

Most players expressed that they slightly agreed to strongly agree that the carriers weren't always honest during the gameplay (Figure 6.38). This is also shown in the response to the statement that the carrier is trustworthy (Figure 6.39). Most players expressed that they strongly disagree or slightly disagree with this statement (58 out of 86 players). From these results, most players are expected to select a carrier with a high star rating rather than a low quote offer.

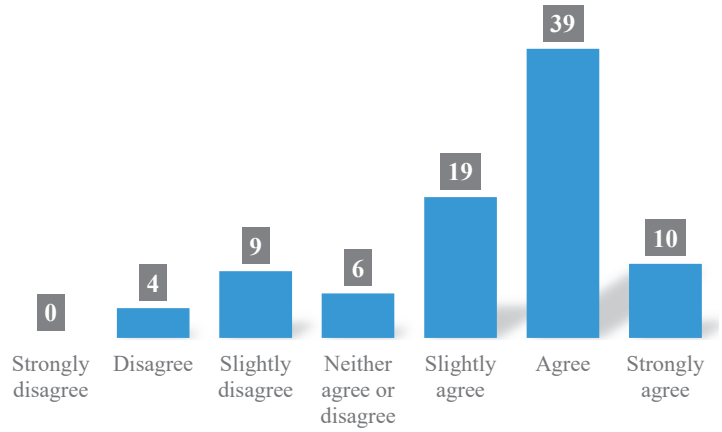


Figure 6.38. Response to the statement "*The carrier wasn't always honest with me*".

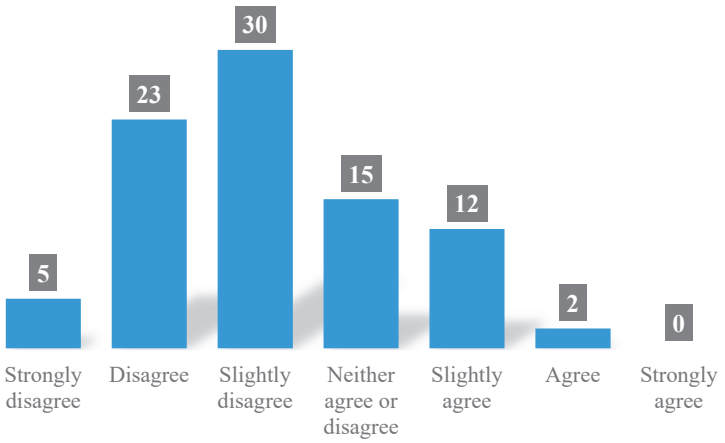


Figure 6.39. Response to the statement "*The carriers were trustworthy*".

6.4. Hypothesis conceptual framework

When a platform mediates collaboration, the perceived value of the relationship is still important. As discussed in Chapter 3, the perceived value of the relationship is an organization's relationship with its stakeholders. For example, suppose an organization needs to take care of delivery for a client. In that case, this organization must seek a trustworthy carrier because the organization may face a risk when collaborating with an untrustworthy carrier, and the organization may lose the client. The game describes different types of clients: long-term or short-term clients, clients with high or low-value goods, and clients who find sustainability important. Figure 6.40 shows the conceptual framework presented in Chapter 2.

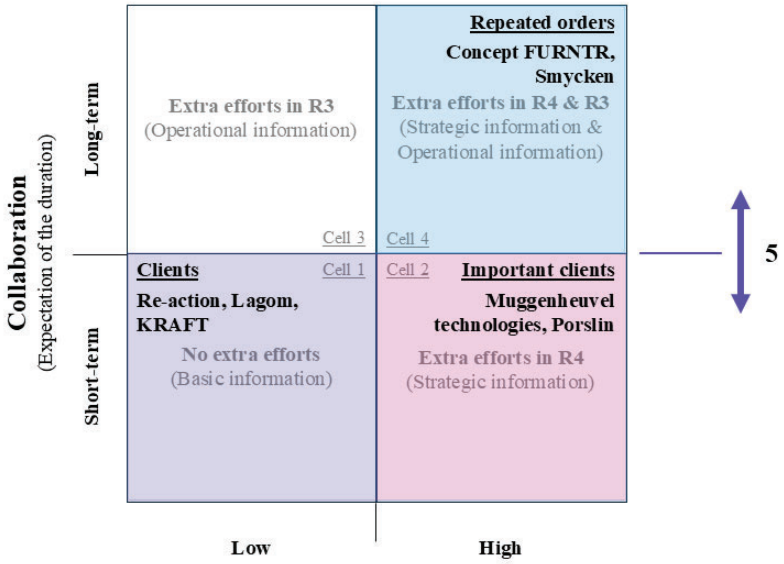


Figure 6.40. Clients are categorized according to their transport order.

As mentioned in Chapter 4, players could request strategic or operational information about the carriers. Players also receive information about the client for whom they must transport goods. It is expected that players who need to transport goods for more important clients (discussed in Chapter 4, and Appendix D) will make an extra effort to check the strategic or operational information when choosing a specific carrier. The main hypotheses to test the conceptual framework is:

- *Hypothesis 5A: More information types are requested for the long-term clients;*
- *Hypothesis 5B: More information types are requested for the high perceived value of the relationship clients.*

These two hypotheses are tested with the different types of orders designed in the game and the players' requests for operational information. Given the limited number of requests players made regarding strategic information, during the game experiments only operational information is taken into account for this hypothesis.

6.4.1. Hypothesis 5A: More information types are requested for the long-term clients

To test this hypothesis, an overview is given on how often operational information is requested in round 3 up to round 7. Table 6.50 shows that the difference between Muggenheuvel technologies (short-term) and Smycken (long-term) is not significant; 277 operational information types are requested for Muggenheuvel technologies compared to 272 for Smycken. This is also the case in round 6 where there are both short-term and long-term clients in the same round.

Table 6.50. Overview of players' information requests in Round 3 and Round 4.

Round	Type of Order	Carrier	Company details	Google Search	Website page	Reviews	Total per carrier	Total per client	Percentual count (%)
3	#33 Muggenheuvel technologies (Short/once/important client)	Van Beers Logistics	40	6	7	26	79	277	50,5
		Transport group Galvan	54	12	14	33	85		
		Eeden logistics	40	8	9	28	113		
	#34 Smycken (Long/repeated/important client)							272	49,5
		De Rouw Transport	36	5	9	22	72		
		Transport & Logistiek Ponjier	44	6	8	29	87		
4	#41 Smycken (long/repeated/important client)	Logistics group Kleiman	29	3	14	2	48	186	70,7
		Van Beers Logistics	5	4	18	47	74		
		VDL International Transport	13	21	5	25	64		
	#5 Lagom (short/once/non-important client)	De Rouw Transport	6	13	13	22	54	77	29,3
		De Bont & Dochters	6	14	1	2	23		
5	#6 CONCEPT FRNTR	Eeden logistics	2	0	0	0	2	84	45,7
		VDL International transport	28	2	1	12	43		
		Transport group Galvan	24	1	1	13	39		
	#42 Smycken	Transport Group Galvan	24	1	1	13	39	100	54,3
		VDL International Transport	28	2	1	12	43		
		Van Beers Logistics	11	0	1	6	18		
6	#7 Porslin (short/once/important client)	De Rouw Transport	31	3	2	12	48	113	55,7
		Transport & Logistiek Ponjier	40	2	9	14	65		
	#61 CONCEPT FRNTR (Long/repeated/important client)	Van Beers Logistics	19	1	0	19	29	90	44,3
		VDL International Transport	19	1	1	6	27		
		De Bont & Dochters	13	2	1	8	24		
		Transport Group Galvan	8	0	0	2	10		

7	#8 Muggenheuvel technologies (Short/once/important client)	De Bont & Dochters	20	2	3	10	35	54	54	
		Transport & Logistiek Ponjier	13	0	1	5	19			
	#62 CONCEPT FRNTR	Logistics Group Kleiman	7	0	0	1	8	46	46	
		Van Beers Logistics	8	1	1	2	12			
		Eeden logistics	11	1	1	3	16			
		Transport group Galvan	7	0	1	2	10			

The operational information requested by players in all rounds is summed up for the short-term and long-term clients. Table 6.51 shows the number of operational information requests of short and long-term clients. From this table, it can be concluded that there are no large differences in operational information requests for the duration of an order. The total information request for short-term orders is 839, compared to the operational information request for long-term clients, which is 778. Although there are only 2 clients with long-term orders, there are 6 long-term orders. In the game, there are 5 short-term orders. If the total count of the requested information is divided by the number of orders there is a difference between the short-term and long-term orders.

Table 6.51. Operational information requests for short and long-term clients during all rounds.

Carrier – short term	**Total requested information**	**Percentual count (%)**	**Carriers – long-term order**	**Total requested information**	**Percentual count (%)**
Re-action	95	11,3	CONCEPT FRNTR	220	28,3
Lagom	77	9,2	Smycken	558	71,7
KRAFT	223	26,6			
Muggenheuvel technologies	331	39,5			
Porslin	113	13,5			
Total	***839***	***100***		***778***	***100***
Normalized	***167.5***			***129.6***	

Based on these results, the difference between the requested operational information for short-term orders and long-term orders is significant with a Chi-square of 4.846 and a *p*-value of 0.028. This means that players requested more operational information for short-term orders than for long-term orders. As shown in the framework (Figure 6.40), it was expected that more operational information would be requested for long-term orders compared to short-term orders. A possible explanation for this could be that, in the game set-up, the long-term orders only appear later in the game, after round 3. The short-term orders are already present in the first three rounds. Since players have already spent several rounds engaging with the game and requesting information for the short-term orders, it is possible that they request less or no additional information for the long-term orders later in the game, as they have already reviewed the information about the various carriers. Since the request for strategic information was very limited this could not be taken into account and tested. Based on the current data, no definitive conclusion can be drawn.

6.4.2. Hypothesis 5B: More information types are requested for the high perceived value of the relationship clients

When choosing a carrier to collaborate with, it is expected that the relationship players have with the client is important. As a player, you do not want to harm that relationship. Players are expected to request more operational information from clients where the perceived value of the relationship is higher, compared to clients where the perceived value of the relationship is lower. Table 6.52 shows how often operational information is requested for the relationship clients' low perceived value and the relationship clients' high perceived value. Although less operational information is requested for the clients' low perceived value, the relationship with clients' high perceived value has more orders in the game. 9 for the relationship clients' high perceived value compared to 3 of the relationship clients' low perceived value. If a closer look

is given at the normalized requested information of the high perceived value of the relationship clients, operational information is requested 537.5 times compared to 395 times for the low perceived value of the relationship clients. The difference is corrected for the order level. This is because in the game for every order players choose one carrier to collaborate with.

Table 6.52. Operational information requests for low perceived value of the relationship clients and high perceived value of the relationship clients.

Clients – Low perceived value of the relationship	Total requested information	Percentual count	Clients – High perceived value of the relationship	Total requested information	Normalized requested information	Percentual count
Re-action	95	24,1	CONCEPT FRNTR	220	73	18
Lagom	77	19,5	Smycken	558	186	45,7
KRAFT	223	56,5	Muggenheuvel technologies	331	165,5	27,1
			Porslin	113	113	9,2
Total	***395***	***100***		***1222***	***537,5***	***100***

From the gameplay and hypothesis 5A we would have expected that the distribution of requesting operational information for the low and high perceived value of the relationship clients would be even. However, from Table 6.52 it could be seen that there is a difference where clients with a high perceived value of the relationship are putting in a transport order, and players are prone to request more operational information. To test if this difference is significant a Chi-square test of frequencies is done.

The outcome shows a Chi-square of 21.917 with a *p*-value of <.001. This shows that the difference between the request of information between the low and high perceived value of the relationship clients is significant. Therefore, it can be concluded that players do request more information from the clients with a high perceived value of the relationship. It was unexpected that more operational information would be requested for clients with a high perceived value of the relationship. The expectation was that the same amount of operational information would be requested and more strategic information. However, not much strategic information was requested during the game. Therefore, it can be understood that more operational information in total was requested.

6.4.3. Overall conclusion conceptual framework

The conceptual framework could partially be tested. Since a limited amount of strategic information was requested, the conceptual framework could only be tested with operational information. Hypothesis 5A showed that the amount of requested operational information for short-term orders was higher than for long-term orders. Hypothesis 5B showed that players requested more operational information for the high perceived value of the relationship clients compared to the low perceived value of relationship clients. However, we could not use the requested strategic information since limited players requested strategic information during gameplay.

The reason why the conceptual framework could be tested partially can be explained by the following factors:

- **No risk of losing a client**. In the game, the risk of losing a client is described in the client profile and states that the client will use fines if a player does not select the best possible carrier for that order. However, there is no risk that the client will not return in the game; the client will return and the player only gets a fine. For example, a player does not have a risk that when he or she does not select the best possible carrier for a specific client, and the transport goes wrong, resulting in a fine for the player, the client 'leaves' the game.
- **Limited use of strategic information**. The information requested in the conceptual framework was based on the request for strategic and operational information. As shown in Hypothesis 3A, the players requested a limited amount of strategic information.
- **Choosing a carrier for long-term orders.** There is a difference between short-term and long-term orders in the game. Every round, a player needs to decide with which carrier a player wants to collaborate. This allows players to collaborate with another carrier with which they may have a positive experience or have more information. The fact that players have the option to collaborate with another carrier on a long-term order may also cause them to request less strategic information. There is no incentive for players to look into the strategic information since there is no risk of having to work with a carrier for an extended period of time.
- **Game objectives.** The FreightBooking game is designed to represent the actual system of a platform. Players also want to achieve their game objectives through profit, sustainability, and customer satisfaction tokens. Deciding which carrier a player intends to collaborate with depends on their experience with a carrier, the information they read, and their performance in the game.

6.5. Conclusion

Using a serious game to understand the relationship between trust and collaboration through a platform provided insights into how trust played a role. The data from the FreightBooking game provide some evidence for some hypotheses that were defined for the conceptual model. However, the meanDT of players did not provide insight into the choice of carrier to collaborate with or the fact that players with a specific meanDT requested more or less operational or strategic information. Previous sections discussed the outcomes of the different hypotheses defined for the conceptual model and framework. Based on these outcomes, the following conclusions can be formulated for the conceptual model:

- **Hypothesis 1: The higher the Disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer.** It was expected that the lower or higher the disposition of players' trust would influence the choice of a carrier with which to collaborate. This means that players are influenced by the level of their disposition to trust in choosing a carrier that is the best one for the transport order. For example, players with a low disposition to trust are likelier to choose a carrier with a higher star rating. Although there was no proof that such a relationship exists, it could be shown that a player's disposition to trust can play a role when choosing a carrier to

collaborate with. The group of players as a whole had a high disposition to trust and most players selected the carrier with a low quote offer. This can be explained by the fact that the players are quite trusting. However, it should be taken into account that it is the first round, and it could be that players are still learning the game. By choosing the carrier with a low quote offer, they pay fewer coins and they earn the most profit coins.

- **Hypothesis 2: When more operational information is requested by players, the qualitative choice to collaborate with a specific carrier is higher.** The requested operational information could not be shown to influence a player's qualitative choice of carrier. An explanation can be that multiple factors play a role when choosing a carrier to collaborate with, and it is not only influenced by operational information.
- **Hypothesis 3A: Players with a low disposition to trust are more likely to request strategic information.** In the FreightBooking game, players requested only a limited amount of strategic information, making testing hypothesis 3A difficult. Reasons for this can be that the players find the operational information enough to base their decision on about with which carrier to collaborate, or that they did not want to pay 2 profit tokens for the strategic information since they did not know what they would receive. The analysis could not show a relation between the MeanDT and the request for strategic information.
- **Hypothesis 3B: Players with a high Disposition to trust are more likely to request operational information.** Players with a high meanDT were expected to request more operational information than those with a low meanDT. The relation between a high disposition to trust and requesting operational information was not significant. However, the experiment shows an opposite effect. Players with a low meanDT request more operational information than players with a high meanDT. The reason may be that (1) a limited amount of strategic information was requested, there is little differentiation between requesting different types of information and (2) in general players with low meanDT are more likely to request information.

  The relationship that could be shown is that players do have a learning effect when requesting operational information. At the beginning of the game, in round 1, players with a low meanDT requested more information compared to the players with a high meanDT. When players engage in multiple rounds, it can be observed that in round 3, players with a high meanDT also request more information because they have learned during the game that not every carrier can be trusted. This was also supported by statements in the post-questionnaire that players filled in. Most players expressed that the information they received could change their minds when deciding to collaborate with a carrier. However, players also expressed that they did not completely trust the information on the platform (e.g., a statement in the post-questionnaire), even though there was a lot of information, and players also found it useful to base their decision on the information. Additionally, players can be hesitant to evaluate if the information can be trusted. For example, players may think that the information on the platform is not true, and relying on this information can be a risk. This is where trust comes into place. For example, trusting the information on the platform, but also trusting the organization and how it presents itself on the platform (e.g., logo, completeness of information, name of company).

- **Hypothesis 4: Players use a positive or negative (prior) experience with a carrier to choose that carrier.** Experience is an important source of information since it provides an organization with first-hand information (Chapter 2). The relationship between a player's experience with a carrier and the chance that a carrier is chosen again was significant.

  The gameplay data showed that players do have a learning effect when analyzing the trustworthiness of carriers and the decision with whom to collaborate. During the game, two types of experiences occur: a) carrier-specific experience, and b) general experience. During gameplay, most of the players chose to collaborate with a high-quality carrier. The players' answers in the post-questionnaire support this. Additionally, players also stated in the post-questionnaire that they consider their positive and negative experiences with a carrier to influence their decisions. The experiences players gained in the game also provided an overall experience where they made better choices between rounds. Of course, this decision does not occur in a vacuum where only experience plays a role. The operational information players receive is also of influence.

In Chapter 2, the conceptual model is extended with a conceptual framework that explains that the collaborations between two organizations do not occur in a vacuum. The relationships an organization has with other organizations in the system are also important. The FreightBooking game also tried to prove the hypotheses that were defined for the conceptual framework. As shown in section 6.4, the conceptual framework could be partially tested by the FreightBooking game. The framework could only be tested for operational information and not for strategic information since only a limited amount of strategic information was requested by the players. The frequency of how many times operational information is requested showed a significant difference in the low and high perceived value of the relationship clients and the difference between short-term and long-term orders. In the game, more players requested operational information for the important clients and requested more operational information for the short-term orders. The latter was not expected. An explanation can be that the risks that players may face, such as losing a client, are non-existent in the game. Additionally, players could have had difficulty realizing what the benefits were of requesting strategic information.

Although the conceptual framework could not be tested completely, the frequencies on how many times operational information was requested gave some insights. Players did find it important what the client conditions were and took this into account by requesting operational information when selecting a carrier.

The FreigthBooking game is designed in such a way that it represents a platform that is used in the transport and logistics field. The game had many subtle differences to make sure that it was not clear to the players that it was about trust. The characteristics of the carriers were subtle to ensure players could not immediately see which carrier was trustworthy and which was not the amount of requested operational and strategic information needed to be used by the players to retrieve such an insight. However, the requested strategic information was limited and could not be used to test the framework.

The next Chapter will discuss the overall findings of this thesis by revisiting the research questions (defined in Chapter 1), the overall conclusion, and future research that needs to be done.

7

Discussion and conclusion

The focus of this dissertation was to gain an understanding of how trust affects the collaboration between organizations supported by a platform. Chapter 1 discusses how the transport and logistics field is becoming more digitized. Platforms are one of the technological innovations that are emerging in the field. In the past years, there has been an increase in the number of platforms that facilitate interactions between organizations. With these interactions via technology, the importance of how trust works in these technology-mediated collaborations becomes increasingly important. As discussed in Chapter 1, most of the literature focuses on trust development and structural assurances; there are limited studies that study the role of trust in these types of collaborations. Chapter 2 presents an initial conceptual model and framework that describes how trust works with other variables when organizations use a platform to collaborate. The conceptual model and framework served as a backbone for the interviews with stakeholders (Chapter 3) and the design of the FreightBooking game (Chapter 4), which aims at testing hypotheses derived from the conceptual model and framework. The experimental set-up of the FreightBooking game is discussed in Chapter 5. Subsequently, the outcome of the gameplay is used to test the hypotheses. The result of the analysis is discussed in Chapter 6. Based on the findings in the previous chapters, the answers to the main research question and sub-questions will be answered in the next sections. First, the key findings on the conceptual model, conceptual framework, and the simulation game are discussed. Subsequently, the main research question is answered. We will conclude this chapter with the research limitations and suggestions for further research.

7.1. Discussion on the main findings and answering the sub-research questions

In this dissertation, the role of trust in technology-mediated collaborations is translated into a conceptual model and a framework and tested by the FreightBooking game. The previous chapters of this dissertation provided insights into the concept of trust, the variables central to the conceptual model and framework, the FreightBooking game's development, and the hypotheses testing. The initial conceptual model presented in Chapter 2, and defined in Chapter 5, explains the most important variables and relations when organizations collaborate supported by a platform. The conceptual framework deepens the relationship between trust and collaboration. It focuses particularly on the actions an organization may take when entering a collaboration through a platform.

The following sections provide a discussion of the main findings of the conceptual model, framework, and the FreightBooking game. The main findings on the conceptual model, conceptual framework, and the FreightBooking game are discussed based on the various sub-questions.

Additionally, the limitations of the study are also discussed. How these limitations can be overcome is discussed in section 7.3.

7.1.1. Which variables play a role in developing trust when entering into an inter-organizational collaboration mediated by platforms?

This first sub-question provides an informative overview of variables that play a role when trusting another organization and is based on a literature review. First of all, trust is important when new collaborations are established since organizations cannot predict all the behavior and actions of another party (Chapter 2). When entering into a collaboration, organizations do it partially by making trade-offs and by their first interpretation and prediction of the behavior of the other party. At this stage, trust comes into play. The choice to collaborate with a carrier not only depends on the trust level of an organization but also on the information they receive (Chapter 2). Information can be twofold: the information you receive as an organization (second-hand) or through experiences (first-hand). Information that is provided on platforms can be used by organizations to predict another organization's behavior. In the initial stage of a collaboration, no first-hand information is available and trust concerning the information you receive as a company is especially important. Based on the information, organizations can partially predict possible outcomes of the collaboration (Chapter 2) but trust is still important. In Chapter 2, a conceptual model was proposed that explained the relationship between trust, information, and collaboration in technology-mediated collaborations.

The emergence of platforms in the transport and logistics sector enhances the interconnectedness of organizations and establishes collaborations on short notice. Organizations do not operate in a vacuum and are part of a more extensive system. The relationships of these organizations with the clients, for which they organize the transport with a carrier, are important when new collaborations are established. Acquiring information is vital, and the perceived value of an organization's relationship and the duration of the collaboration is of influence. Both the conceptual model and framework help to understand the interplay between information and trust and which efforts organizations need to make when starting a collaboration supported by platforms.

The conceptual framework proposed in Chapter 2 explains the relation of trust and collaboration of the conceptual model in more depth. As explained in the previous chapter, organizations are part of a supply chain where the relationship that they have with a current client is important. Therefore, organizations need to consider the importance of their relationships with other organizations in the system when they start a collaboration. In other words, the perceived value of the relationship. In the FreightBooking game, this perceived value of the relationship is translated into the different clients a player needs to transport goods for.

7.1.2. What are platform users' perspectives on trust when collaborating through a platform in the transport & logistics sector?

The second sub-question is exploratory. To understand the stakeholders' perspectives on trust issues when using a platform to collaborate, in-depth interviews were held with platform organizations, platform users, and organizations who have used a platform in the past. Chapter 3 showed the stakeholders' perceptions of the advantages and disadvantages of platforms and considered trust issues. The FreightBooking game, discussed in Chapter 4, is partially designed based on the outcomes of the stakeholders' in-depth interviews. Most design decisions were based on the functioning of the platform. In addition to providing input to the design of the game, the stakeholders' insights into the role of trust in platforms provided some valuable insights on the role of trust in platforms. From the interviews, the results can be summarized as follows:

- **Platform community (Trust - social perspective).** A platform's community is an essential factor for trusting other organizations. Which organization is part of a community says a lot about the commitment and shared values of organizations that are part of the platform community. Organizations with the same values and commitment can become a 'natural friend' that an organization would have in a one-to-one relationship.
- **The platform organization (Trust - technological perspective).** Understanding and knowing the organization behind the platform is important for gaining trust in the platform itself. For platform users, it is crucial that the platform organization understands the business and delivers what it promises. It is not only the technological infrastructure but also the behavior and character of the platform organization that is essential to gaining trust.
- **Distrust.** Distrust when collaborating with another organization depends on the organization's role, such as a platform organization that wants to take over the market or the 'natural' distrust towards specific types of organizations in the transport and logistics field. Subsequently, distrust issues arise when there are system failures on a technological level.

7.1.3. How do the identified variables influence the establishment of inter-organizational collaboration supported by platforms?

In this dissertation, a conceptual model and conceptual framework are presented that explain how trust plays a role when organizations want to start a collaboration supported by a platform. The main research instrument that is used to test the formulated relationships is simulation gaming. The FreightBooking game is a single-player, digital game where players need to transport goods for their clients. Players receive transport quotes from carriers on the

FreightBooking game platform. Based on these transport quotes, they can choose with whom they want to collaborate, based on the information they can look up the carrier (see grey box below for a more detailed explanation of the FreightBooking game).

Working of FreightBooking game: As explained in Chapter 4, the players play the role of a freight forwarder in the game. The players' objective is to transport goods for their clients by booking the best possible carrier based on the clients' transport orders. During 7 rounds, players receive different transport quotes from the 8 carriers in the game. To decide which carrier a player wants to collaborate with, the player can search for operational information on the FreightBooking game platform. For example, players can check the reviews (fictitious) of carriers or do a Google search to see what the news items are of that carrier. Additionally, players can buy strategic information to see how many sustainable trucks a carrier has or the percentage of times goods are delivered on time by a carrier. To be able to make a decision on with whom they want to collaborate and which type of information is relevant, players receive a detailed transport order from clients. These transport orders represent different types of clients (long-term or short-term) with varying conditions of transport (sustainable transport, high- or low-value goods). For each transport order players receive a specific amount of profit, sustainability, and customer satisfaction coins (game KPIs). At the end of the game, players can 'win' the game if these KPIs are above a certain threshold.

The conceptual model and conceptual framework underly the FreightBooking game. During the gameplay, each decision and action of a player is logged. Additionally, a pre-and post-questionnaire is used to ask questions about a player's actions and decisions in the game, their disposition to trust level, and their gameplay experience. This data is used to test the hypotheses defined for the conceptual model and framework.

To test the relationships in the conceptual model and framework, an experimental set-up was designed around the FreightBooking game. Before playing the FreightBooking game, players needed to fill in pre-questionnaires that contained statements on how many times they used a platform and what their experience was. After playing the game, players needed to fill in a post-questionnaire with statements on the gameplay, their disposition of trust, and how they experienced the game. The FreightBooking game was played with 4 groups, 101 players, where 86 players completed the experiment. The results of the 86 players were used to test the hypotheses of the conceptual model and framework.

Before answering the main research question, the relations of the conceptual model are discussed, concluding with a discussion of the main findings of the conceptual framework.

Conceptual model

In Chapter 2, an initial conceptual model was proposed that explained the relationship between trust, information, and collaboration in technology-mediated collaborations. Based on the interviews with stakeholders, the initial conceptual model was adjusted (presented in Chapter 5). In this section, we will discuss the findings of each relationship defined in the conceptual model and the limitations of the study.

The relationships in the conceptual model have been formulated as hypotheses that can be tested in the simulation game (Figure 7.41 shows the conceptual model with the hypotheses):

- H1: the higher the disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer;
- H2: When more operational information is requested by players, the qualitative choice[7] to collaborate with a specific carrier is higher;
- H3A: Players with a low disposition to trust are more likely to request strategic information;
- H3B: Players with a high disposition to trust are more likely to request operational information;
- H4: Players use a positive or negative (prior) experience with a carrier to choose a carrier.

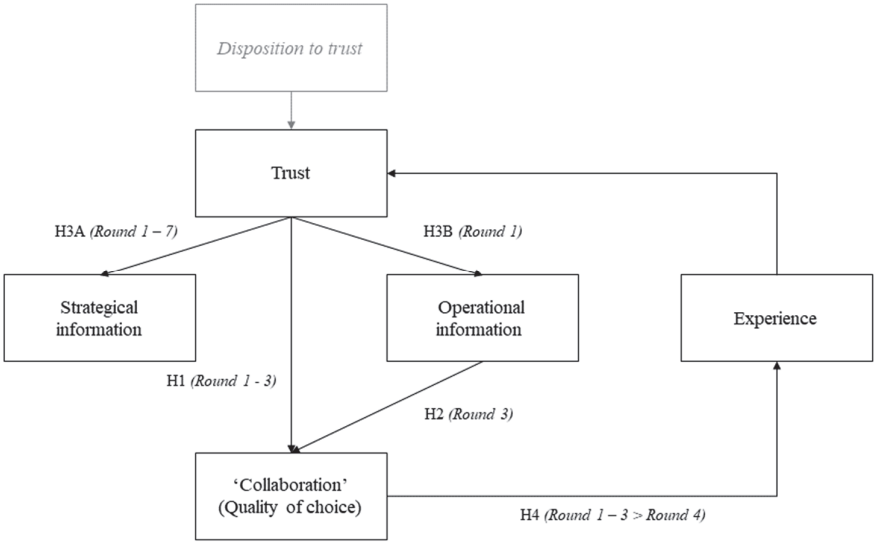


Figure 7.41. The conceptual model with the hypotheses.

An important relationship in the conceptual model is the relationship between trust and collaboration (Chapter 6, hypothesis 1). At the initial stage of the collaboration, trust is especially important since there is insufficient knowledge and experience about the other party (Chapter 2). When entering a collaboration, organizations do it partially by making trade-offs and by their first interpretation and prediction of the behavior of the other party. This was also shown by additional analysis of hypothesis 1 where we noticed that in the first round, most players select the cheapest carrier compared to the expensive carrier (Chapter 6). The 'calculativeness of players', described by (Child, 2001; Doney & Cannon, 1996; Lewicki & Buncker, 1995) played a role when players wanted to establish a collaboration on the platform for the first time. In the first round, players did not have any experience yet with the carriers and needed to interpret a lot of information from the carriers. A way to make a choice is to calculate what the trade-off is (e.g., earning profit coins and meeting transport conditions) and base it on information that can be used to predict behavior (e.g., star rating carrier). Additionally, a 'gut feeling' could also play a role. Stakeholders expressed that sometimes you do not have all the information yet, but the feeling you have towards a company may be a

[7] The qualitative choice is the carrier's grade in the FreightBooking game. For example, Van Beers Logistics is the least trustworthy carrier and has a grade of 1 compared to Eeden logistics which can be trusted more and has a grade of 3. Logistics group Kleiman has the highest grade of 8.

decisive factor (Chapter 3). This could also have taken place in round 1, where there is a lot of information to internalize, and players do not have experience yet.

What we could not show is that the value of the meanDT (i.e. Mean Disposition to Trust) influences the choice to collaborate with a carrier (Chapter 6, hypothesis 1). The group as a whole had a high meanDT, which means that the group was quite trusting. To test hypothesis 1 in the future, it would be interesting to have a larger group of players where the differentiation between the disposition to trust is higher, for example, because of the negative experience they have had with platforms, or that organizations stopped working with platforms.

The choice to collaborate with a carrier depends not only on the trust level of an organization but also on the information they receive (Chapter 2). This can be first-hand information (i.e., experience that organizations have) or second-hand information (i.e., information organizations read on the platform). Within the FreightBooking game, first-hand information is translated into experience. First, we will discuss the findings on the relationship between second-hand information and trust (Hypothesis 2 and Hypothesis 3) and after that first-hand information (Hypothesis 4).

Information that is provided on platforms can be used by organizations to predict another organization's behavior. In the initial stage of a collaboration where no prior experience exists, information is vital. Based on the information, organizations can predict possible outcomes of the collaboration (Chapter 2). Stakeholders also expressed that they use different types of information, like Google or a company logo and name, to indicate whether an organization is trustworthy (Chapter 3). In the FreightBooking game, players use different information types, operational and strategic, to predict the behavior of organizations. How the operational and strategic information that is used in the game relates to trust was hard to prove with this game. A possible reason for this could be that players had to pay for strategic information, players did not recognize the value of the strategic information, or they could choose a carrier based on only operational information.

Based on the conceptual model, three hypotheses (i.e., hypothesis 2, hypothesis 3A, and 3B) were defined that explain the relationship between information and trust. Hypothesis 2 and Hypothesis 3B could not be proven by the FreightBooking game. We could not show that the amount of operational information would influence the quality of choice of a carrier (i.e., collaboration) (Hypothesis 2). An explanation for this is that this decision is dependent on many variables and not only on the information they receive. For example, a player can use the transport conditions of a client to base his or her decision on or the scoring on the KPIs could be an important factor because players want to win the game. The FreightBooking game was designed in such a way that it represents the reality of a platform where there were many nuances in the information of carriers, the behavior of carriers, and incidents in the game. In future research, the subtle differences within the operational information could be simplified a bit to see if operational information is an important factor that influences the decision to collaborate.

What we also could not prove with the FreightBooking game is that players with a low disposition to trust request more strategic information (hypothesis 3A). The request for strategic information was limited. The reason is that players needed to pay 2 profit coins to receive strategic information. It could be that players find that too expensive and do not know

what benefit it will bring them. To test these two hypotheses, it would be interesting for future research to lower the price of strategic information.

What we could support with the FreightBooking game is a part of Hypothesis 3B. As explained before with hypothesis 1, the group had a high trust level overall. Hypothesis 3B also used the meanDT (i.e., high disposition of trust) of players in relation to requesting operational information. This relationship could not be shown by the FreightBooking game. It was expected that when organizations do not know another organization, they are more likely to request more strategic information. For example, by requesting more strategic information an organization can evaluate if the other organization states its true identity or can deliver what it promises. However, what we did see was the opposite effect.

What could be supported was that, in the initial stage of collaboration, players who have a 'lower' disposition to trust request more information compared to players with a 'higher' disposition to trust. As discussed in Chapter 2, acquiring information is important since organizations can predict the outcome of the collaboration better and also get the right expectations about the other party (Doney & Cannon, 1996; McKnight et al., 2002). Even when organizations have limited information this can be used to make predictions about the company (Chapter 3). In Chapter 3, stakeholders expressed that if you do not know the company yet, you will search for information, on Google or through the company logo, to get more insights into who the company is since it will help you to have a certain trust level towards the company.

Besides the information that players can look up on the FreightBooking platform, during gameplay players also acquire information by the experience. According to the literature review in Chapter 2, first-hand information is more valuable than second-hand information. However, the FreightBooking game could prove that the experience of a player with a carrier influences the choice of quality of a carrier (i.e. collaboration). What we do see is that players do learn from their experiences with a specific carrier and take them into account when entering a new collaboration. Additionally, stakeholders also stated in the post-questionnaire that they do take a negative experience into account and most likely they will not collaborate with that specific carrier again (Chapter 3).

During gameplay also a general experience emerged. In other words, the experience a player has during gameplay. What we could show with the FreightBooking game is that experiences are used for decision-making (e.g., experience that the cheapest option is usually not the best option to choose). Players learn from it and take it into account as a decisive factor for future collaborations (Chapter 6). Subsequently, stakeholders also stated that trust is established based on the personal knowledge someone has and experience is an important factor in it.

Although the FreightBooking game could not prove the relationship between a low or high disposition of players' trust and the request for information due to the subtle differences in the game and the level of realism of the game, it provided some interesting insights. What we learned from the data analysis and supported by the literature review (Chapter 2) and stakeholders' perspectives (Chapter 6) is that in the initial stage of a collaboration, the calculativeness of trust takes place. Initial trust does play a role, where people with a 'lower' disposition to trust acquire more operational information to evaluate if an organization is trustworthy. Even if organizations have limited information, they still can base their trust on this information (Chapter 2). However, as discussed in Chapter 2, trust is a complex concept and occurs in relationships between organizations where more variables are of influence. This

is what we see: experience is also an important factor in evaluating whether another party is trustworthy (Chapter 6). This can be based on the specific experience with an organization but also in general. When establishing trust, experiences are used to evaluate if a carrier is trustworthy or deciding to collaborate with the carrier (Chapters 3 and 6).

Conceptual framework

The framework proposed in Chapter 2 explains the relationship between trust and collaboration of the conceptual model in more depth (Figure 7.42). The role of trust in a technology-mediated collaboration does not take place in a vacuum. When organizations collaborate with another organization, they are part of a system, such as a supply chain. Therefore, organizations need to consider their relationships with other organizations in the system when they start a collaboration. In other words, the perceived value of the relationship with other organizations. In the FreightBooking game, this perceived value of the relationship is translated into the different clients a player needs to transport goods for. The hypotheses that are tested by the FreightBooking game are:

- H5A: More information types are requested for the long-term clients;
- H5B: More information types are requested for the high-perceived value of the relationship clients.

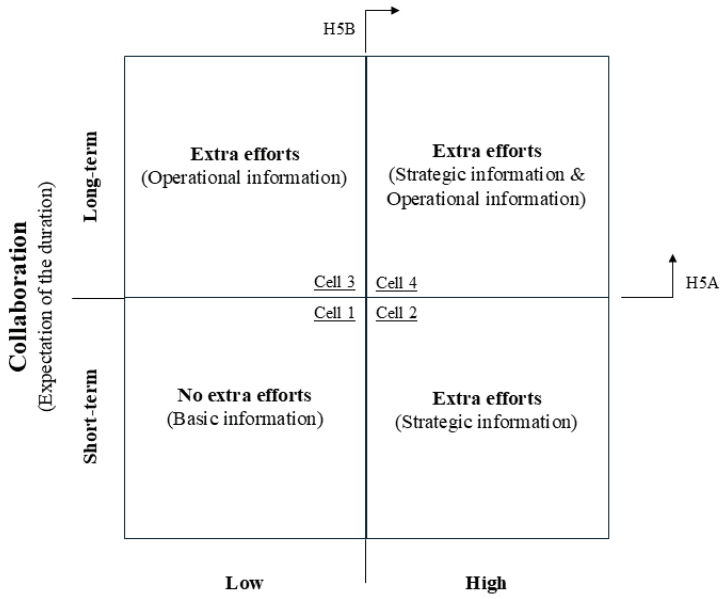


Figure 7.42. The conceptual framework with hypotheses.

With the FreightBooking game we could not prove that having to transport goods for important clients, players would request more information types (i.e., operational and strategic information). A possible reason for this can be that although important clients could impose a fine there were no serious consequences that dictated that players needed to request information. For example, a client would not come back to the game if transport conditions

were not met. In future work, this adjustment could be interesting to make to nudge the players to request operational or strategic information before they make a decision.

What we could show is that players request more operational information for the more important clients compared to the non-important clients (i.e., more operational information was requested for the high perceived value of the relationship clients, Hypothesis 5B). However, it was expected that the same amount of operational information and more strategic information would be requested for these types of clients. An explanation for this can be that there is limited strategic information requested by the players but also in round 3,(order 3) an important client wants to transport goods and in this round the transport outcome for all carriers is negative. For players, this could be an incentive to request and check more operational information for upcoming orders.

An unexpected result was the fact that for short-term orders more operational information was requested compared to the long-term orders (Hypothesis 5A). An explanation for this could be that the long-term orders appeared later in the game and players already read the information or have experiences with specific carriers. The importance of operational information was also expressed by stakeholders (Chapter 3). Trust in another party is predominantly based on the operational aspects, such as the quote offer and whether the company delivers as expected (Chapter 3).

Before we answer the main research question, first the FreightBooking game is also evaluated on the different worlds (i.e., reality, meaning, and play) based on the study by Harteveld (2011).

7.2. The FreightBooking game

Before we will answer the main research question first we will discuss the use of the simulation game FreightBooking as a research instrument to study the influence of trust on inter-organizational collaboration supported by platforms.

In this study, a simulation game was used to study the role of trust when organizations use a platform. As discussed in Chapter 1 and Chapter 4, simulation games are a suitable research method to test phenomena in a safe environment. When designing a game it is important that the researcher needs to balance the worlds of reality, meaning, and play (Chapter 1 and Chapter 4).

During the game design process, many prototypes were built and tested to ensure that the players find the game fun to play, it matches the meaning of the game and meets reality. The FreightBooking game had many earlier versions were different game mechanisms and set-ups were tested to understand how a game around trust can be built. For example, we started with a board game where players received character descriptions stating if they needed to behave trustworthy or untrustworthy when starting a collaboration with another player. For players, this was very challenging and exhausting since they needed to behave unnaturally. In a previous version of the FreightBooking game, we tested the number of carriers and the information players received. Test players expressed that too many carriers and information were difficult and made the game too complex. This took away the fun of the game. By using the previous versions of the FreightBooking game and other set-ups we came to the final game set-up.

The level of realism of the FreightBooking game was quite high. The players expressed that the FreightBooking game represents the collaboration process among organizations when using a platform (Chapter 4). When designing the FreightBooking game, the working of a real platform and how platform users used a platform were derived from the interviews with stakeholders. For example, the way in which quote offers were designed or which type of information was on the platform was based on the output of the interviews (Chapter 3). Using the output of the interviews allowed us to ensure that players have a feeling that they are working with a platform and to make sure that the game is easy to understand.

The FreightBooking game is about trust and which actions would be undertaken by players if they have a low or high trust level. The game was designed in such a way that players would not notice that the main subject of the game is trust. The subtle differences in the carrier descriptions ensured that it was not obvious to players that certain carriers were untrustworthy and other carriers were trustworthy. For example, players could find out if a carrier is (un)trustworthy by the company's address on the Google page or certain reviews (Chapter 4).

Another important aspect when designing a game is the playfulness. After the gameplay, players expressed that they were engaged in the gameplay (Chapter 6). When using a simulation game as a research instrument it is important that a game is fun to play because this will lead to better engagement of the players and eventually to better results (Chapter 1 and Chapter 4). The FreightBooking game represents the working of a platform which made the rules of the game easy to understand. Most players expressed that they used platforms quite often (Chapter 4) and this may also cause the rules of the game to be easily understood.

The FreightBooking game did not allow testing of some of the hypotheses because the game had many subtle differences in the trustworthiness of carriers and how information was presented in the game. In future work, this could be adjusted by clients not returning in a later round in the game if players do not select a carrier that meets their transport conditions, by ensuring that when selecting a carrier for a long-term order this is done for all the orders at once, and by strategic information being less expensive. The FreightBooking game gave us first insights into how a game can be built around the topic of trust without amplifying certain trust characteristics but in an environment that meets a real environment in which trust issues occur.

A serious game offers a unique research tool when a phenomenon is (a) relational and human dependent, such as trust, and (b) embedded in a complex system that has many interdependencies, such as the transport and logistics sector. Games as a research method allow for capturing actual human behavior in a safe environment rather than self-reported attitudes (Freese et al. 2020). However, some limitations of the method chosen should also be mentioned. First, reality must be simplified, which can make it hard for participants to map their in-game experience onto real-world practice (Duke & Geurts, 2004; Freese et al. 2020). Second, the environment can feel "artificial," prompting players to behave differently than they would outside the game (Duke & Geurts, 2004). For instance, they may accept partnership risks that they would normally avoid, because the consequences, such as losing a shipment or incurring a heavy fine, are only virtual. Finally, the digital interface itself reinforces the sense of being in a game, further distancing decisions from the stakes and emotional weight found in everyday operations (Boonekamp, Schaap, & van den Berg, 2022).

7.3. Answering the main research question

The main research question presented in Chapter 1: *How does inter-organizational trust influence collaborations mediated by platforms in the transport and logistics field?* is an exploratory one. Trust is related with the person who is part of an organization, the experiences an organization has, the information that is acquired, and the objectives of an organization. This dissertation showed that trust is not a stand-alone concept but strongly relates to information (Chapter 2). In the initial stage of a potential collaboration, a person's disposition to trust is used to decide whether to collaborate. When the trust-building process takes place, missing trust is partially replaced by information. Information can be based on experience or consist of acquired information (Chapter 6). The experience can be a specific experience or a general experience (Chapter 6). Trust in the social and technological infrastructure supports trust-building in technology-mediated collaborations (Chapter 3). The platform community (i.e., users and platform organization) and mechanisms, such as ratings, can increase and strengthen trust (Chapter 3). Moreover, the context in which the trusting relationship will take place plays a role. If the platform community and organization are trustworthy, i.e., the have the same values and intentions, this also influences the trust level of an organization. For instance, because certain companies with the same intentions joined the platform, an organization can use this to build the trust level towards the platform.

One of this dissertation's aims discussed in Chapter 1 was to provide suggestions, focusing on trust, for platforms that enhance or support collaboration. Although this dissertation focuses on trust between organizations when using a platform, the suggestions formulated below are not only aimed at the platform users but also at platform organizations. The suggestions that can be formulated, based on the results presented in Chapter 6 and the insights gained through stakeholders presented in Chapter 3 are:

- **In the initial stage of the collaboration supported by platforms, trust is more important than information;**
  This conclusion is based on a combination of hypotheses 1, 2, and 4. Hypothesis 1 describes the relation between the strength of a player's disposition to trust and the collaboration with a carrier with a specific quote offer. Hypothesis 2 describes the relation between the requests for operational information and the decision to collaborate with a carrier. Hypothesis 4 describes the relation between an earlier positive or negative experience and selecting a carrier to collaborate with.

  With the FreightBooking game, we could not show a significant relationship for Hypothesis 1 and Hypothesis 2, while the relationship for Hypothesis 4 is significant. However, we did find that in the initial stage, players do rely on their own trust if information and experience are limited (Hypothesis 1). Additionally, in later stages, players learned how they could use the information to make the best choice for a carrier to collaborate with (Hypothesis 4). In the first round, the same information was available to the player, but, since the game was a new environment, they still needed to make sense of what information was relevant and useful. Moreover, players did not have any experience yet with one of the carriers. The outcome of the results from these three hypotheses showed that although an organization has a lot of information, the 'leap of faith' (Lewis & Weigert, 1985), still needed to be made based on their initial

disposition to trust. In other words, at an early stage of collaboration, trust is a more decisive factor than information.

- **In a new situation, such as the use of a platform, where initial trust plays a role, information is an important factor that influences the decision-making process.**
  This conclusion is based on the outcome of testing hypothesis 3B (Chapter 6), where the data is analyzed to see whether there is a relation between a player's disposition to trust and acquiring operational information. This data showed that players want to acquire information that is important for decision-making but at the same time, players have questions whether the information provided by the platform is correct or not. The contributions for platform users and organizations are as follows:

  Users of the platform do not only need to acquire enough information to oversee all possible outcomes of the collaboration but they also use and understand that gut feeling is an information source in their decision-making process. As explained by stakeholders in Chapter 3, sometimes gut feeling tells you more than the information on the platform. Here trust comes into place, where users of the platform need to use their gut feeling as a factor in their decision-making process. Gut-feeling is related to intuition, where intuition is a cognitive conclusion drawn by individuals based on their experiences and knowledge (Scheiner, Bacarella, Bessant, & Voigt, 2015).

  For platform organizations, these result shows that information is connected to the trust development of their users. Platform organizations need to be aware of how information is presented and incorporated into a platform. For example, in one of the debriefing sessions, a player explained that he did not trust a carrier because, in one of the reviews, the slogan of that carrier was used to explain that the services that the carrier provided were good. Although this specific carrier was a high-quality carrier, the player was in doubt whether the review was fake or not.

- **Trust in another organization is strongly connected to trust in the technology, trust in the platform organization, and trust in the platform community.**
  The interviews held with the stakeholders not only provided valuable input for the design of the FreightBooking game but also provided valuable insights into how trust works when using a platform. One of the main findings from the interviews is that trust in another organization is intertwined with trust in the technology, trust in the platform organization, and also trust in the platform community (Chapter 3).

  Trust in another company is not only derived from the information you can look up about that company, or the experience you have with that company. It is also influenced by the platform community because the platform community will tell you a lot about the values of the organizations that are part of the platform. The functioning of the platform is also intertwined with the trustworthiness of other organizations because as a user you want to know that security mechanisms and safeguards are in place on the platform. For example, are there mechanisms in place that an organization will pay? The functioning of the platform also depends on the platform organization. Who is behind the platform? What are the values of that company? Are they open to advice and

is it easy to connect to them if something goes wrong? All these aspects of trust are intertwined and influence each other.

- **The experience in a platform community is strongly connected to the experience with a specific organization.**
  Hypothesis 4 describes the relation that a positive or negative experience of a player with a carrier influences the decision to collaborate with that carrier. The gameplay results of the FreightBooking game did find a significant relationship. From the gameplay results it could be seen that two types of experiences emerged during the gameplay: a general experience and a carrier-specific experience (Chapter 6). The gameplay data showed that players do use their prior negative/positive experiences to choose a specific carrier. Additionally, players learn from their experiences since the difference between the choice of a carrier in round 1 and round 3 is significant.

  When players needed to select a carrier to collaborate with, not only the carrier-specific experience played a role but also the general experience. In the post-questionnaire, players stated that they thought a couple of carriers were trustworthy but other carriers, such as Van Beers Logistics weren't trustworthy. This shows that when using a platform, there is an interplay between the experience a player has with a carrier and the general experience. This implies, that a specific experience an organization has with another organization on a platform can influence the overall experience that an organization has. If we look at this from more a general view when using platforms to collaborate, the experience an organization has with a community member also influences the experience with the community itself.

These abovementioned factors can help to understand the interplay between trust and information and help platform users and organizations present the information, determine what information is important when starting a collaboration, and understand how trust develops in technology-mediated collaborations.

7.4. Contributions of the study

This dissertation provides two overarching contributions: conceptual and methodological.

The first contribution is the conceptual model and framework that is proposed in Chapter 2. The literature review on trust showed that trust has a strong relationship with an organization's decisions, experience, and interpretation of the predictability of another organization. Trust can be viewed from a social and technological perspective on different levels, such as an organizational and institutional level. By visualizing which variables are important when discussing trust in technology-mediated collaborations, this dissertation contributes to the trust literature on the role of trust in technology-mediated collaborations. Beyond the in-depth understanding of how trust can be viewed from the interplay of the social and technological perspectives, the conceptual model and framework illustrate how trust is embedded and develops in technology-mediated collaborations.

The methodological contribution of this research is the simulation game. The FreightBooking simulation game tries to represent how trust develops in a real situation. As discussed in Chapter 4, most simulation games use the prisoner's dilemma to test the impact of trust on a relationship. However, as shown in Chapter 2, more variables play a role in technology-mediated collaborations than the trade-off shown in a typical prisoner's dilemma, such as information (first-hand and second-hand). The FreightBooking game is one of the few games that studies the interplay between trust and information in the transport and logistics sector. It provides experts and professionals with a game that allows them to experiment in a safe environment, with the role of trust and information when using platforms, and allows them to discuss the topic of trust.

7.5. Recommendations for further research

In the last few years, we have researched trust and freight booking platforms. Although a literature review and interviews were conducted, and the simulation game FreightBooking was designed, the above findings have some limitations.

- **Playing the FreightBooking game with a larger (experts and professionals) group.** The game has been played mainly with students. Some student groups already had working experience, expertise (group 2), and knowledge (group 3) in transport and logistics. Playing the game with professionals may provide insights into how they view trust in the usage of platforms and this can further validate the game and its processes.

  Besides the insights into how professionals and experts play the game, it would be useful to play the game with a more diverse set of players. By having a wider variety of players, there will probably be a larger differentiation between players' disposition to trust. Zaheer & Zaheer (2006) discuss that trust and the mechanisms and building trust depend on the institutional support for trust, and the institutional and cultural context. Platforms operate in an international context and allow organizations from different cultural and institutional backgrounds to collaborate. A larger group of players with various backgrounds increases the possibility that the disposition of trust varies more across players. This allows us to understand whether a low disposition to trust will mean that some players search for more assurances, such as buying a FreightBooking report.

- **Capturing institutional structures/mechanisms of inter-organizational trust.** While the current study highlights the role of initial trust as a driver of collaboration, this may only partially capture the complexity of trust between organizations. Inter-organizational trust is not merely the sum of individuals' attitudes or intuitions; rather, it is shaped by shared norms, laws and regulations and other institutional structures. Future research could explore how these structural and institutional dimensions of trust can be more effectively incorporated into simulation games. For example by incorporating contracts or formal agreements into the FreightBooking game.

- **Further development of the FreightBooking game.** As discussed in section 7.1, the FreightBooking game has some limitations. One important realization and a limitation

of the FreightBooking game is that due to the game set-up, players only experienced the left side of the conceptual framework, cell 1 and cell 3 (Figure 7.42). In the conceptual framework, it is assumed that in cell 1 and cell 3, organizations only require basic and operational information to base their decision on. However, data from the FreightBooking game showed that, in general, more information is requested for important customers. Although the strategic part wasn't that strong in the game, information was still important for the players to base their decisions on. In the FreightBooking game, players could not lose a client if the conditions of the transport order could not be met. The player only had a risk of getting a fine from a client. However, if a relationship is at risk, players would have put more effort into finding a suitable carrier and might look for more assurances than the standard information. Therefore, the players' risk of harming a relationship was limited. This prevented us from fully testing the conceptual framework.

Another limitation of the game was the fact that for every recurring (long-term) order, a player could collaborate with a different carrier. The risk of choosing an unsuitable carrier for a long-term order was limited through this design decision. A design adjustment could be that the player needs to select one carrier that transports all the client's recurring orders for a long-term order. This will also enhance the seeking of assurances. Having to select a carrier for three long-term orders in the game might influence a player to search for more strategic information, which would be in line with the developed conceptual framework.

As discussed in the previous section, the FreightBooking game has many subtle characteristics, for instance, client descriptions. It almost mirrors how the real system works. There are different types of carriers in the game, from untrustworthy to trustworthy. A carrier's untrustworthy characteristics are described subtly on the information pages of a carrier or in the FreightBooking report. For example, on the Google page of Van Beers Logistics, one of the Google search hits is that they need to pay a huge fine because of tax evasion. Moreover, some reviews aren't that good. Players need to notice these properties to evaluate whether a carrier is trustworthy. The carriers' descriptions and trustworthy characteristics are described subtly to make it not too obvious which carrier is trustworthy and which one is not. For the research objective, these nuances could potentially be reduced. As described above, the game included many nuanced elements, which sometimes made it challenging for players to distinguish between different carriers clearly. Players' evaluations of carriers were largely based on the availability of information. However, beyond availability, the quality of the information is equally important.

The game included some initial steps to reflect this, such as missing reviews, offline carrier websites, or poor Google search results. Still, to better understand the relationship between trust and information, future versions of the game should place more emphasis on information quality in addition to availability. This could involve, for example, missing details on a company profile, information presented in a different language, or inconsistencies between different information sources.

In the current version of the game, no warm-up round was included, as the focus of the research is on initial trust**.** To study this concept accurately, players needed to enter the game without prior interaction or opportunities to build familiarity. However, for a future version of the game, it could be interesting to experiment with the inclusion of a warm-up round. One possible approach would be to introduce a "Round 0," in which players choose from three carriers that do not reappear in the rest of the game. This way, players would gain some experience with the game mechanics and decision-making process, while still starting ‘fresh’ in Round 1.

References

Arthur D Little (2017). Digital platforms in freight transportation: a true industry disruptor?. Report

Asadullah, A., Faik, I., & Kankanhalli, A. (2018). Digital platforms: A review and future directions. In *Proceedings of the 22nd Pacific Asia Conference on Information Systems - Opportunities and Challenges for the Digitized Society: Are We Ready?, PACIS 2018*.

Bachmann, R. (2001). Trust, power and control in trans-organizational relations. *Organization Studies*, *22*(2), 337–365.

Bachmann, R., & Zaheer, A. (2008). Trust in inter-organizational relations. In S. Copper, M. Beers, C. Humam, & P. S. Ring (Eds.), *Handbook of inter-organizational relations* (1st ed., pp. 534–554). Oxford, UK: Oxford University Press.

Barney, J. B., & Hansen, M. H. (1994). Trustworthiness as a source of competitive advantage. *Strategic Management Journal*, *15*, 175–190.

Bélanger, F., & Carter, L. (2008). Trust and risk in e-government adoption. *Journal of Strategic Information Systems*, *17*(2), 165–176. https://doi.org/10.1016/j.jsis.2007.12.002

Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, Reciprocity, and Social History. *Games and Economic Behavior*, *10*, 122–142.

Bernaer, S., Meganck, M., Vanden Berghe, G., & De Causmaecker, P. (2006). Designing trust with software agents: A case study. *Journal of Information, Communication and Ethics in Society*, *4*(1), 37–48. https://doi.org/10.1108/14779960680000280

Bhattacharya, R., Devinney, T. M., & Pillutla, M. M. (1998). A formal model of trust based on outcomes. *The Academy of Management Review*, *23*(3), 459–472.

Boyce, C., & Neale, P. R. (2006). Conducting in-depth interviews: a guide for designing and conducting in-depth interviews for evaluation input. Pathfinder International Tool Series, Monitoring and Evaluation 2.

Boonekamp, R., Schaap, T., & van den Berg, H. (2022). Examining immersion in a game-based experiment to study extreme behavior: Analysis of behavior in extreme and unfamiliar circumstances. *International Journal of Serious Games*, *9*(1), 43-58. https://doi.org/10.17083/ijsg.v9il.453

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/https://doi.org/10.1191/1478088706qp063oa

Brookbanks, M., & Parry, G. (2022). The impact of a blockchain platform on trust in established relationships: a case study of wine supply chains. *Supply Chain Management*, *27*(7), 128–146. https://doi.org/10.1108/SCM-05-2021-0227

Canavari, M., Fritz, M., Hofstede, G. J., Matopoulos, A., & Vlachopoulou, M. (2010). The role of trust in the transition from traditional to electronic B2B relationships in agri-food chains. *Computers and Electronics in Agriculture*, *70*(2), 321–327. https://doi.org/https://doi.org/10.1016/j.compag.2009.08.014

Chetty, R., Hofmeyr, A., Kincaid, H., & Monroe, B. (2001). The trust game does not (only) measure trust: The risk-trust confound revisited. Journal of Behavioral and Experimental Economics, 90, Article 101520. https://doi.org/10.1016/j.socec.2020.101520

Chien, S.-H., Chen, Y.-H., & Hsu, C.-Y. (2012). Exploring the impact of trust and relational embeddedness in e-marketplaces: An empirical study in Taiwan. *Industrial Marketing Management*, *41*, 460–468.

Child, J. (2001). Trust—the fundamental bond in global collaboration. *Organizational Dynamics*, *29*(4), 274–288. https://doi.org/10.1016/s0090-2616(01)00033-x

Connelly, B. L., Crook, T. R., Combs, J. G., Ketchen Jr., D. J., & Aguinis, H. (2015). Competence- and integrity-based trust in interorganizational relationships: Which matters more? *Journal of Management*, *44*(3), 919–945. https://doi.org/10.1111/j.0737-6782.2005.00120.x

Cummings, L., & Bromiley, P. (1996). The organizational trust inventory (OTI): Development and validation. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in Organizations: Frontiers of theory and research* (pp. 302–330). Thousand Oaks, CA, US: Sage publications, Inc. https://doi.org/http://dx.doi.org/10.4135/9781452243610.n15

Currall, S. C., & Inkpen, A. C. (2002). A multilevel approach to trust in joint ventures. *Journal of International Business Studies*, *33*(3), 479–495. https://doi.org/10.1057/palgrave.jibs.8491027

Das, T. K., & Teng, B.-S. (1998a). Between trust and control: Developing confidence in partner cooperation in alliances. *The Academy of Management Review*, *23*(3), 491–512.

Dasgupta, P. (1988). Trust as a commodity. In D. Gambetta (Ed.), *Trust: Making and Breaking Cooperative Relations* (pp. 49–72). Cambridge, Massachusetts, USA: Basil Blackwell Inc.

de Caluwé, L., Geurts, J., & Kleinlugtenbelt, W. J. (2012). Gaming research in policy and organization: An assessment from the Netherlands. *Simulation and Gaming*, *43*(5), 600–626. https://doi.org/10.1177/1046878112439445

Derave, T., Prince Sales, T., Gailly, F., & Poels, G. (2021). Comparing digital platform types in the platform economy. In M. La Rosa, S. Sadiq, & E. Teniente (Eds.), *Advanced Information Systems Engineering* (pp. 417–431). Cham: Springer International Publishing.

Deterding, C., Canossa, A., Harteveld, C., Cooper, S., Nacke, L., & Whitson, J. (2015). Gamifying research strategies, opportunities, challenges. *Ethics*, 2421–2424.

Deutsch, M. (1958). Trust and suspicion. *The Journal of Conflict Resolution*, *2*(4), 265–279.

Dodgson, M. (1994). Technological collaboration and innovation. In M. Dodgson & R. Rothwell (Eds.), *The handbook of Industrial Innovation* (pp. 285–292). Alderschot: Edward Elgar Publishing.

Doney, P. M., & Cannon, J. P. (1996). An examination of the nature of trust in buyer-seller relationships. *Journal of Marketing*, *61*(2), 35. https://doi.org/10.2307/1251829

Duke, R. D., & Geurts, J. L. A. (2004). Policy games for strategic management.

Dyer, J. H., & Singh, H. (1998). The relational view: cooperative strategy and sources of

interorganizational competitive advantage. *The Academy of Management Review*, *23*(4), 660–679. https://doi.org/10.2307/259056

Elbert, R., & Gleser, M. (2019). Digital forwarders: a market oriented taxonomy. In *Logistics management: Strategies and Instruments for Diigitalizing and decarbonizing supply chains - Proceedings of the German Academic Association for Business Research* (pp. 141–156). https://doi.org/10.1007/978-3-030-29821-0

Fombrun, C., & Shanley, M. (1990). What's in a name? Reputation building and corporate strategy. *Academy of Management Journal*, *33*(2), 233–258. https://doi.org/10.1017/CBO9781139344258.009

Freese, M., Lukosch, H., Wegener, J., & König, A. (2020). Serious games as research instruments – do's and don'ts from a cross-case-analysis in transportation. *European Journal of Transport and Infrastructure Research*, *20*(4), 103–126. https://doi.org/10.18757/ejtir.2020.20.4.4205

Gal, U., Blegind Jensen, T., & Lyytinen, K. (2014). Identity orientation, social exchange, and information technology use in interorganizational collaborations. *Organization Science*, *25*(5), 1372–1390. https://doi.org/10.1287/orsc.2014.0924

Gambetta, D. (1988). Do we trust trust? In D. Gambetta (Ed.), *Trust making and Breaking Cooperative Relations* (pp. 213–237). Cambridge, Massachusetts, USA: Basil Blackwell Inc.

Garstone, S. (1995). Electronic data interchange (EDI) in port operations. *Logistics Information Management*, *8*(2), 30–33. https://doi.org/10.1108/09576059510084984

Gefen, D. (2000). E-commerce: The role of familiarity and trust. *Omega*, *28*(6), 725–737. https://doi.org/10.1016/S0305-0483(00)00021-9

Geurts, J. L. A., Duke, R. D., & Vermeulen, P. A. M. (2007). Policy gaming for strategy and change. *Long Range Planning*, *40*(6), 535–558. https://doi.org/10.1016/j.lrp.2007.07.004

Graham, J. R., & Barter, K. (1999). Collaboration: a social work practice method. *Families in Society: The Journal of Contemporary Social Services*, *80*(1), 6–13. https://doi.org/10.1606/1044-3894.634

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *The American Journal of Sociology*, *91*(3), 481–510.

Gruchmann, T., Pratt, N., Eiten, J., & Melkonyan, A. (2020). 4PL digital business models in sea freight logistics: The case of FreightHub. *Logistics*, *4*(2), 1–15. https://doi.org/10.3390/logistics4020010

Gulati, R., & Nickerson, J. A. (2008). Interorganizational trust, governance choice, and exchange performance. *Organization Science*, *19*(5), 688–708. https://doi.org/10.1287/orsc.1070.0345

Hansen, H., Samuelsen, B. M., & Silseth, P. R. (2008). Customer perceived value in B-t-B service relationships: Investigating the importance of corporate reputation. *Industrial Marketing Management*, *37*(2), 206–217. https://doi.org/https://doi.org/10.1016/j.indmarman.2006.09.001

Hardwick, J., Anderson, A. R., & Cruickshank, D. (2013). Trust formation processes in innovative collaborations: Networking as knowledge building practices. *European Journal of Innovation Management*, *16*(1), 4–21. https://doi.org/10.1108/14601061311292832

Hardy, C., Phillips, N., & Lawrence, T. B. (2003). Resources, knowledge and influence: the organizational effects of interorganizational collaboration. *Journal of Management Studies*, *40*(2), 321–347. https://doi.org/10.1111/1467-6486.00342

Hart, P., & Saunders, C. (1997). Power and trust: critical factors in the adoption and use of electronic data interchange. *Organization Science*, *8*(1), 23–42.

Harteveld, C. (2011). *Triadic Game Design*. London, England: Springer. https://doi.org/10.1007/978-1-84996-157-8

Hattori, R. A., & Lapidus, T. (2004). Collaboration, trust and innovative change. *Journal of Change Management*, *4*(2), 97–104. https://doi.org/10.1080/1469701032000154919 7

Hesse, M. (2002). Shipping news: the implications of electronic commerce for logistics and freight transport. *Resources, Conservation and Recycling*, *36*(3), 211–240. https://doi.org/https://doi.org/10.1016/S0921-3449(02)00083-6

Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998). Is anybody out there? Antecedents of trust in global virtual teams. *Journal of Management Information Systems*, *14*(4), 29–64. https://doi.org/10.1080/07421222.1998.11518185

Jeffries, F. L., & Reed, R. (2000). Trust and adaptation in relational contracting. *The Academy of Management Review*, *25*(4), 873–882. https://doi.org/https://doi.org/10.5465/amr.2000.3707747

Jones, G. R., & George, J. M. (1998). The experience and evolution of trust: Implications for cooperation and teamwork. *Academy of Management Review*, *23*(3), 531–546. https://doi.org/https://doi.org/10.5465/amr.1998.926625

Kaplan, S., & Sawhney, M. (2000). E-hubs: the new B2B (business-to-business) marketplaces. *Harvard Business Review*, *78*(3), 97–103. https://doi.org/10.1210/jc.2009-0402

Kim, D. J., Ferrin, D. L., & Raghav Rao, H. (2008). Trust and satisfaction, two stepping stones for successful e-commerce relationships: A longitudinal exploration. *Information Systems Research*, *20*(2), 237–257. https://doi.org/10.1287/isre.1080.0188

Klabbers, J. H. G. (2009). Terminology ambiguity: Game and simulation. *Simulation and Gaming*, *40*(4), 446–463. https://doi.org/https://doi.org/10.1177/1046878108325500

Klabbers, J. H. G. (2018). On the architecture of game science: A rebuttal. *Simulation and Gaming*, *49*(3), 356–372. https://doi.org/10.1177/1046878118779706

Kortmann, R., & Harteveld, C. (2009). Agile game development: lessons learned from software engineering. In *Learn to Game, Game to Learn; the 40th ISAGA Conference*.

Kriz, W. C. (2003). Creating effective learning environments and learning organizations through gaming simulation design. *Simulation and Gaming*, *34*(4), 495–511. https://doi.org/10.1177/1046878103258201

Kurapati, S., Kourounioti, I., Lukosch, H., Tavasszy, L., & Verbraeck, A. (2018). Fostering sustainable transportation operations through corridor management: A simulation gaming approach. *Sustainability (Switzerland)*, *10*(2). https://doi.org/10.3390/su10020455

Lee, H. L., Padmanabhan, V., & Whang, S. (1997). Information distortion in a supply chain: The bullwhip effect. *Management Science*, *43*(4), 546–558. https://doi.org/10.1287/mnsc.43.4.546

Lewicki, R. J. (2006). Trust, trust development, and trust repair. In M. Deutsch, P. T. Coleman, & E. C. Marcus (Eds.), *The handbook of conflict resolution* (pp. 92–119). Hoboken, NJ, US: Wiley Publishing. https://doi.org/10.1371/journal.pone.0191523

Lewicki, R. J., & Bunker, B. B. (1995). Trust in relationships: A model of development and decline. In B. B. Bunker & J. Z. Rubin (Eds.), *The Jossey-Bass mangement series and The Jossey-Bass conflict resolution series. Conflict, cooperation, and justice: Essays inspired by the work of Morton Deutsch* (pp. 133–173). San Francisco, CA, US.

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. *Academy of Management Review*, *23*(3), 438–458. https://doi.org/10.5465/AMR.2003.10196729

Lewis, J. D., & Weigert, A. (1985). Trust as a social reality. *Social Forces*, *63*(4), 967–985. https://doi.org/https://doi.org/10.1093/sf/63.4.967

Lippert, S. K., & Swiercz, M. P. (2005). Human resource information systems (HRIS) and technology trust. *Journal of Information Science*, *31*(5), 340–353. https://doi.org/10.1177/0165551505055399

Luhmann, N. (1979). *Trust and Power*. (C. Morgner & M. King, Eds.). Cambridge, UK: Polity Press.

Lukosch, H. K., & Comes, T. (2019). Gaming as a research method in humanitarian logistics. *Journal of Humanitarian Logistics and Supply Chain Management*, *9*(3), 352–370. https://doi.org/10.1108/JHLSCM-06-2018-0046

Lukosch, H. K., Groen, D., Kurapati, S., Klemke, R., & Verbraeck, A. (2016). The Role of Awareness for Complex Planning Task Performance. *International Journal of Game-Based Learning*, *6*(2), 15–28. https://doi.org/10.4018/IJGBL.2016040102

Lukosch, H. K., Bekebrede, G., Kurapati, S., & Lukosch, S. G. (2018). A Scientific Foundation of Simulation Games for the Analysis and Design of Complex Systems. *Simulation & Gaming*, *49*(3), 279–314. https://doi.org/10.1177/1046878118768858

Lumineau, F. (2017). How contracts influence trust and distrust. *Journal of Management*, *43*(5), 1553–1577. https://doi.org/10.1177/0149206314556656

Mayer, I. S., & Bekebrede, G. (2006). Serious games and "simulation based e-learning" for infrastructure management. In *Affective and emotional aspects of human-computer interaction: Game-based and innovative learning approaches* (pp. 136–155).

Mayer, I. S. (2009). The gaming of policy and the politics of gaming: A review. *Simulation and Gaming*, *40*(6), 825–862. https://doi.org/10.1177/1046878109346456

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review*, *20*(3), 709–734. https://doi.org/https://doi.org/10.5465/amr.1995.9508080335

Mcallister, D. J. (1995). Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, *38*(1), 24–59.

McAllister, D. J. (1995). Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, *38*(1), 24–59. https://doi.org/10.2307/256727

McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an organizing principle. *Organization Science*, *14*(1), 91–103. https://doi.org/10.1287/orsc.14.1.91.12814

Mcknight, D. H., & Chervany, N. L. (1996). The meanings of trust. *Proceedings of SPIE*. https://doi.org/10.1117/12.304574

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). The impact of initial consumer trust on intentions to transact with a web site: A trust building model. *Journal of Strategic Information Systems*, *11*(3–4), 297–323. https://doi.org/10.1016/S0963-8687(02)00020-3

McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *The Academy of Management Review*, *23*(3), 473–490. https://doi.org/http://dx.doi.org/10.2307/259290

Melese, Y., Stikkelman, R., & Herder, P. (2016). A socio-technical perspective to flexible design of energy infrastructure systems. In *2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC)* (pp. 4669–4674). Budapest: IEEE. https://doi.org/10.1109/SMC.2016.7844968

Mikl, J., Herold, D. M., Ćwiklicki, M., & Kummer, S. (2021). The impact of digital logistics start-ups on incumbent firms: a business model perspective. *International Journal of Logistics Management*, *32*(4), 1461–1480. https://doi.org/10.1108/IJLM-04-2020-0155

Mishra, A. K. (1996). Organizational responses to crisis: The centrality of trust. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in Organizations* (pp. 261–287). Sage, Thousand Oaks.

Nadler, S. S., & Kros, J. F. (2010). An assessment of supply chain managers' trust in online auctions. *Industrial Management & Data Systems*, *110*(6), 805–822. https://doi.org/https://doi.org/10.1108/02635571011055063

Ningrum, A. D., & van Schuylenburg, M. (2020). Serious gaming for port development as a learning tool: a case study of port constructor. *IOP Conference Series: Earth and Environmental Science*, *530*. Retrieved from https://api.semanticscholar.org/CorpusID:236864366

Nooteboom, B. (2008). Collaboration, trust, and the structure of relationships. In B Nooteboom & E. Stam (Eds.), *Micro-foundations for innovation policy* (pp. 199–218). Amsterdam University Press.

Patel, H., Pettitt, M., & Wilson, J. R. (2012). Factors of collaborative working: A framework for a collaboration model. *Applied Ergonomics*, *43*(1), 1–26. https://doi.org/10.1016/j.apergo.2011.04.009

Pavlou, P. A. (2002). Institution-based trust in interorganizational exchange relationships: The role of online B2B marketplaces on trust formation. *Journal of Strategic Information Systems*, *11*(3–4), 215–243. https://doi.org/10.1016/S0963-8687(02)00017-3

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, *7*(3), 69–103. https://doi.org/10.1.1.86.7139

Peters, V., & Van de Westelaken, M. (2014). *Simulation Games - A concise introduction to the design process*. Nijmegen, The Netherlands: samenspraak Advies.

Pirson, M., & Malhotra, D. (2011). Foundations of organizational trust: What matters to different stakeholders? *Organization Science*, *22*(4), 1087–1104. https://doi.org/10.1287/orsc.1100.0581

Powell, W. W., Koput, K. W., & Smith-doerr, L. (1996). Interorganizational collaboration and the locus of innovation : Networks of learning in biotechnology. *Administrative Science Quarterly*, *41*(1), 116–145.

Ratnasingam, P. (2005). Trust in inter-organizational exchanges: A case study in business to business electronic commerce. *Decision Support Systems*, *39*(3), 525–544. https://doi.org/10.1016/j.dss.2003.12.005

Riegelsberger, J., Sasse, M. A., & McCarthy, J. D. (2005). The mechanics of trust: A framework for research and design. *International Journal of Human Computer Studies*, *62*(3), 381–422. https://doi.org/10.1016/j.ijhcs.2005.01.001

Ring, P. S., & de Ven, A. H. Van. (1994). Developmental processes of cooperative interorganizational relationships. *The Academy of Management Review*, *19*(1), 90–118.

Ring, P. S., & Van De Ven, A. H. (1992). Structuring cooperative relationships between organizations. *Strategic Management Journal*, *13*(7), 483–498.

Rossotto, C. M., Lal Das, P., Ramos, E. G., Miranda, E. C., Badran, M. F., Licetti, M. M., & Murciego, G. M. (2018). Digital platforms: A literature review and policy implications for development. *Competition and Regulation in Network Industries*, *19*(1–2), 93–109. https://doi.org/10.1177/1783591718809485

Rotter, J. B. (1967). A new scale for the measurement of interpersonal trust. *Journal of Personality*,

35(4), 651–665. https://doi.org/http://dx.doi.org/10.1111/j.1467-6494.1967.tb01454.x

Rouse, W. B., Cannon-Bowers, J. A., & Salas, E. (1992). The role of mental models in team performance in complex systems. *IEEE Transactions on Systems, Man and Cybernetics*, *22*(6), 1296–1308. https://doi.org/10.1109/21.199457

Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, *23*(3), 393–404. https://doi.org/10.5465/AMR.1998.926617

Sabel, C. F. (1993). Studied trust: Building new forms of cooperation in a volatile economy. *Human Relations*, *46*(9), 1133–1170. https://doi.org/https://doi.org/10.1177/001872679304600907

Schramm, H. J., Czaja, C. N., Dittrich, M., & Mentschel, M. (2019). Current advancements of and future developments for fourth party logistics in a digital future. *Logistics*, *3*(1), 1–17. https://doi.org/10.3390/logistics3010007

Scott, A. (2018). Carrier bidding behavior in truckload spot auctions. *Journal of Business Logistics*, *39*(4), 267–281. https://doi.org/10.1111/jbl.12194

Shubik, M. (1970). Game theory, behavior, and the paradox of the prisoner's dilemma: Three solutions. *The Journal of Conflict Resolution*, *14*(2), 181–193. Retrieved from http://www.jstor.org/stable/173263

Sitkin, S. B., & Roth, N. L. (1993). Explaining the limited effectiveness of legalistic "remedies" for trust/distrust, *4*(3), 367–392. https://doi.org/https://doi.org/10.1287/orsc.4.3.367

Song, J., & Regan, A. C. (2001). Transition or transformation? emerging freight transportation intermediaries. *Transportation Research Record*, *1763*(1), 1–5. https://doi.org/https://doi.org/10.3141/1763-01

Spagnoletti, P., Resca, A., & Lee, G. (2015). A design theory for digital platforms supporting online communities: A multiple case study. *Journal of Information Technology*, *30*(4), 364–380. https://doi.org/10.1057/jit.2014.37

Spekman, R. E., & Davis, E. W. (2004). Risky business: Expanding the discussion on risk and the extended enterprise. *International Journal of Physical Distribution & Logistics Management*, *34*(5), 414–433. https://doi.org/10.1108/09600030410545454

Szajnfarber, Z., & Gralla, E. (2017). Qualitative methods for engineering systems: Why we need them and how to use them. *Systems Engineering*, *20*(6), 497–511. https://doi.org/10.1002/sys.21412

Tan, Y., & Thoen, W. (2000). Towards a generic model of trust for electronic commerce. *International Journal of Electronic Commerce*, *5*(2), 61–74.

Tapscott, D., & Tapscott, A. (2017). How blockchain will change organizations. *MITSloan Management Review*, *58*(2), 10–13.

Teece, D. J. (1992). Competition, cooperation, and innovation: Organizational arrangements for regimes of rapid technological progress. *Journal of Economic Behavior and Organization*, *18*(1), 1–25. https://doi.org/10.1016/0167-2681(92)90050-L

Thatcher, J. B., McKnight, D. H., Baker, E. W., Erg, R., & Roberts, N. H. (2011). The role of trust in postadoption IT exploration: An empirical examination of knowledge management systems. *IEEE Transactions on Engineering Management*, *58*(1), 56–70. https://doi.org/10.1109/TEM.2009.2028320

van den Hoogen, J., Lo, J., & Meijer, S. (2016). Debriefing research games: Context, substance and method. *Simulation & Gaming*, *47*(3), 368–388. https://doi.org/https://doi.org/10.1177/1046878116651023

Vanneste, B. S. (2016). From interpersonal to interorganisational trust: The role of indirect reciprocity. *Journal of Trust Research*, *6*(1), 7–36. https://doi.org/10.1080/21515581.2015.1108849

Vanneste, B. S., Puranam, P., & Kretschmer, T. (2014). Trust over time in exchange relationships: meta-analysis and theory. *Strategic Management Journal*, *35*(12), 1891–1902. https://doi.org/10.1002/smj.2198

Verhagen, T., Meents, S., & Tan, Y.-H. (2006). Perceived risk and trust associated with purchasing at electronic marketplaces. *European Journal of Information Systems*, *15*(6), 542–555. https://doi.org/10.1057/palgrave.ejis.3000644

Vize, R., Coughlan, J., Kennedy, A., & Ellis-Chadwick, F. (2013). Technology readiness in a B2B online retail context: An examination of antecedents and outcomes. *Industrial Marketing Management*, *42*(6), 909–918. https://doi.org/https://doi.org/10.1016/j.indmarman.2013.05.020

Watzlawick, P., Beavin, J. H., & Jackson, D. D. (1967). Some tentative axioms of communication. In P. Watzlawick, J. H. Beavin, & D. D. Jackson (Eds.), *Pragmatics of human communication: A study of interactional patterns, pathologies and pardoxes* (pp. 48–71). New York, USA: W.W. Norton & Company, Inc. https://doi.org/10.4324/9781315080918-7

Williams, M. (2001). In whom we trust: Group membership as an affective context for trust development. *Academy of Management Review*, *26*(3), 377–396. https://doi.org/https://doi.org/10.5465/amr.2001.4845794

Woolthuis, R. K., Hillebrand, B., & Nooteboom, B. (2005). Trust, contract and relationship development. *Organization Studies*, *26*(6), 813–840. https://doi.org/10.1177/0170840605054594

Yates, J. F., & Stone, E. R. (1992). The risk construct. In J. F. Yates (Ed), *Risk-Taking behavior* (pp. 1 - 25). John Wiley & Sons

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, *9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749–762. https://doi.org/10.1287/orsc.1070.0307

Zand, D. E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly*, *17*(2), 229–239.

Zavolokina, L., Zani, N., & Schwabe, G. (2023). Designing for trust in blockchain platforms. *IEEE Transactions on Engineering Management*, *70*(3), 849–863. https://doi.org/10.1109/TEM.2020.3015359

Zucker, L. G. (1986). Production of trust: Institutional sources of economic structure. *Research in Organizational Behavior*, *8*, 53–111.

Appendix A

Trust definitions from a social and technological perspective

As explained in Chapter 2, trust can occur in a social and technological environment. Various studies defined trust from a social perspective and a technological perspective. Table A1 and Table A2 provide an overview of the various definitions of trust from social and technological perspectives. Subsequently, the various trust definitions can be distinguished by different components, such as benevolence and vulnerability, but also whether or not the study defined trust as an expectancy or belief. Table A3 and Table A4 provide an overview of what each trust definition makes unique.

Table A1. Trust definitions from a social perspective.

Literature	Trust Definition
(Deutsch, 1958)	An individual may be said to have trust in the occurrence of an event if he expects its occurrence and his expectation leads to behavior which he perceives to have greater negative motivational consequences if the expectation is not confirmed than positive motivational consequences if it is confirmed (p. 266).

(Rotter, 1967)	Generalized expectancy held by an individual or group that the word, promise, verbal or written statement of another individual or group can be relied upon (p. 651).
(Zand, 1972)	Actions that increase one's vulnerability to another whose behavior is not under one's control, in a situation in which the penalty one suffers if the other abuses that vulnerability is greater than the benefit one gains of the other does not abuse that vulnerability (p. 230).
(Lewis and Weigert, 1985)	The members of that system act according to and are secure in the expected futures constituted by the presence of each other or their symbolic representation (p. 968).
(Gambetta, 1988)	A particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action (or independently of his capacity ever to be able to monitor it) and in context in which it affects his own actions (p. 217).
(Dasgupta, 1988)	Correct expectations about the actions of other people that have a bearing on one's own choice of action when that action must be chosen before one can monitor the actions of others (p. 51).
(Sitkin & Roth, 1993)	Rest on a foundation of expectations about an employee's ability to complete task assignments reliably (p. 367).
(Sabel, 1993)	The mutual confidence that no party to an exchange will exploit the others' vulnerability (p. 1133).
(Ring & Van de Ven, 1994)	A view based on confidence in another's goodwill (p. 93).
(Mayer, Davis, & Schoorman, 1995)	The willingness of a party to be vulnerable to the actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (p. 712).
(Lewicki & Bunker, 1995)	A state involving confident positive about another's motives with respect to oneself in situations entailing risk (p. 139).

(McAllister, 1995)	The extent to which a person is confident in, and willing to act on the basis of, the words, actions, and decisions of another (p. 25).
(Cummings & Bromiley, 1996)	An individual's belief or a common belief among a group of individuals that another individual or group (a) makes good-faith efforts to behave in accordance with any commitments both explicit or implicit, (b) is honest in whatever negotiations preceded such commitments and (c) does not take excessive advantage of another even when the opportunity is available (p. 303).
(Doney & Cannon, 1996)	The perceived credibility and benevolence of a target of trust (p. 36).
(Zaheer, McEvily & Perrone, 1998)	The expectation that an actor (1) can be relied on to fulfill obligations, (2) will behave in a predictable manner, and (3) will act and negotiate fairly when the possibility for opportunism is present (p. 143).
(Lewicki, McAllister, & Bies, 1998)	Confident positive expectations regarding another's conduct (Another's conduct: addressing another's words, actions, and decisions) Confident expectations: willingness to act on the basis of another's conduct (p.439).
(Bhattacharya, Devinney, & Pillutla, 1998)	An expectancy of positive (or nonnegative) outcomes that one can receive based on the expected action of another party in an interaction characterized by uncertainty (p. 462).
(McKnight, Cummings, & Chervany, 1998)	One believes in, and is willing to depend on another party (p. 474).
(Rousseau, Sitkni, Burt, & Camerer, 1998)	A psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another (p. 395).
(Mishra, 1996)	One party's willingness to be vulnerable to another party based on the belief that the latter party is competent, open, concerned, and reliable.
(Jones & George, 1998)	The experience of which is the outcome of the interaction of people's values, attitudes, and moods and emotions (p. 532).

(Das & Teng, 1998a)	Positive expectations about another's motives with respect to oneself in situations entailing risk (p. 494).
(Williams, 2001)	One's willingness to rely on another's actions in a situation involving the risk of opportunism (p. 378).
(Currall & Inkpen, 2002)	The decision to rely on another IJV (in joint venture) party (i.e. person, group or firm) under a condition of risk (p. 484).
(McEvily, Perrone, & Zaheer, 2003)	The willingness to accept vulnerabilities based on positive expectations about another's intentions or behaviors (p. 92).

Table A2. Trust definitions from a technological perspective.

Literature	**Definition**
(Hart & Saunders, 1997)	Confidence that the behavior of another will conform to one's expectations, and in the goodwill of another (p. 24).
(Tan & Thoen, 2000)	The behavioral manifestation of trust, i.e. you delegate an action to the other party or you accept information from the other party.
(McKnight, Choudhury, & Kacmar, 2002)	Perceptions about others' attributes and a related willingness to become vulnerable to others (p. 299).
(Pavlou, 2002a)	The subjective belief with which organizational members collectively asses that a population of organizations will perform potential transactions according to their confident expectations, irrespective of the ability to fully monitor them (p. 218).
(Ratnasingam, 2005)	The subjective probability by which organizations believe that the underlying technology infrastructure is capable of facilitating transactions according to their confident expectations (p. 527).
(Lippert & Swiercz, 2005)	An individual's willingness to be vulnerable to a technology based on person-specific expectations of the technology's predictability, reliability, and utility as moderated by the individual's predisposition to trust the technology (p. 341).
(Riegelsberger, Sasse, & McCarthy, 2005)	An attitude of positive expectation that one's vulnerabilities will not be exploited (p. 386).

Table A3. Distinction of trust concepts from a social perspective

Literature	Components	Aspects	Expectancy/Belief
(Deutsch, 1958)	Outcome correspondence, benevolence, mutual dependence	Behavioral	Expectancy
(Rotter, 1967)	Vulnerability, mutual dependence	Emotional	Expectancy
(Zand, 1972)	Dependency, vulnerability	Behavioral	Expectancy
(Lewis & Weigert, 1985)	Faithfulness	Behavioral, Emotional, Cognitive	Expectancy
(Gambetta, 1988)	Reliance, dependency, faith, confidence	Behavioral, Emotional	Expectancy
(Dasgupta, 1988)	Honesty, ability, monitoring	Behavioral, Cognitive	Expectancy
(Sitkin & Roth, 1993)	Task reliability	Behavioral, Cognitive	Expectancy
(Sabel, 1993)	Confidence	Cognitive	Expectancy
(Ring & Van de Ven, 1994)	Faith, integrity, confidence	Behavioral Emotional, Cognitive	
(Mayer, Davis, & Schoorman, 1995)	Ability, benevolence, integrity	Behavioral, Emotional, Cognitive	Expectancy
(Lewicki & Bunker, 1995)	Chronic disposition, situational parameters, history of the relationship	Behavioral, Emotional, Cognitive	Expectancy
(McAllister, 1995)	Competence, responsibility	Emotional, Cognitive	Expectancy/Belief
(Cummings & Bromiley, 1996)	Good faith, honesty, limited opportunism	Behavioral, Cognitive	Belief
(Doney & Cannon, 1996)	Credibility, benevolence	Cognitive	Expectancy

(Zaheer, McEvily & Perrone, 1998)	Reliability, predictability, fairness	Behavioral, Emotional, Cognitive	Expectancy
(Lewicki, McAllister & Bies, 1998)	Confidence	Behavioral	Expectancy
(Bhattacharya, Devinney and Pillutla, 1998)	Confidence, mutuality, good outcomes	Behavioral	Expectancy
(McKnight, Cummings, & Chervany, 1998)	Trusting intentions, trusting beliefs	Cognitive	Belief
(Rousseau, Sitkin, Burt, & Camerer, 1998)	Confidence, vulnerability	Behavioral, Cognitive	Expectancy
(Mishra, 1996)	Competence, openness, reliability, concern	Behavioral, Emotional, Cognitive	Belief
(Jones & George, 1998)	Values (e.g. loyalty, honesty), attitudes (e.g. knowledge structures), moods, and emotions	Behavioral, Emotional, Cognitive	Expectancy
(Das & Teng, 1998a)	Reliability, goodwill	Cognitive	Expectancy
(Williams, 2001)	Benevolence, ability, integrity	Emotional Cognitive	Expectancy
(Currall & Inkpen, 2002)	Reliance (confidence) , social judgements (benevolence, motivation)	Behavioral, Cognitive	Decision
(McEvily, Perrone, & Zaheer, 2003)	Competence, integrity, benevolence, faith	Behavioral, Cognitive	Expectancy/Intention

Table A4. Distinction of trust from a technological perspective

Literature	**Components**	**Aspects**	**Expectancy/Belief**
(Hart & Saunders, 1997)	Competence, openness, caring, reliability	Behavioral, Cognitive	Expectancy
(Tan & Thoen, 2000)	Competence, dependence, disposition, fulfillment	Cognitive	Belief

(McKnight, Choudhury, & Kacmar, 2002)	Predictability, reliability and utility	Cognitive	Belief/Intention
(Pavlou, 2003)	Credibility, benevolence	Cognitive	Belief
(Ratnasingam, 2005)	Confidentiality mechanisms, integrity mechanisms, authentication mechanisms, non-repudiation mechanisms, access control mechanism, availability mechanisms	Cognitive	Expectancy
(Lippert & Swiercz, 2005)	Predictability, reliability, utility (i.e. faith, perception and assessment of usefulness)	Cognitive,	Expectancy
(Riegelsberger, Sasse, & McCarthy, 2005)	Ability, motivation	Emotional, Cognitive	Expectancy

Appendix B

Interview guide on stakeholders' perspective on trust

This appendix will provide insights into which questions were asked during the stakeholder interviews. Since different types of stakeholders were interviewed, there are two set-ups for the interviews:

- B.1. Interview guide: users and non-users of platforms
- B.2. Interview guide: Platform organization

B.1. Interview guide: users and non-users of platforms (general)

The interview guide focused on platforms in general in the transport and logistics sector. Notes written in italics are not necessarily conveyed to the interviewee.

General questions about the platform

1. **What are the advantages of using a platform?**

2. **What are the disadvantages of using a platform?**

3. **Which platforms does your company use?**
    - *If a company is using a platform, go to questions 'yes, using a platform'*
    - *If a company is not using a platform, go to questions 'yes, using a platform'*

4. ***If yes, what platforms is your company using?***
    4.1.Why is your company using this platform?
    4.2.What is the added value for your company for using this platform?
    4.3.Are there any costs involved for using the platform?

Yes, using a platform: questions focused on trust

5. What does platform Y do to be a trustworthy platform?
- 5.1. On what information do you base whether a platform is trustworthy?
- 5.2. How does a platform ensure the confidentiality of information?

6. How do you search for a trustworthy company on a platform?
- 6.1. When is another company trustworthy?
- 6.2. On what information do you baes whether a company is trustworthy? What information about a company is important to its trustworthiness?
- 6.3. Does a previous experience with a company play an important role in the trustworthiness of that company?

7. When is there a mutual lack of trust in a company?
- 7.1. On what information do you base whether that company is untrustworthy?
- 7.2. Has there been a situation with a party where there was a lack of mutual trust?

8. Does trust that you have in a platform contributes to the trustworthiness of a company on the platform?

Yes, using a platform: questions focused on information

9. What information are you willing to share with a platform?
- 9.1. What information do you need to share with a platform to use the platform?
- 9.2. What information are you not willing to share with a platform?

10. What information are you willing to share with another company on the platform?
- 10.1. What information should you share with another company through the platform y?
- 10.2. Wo you share information with a company outside the platform?

11. Has there been a situation where something went wrong with the transport?
- 11.1. How is information shared on the platform when something goes wrong with the transportation?
- 11.2. How is there communication if something goes wrong with the transport? Via the platform or directly via you or the other company?

Yes, using a platform: questions focused on collaboration:

12. Do you often collaborate with the same party through platform Y? Is it facilitated by platform Y?

13. What are the biggest threats and/or disadvantages when you collaborate with another company through a platform Y?

Not using a platform: questions focused on trust

14. What is the reason your company does not use platforms?
- 14.1. Has your company worked with platforms that eventually stopped or that your company stopped using?

15. What was the reason your company stopped using this platform?

Not using a platform: questions focused on trust

16. Does trust play a role in not using a platform?

16.1. When is there a mutual lack of trust towards the platform?

17. On what information does your company base the lack of trust towards a platform?

18. Has there been a situation where there was a lack of trust towards a platform?

19. When has there been a mutual lack of trust towards the users of a platform?

19.1. On what information does your company base the lack of trust towards the platform users?

20. To what extent did the lack of trust in the platform affect the trustworthiness of other users of a platform?

No, stopped using a platform: questions focused on trust/information

21. Does trust play a role in quitting using the platform?

21.1. To what extent did your company's lack of trust in the platform affect its use of the platform?

22. When is there a mutual lack of trust towards the platform?

22.1. On what information does your company base the lack of trust towards the platform?

22.2. What information are/were you willing to share with the platform?

23. Has there been a situation where there was a lack of trust towards the platform?

24. Does a previous experience with a platform play a role in the trustworthiness of using a platform again?

25. When is there a mutual lack of trust towards the platform users?

25.1. On what information does your company base the lack of trust toward platform users?

26. To what extent did the lack of trust in the platform affect the trustworthiness of other users of the platform?

No stopped using a platform: questions focused on collaboration.

27. What are the biggest threats and/or drawbacks when partnering with another company through a platform?

27.1. With the way how collaboration between companies is changing when using platforms, to what extent does trust play a role?

27.2. In what situations is trust important when collaborating through a platform?

B.2. Interview guide: platform organization Y

General questions

1. **What is platform Y? And how does it work?**

2. **What are the advantages for companies using platform Y compared to traditional working methods?**
   2.1. What are the advantages for carriers/shippers of using platform Y?

3. **Did platform Y encounter any challenges with its introduction?**
   3.1. If yes, what were the challenges?
   3.2. If yes, what actions did Platform Y undertake to overcome these challenges?

4. **How does platform Y provide support to users of the platform?**

Questions focused on trust

5. **What is platform Y doing to be a trustworthy platform?**
   5.1. On what information do you base whether a platform is trustworthy?
   5.2. How does platform Y ensure the confidentiality of information?

6. **How do you search for a trustworthy company on platform Y?**
   6.1. When is a carrier/shipper or other users trustworthy?
   6.2. On what information do you base whether a carrier/shipper or other users is trustworthy? What information about a carrier/shipper or other users is important to its trustworthiness?
   6.3. Does previous experience with a carrier/shipper or other users play an important role in the trustworthiness of a carrier/shipper?

7. **When is there a mutual lack of trust with a carrier/shipper or other users?**
   7.1. On what information do you base whether a carrier/shipper or other users is untrustworthy?
   7.2. Has there been a situation with a carrier/shipper or other users with a lack of mutual trust?

8. **How does platform Y ensure the trustworthiness of users' data?**

Questions focused on information

9. **Is all company information visible on the platform to any user?**
10. **What information should a company share with platform Y?**
    10.1. Is it possible for companies to share information that is not required?

Questions focused on collaboration

11. **How is a collaboration between companies established on platform Y?**
    11.1. Is it possible to collaborate with a select group of companies?
    11.2. Is it possible to select companies with whom an organization wants to collaborate long-term?

12. Is it possible for companies to communicate outside the platform?

13. In case something goes wrong with the transport, how can companies cooperate with each other?

13.1. Will additional charges be made to the shipper/carrier?

Appendix C

Description of game choices of the FreightBooking game

In this appendix, a detailed description of the game flow within the FreightBooking game is given. First, an explanation of the scenario is given. The scenario provides an overview of the game flow. Second, the clients are described in more detail. After the clients are described, the carriers are described through their star rating, frequency of a positive or negative transport outcome, and the sustainability score that is presented through the FreightBooking report. Moreover, the various Google pages are presented per carrier and the carrier websites. Concluding with the different transport outcomes.

C.1. Scenario description

The FreightBooking game is used as a research instrument to study the impact of trust on technology-mediated collaborations. As discussed in Chapter 4, Section 4.2. the game must be designed in such a way that research questions can be answered. Therefore, a scenario is developed that is identical in each experiment. The scenario describes what will happen per day. Table C1 gives an overview of the scenario per transport day.

Table C1. Scenario description FreightBooking game.

Tr. day	Order	Client	Transport earnings	Carrier	Quote offer	Transport message		Outcome KPI		
						+	-	Profit	Sustainability	Customer satisfaction level
1	#1	Re-action	15	De Rouw Transport	8	+		7	0	2
				De Bont & Dochters	5	+		10	0	2
2	#2	KRAFT	10	Logistics Group Kleiman	8		-	2	2	-2
				VDL International Transport	3	+		7	2	2
				Transport & Logistiek Ponjier	5	+		5	0	2
3	#3	Muggenheuvel Technologies	20	Van Beers Logistics	9		-	11	-5	-2
				Eeden logistics	13		-	7	5	-2
				Transport Group Galvan	12		-	8	-5	-2
	#4	Smycken	25	De Rouw transport	15	+		10	5	2
				Eeden logistics	12	+		13	5	2
				Transport & Logistiek Ponjier	12	+		13	5	2
4	#41	Smycken	25	Logistics Group Kleiman	20	+		5	5	2
				Van Beers Logistics	12		-	13	-5	-2
				VDL International transport	14		-	11	5	-2
	#5	Lagom	10	De Rouw Transport	6	+		4	2	2

				De Bont & Dochters	3	+		7	0	2
5	#6	CONCEPT FURNTR	15	VDL Internatio nal transport	4	+		11	5	2
				Eeden logistics	11	+		4	0	2
				Transport Group Galvan	9		-	6	0	-2
	#42	Smycken	25	Van Beers Logistics	12	+		13	5	2
				VDL Internatio nal Transport	10	+		15	-5	-2
				Transport Group Galvan	15		-	10	5	2
6	#7	Porslin	15	De Rouw Transport	10	+		5	5	2
				Transport & Logistiek Ponjier	9		-	6	-5	2
	#61	CONCEPT FURNTR	15	Van Beers Logistics	4		-	11	-5	-2
				VDL Internatio nal Transport	4		-	11	5	-2
				De Bont & Dochters	5		-	10	-5	2
				Transport Group Galvan	9	+		6	5	2
7	#8	Muggenheuvel technologies	20	De Bont & Dochters	8		-	12	-5	-2
				Transport & Logistiek Ponjier	12	+		8	5	2
	#62	CONCEPT FURNTR	15	Logistics Group Kleiman	9	+	-	6	5	2
				Van Beers Logistics	4		-	11	-5	-2

				Eeden Logistics	9		-	6	-5	-2
				Transport Group Galvan	13	+		2	5	2

C.2. Clients

In the FreightBooking game, clients have a transport demand for which the players need to select a suitable carrier. Each client has different requirements, such as green transportation. Table C2 gives a detailed overview of the different types of clients.

Table C2. Overview of the clients and their characteristics.

Transport days (Round)	Order No.	Client logo	Profile	Characteristics	Possible fine
1	#1	Re-action	We request transportation for our goods. We believe that the transport can be done easily. For our transport we will pay your company 15 income coins.	• irregular client • low valuable goods • Short term order • Non sustainable	
2	#2	KRAFT	We at KRAFT heard positive stories about your services. We request transport services for our most sold products. We pay your company: 10 income coins.	• irregular client • low valuable goods • Not sustainable • Short term order	
3	#3	Muggenheuvel Technologies	Hi, it is Peter, from Muggenheuvel technologies, we request your services to transport one of our newest technologies in a sustainable way! We trust that your company can deliver the goods according to our conditions. Since we are a long-term client and we had no previous issues, we pay your company: 20 income coins.	• Long-term client • High valuable goods • short-term order • Sustainable	If the goods are too late or cannot be transported in a green way, we are forced to give you a fine of 5 profit tokens.

	#4		Hi, It's Maria from Smycken. For the upcoming three days, we have a re-occurring order. The goods are of high value and it is extremely important that it is delivered on time and green way. We will pay for your services: 25 income coins	• Long-term client • High valuable goods • Long-term order • Sustainable transport	Be aware that we will give you a fine if it is the transport is not delivered in a green way or on time. Fine is 10 profit tokens.
4	Repeated order #41				
	#5		Lagom, request your transport services to ship low valuable goods to the hinterland. We will pay for the services: 10 income coins.	• New client • Low valuable goods • Short-term order • Non sustainable	
5	*Repeated order #42*				
	#6		We were very happy with your previous service. We would like to request transport services again from your company to ship one of our standard products in a green way. The order is re-occurring for the next three days. For the order you will receive: 15 income coins.	• Irregular client • Low valuable goods • Sustainable transport • Long-term order	
6	*Repeated order #61*				
	#7		After 2 years, we request your services again. We would like to transport one of highly valuable goods to the hinterland in a green way. We hope you can help us. We will pay 15 income coins.	• irregular client • High valuable goods • Sustainable transport • Short term order	

7	*Repeated order #62*				
	#8	Muggenheuvel Technologies	Hi, Peter again. We request your services to transport high valuable technological equipment. I sincerely hope that the transport will be arranged according to our conditions. We will pay: 20 income coins.	• Long-term client • High valuable goods • Sustainable transport • Short term order	If the goods are too late or cannot be transported in a green way, we are forced to give you a fine of 5 profit tokens.

C.3. Carriers

Different carriers can provide transport. Eight carriers are used in the game. As discussed in section 4.3, the eight different carriers are introduced in the first three rounds. Table C3 shows when they give a quote offer on which Transport day. Subsequently, the outcome of each transport order is visualized in green or red.

Table C3. Carrier overview.

Transport day	**Order**	**Logistics Group Kleiman**	**De Rouw Transport**	**Van Beers Logistics**	**Eeden logistics**	**Transport & Logistiek Ponjier**	**VDL International transport**	**De Bont & Dochters**	**Transport Group Galvan**
1	#1		x					x	
2	#2	x				x	x		
3	#3			x	x				x
	#4		x		x	x			
4	#5		x					x	
	#41	x		x			x		
5	#6				x		x		x
	#42			x			x		x
6	#7		x			x			
	#61			x			x	x	x
7	8					x		x	
	#62	x		x	x				x
Total		3	4	5	4	4	5	4	5
Positive outcomes		2	4	1	2	3	3	2	3
Negative outcomes		1	0	4	2	1	2	2	2

Each carrier has a character description. For example, what news line needs to be included on the Google search page, or what type of website does the carrier have? Table C4 gives an overview of the character description per carrier.

Table C4. Character description per carrier.

Carrier	Indication trustworthiness	Average star rating	FreightBooking report				
			Green transport	*Goods delivered in a green way*	Service quality	*On time delivery*	*Satisfaction of clients*
Logistics Group Kleiman	High	4,5	High	*95%*	Medium	*50%*	*60%*
Transport & Logistiek Ponjier	High	4	Low	*17%*	High	*92%*	*93%*
De Rouw transport	High	3	Medium	*49%*	Medium	*51%*	*52%*
Eeden logistics	Medium	4	Low	*22%*	High	*85%*	*90%*
VDL International transport	Medium	3,5	High	*93%*	Low	*22%*	*25%*
Transport Group Galvan	Medium/Low	3	Low	*15%*	Medium	*55%*	*53%*
De Bont & Dochters	Low	2	Medium	*56%*	Medium	*52%*	*55%*
Van Beers Logsitics	Low	2,5	Medium	*52%*	Low	*30%*	*25%*

Carriers' ratings (mentioned in Table C4) are an average of multiple ratings. An overview of the different reviews and star ratings per carrier can be seen in Table C5.

Table C5. Reviews and star rating of each carrier.

Carrier	**Average star rating**	**Reviews**				
Logistic Group Kleiman	4,5	5,0 star rating 7 days ago Logistics Group Kleiman could meet our request to transport goods sustainably. Although the transport price was high we valued their services.	1,5 star rating 5 days ago We requested sustainable transportation. Logistics Group Kleiman reassured me that it would be delivered in a green way. Yet, there was an issue with their hydrogen trucks. The goods were delivered in a non-green way.	4,0 star rating 2 days ago Logistics Gourp Kleiman promises what it delivers! Bit pricey, but great service and expertise.		
Transport & Logistiek Ponjier	4,0	4,0 star rating 5 days ago This client left no information	3,5 star rating 4 days ago This client left no information	2,5 star rating 3 days ago Transport & Logistiek somehow could not arrange green transportation due to many request they receive from their long-term clients.	4,0 star rating 1 day ago Great service, and they bought quite a lot of electric trucks.	
De Rouw Transport	3,0	3 star rating (6 days ago) Sustainability is part of our DNA.	1,0 star rating 4 days ago Not good services at all. De Rouw	2,5 star rating 3 days ago We frequently work with de Rouw	4,0 star rating 2 days ago This client left no comment	3,0 star rating 1 day ago

		De Rouw Transport can offer these services.	Transport delivered the goods by one of their hydrogen trucks. Yet, the goods were, somehow, too late at the location. De Rouw Transport did not give a reason why this happened.	Transport. Overall we are happy with their services. But for De Rouw transport it is sometimes challenging to meet our sustainability standards.		Great! We recommend this carrier.
Eeden logistics	4,0	3,0 star rating 7 days ago Great service We highly recommend Eeden Logistics.	4,0 star rating 5 days ago As long-term client, we always are very happy with the services by Eeden logistics. They just started with buying some hydrogen trucks. Not that many, but as a client, we finally can think of delivering our goods in a green way.	4,5 star rating 4 days ago On-time, good communication with the truck driver, and personal service by Eeden logistics. Our high valuable goods were handled with care.	2,5 star rating 2 days ago We collaborated for the first time with this company. Although the service was good, they apologized that they could not deliver our goods in a green way, what we preferred.	5,0 star rating 1 day ago This client left no information
VDL International transport	3,5	3,0 star rating 6 days ago Sustainable transport, that is what they do! Service was okay for the price and they delivered the goods sustainably.	4,0 star rating 5 days ago VDL International Transport delivered the goods with their hydrogen trucks. We never collaborated with VDL International Transport. However,	2,0 star rating 4 days ago The quality of services was not as expected. They showed up late, and communication was difficult with the driver. They did, luckily, delivered the	1,0 star rating 3 days ago This client left no comments	1,5 star rating 2 days ago Worst service we ever experienced. We knew it was a small company, the price they offered was okay, but the service was terrible. As a result, our

			they were quite flexible, since we changed our transport planning quite a bit. We highly recommend this great, innovative company.	goods by hydrogen trucking.		company is never going to collaborate with VDL International again.
Transport Group Galvan	3,0	1,5 star rating 4 days ago We were very unhappy with the services of Transport Group Galvan. We requested sustainable transportation. They promised that these conditions could be met. However, during the transport, we received the message that they couldn't arrange sustainable transportation due to request of other clients for these kinds of services.	3,0 star rating 5 days ago We are happy with the services of Transport Group Galvan and recommend this company.	4,5 star rating 3 days ago Great service. We did not request sustainable transportation. However, Transport Group Galvan transported out goods with hydrogen trucking. Due to this, we made some extra earnings on transportation.	2,5 star rating 2 days ago Transport Group Galvan fulfilled our request and gave a fair quote for their services.	
De Bont & Dochters	2,0	3,5 star rating 7 days ago	1,5 star rating 4 days ago	3,5 star rating 3 days ago	2,0 star rating 2 days ago	

		Great value for the services that they offer.	The service was not expected to be. The goods arrived late at the client, and there was a lack of communication.	This client provided no comments	We are extremely unhappy with the services of De Bont & Dochters. They stated on their website that they have 'green' trucks. However, from two out of three shipments, there were problems with these trucks. Our goods were transported in a non-sustainable way.	
Van Beers Logistics	2,5	3,5 star rating 7 days ago This client left no comments	4,5 star rating 4 days ago Great service! For us, at New Crafts, our design furniture must be delivered in a sustainable way. Van Beers Logistics arranged this by transporting our goods by hydrogen trucks. We were very happy and would again collaborate Van Beers Logistics if we want to transport our goods sustainable.	2,0 star rating 2 days ago Communication with the driver was impossible. We had a bad feeling whether or not we would give our goods with this driver. The transport went okay.	1 star rating 1 day ago Van Beers Logistics did not show up to pick up our goods. We would never collaborate again with this company.	1,5 star rating 1 day ago This client left no comment

C.4. Google page

As shown in Chapter 4, each carrier has its own Google page with its own Google search headlines. The headlines are based on the trustworthiness of the carrier. Table C4 gives an overview of the ranking of carriers from trustworthy to untrustworthy. Based on this ranking, the Google headlines are defined. The next Figures give an overview of the 8 Google pages per carrier.

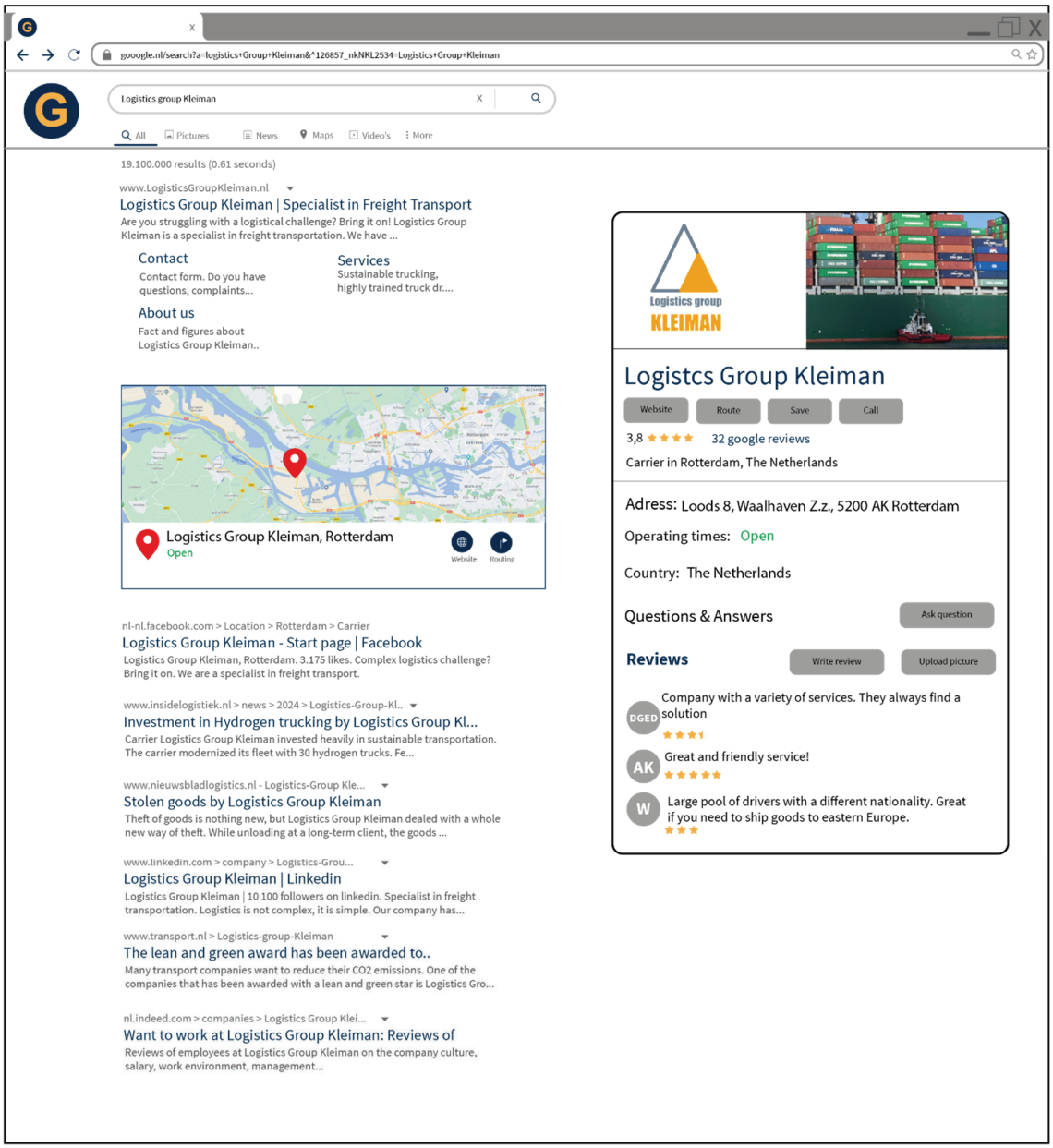


Figure C1. Google page of Logistics Group Kleiman.

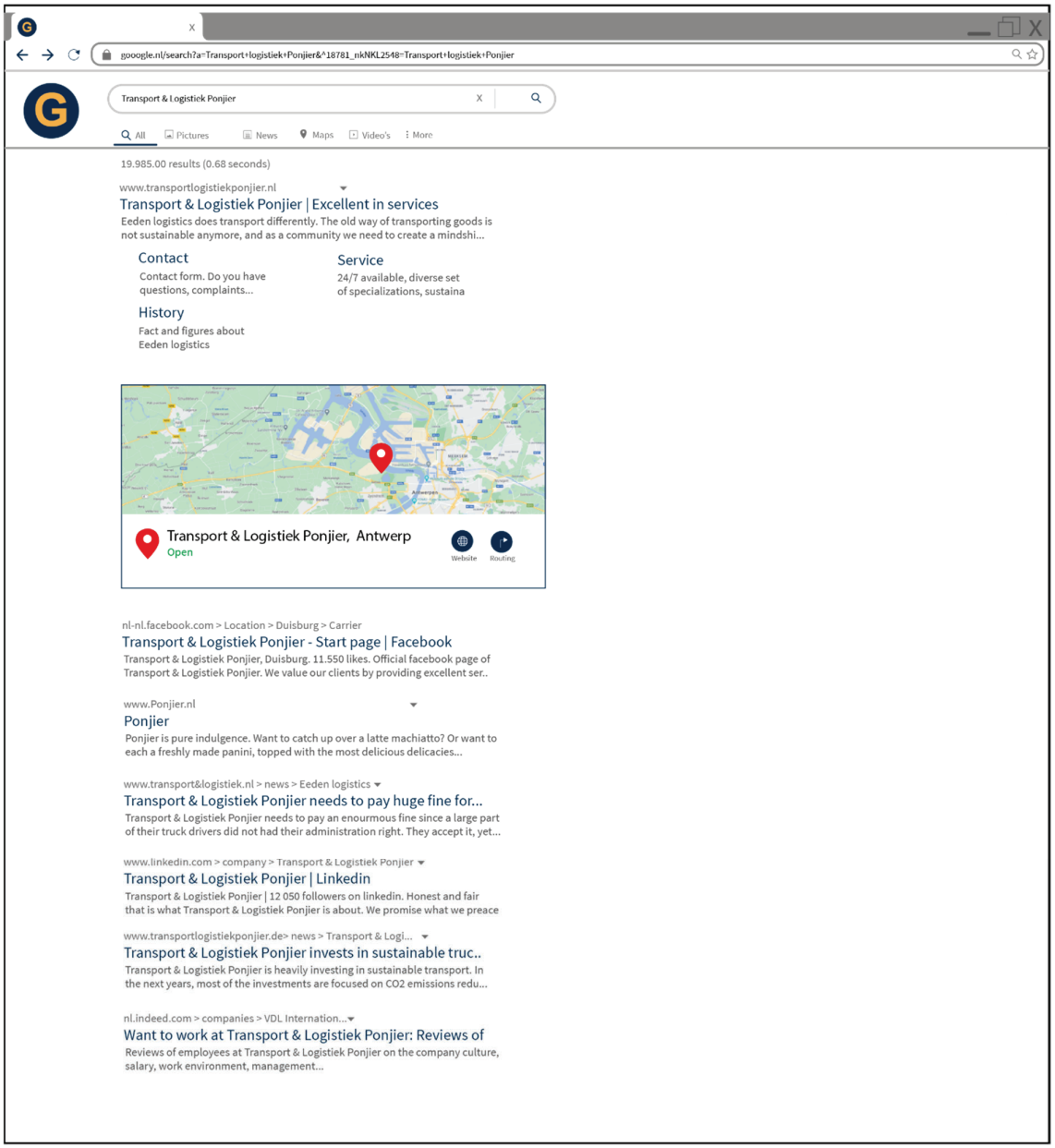


Figure C2. Google page of Transport & Logistiek Ponjier.

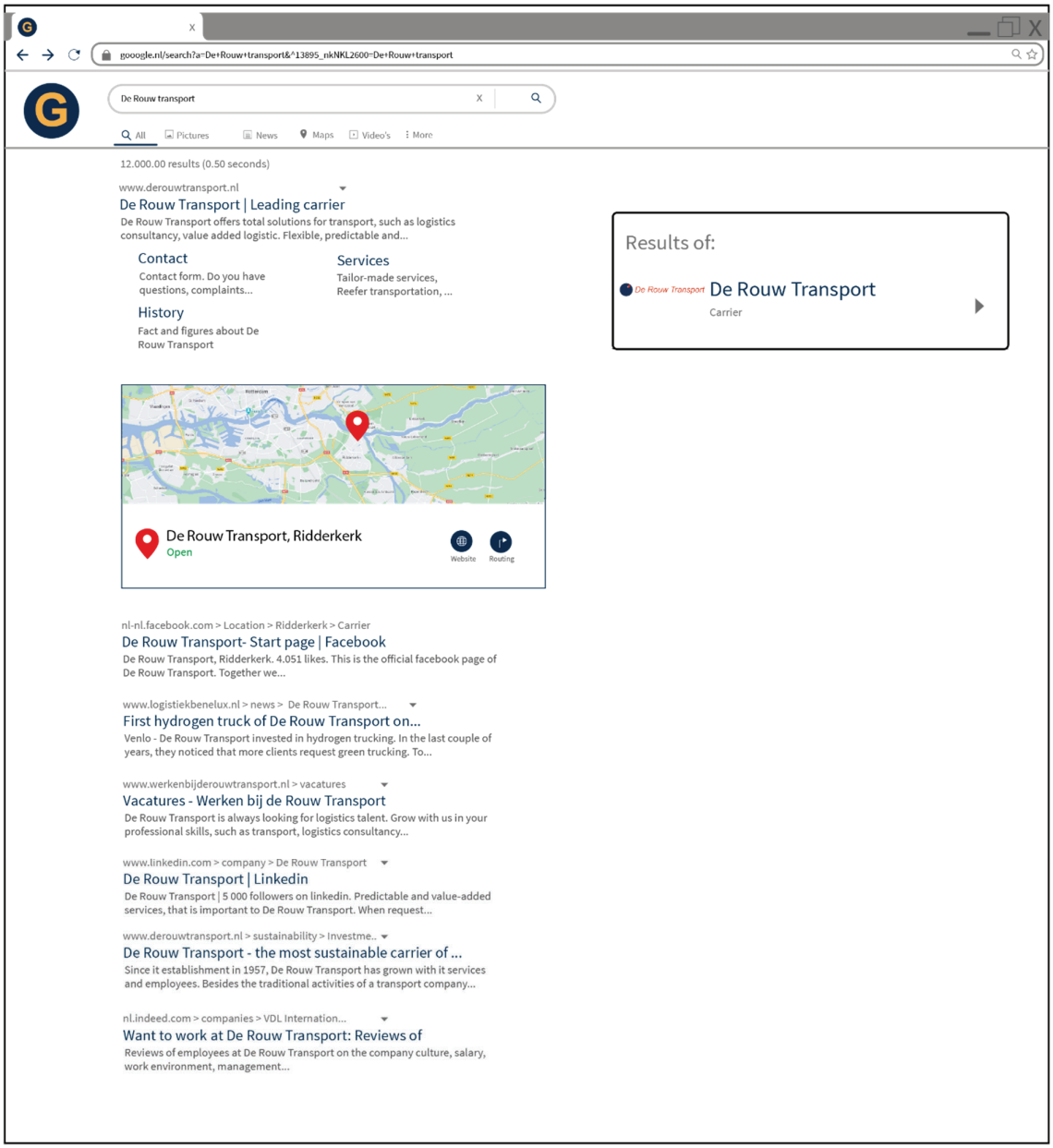


Figure C3. Google page of De Rouw Transport.

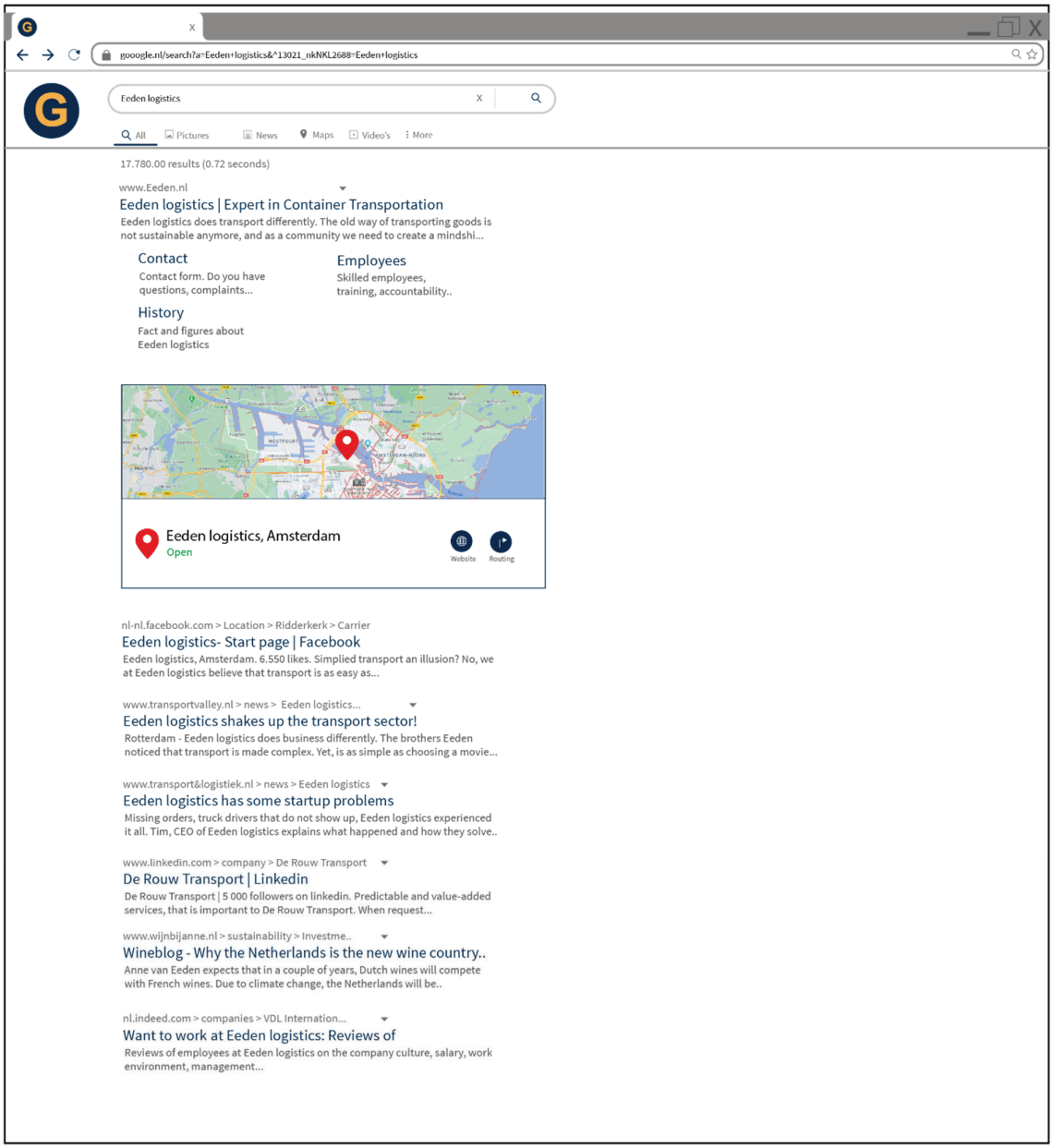


Figure C4. Google page of Eeden logistics.

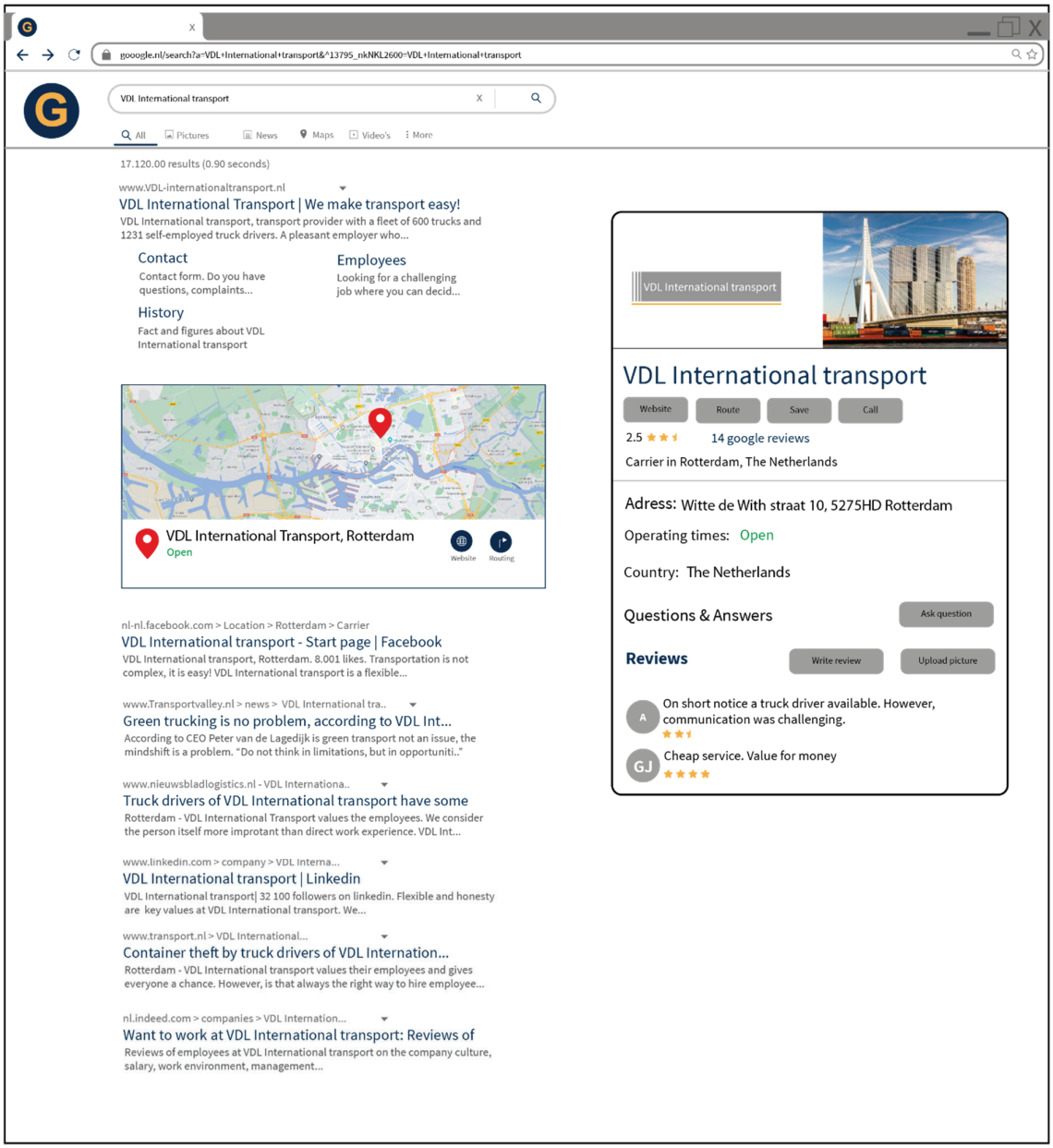


Figure C5. Google page of VDL International Transport.

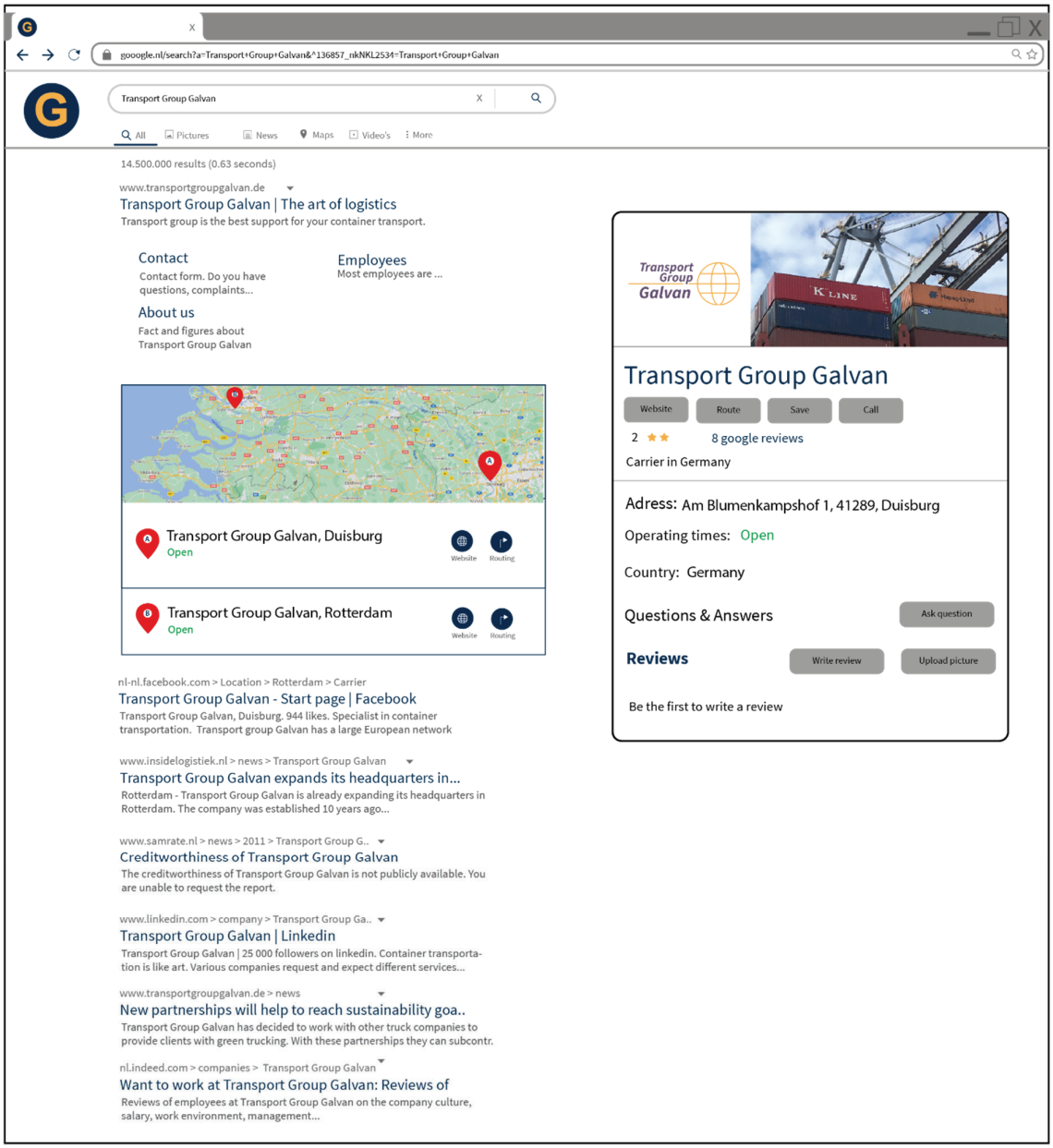


Figure C6. Google page of Transport Group Galvan.

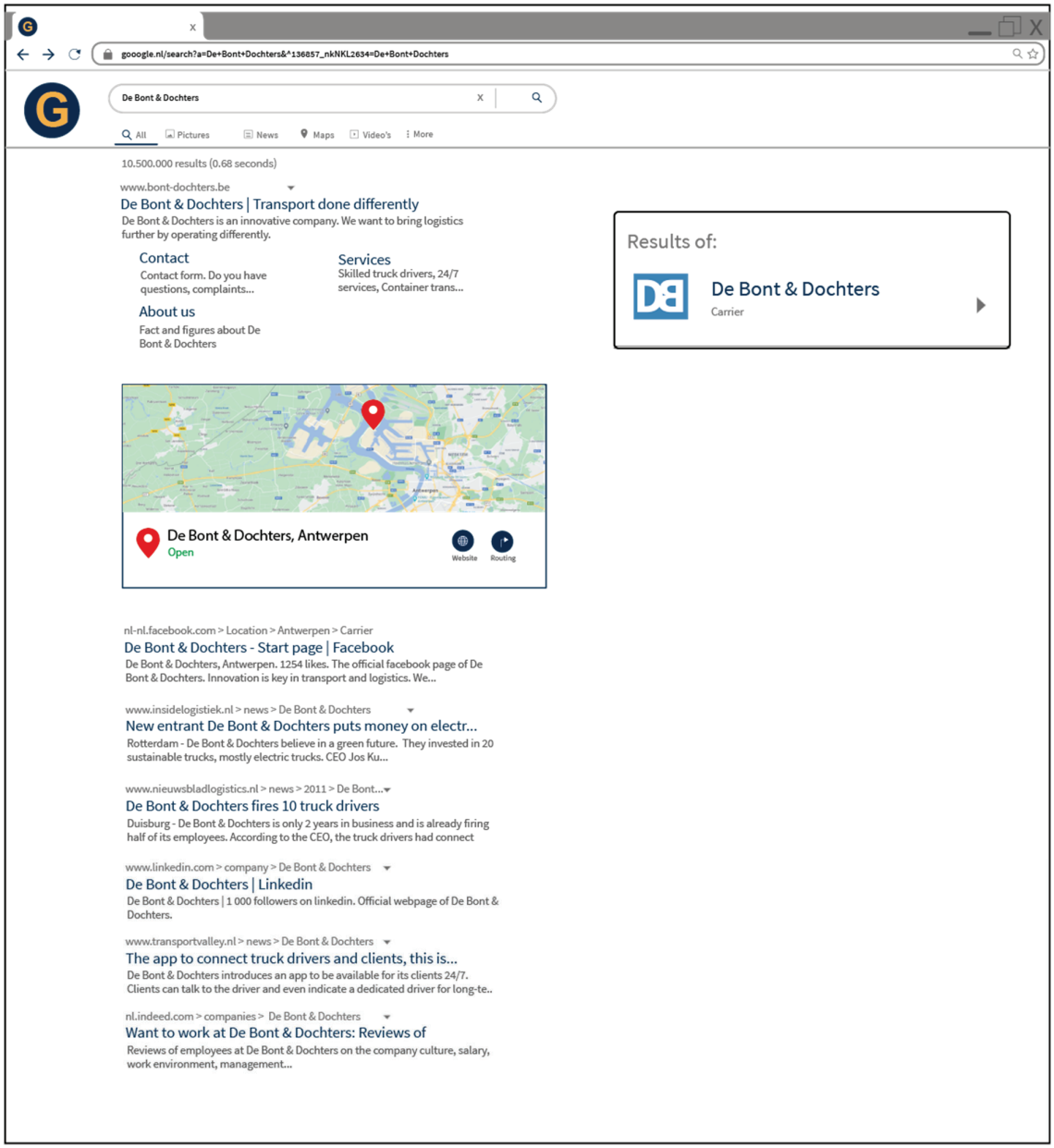


Figure C7. Google page of De Bont & Dochters.

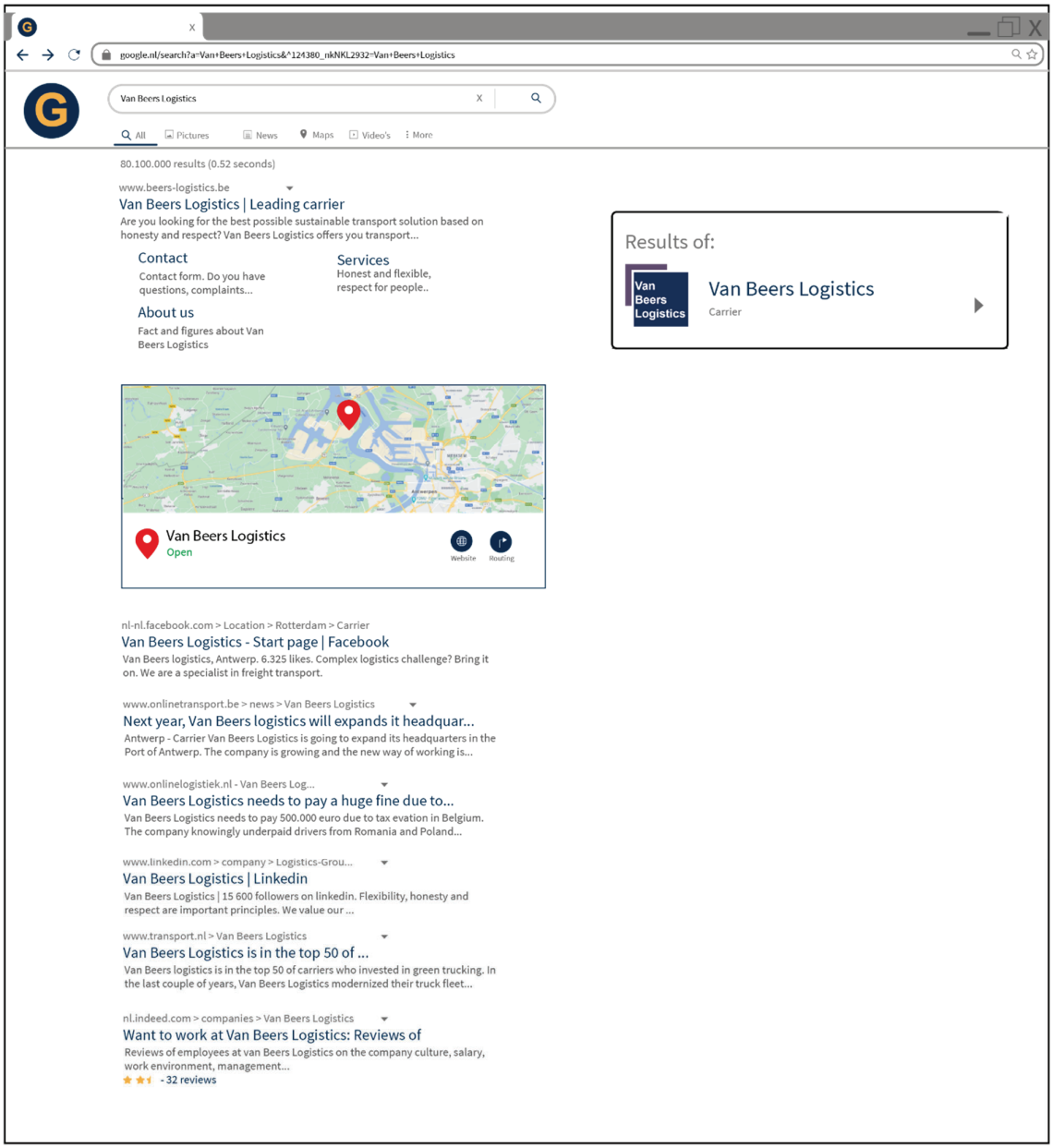


Figure C8. Google page of Van Beers Logistics.

C.5. Carrier website

Each carrier also has its company page in the FreightBooking game. These website pages are designed according to the ranking of trustworthy carriers compared to untrustworthy carriers. The next figures provide the websites of the carriers that are incorporated into the game.

Figure C9. Website of Logistics Group Kleiman.

Figure C10. Website of Transport & Logistiek Ponjier.

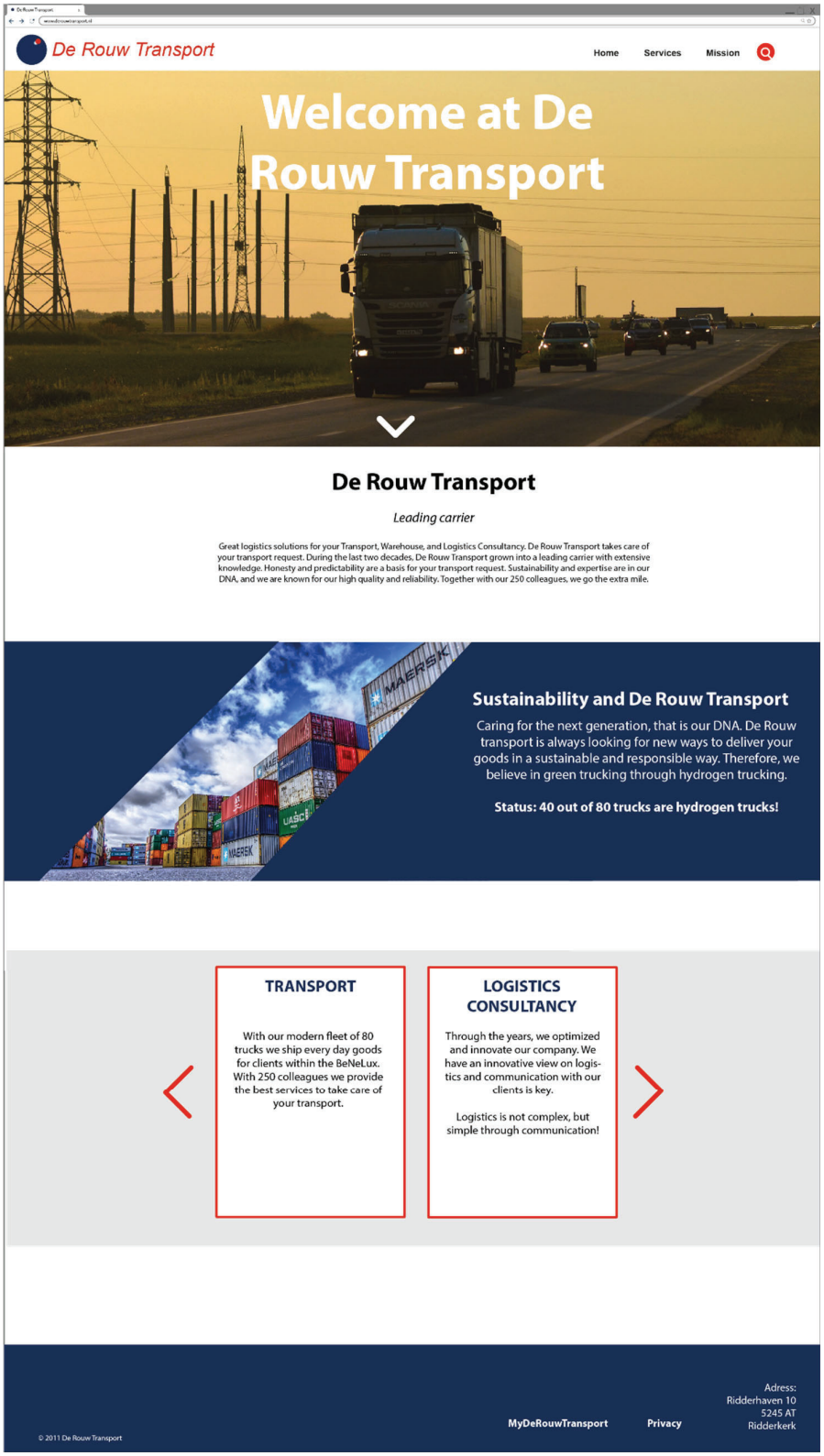


Figure C11. Website of De Rouw transport.

Figure C12. Website of Eeden Logistics.

Figure C13. Website of VDL International Transport.

Figure C14. Website of Transport Group Galvan.

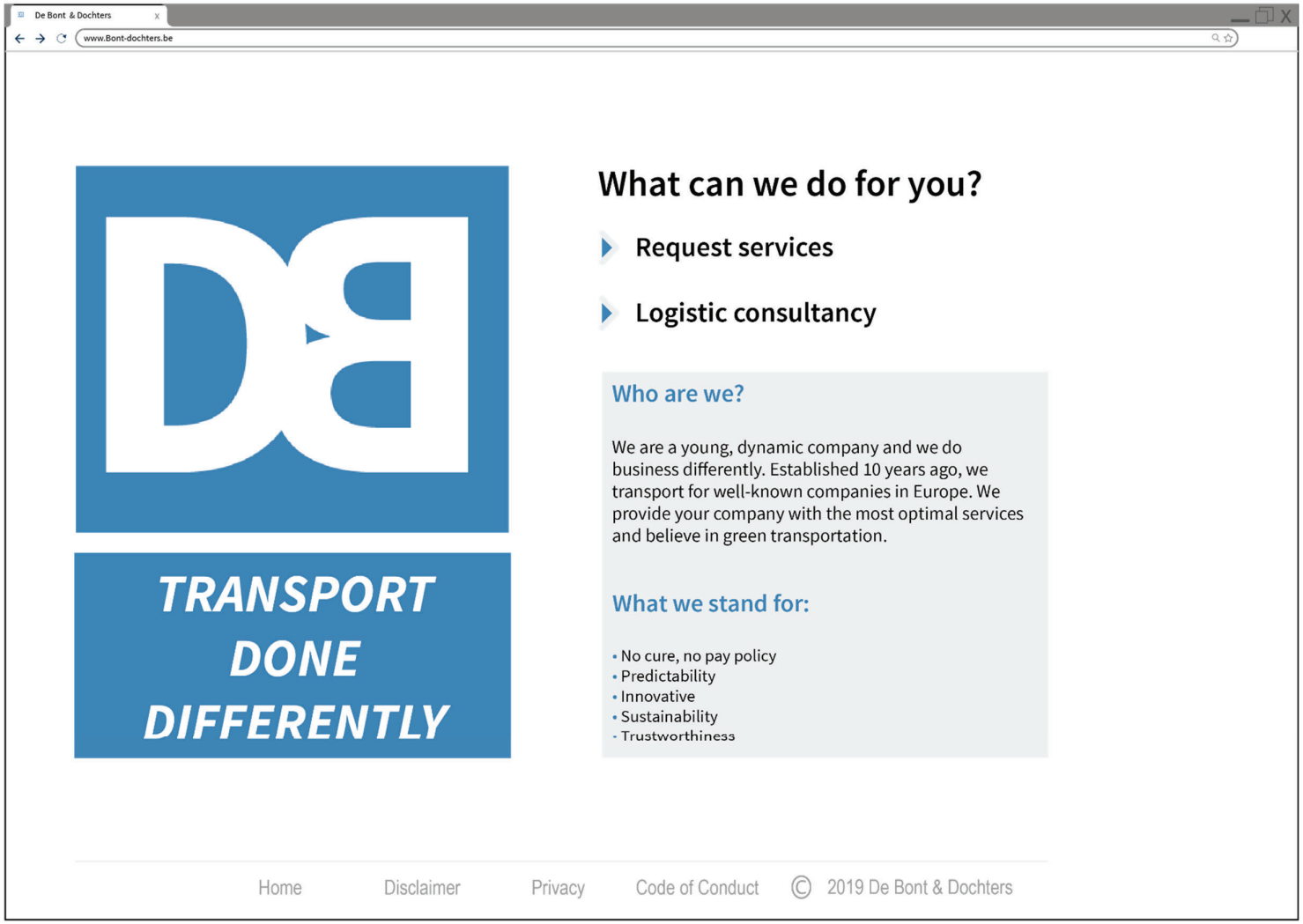


Figure C15. Website of De Bont & Dochters.

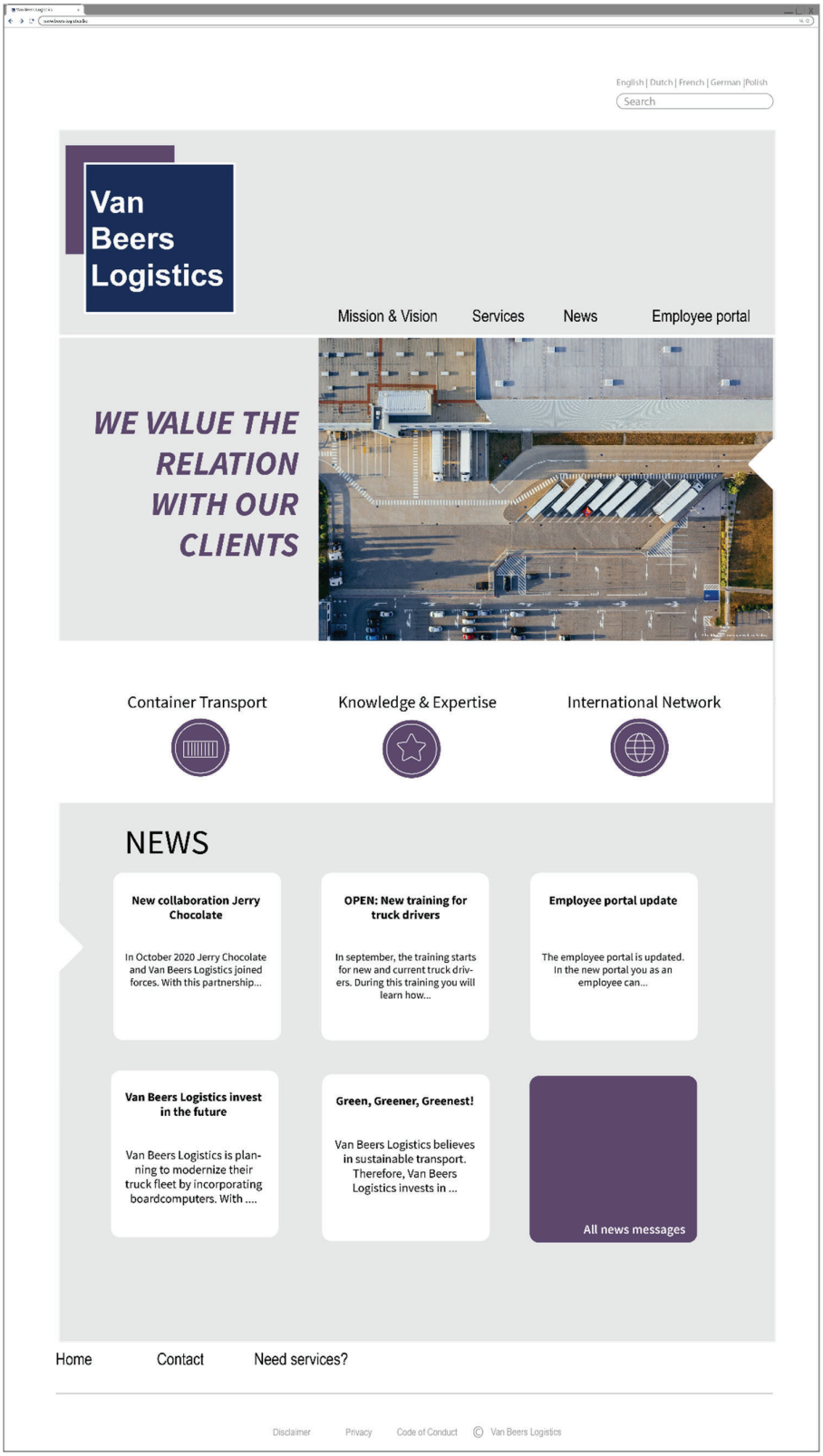


Figure C16. Website of Van Beers Logistics.

Appendix D

Simulation game FreightBooking.com

In this Appendix, a walkthrough of the game session of the serious game FreightBooking.com is presented. Chapter 4 discusses the FreightBooking game as a digital, single-player game. Different players can play the game at the same time. This allows for discussion of the role of trust in technology-mediated collaboration with the players and the scoring of the players. First, the game set-up is discussed. Section D2 has a general overview of the interface and the main game buttons that the players can select to read more information. For example, the player's mission. Subsequently, a walkthrough is provided where the game steps that occur in one transport day (i.e., in one round) are discussed. We conclude with the debriefing in section D4.

D.1. Briefing of the game FreightBooking

FreightBooking.com is a serious game that represents a booking platform. A gaming session starts with a presentation on platformization in logistics. The presentation provides insights into the rise of platforms in logistics and the possible impact on collaboration. First, general information is provided on the trends, such as the rise of platforms, that can impact ports. We also delve deeper into the impact of platforms on collaboration between parties (see Figure D1 for an impression). At the end of the presentation, the game's goal is discussed. During the briefing phase, the concept of trust is not mentioned. This is done to avoid player bias.

Figure D1. Impression of the presentation during the briefing phase.

Before the players can start the experiment, they receive a link. They will receive a code via this link. This code can be used to start the game. Besides the code the players are directed to the page where they can fill in the pre-questionnaire. In the game, play codes are used to represent the different players. These codes guarantee anonymity, and the gameplay can be connected to the pre-and post-questionnaire. The experimental set-up of the game, including the questionnaire questions, is discussed in Chapter 5. When the players finish filling in the pre-questionnaire, they are directed to the landing page of the FreightBooking.com game. Figure D2 gives an impression of the landing page. On this page, the players can fill in their code and start the game.

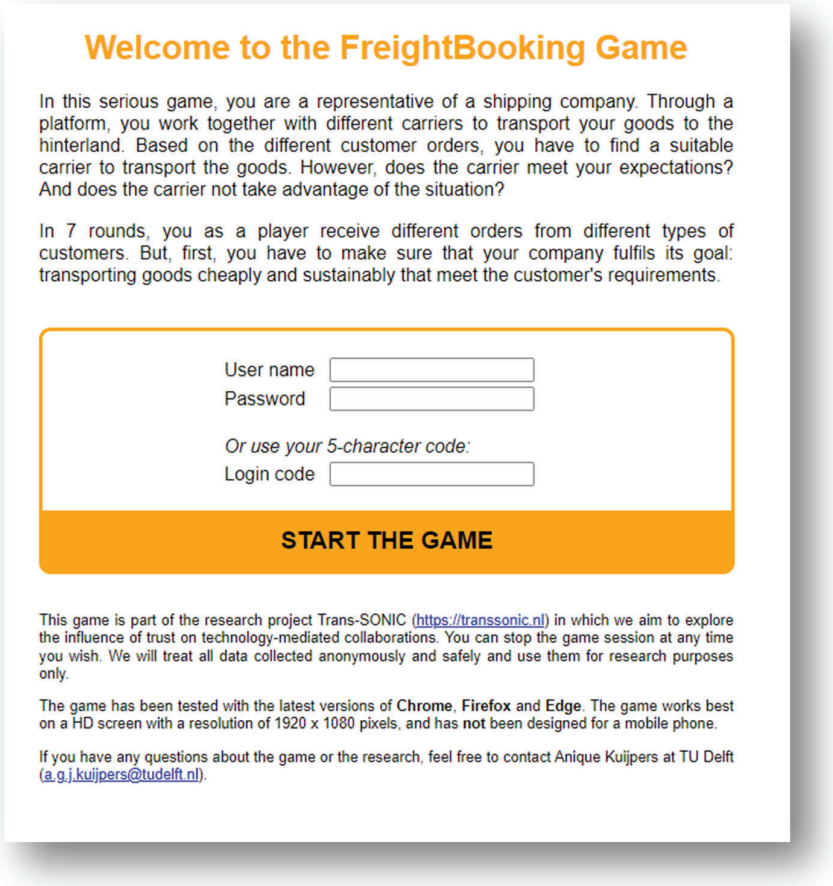


Figure D2. Landing page of FreightBooking.com.

D.2. General game overview

FreightBooking.com consists of 7 days, which represent the game levels. Day 1 is a 'tutorial round' where the player can familiarize themselves with the game. The general information on the gameplay is shown in Figure D3. On this page, players are informed about the main game steps. For example, what players must do after publishing a client's order. Besides the game steps, players are also informed on what they must pay attention to.

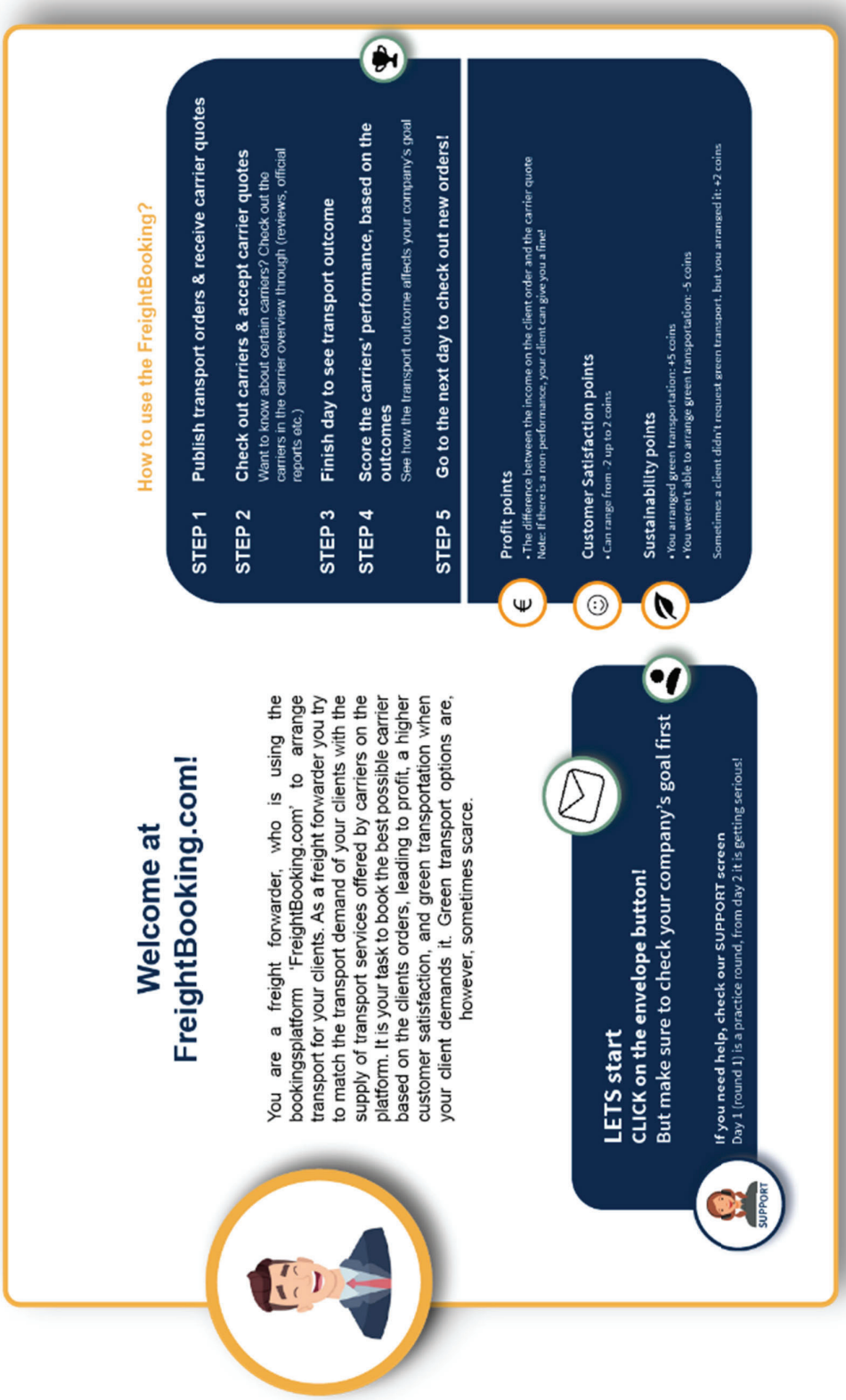


Figure D3. Briefing page (1) in FreightBooking.com.

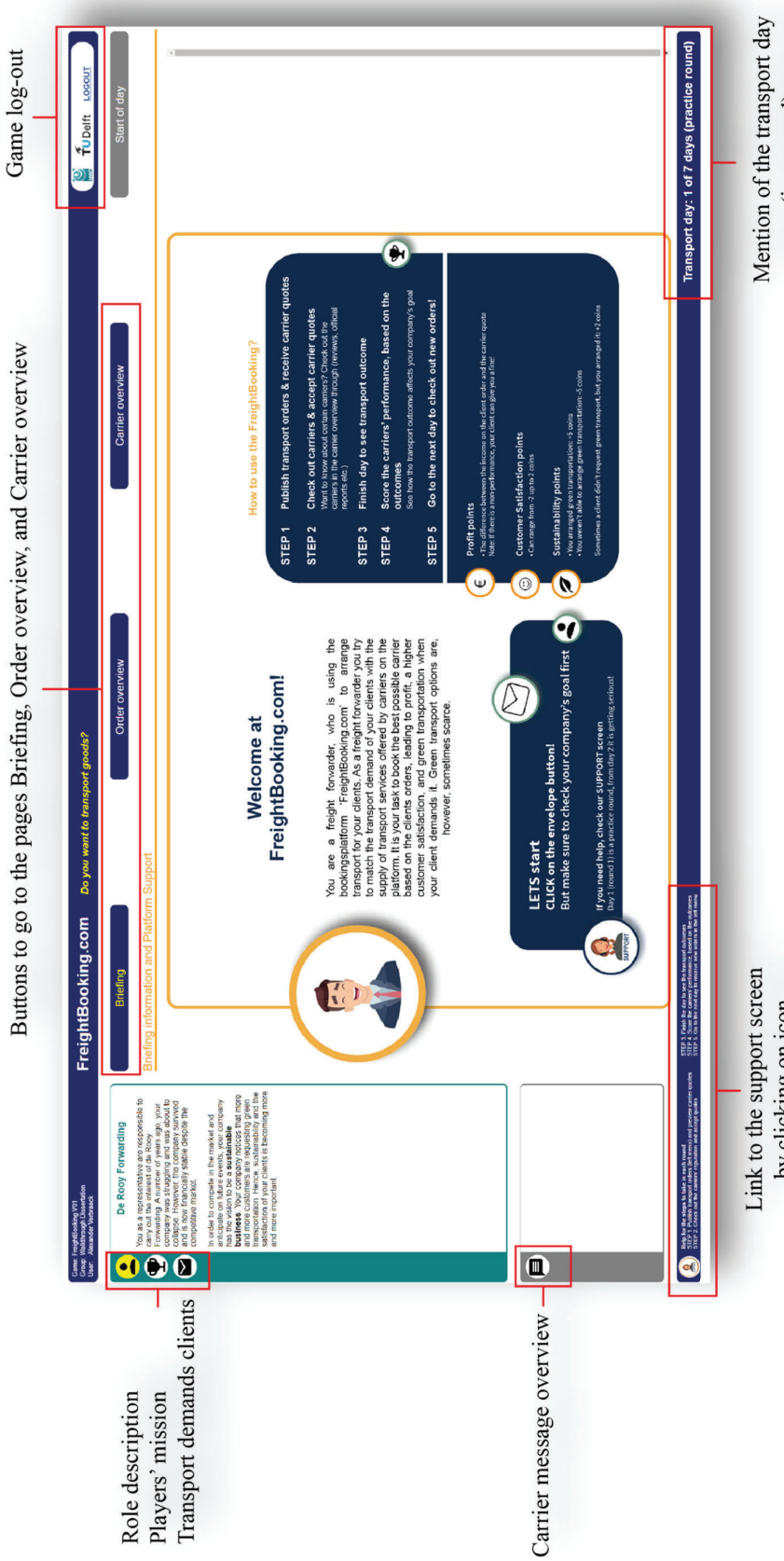
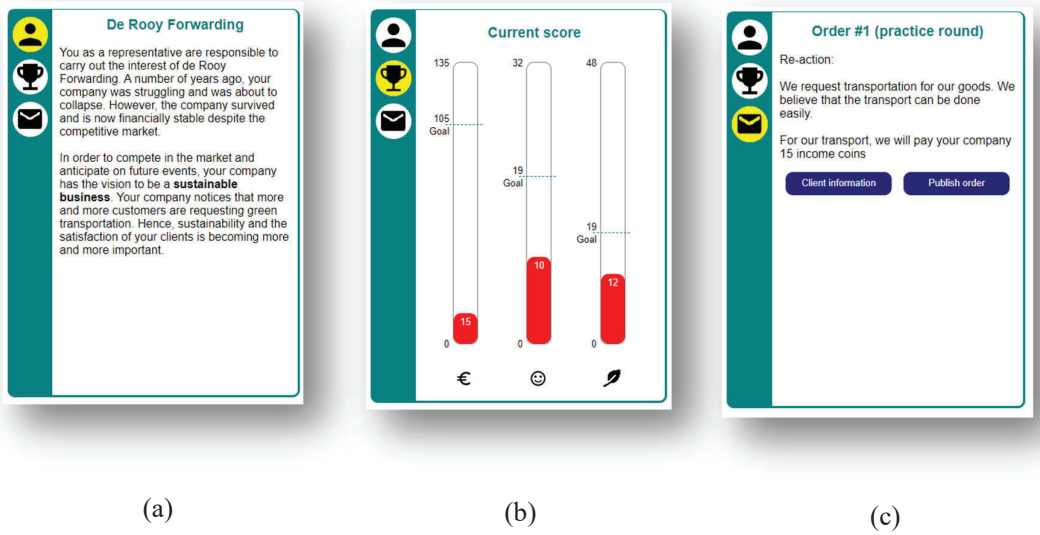


Figure D4. General overview FreightBooking game.

After the general information is available, the players can explore the platform. In this game, the players play a representative of a shipper. As a representative, there is a mission that you need to achieve. The mission is translated into three different key performance indicators:

- Income tokens
- Sustainability tokens
- Customer Satisfaction level tokens

Figure X gives an overview of the players' description and the mission that the players have.



(a) (b) (c)

Figure D5. (a) The role description of the player (II) (b) the different key performance indicators (III), (c) transport request.

If the players have questions about where to find certain information or do not know what to do in the game, they can go to the '*support*' button. In the lower-left corner (see Figure D4 for the general overview of the game), the players can find the support information. By clicking on the support logo, the player receives some general information on game steps (Figure D6).

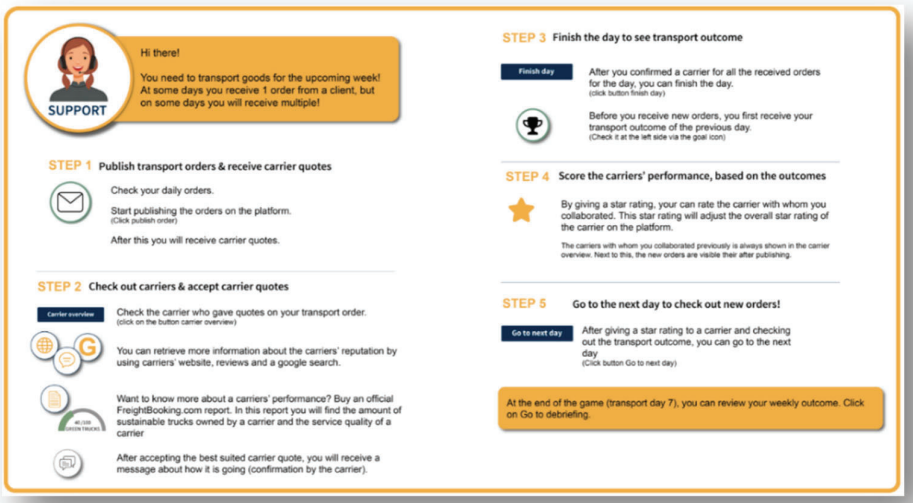


Figure D6. Support screen.

D.3. Walkthrough of Game

After the players have read the mission and explored the game, they can check if they received a transport request from a client. As mentioned before, the game consists of 7 rounds and transport days. In every round, players receive several transport requests. A transport request consists of a general message which states how much you can earn as a player. If a player would like to receive more information about the client, the player can click on the button' *client information'* (Figure D7). A pop-up screen appears with some background information on the client. For example, if it is a long-term client, what is important for the client?

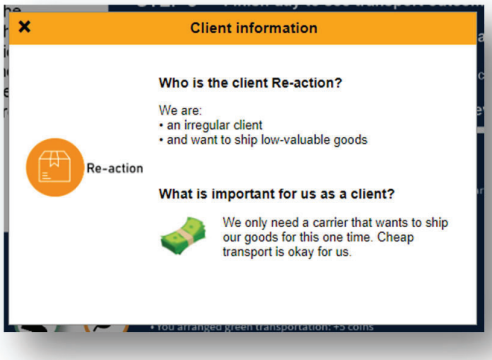


Figure D7. Pop-up screen of the client information.

After the player reads all the information, the player can decide to publish the order by clicking on the '*publish order*' button (see Figure X (c) for the publish order button). After the player publishes the transport request order, the transport request order appears in the order overview (see Figure D4, general overview game). Based on the published order, the player receives different carrier transport quotes. In the game, 8 carriers are defined, each with their own characteristics. In every round a selection of carriers gives a quote offer (Figure D8). If players

want to know more about the carriers behind the quote offers, they can go to the carrier overview page (Figure D9).

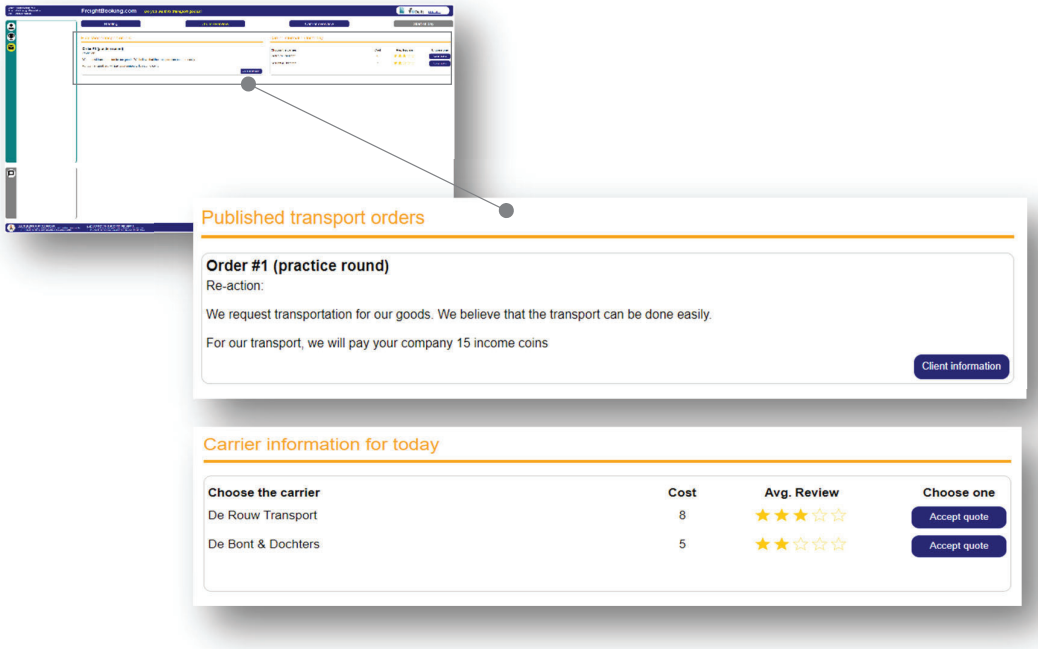
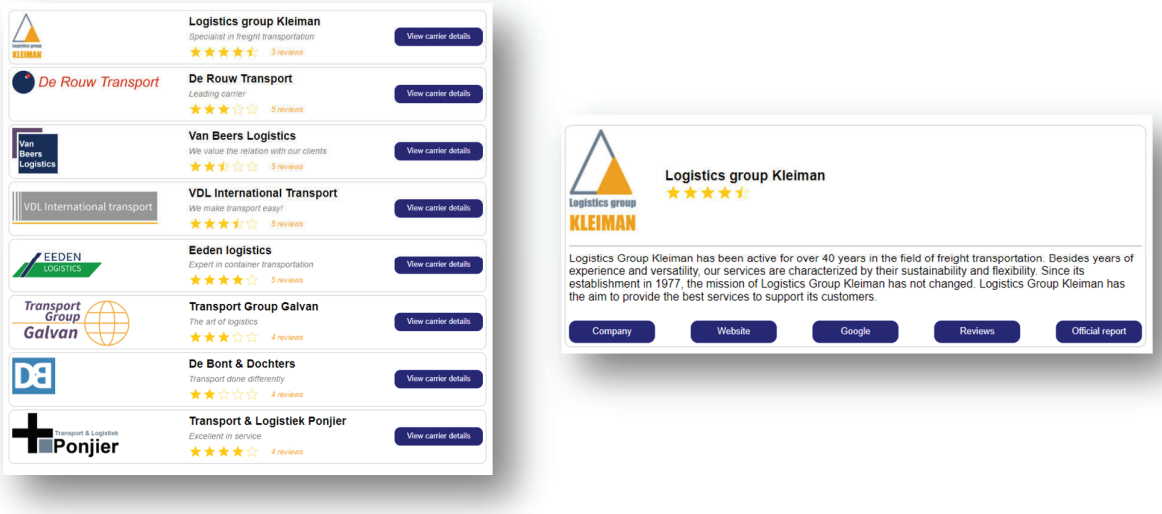


Figure D8. Published order in the 'order overview'.

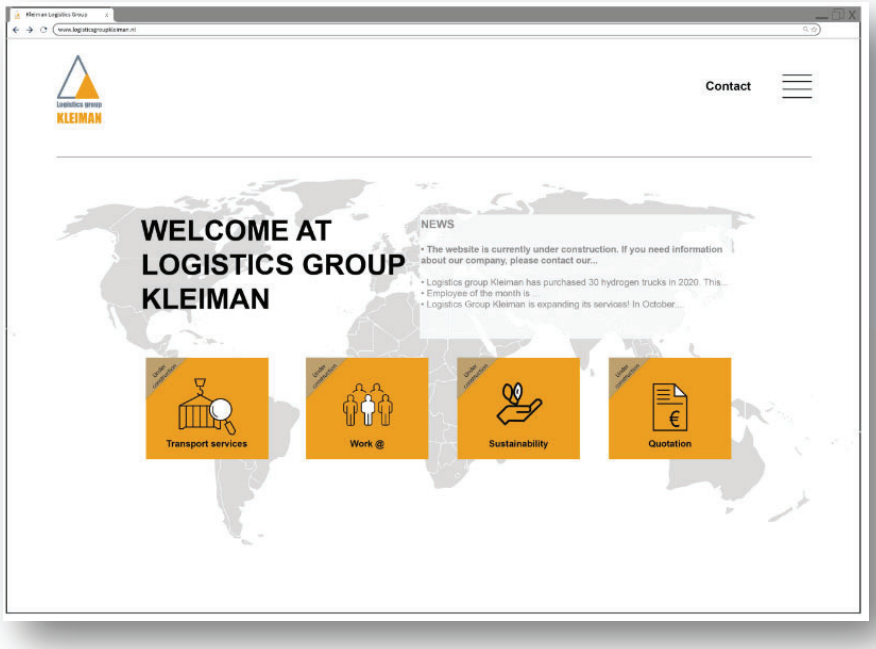
On the '*carrier overview*' page, players can acquire more information on specific carriers by clicking on the button 'view carrier details'. Every carrier has a page with some general information about it. Additionally, players can check other information, such as the carrier's Google page, website, and reviews, and request an extra report. Figure D9 illustrates every carrier's different information pages in the FreightBooking.com game.



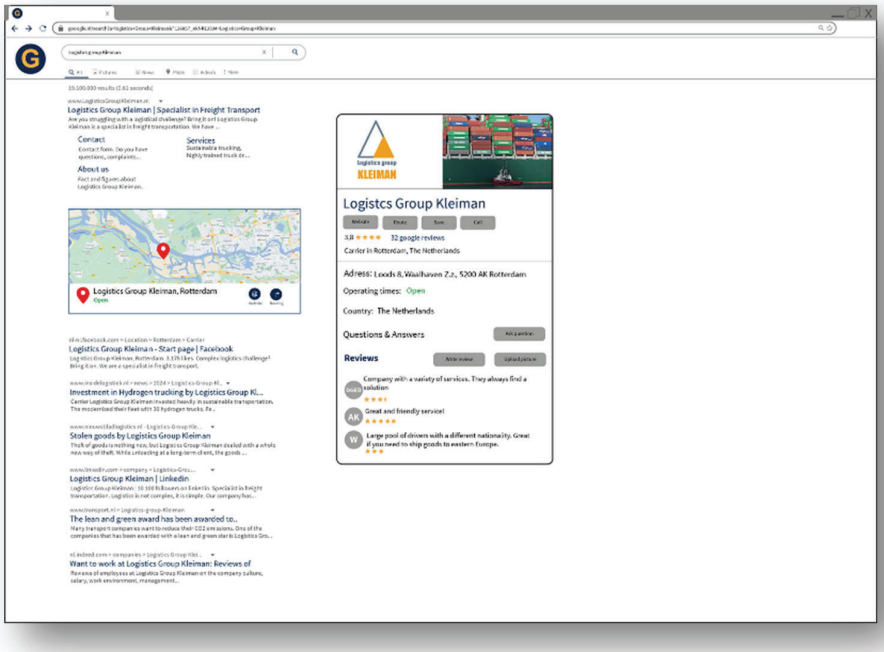
(a) (b)

Figure D9. (a) Carrier overview and (b) Carrier page.

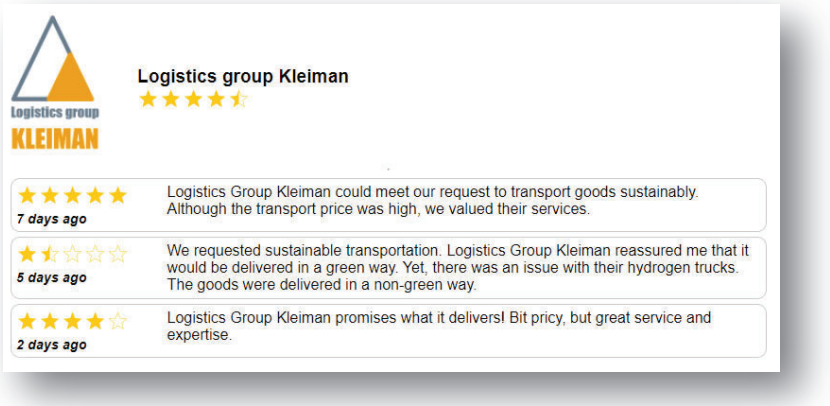
As explained in Chapter 4, the carriers each have their characteristics. Based on these characteristics the different information pages are set up. Figure D10 provides an overview of the website, google page, and review page. These three information pages can be requested by the players without any additional costs.



(a)



(b)



(c)

Figure D10. (a) Website of the carrier, (b) google page, and (c) review page.

The players can also decide that they want to buy a report. In this report, additional information about the carrier is given. The reports give information about (i) Customer Satisfaction level, (ii) Truck fleet, (iii) Goods delivered on time, and (iv) Goods delivered by green trucking. If players want to see this information they need to buy it. This will cost 2 profit tokens. Figure D11 provides an impression of the FreightBooking report.

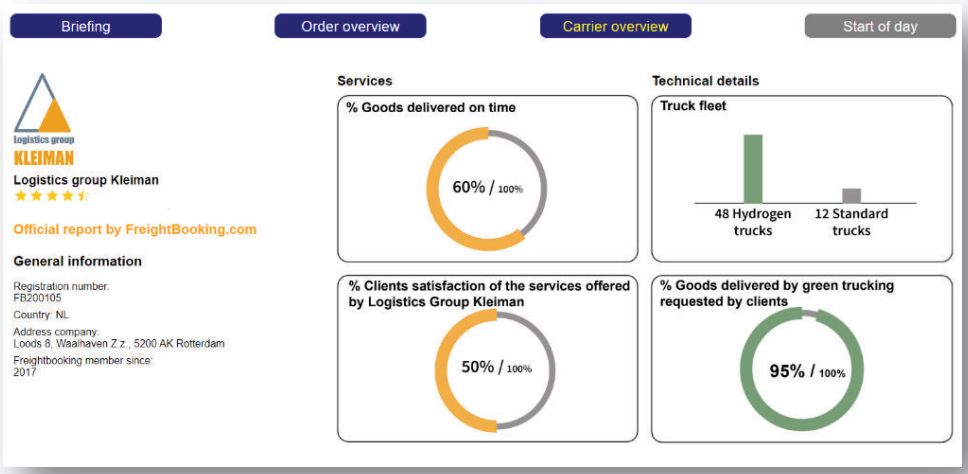


Figure D11. FreightBooking report of Logistics Group Kleiman.

After the player has checked out the different information pages (optional), they can decide with which carrier they want to collaborate. By clicking on the button 'accept quote', the quote offer of a specific carrier is accepted. After the quote offer, players can finish the day and receive a transport outcome (See Figure D12).

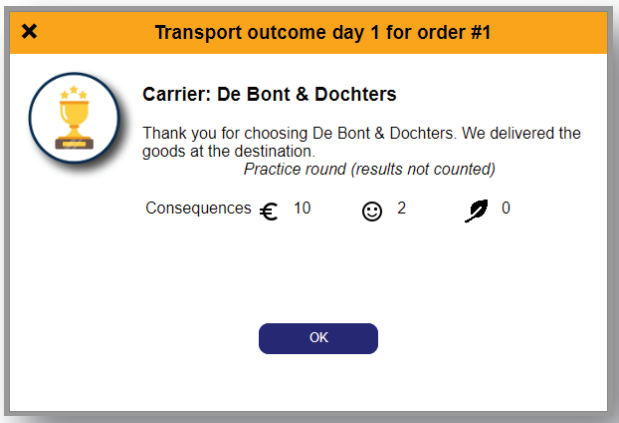
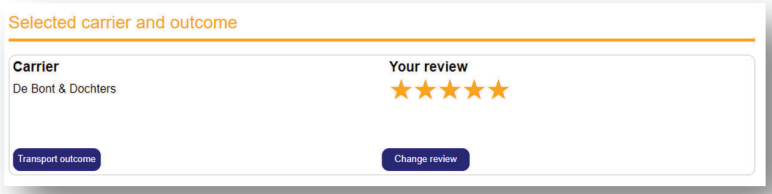
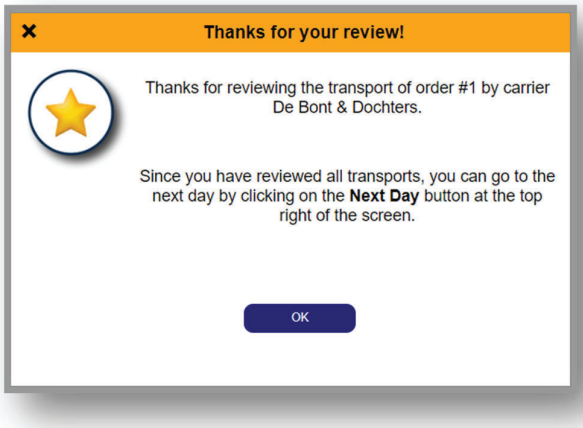


Figure D12. Transport outcome in round 1 of order #1.

The KPIs are automatically adjusted after the players have analyzed the transport outcome. Before the players receive a new transport order from a client, they first need to give a star rating to the carrier. Players can give a star rating from 1 star to 5 stars. After the player gives a star rating to the carrier, a screen will pop up with instructions on what to do next (Figure D13).



(a)



(b)

Figure D13. (a) Giving a star rating to a carrier and (b) a pop-up screen.

When the players want to receive a new transport demand, they need to click on the button to go to '*next day*'. Afterward, the players receive new transport demands from clients. In round 1, the players receive only one order. However, later in the game, players can receive multiple orders per transport day. You can see the new and old orders in the order overview (Figure D14) as a player.

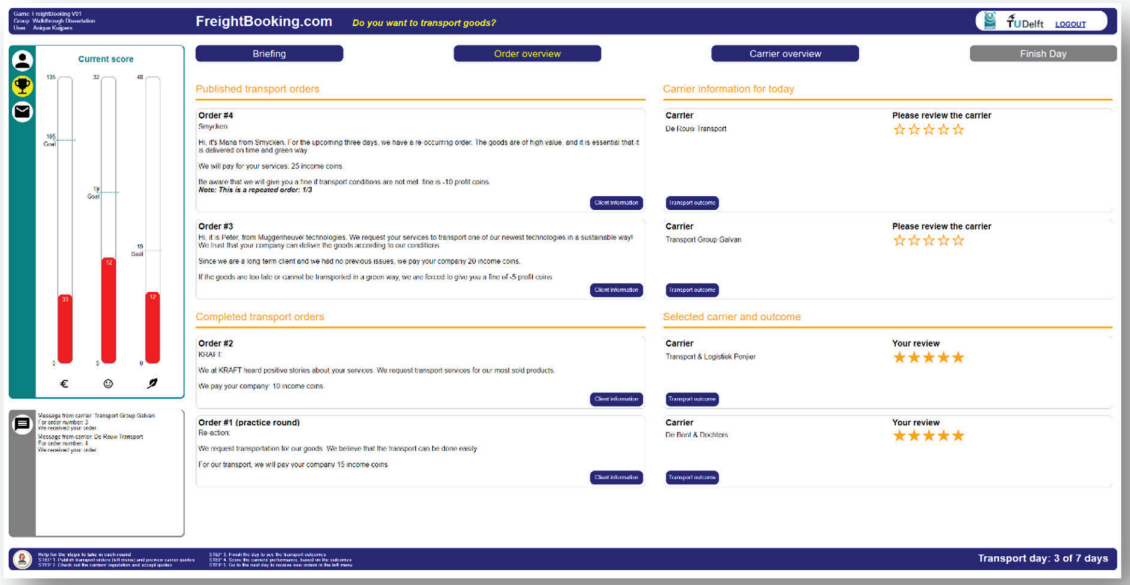
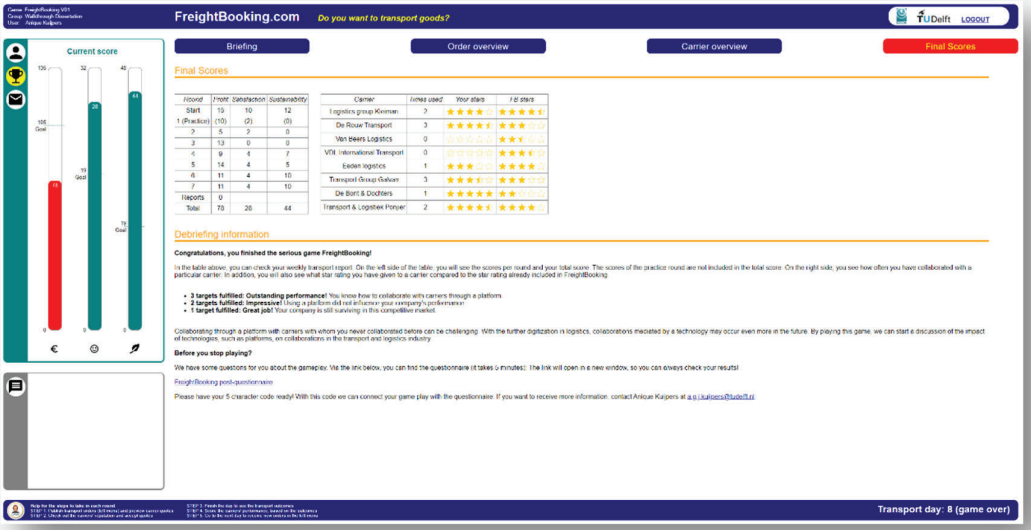


Figure D14. Four orders in the order overview.

D.4. End of the game and debriefing

After all the transport demands of clients are taken care of, the players receive a debriefing page on transport day 8. On the debriefing page, the players receive an overview of the scores on the three KPIs (i.e., profit, customer satisfaction level, and sustainability) per round. Besides the scores on the KPIs, players also receive an overview of the carriers they chose in each round, including the star rating they gave the carriers (see Figure D15). Subsequently, a link to the post-questionnaire is provided. Through this link, players are re-directed to the post-questionnaire. After the post-questionnaires are filled in by the players, a debriefing is held to discuss trust issues that arise in the game (discussed in Chapter 5).



(a)

Final Scores

Round	Profit	Satisfaction	Sustainability
Start	15	10	12
1 (Practice)	(10)	(2)	(0)
2	5	2	0
3	13	0	0
4	9	4	7
5	14	4	5
6	11	4	10
7	11	4	10
Reports	0	-	-
Total	78	28	44

Carrier	Times used	Your stars	FB stars
Logistics group Kleiman	2	★★★★☆	★★★★½
De Rouw Transport	3	★★★★½	★★★☆☆
Van Beers Logistics	0	☆☆☆☆☆	★★½☆☆
VDL International Transport	0	☆☆☆☆☆	★★★½☆
Eeden logistics	1	★★★☆☆	★★★★☆
Transport Group Galvan	3	★★★½☆	★★★☆☆
De Bont & Dochters	1	★★★★★	★★☆☆☆
Transport & Logistiek Ponjier	2	★★★★½	★★★★☆

(b)

Figure D15. (a) Debriefing page and (b) table with scores.

Appendix E

Measures and items of pre- and post-questionnaire

The items and measures included in the pre-and post-questionnaire are based on previous literature. Table E1 and Table E2 give an overview of the various items and measurements used in the pre- and post-questionnaires.

Table E1. Overview of items and measures.

Measures and Items (pre questionnaire) *On a scale of 1 (not at all) to 7 (a great extent), how important are the following issues when collaborating through a platform?*	
Company specific questions	***Reference***
What is your current profession? [title/type of company] How many years have you been working in the transport and logistics field?	*New item*
Disposition to trust *(the extent to which a person displays a tendency to be willing to depend on others across a broad spectrum of situations and persons)*	***Reference***
In general, people really do care about the well-being of others *(benevolence)* The typical person is sincerely concerned about the problems of others *(benevolence)* Most of the time, people care enough to try to be helpful, rather than just looking out for themselves *(benevolence)* In general, most folks keep their promises *(Integrity)* I think people generally try to back up their words with their actions *(Integrity)*	

Most people are honest in their dealings with others *(Integrity)* I believe that most professional people do a very good job at their work *(Competence)* Most professionals are very knowledgeable in their chosen field *(Competence)* A large majority of professional people are competent in their area of expertise *(Competence)* I usually trust people until they give me a reason not to trust them *(trusting stance)* I generally give people the benefit of the doubt when I first meet them *(trusting stance)* My typical approach is to trust new acquaintances until they prove I should not trust them *(trusting stance)*	*McKnight, Choudhury & Kacmar (2002).* *The impact of initial consumer trust on intentions to transact with a web site: a trust building model*
Disposition to trust	***Reference***
I generally do not trust other people I generally have faith in humanity I feel that people are generally reliable I generally trust other people unless they give me reason not to	*Belanger & Carter (2008).* *Trust and risk in e-government adoption*
Perceived relational risk (the probability and consequences that the cooperative relationship of the alliance is not effective or desirable)	***Reference***
The partner firm may turn out be dishonest The partner firms may have incompatible objectives in the alliance The partner firm may manipulate the alliance's operations The partner firm may alter the facts in order to get what it needs The partner firm may not carry out its duties if it is not checked up The partner firm may not always do things that it promises to do The partner firm may do anything within its means that will help it further its interests The partner firm may not be fair in its dealings The partner firm's policies and program may not benefit the alliance The partner firm may not be accommodating to special requests from other partners in the alliance The partner firm may appropriate valuable resources from the alliance The partners firm may have hidden agendas for the alliance The alliance may not achieve a high degree of harmony The interests of the partner firms may conflict in the alliance	*Das & Teng (2001)* *Relational risk and its personal correlats in strategic alliances.*
Risk taking attitude	***Reference***
Take tremendous care before selecting from alternatives Never try new things for the fear of making mistake Safer to try familiar versus unfamiliar I am cautious about trying new things	*Sharma et al. (2009).* *A higher-order model of risk propensity*

I am the king of person who would try anything new	
Perceived risk *(the citizen's subjective expectation of suffering a loss in pursuit of a desired outcome)*	***Reference***
The decision of whether to use a state e-government service is risky In general, I believe using state government services over the internet is risky	*Belanger & Carter (2008).* *Trust and risk in e-government adoption*
General risk propensity *(is a person's cross-situational tendency to engage in behaviors with a prospect of negative consequence such as loss, harm, or failure)*	***Reference***
Taking risks makes life more fun My friends would say that I'm a risk taker I enjoy taking risks in most aspects of my life I would take a risk even if it meant I might get hurt Taking risks is an important part of my life I commonly make risky decisions I am a believer of taking chances I am attracted, rather than scared, by risk	*Zhang et al. (2019).* *Development and validation of the general risk propensity scale*
Perceived web risk *(the extent to which a user believes it is unsafe to use the web or that negative consequences are possible))*	***Reference***
Entering credit card information over the web is unsafe I think it is risky to provide one's credit card information to web-based vendors I hesitate to enter my credit card information on the web Entering personal information over the web is unsafe I think it is risky to provide one's social security number to web-based vendors I would hesitate to enter personal information like my name, address and phone number on the web	*McKnight, Choudhury,& Kacmar (2002)*
Seller risk *(the belief of a probability of suffering a loss when engaging in a transaction with members of the population of sellers at a particular electronic marketplace)*	***Reference***
As I consider to purchase a <product> through this online marketplace, I become concerned about whether sellers will commit fraud As I consider to purchase a <product> through this online marketplace, I become concerned about whether sellers will swindle As I consider to purchase a <product> through this online marketplace, I become concerned about whether sellers offer products that will not perform as expected As I consider to purchase a <product> though this online marketplace, I become concerned about whether sellers will behave opportunistic	*Verhagen, Meents, Tan (2006)*

Table E2. Items and measurements of post-questionnaire.

Measures and Items (post questionnaire) *On a scale of 1 (not at all) to 7 (a great extent), how important are the following issues when collaborating through a platform?*	
Interorganizational trust	***Reference***
The extent to which the supplier trust the automaker to treat the supplier fairly The extent to which the automaker has a reputation for trustworthiness (following through on promises and commitments) in the general supplier community If the given chance, the extent to which the automaker perceives that the carrier will take unfair advantage of the supplier	*Dyer & Chu (2000)*
This supplier keeps promises it makes to our firm This supplier is not always honest with us We believe the information that this vendor provides us This supplier is genuinely concerned that our business succeeds When making important decisions, this supplier considers our welfare as well as its own We trust this vendor keeps our best interest in mind This supplier is trustworthy We find it necessary to be cautious with this supplier	*Doney & Cannon (1997)*
Interorganizational trust (related to game play)	***Reference***
Which carrier did you trust less? And why *(check one of the carrier boxes)* What type of information was decisive for trusting a carrier? Which actions did you undertake to increase your trustworthiness towards a carrier?	*New items*
Operational Information	***Reference***
This supplier shares proprietary information with our firm This supplier will share confidential information to help us	*Doney & Cannon (1997)*
Strategical information	***Reference***
The supplier has a reputation for being honest This supplier is known to be concerned about customers This supplier has a bad reputation in the market	*Doney & Cannon (1997)* *Kwon & Suh (2004)*

Information *(based on game play)*	
What type of information is important when entering into a collaboration?	*New items (based on game play)*
Information quality	***Reference***
This website provides us with correct information about the item that I want to purchase Overall, I think this website provides useful information This website provides timely information on the item This website provides reliable information This website provides sufficient information when I try to make a transaction I am satisfied with the information that this website provides Overall, the information this website provides is of high quality	*Kim, Ferrin, & Rao (2008).* *A trust-based consumer decision making model in electronic commerce: the role of trust, perceived risk, and their antecedents*
Information quality	***Reference***
The exchange data is up-to-date enough for my purposes The data this exchange provides is never outdated The exchange maintains the right data for my purposes The exchange provides up-to-date information with regard to transactions I feel satisfied with the data accuracy of the exchange system There are no accuracy problems in the data that I use in this exchange The exchange data that I use is accurate enough for my purposes Data provided by this exchange is completely error free The data maintained by the data exchange is pretty much what I need to carry out my tasks This exchange provides data that is current enough to meet my business needs The information content of the exchange meets my needs Based on my needs, this exchange data has no missing data items	*Nicolaou, Ibrahim, & van Heck (2013)* *Information quality, trust, and risk perceptions in electronic data echanges*

Experience	***Reference***
My past experience in Amazon's auction marketplace was positive I received excellent service from sellers in Amazon's auction marketplace in the past Sellers in Amazon's auction marketplace did a good job in the past	*Pavlou & Gefen (2004)*
Experience (based on game play)	***Reference***
What role doe s experience plat in deciding with which carrier to collaborate? To what extent does experience have an influence on the intention to collaborate with a carrier?	*New item (based on game play)*
Collaboration (based on game play)	***Reference***
How was the decision to collaborate with a carrier changed by the given information? How was the decision to collaborate with a carrier influenced by previous experiences with a specific carrier? The decision with which carrier to collaborate changed during gameplay	*New items (based on game play)*
Intention to buy from the seller through the social platform	***Reference***
It is very likely that I would make purchases from the seller through this social platform in the future Based on the information shown on the seller's post, I would consider buying from the seller through this social platform I would feel comfortable purchasing from the seller through this social platform in the future I am willing to buy from the seller through this social platform	*Martinez-lopez et al. (2021).* *Buying through social platforms: perceived risks and trust*
Game play	***Reference***
The objective of today's game is sufficiently clear I was engaged in the game play It was easy to understand the rules of the game The game is sufficiently complex to represent the collaboration process among organizations when using a platform The game offered the opportunity to understand the advantages of trust when using a platform?	

The game offered the opportunity to reflect on the disadvantages of trust when using a platform to collaborate?	

Appendix F

Pre- and post-questionnaire

The experimental set-up of the simulation game FreightBooking.com consists of three research measurement, (1) pre-questionnaire, (2) serious game, (3) post-questionnaire. The pre- and post-questionnaire was part of the game play.

The pre-questionaire consisted of general information of the TransSonic project, data management plan, and questions on background respondent, and sellers risk. In the pre-questionnaire some questions between different group varied. For example, if the group already had MBA student or people who worked then the first couple of questions were adjusted or extra questions were asked. For example, how many working experience do you have? What was the work experience?

F.1. Pre-questionnaire

pre-questionnaire 07/10/2021

Let's play the serious game FreightBooking.com!

Great that you want to play the serious game **FreightBooking**. This serious game is part of the NWO project, TransSONIC. Of course, you may ask, what is the goal of this research? After playing the game, we will tell you more about this.

But we can tell you this…

The game consists of a pre-questionnaire, gameplay, and post-questionnaire. The focus of the questionnaires and the game is on platformization in the transport and logistics industry. Do not worry, the pre-questionnaire will only take up to 3 minutes to fill in. **The questions in this pre-questionnaire** are focused on questions related to risks when transacting through a platform. When you have filled in the pre-questionnaire, you are ready to start playing FreightBooking.com!

A. Data management

When you play the serious game, we will gather gameplay information. This information will be used for scientific purposes (e.g., academic conferences, scientific articles). Your privacy will be protected according to the guidelines of Dutch law. No personally identifiable information will be requested. In addition, only researchers affiliated with the Trans-SONIC project will have access to your responses. The data collected as part of this study will be stored in a secure location (TUD servers, password-protected computers) and will be destroyed within ten years of the start of the study. Within the restrictions, the results of this study will be made available to you upon request. Your participation in this research is entirely voluntary. If you decide to participate in this research, you may stop participating at any time.

Please tick the appropriate boxes	**Yes**	**No**
1. I have read and understood the study information dated [XX/XX/2020]	☐	☐
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions, and I can withdraw from the study at any time, without having to give a reason	☐	☐
3. I understand that taking part in this study involves playing a serious game and answering questions in a pre-and post-questionnaire (e.g., questions related to gameplay)	☐	☐
4. I understand that information I provide will be used for scientific publications and presentations that will be developed within the trans-SONIC project.	☐	☐
5. I understand that personal information, such as name, age, or where I live, will not be collected during gameplay or in the pre-and post-questionnaire	☐	☐
6. I give permission for the game data of the survey to be archived in TU Delft repository so it can be used for future research and learning.	☐	☐

5- character code for the game play:

Pre-questionnaire

1. **Which bachelor degree did you take?**

2. **What master are you following?**

(in years)

The next 4 questions are about platforms that you maybe use in your daily life and the possible risks involved.

3. **How often do you use a platform (e.g., bol.com/Amazon) to buy a service/product?**

Never	*Very rarely*	*Rarely*	*Occasionally*	*Very frequently*	*Always*
o	o	o	o	o	o

4. **How is your overall experience when purchasing a service/product through an online platform?**

Very poor	*Poor*	*Acceptable*	*Good*	*Very good*
o	o	o	o	o

5. **How often have you had a negative experience with a seller on a platform when buying a product/service via the platform?**

Never	*Very rarely*	*Rarely*	*Occasionally*	*Very frequently*	*Always*
o	o	o	o	o	o

6. **How often have you had a positive experience with a seleer on a platform when buying a product/service via the platform?**

Never	*Very rarely*	*Rarely*	*Occasionally*	*Very frequently*	*Always*
o	o	o	o	o	o

pre-questionnaire 07/10/2021

7. As I consider purchasing a service/product through an online platform, I become concerned purchasing a service/product through an online platform, I become about whether a seller offer services/product that will not perform as expected

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

8. As I consider purchasing a service/product through an online platform, I become concerned about whether sellers will behave opportunistically

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

F.2. Post-questionnaire

post-questionnaire 07/10/2021

Thank you for playing the serious game FreightBooking.com! Below you find some questions about the game play.

<questions related to interorganizational trust>

1. Throughout the game, the carriers kept their promises they made to me.

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

2. The carriers weren't always honest with me

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

3. I believed the information the carriers provided me

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

4. The carriers were trustworthy

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

5. I found it necessary to be cautious with the carriers

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

post-questionnaire 07/10/2021

6. **Which carrier did you trust most?** <new item>

Logistics group Kleiman	o
De Rouw transport	o
Van Beers Logistics	o
VDL International transport	o
Eeden logistics	o
Transport Group Galvan	o
De Bont & Dochters	o
Transport & Logistiek Ponjier	o

7. **Throughout the game, previous experience with a carriers played an important role in the trustworthiness of the carrier** *<new item> naar experience*

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

<Questions related to information>

8. **What information did you used to decide a carrier is trustworthiness?** <new item>

Transport outcome (including carrier and client message)	o
Reviews	o
Google page	o
Website of carrier	o
Client order (e.g. client type, low/high valuable goods, sustainability)	o
Freightbooking.com report	o
Star rating	o
Other:	

post-questionnaire 07/10/2021

<Questions related to collaboration>

9. **Throughout the game, the willingness to collaborate with a particular carrier changed through the information I could find of that carrier**
10.

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

11. **Throughout the game, the willingness to collaborate with a particular carrier changed through the transport outcome I received from the carrier**

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

<Questions related to experience>

12. **I received excellent services from the carriers in FreightBooking.com ~~in the past~~**

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

13. **Carriers in FreightBooking.com did a good job ~~in the past~~**

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

14. **A previous negative experience with a carrier was a decisive factor when choosing to collaborate again with that carrier**

TUDelft Freight Booking .com post-questionnaire 07/10/2021

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree
o	o	o	o	o	o	o

15. A previous positive experience with a carrier was a decisive factor when choosing to collaborate again with that carrier

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree
o	o	o	o	o	o	o

<Questions related to game play>

16. I was engaged in the game play

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree
o	o	o	o	o	o	o

17. It was easy to understand the rules of the game

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree
o	o	o	o	o	o	o

18. The game is sufficiently complex to represent the collaboration process among organizations when using a platform

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree
o	o	o	o	o	o	o

<questions on a disposition to trust, the extent to which a person displays a tendency to be willing to depend on others across a broad spectrum of situations and persons>

19. I generally do not trust other people

Strongly disagree	Disagree	Slightly disagree	Neither agree or disagree	Slightly agree	agree	Strongly agree

post-questionnaire 07/10/2021

o	o	o	o	o	o	o

20. I generally have faith in humanity

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

21. I feel that people are generally reliable

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

22. I generally trust other people unless they give me a reason not to

Strongly disagree	*Disagree*	*Slightly disagree*	*Neither agree or disagree*	*Slightly agree*	*agree*	Strongly agree
o	o	o	o	o	o	o

Appendix G

Data analyses of conceptual model and framework of trust in technology-mediated collaborations

In this appendix, the hypothesis of the conceptual model and framework are for each group tested. Chapter 6 provides the analysis of the overall group. In this appendix, the analysis of each group is discussed. In the next sections, the analysis of the hypotheses is discussed per group. Every section starts with testing the internal consistency of the construct '*Disposition of trust'*. For the experiment, only the answers of the players are used that filled in the pre-questionnaire, gameplay, and post-questionnaire.

The next section provides the analysis of all the groups per hypothesis. First of all, the internal consistency of the variable '*Disposition to trust*' per group is discussed. After that, the outcome of the analysis of each hypothesis is discussed.

G.1. Game experience of players

How the players experience the game is important since it can influence the results of the gameplay. Figure G1 shows the response to the 3 statements on game experience that are included in the post-questionnaire. Most players (71 out of 86) expressed that they were engaged in the gameplay in a positive way. Only 10 players expressed that they were not engaged in the gameplay.

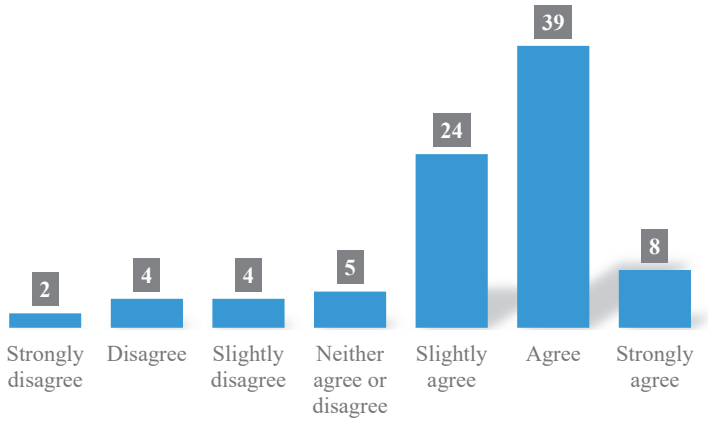


Figure G1. Response to the statement '*I was engaged in the gameplay'.*

Since the game is used as a way to test a conceptual model and framework, the reality aspect of the game is important. More than half of the players expressed that they find the game sufficiently represents the real world (56 out of 86). Subsequently, most players indicated that it was easy to understand the game rules. This also enhances the gameplay and the outcomes of the game.

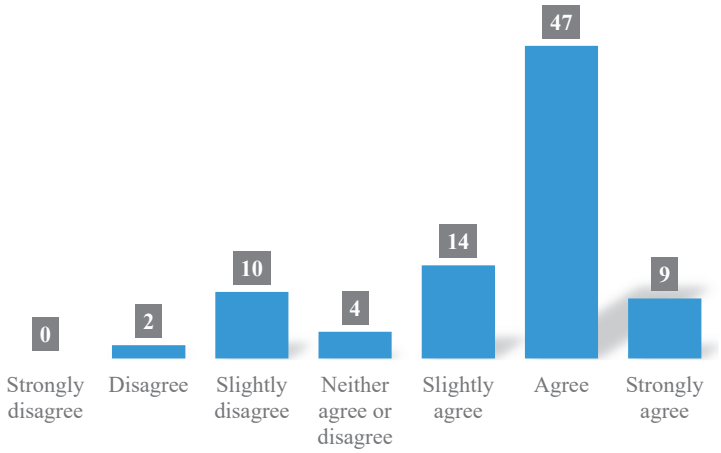


Figure G2. Response to the statement *'It was easy to understand the rules of the game'.*

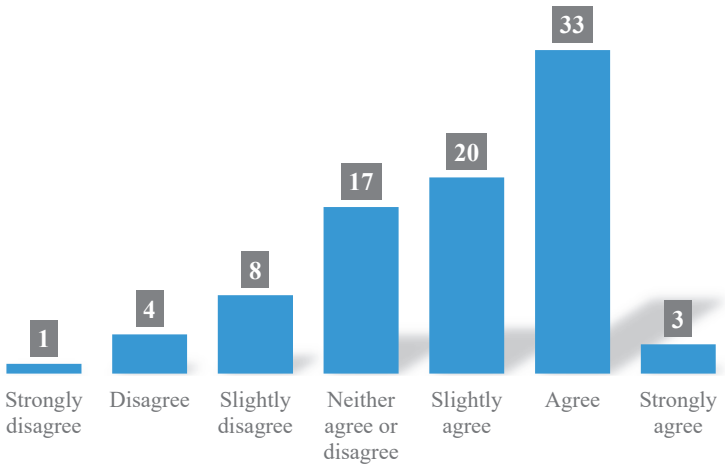


Figure G3. Response to the statement *'The game is sufficiently complex to represent the collaboration process among organizations when using a platform'.*

G.2. Internal consistency of disposition to trust per group

In order to use the variable '*Disposition to trust'*, first the internal consistency needs to be tested of this construct. The first step what is done is to recode the variables in SPSS to check the internal consistency. To calculate the internal consistency first the Likert scale needs to be recoded. 3 out of 4 questions are formulated as positive, only 1 question is formulated as negative. Table F1 gives an overview of the operationalization used in SPSS.

Table G1. Operationalization of constructs '*Disposition to trust*'.

Likert scale items	**Operationalization for positive question**	**Operationalization for negative question**
Strongly disagree	1	7
Disagree	2	6
Slightly disagree	3	5
Neither agree or disagree	4	4
Slightly agree	5	3
Agree	6	2
Strongly agree	7	1

After the recoding, the internal consistency can be checked. We used SPSS version 28.0.0.1 to test the internal consistency of the construct '*Disposition to trust*'. For every group, the questions about '*Disposition to trust'* are the same. Table G2 gives an overview of the analysis in SPSS. To be internally consistent, the Cronbach Alpha should be above 0.7. With less than 10 items the Cronbach Alpha should be above 0.5. In this case, the Cronbach alpa is above 0.7 and even 0.5 and therefore it can be stated that the questions on '*Disposition to trust*' are internally consistent.

Table G2. Internal consistency of the construct 'Disposition of trust' per group.

Group	Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
1	0.814	0.859	4
2	0.850	0.860	4
3	0.808	0.817	4
4	0.726	0.737	4

G.3. Analysis of hypotheses of conceptual model and conceptual framework

In the next sections, the operationalization of each hypothesis is discussed. First, the outcomes of the hypotheses of the conceptual model are discussed. Second, the outcomes of the hypotheses of the conceptual framework are discussed.

G.3.1. Analysis of the hypotheses of the conceptual model

The objective of this dissertation is to understand what the impact of trust is on inter-organizational collaboration when using platforms. A conceptual model and framework are defined that describe the different relations between the variables trust, information, and collaboration (see Figure G4 for the conceptual model).

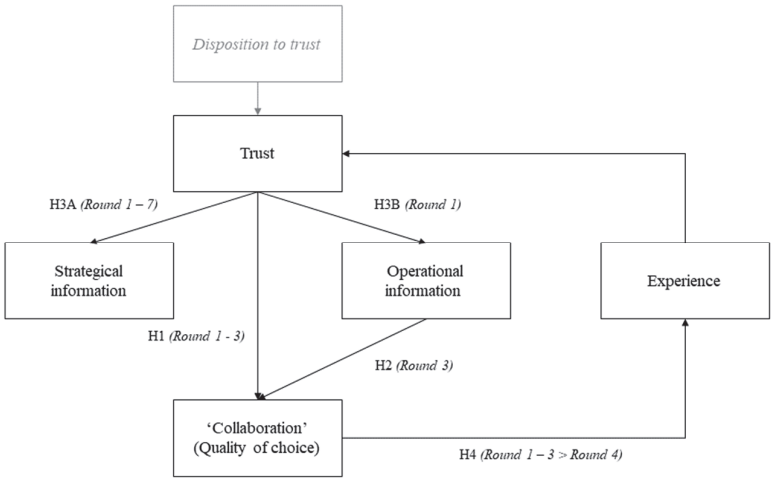


Figure G2. The hypotheses of the conceptual model.

Hypothesis 1: The higher the disposition to trust, the more willing a player is to collaborate with a carrier that has a low quote offer

Hypothesis 1 describes whether or not a high a low disposition to trust influences the willingness to collaborate with a specific carrier. Table G3 gives an overview of the carriers that put a quote offer in that round and how many times that carrier is chosen in that specific round (Rx).

Table G3. Overview of how many times a carrier is chosen in the first 3 rounds of the 4 groups.

Carrier	G1			G2			G3			G4		
	R 1	R 2	R 3	R 1	R 2	R 3	R 1	R 2	R 3	R 1	R 2	R 3
De Rouw Transport	3			3			6			17		
De Bont & Dochters	7			12			14			24		
Logistics group Kleiman		3			1			4			3	
Transport & Logistiek Ponjier		2			8			9			22	
VDL International Transport		5			6			7			16	
Eeden logistics			6			13			15			24
Transport Group Galvan			3			1			3			10
Van Beers Logistics			1			1			2			7

To test this hypothesis the correlation coefficient between the variables '*Disposition to trust'*, '*Average star rating'*, and '*Average quote offer'* is calculated. Table G4 and Table G5 show an overview of the results of the analysis of the 4 groups.

Table G4. Overview of the outcome of the analysis between variables '*MeanDT*' and '*Average star rating*' of the 4 groups.

Group		Group 1 – Average star rating	Group 2 – Average star rating	Group 3 – Average Star Rating	Group 4 – Average star rating
Group 1 – MeanDT	Correlation coefficient	-.051			
	Sig. (2-tailed)	0.849			
	N	10			
Group 2 – MeanDT	Correlation coefficient		-.022		
	Sig. (2-tailed)		0.917		
	N		15		
Group 3 – MeanDT	Correlation coefficient			-.306	
	Sig. (2-tailed)			.086	
	N			20	
Group 4 - MeanDT	Correlation coefficient				.014
	Sig. (2-tailed)				.909
	N				41

Table G5. Overview of the outcome of the analysis between variables '*MeanDT*' and '*Average Quote offer*' of the 4 groups.

Group		Group 1 – Average star rating	Group 2 – Average star rating	Group 3 – Average Star Rating	Group 4 – Average star rating
Group 1 – MeanDT	Correlation coefficient	-.188			
	Sig. (2-tailed)	.465			
	N	10			
Group 2 – MeanDT	Correlation coefficient		--.022		
	Sig. (2-tailed)		0.917		
	N		15		
Group 3 – MeanDT	Correlation coefficient			-.245	
	Sig. (2-tailed)			.167	
	N			20	
Group 4 - MeanDT	Correlation coefficient				-.018
	Sig. (2-tailed)				.882
	N				41

Hypothesis 2: The more operational information is requested by players, the qualitative choice to collaborate with a specific carrier is higher

The data that is used to test the hypothesis between the variables '*Amount of requested operational information'* and '*Qualitative choice'*. The operationalization of these variables is discussed in Chapter 6, section 6.3.2.

Table G6. Overview of the outcome of the Kendall Tau-b analysis of hypothesis 2 of the 4 different groups.

Group 1	Correlation coefficient	-.657
	Sig. (2-tailed)	.240
	N of valid cases	10
Group 2	Correlation coefficient	.**
	Sig. (2-tailed)	.
	N of valid cases	15
Group 3	Correlation coefficient	-.168
	Sig. (2-tailed)	.425
	N of valid cases	20
Group 4	Correlation coefficient	-.297
	Sig. (2-tailed)	.035
	N of valid cases	41

** This group requested no operational information in round 3 for order #3.

Hypothesis 3A: Players with a low disposition to trust are more likely to request strategic information

To test this hypothesis the relationship between the variables 'MeanDT' and 'Total Count of SI' should be correlated. As explained in Chapter 6, section 6.3.3. not many players requested strategic information. Table G7 shows the amount of strategic information bought per group. Since not many players bought strategic information, testing the hypothesis per group has not been done.

Table G7. Count of requests for strategic information per group.

Group	Players who requested strategic information
1	2
2	4
3	0
4	0

Hypothesis 3B: players with a high disposition to trust are more likely to request operational information

To test this hypothesis, the variables '*meanDT*' and '*Request operational information*' are correlated with each other. The test that is being used is the Kendal Tau-b test. Table G8 shows the outcomes of the analysis of the four groups.

Table G8. The outcome correlation between '*meanDT*' and the '*Operationalization request operational information*' per group.

Group		Group 1 – operationalization	Group 2 – operationalization	Group 3 – operationalization	Group 4 – operationalization
Group 1 – MeanDT	Correlation coefficient	.000			
	Sig. (2-tailed)	1.000			
	N	10			
Group 2 – MeanDT	Correlation coefficient		-.392		
	Sig. (2-tailed)		.073		
	N		15		
Group 3 – MeanDT	Correlation coefficient			-.007	
	Sig. (2-tailed)			.971	
	N			20	
Group 4 - MeanDT	Correlation coefficient				.139
	Sig. (2-tailed)				.264
	N				41

Hypothesis 4: Players use a positive or negative (prior) experience with a carrier to choose a carrier

As discussed in Chapter 3 and Chapter 6, experience is an important source of information. As discussed in Chapter 6, the correlation between experience is difficult to test and is done by counting the player's experience frequencies. Since only a closer look at the frequencies is given, the overall group frequency is used, and there is no division made in the frequencies per group.

G.3.2. Analysis of the hypotheses of the conceptual framework

As discussed in Chapter 6, section 6.4., two hypotheses are defined for the framework. The data of the four gameplays showed that not many players requested strategic information. Since a limited amount of strategic information was bought by players, these two hypotheses are not analyzed per group but as a whole. Therefore, no analyses per group are discussed in this appendix.

Acknowledgements

Embarking on a PhD is often described as a journey. Mine began with full dedication and ambition, ready to dive deep into a subject that sits at the intersection of trust, serious games, collaboration, and platforms. But somewhere along the way, I came to realize that life, with all its unexpected turns and meaningful relationships, matters more than any dissertation. Still, this project has brought me valuable experiences, insights, and connections, and for that, I am deeply grateful.

From the very beginning, I was lucky to have people around me who made this journey lighter, warmer, and often much more fun. Maria, thank you for every coffee and tea break, for our endless conversations about research, and for facing the PhD highs and lows together. From deep reflections to spontaneous bowling sessions on random Tuesday afternoons, you were always there. *Gracias por tu apoyo y entusiasmo, y porque pudimos compartir prácticamente todo. Durante mi doctorado y en la vida, has sido mi sombra de paranimfa.* Fernando and Barbara, thank you for the amazing Brazilian BBQs, for your openness, and for letting me show that even some Brabanders can be later than the average Brazilian. Oeteldonk was never the same after experiencing it with you. Fernando, your energy, creativity, and love for both developing and playing games made you a vital part of this process. *Que você está agradecido, você já sabe!* To my officemates, Bahareh, Maria, and Kenny, thank you for the chats, the Friday drinks behind our desks, and the laughter that got us through long afternoons. And to everyone I met along the way during my PhD: thank you for the good times and shared memories.

Of course, this dissertation would not exist without the guidance of my supervisors. Alexander Verbraeck, Heide Lukosch, and Els van Daalen, thank you for your endless enthusiasm for logistics and serious gaming, your angelic patience, and your mentorship. Special thanks to Els and Heide for being strong female role models in a world that still leans heavily male, and to Alexander for always encouraging me to continue, even when things got tough. I'm especially thankful for your understanding and flexibility when my personal life took priority. To the Trans-SONIC team, thank you for your sharp insights, encouragement, and critical questions during our consortium meetings.

A PhD is unlike any other job. You commit yourself to one subject for years, which is exciting, but also challenging. I'll be honest: I'm not a naturally focused researcher. I'm interested in too many things and often prefer results that come a bit faster. That's why I'm grateful that halfway through, I got the chance to step into a different rhythm at SmartPort. Thank you to the SmartPort team for the opportunity to grow and collaborate. Special thanks to Dirk, Elisabeth, Joan, Nikki, Wiebe, Roy, and Noah, for the unforgettable time and amazing Fun & Focus weekends that recharged both my mind and motivation. I completed this PhD mostly alongside my job. A special thanks to everyone I met and worked with along the way, you often provided just the right kind of distraction.

None of this would have been possible without the family I grew up with. To my family: thank you for giving me a safe, warm, and trusted environment. To my grandparents, Opa, who taught me never to judge too quickly (and not to block the TV during a football match), and Oma, who always kept an open mind, thank you for setting the tone.

But most importantly to my parents: thank you for guiding me through moments of doubt, for supporting Peter and me during Tom's illness, and for helping take care of Tom and Loïs when I needed space to work. Most of all, thank you for simply being there, through dinners, weekends away, and everyday chats that meant everything. My brother Tim, thank you for always helping me, even when we were little and I needed help grabbing toys. And now, for being my paranymph. Denise and little Olaf: thank you for your joy, your curiosity, and those very first smiles. And of course to my in-laws: thank you not just for asking about the PhD, but also for caring just as much, if not more, about everything beyond it.

And finally, Peter. Thank you for all the beautiful moments we've shared, from beer contests in the student bar, to adventures in Australia, to walking this PhD journey from beginning to end. But most of all: thank you for becoming the father of our two children, Tom and Loïs. These past years have been far from easy, dealing with a rare autoimmune disease, the arrival of our daughter Loïs, busy jobs, and this dissertation. But your words kept me going: "It'll all be fine. And if it takes a bit longer, so what?"

So what I really want to say to all of you is simply this:

Da gè bedankt zijt, da witte!

About the author

Anique Kuijpers (January 5, 1990, ’s-Hertogenbosch) was born and raised in Oeteldonk, with a passion for design. From a young age, she was fascinated by design and spatial thinking, which led her to pursue a degree in the Built Environment at the Eindhoven University of Technology.

During her bachelor's studies, she soon discovered that her main interest lay in the human aspect of the built environment, particularly in combination with mobility. During her bachelor's degree, she served as treasurer on a student board, where she was responsible not only for financial administration but also for managing the student bar. This experience gave her a first taste of entrepreneurship and confirmed that, in addition to theoretical thinking, she prefers a hands-on, social approach to work.

After obtaining her bachelor's degree in 2014, Anique enrolled in the master’s program Construction Management & Engineering, a joint track between the Built Environment and Industrial Engineering faculties. While many of her peers focused on the technical aspects of construction, she chose to specialize in logistics. She explored topics such as supply chain networks, simulation techniques, entrepreneurship, and design science. During an exchange semester at KTH in Stockholm, she further specialized in serious gaming within the context of mobility and logistics.

In 2017, she completed her master’s degree and, in September of the same year, began her PhD research at TU Delft, within the Policy Analysis department of the Faculty of Technology, Policy & Management. Her research focuses on the role of trust in collaborations between organizations that increasingly rely on digital technologies such as platforms and blockchain.

In early 2020, Anique began combining her PhD work with a position as Project Developer Smart Logistics at SmartPort. In this role, she initiated and managed research projects with

companies, aimed at promoting data-driven practices in the logistics sector. Examples include studies on the impact of platforms on logistics processes and the development of predictive models for inland shipping.

After two and a half years, she returned to her beloved hometown of 's-Hertogenbosch, known to locals as '*Het Pronkjuweel'*. From there, she briefly worked in the Brainport region before joining the MKB Datalab at the Jheronimus Academy of Data Science. This young, entrepreneurial initiative of the university aligns perfectly with her interests: working with data, mentoring students, and supporting SMEs in a creative, practical way, and discovering how entrepreneurship can be.

Publications

- Kuijpers, A., Lukosch, H.K., Verbraeck, A. (2021). The Trust Game: The Influence of Trust on Collaboration in the Light of Technological Innovations. In: Wardaszko, M., Meijer, S., Lukosch, H., Kanegae, H., Kriz, W.C., Grzybowska-Brzezińska, M. (eds) Simulation Gaming Through Times and Disciplines. ISAGA 2019. Lecture Notes in Computer Science(), vol 11988. Springer, Cham. https://doi.org/10.1007/978-3-030-72132-9_15

- Kuijpers, A. (2019). Trust as a Mechanism to enable Collaboration for Truck Platooning. *BIVEC/GIBET TRANSPORT RESEARCH DAYS 2019*, 132.

- Kuijpers, A., Lukosch, H.K., Verbraeck, A. (2019). Exploring a Mixed Method Approach: Simulation Games and Q Methodology. In: Liapis, A., Yannakakis, G., Gentile, M., Ninaus, M. (eds) Games and Learning Alliance. GALA 2019. Lecture Notes in Computer Science(), vol 11899. Springer, Cham. https://doi.org/10.1007/978-3-030-34350-7_50

Co-authored

- Lukosch, H.K., Kuijpers, A., & Verbraeck, A. (2018, October). Exploring the relation between Awareness, Trust and Innovation: A simulation gaming study. In *European Conference on Games Based Learning, Academic Conferences International Limited* (p. 904).

Presentations

- Kuijpers, A., Lukosch, H.K., & Verbraeck, A. (2018). Lack of Trust as a Blocker for Self-Organization in Container Transportation: A Research Agenda. World Conference on Transport Research Society. Antwerp, Belgium.

- Kuijpers, A., van Daalen, C., Lukosch, H.K, & Verbraeck, A. (2021). A Simulation gaming study: Assessing the Role of Trust in Technology-Mediated Collaborations. TRAIL PhD Conference, Utrecht, The Netherlands.

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Summary

Platform technologies are increasingly shaping Business-to-Business (B2B) environments, including the transport and logistics sector. These platforms act as networks connecting supply and demand, enabling interactions and collaboration in largely impersonal settings. In such contexts, trust plays a vital role in reducing risks and uncertainty. With the rise of platforms and potential information asymmetry, this dissertation explores how trust influences collaboration and how platform-mediated collaboration can be enhanced.

About the Author

Anique G.J. Kuijpers holds an MSc degree in Construction Management and Engineering from Eindhoven University of Technology. She conducted her PhD at the faculty of Technology, Policy and Management, Delft University of Technology, as part of the Trans-SONIC project.

TRAIL Research School ISBN 978-90-5584-370-1

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