COMPOSE 2.0

FINAL REPORT FEBRUARY 2023

TKI DINALOG
Dutch Institute for Advanced Logistics

SUMMARY

The goal of this research project, called Compose 2.0, is to build on the work that was previously conducted under 'Compose 1.0'. We have analysed how human behavior influences the scaling up of horizontal collaboration in supply chains. We have done this by combining the academic fields of operations research (for the financial business case) and social psychology (for the personal incentives) with multiple deliverables:

1. We have set up an interactive experiment, based on transportation, to analyse the human behaviour in forming coalitions and how to share the benefits. This tooling and this experiment is available within the LISS-panel (representing the Dutch community), but can also be used by all kind of groups. The tooling is available for comparable experiments.
2. The outcome of this experiment is that a large company is more often excluded from the coalition compared to the medium-size and smaller company. In psychological terms: 'strength = weakness'. People who are stronger in taking perspective, are more often part of the coalition and receive a larger share of the benefits.
3. We have described this in a scientific paper. We have also written an academic paper with an overview of all human behaviour aspects on horizontal collaboration.

Next to these important deliverables, we have also written two working plans:
- How can we translate the deliverables, described above, towards recommendations for the Dutch logistics community?
- How to continue with the "Compose Tooling Platform"?

On top of this, we have created educational material, which can be applied for students for (applied) universities, contributed to external events and have executed five internship graduation projects on horizontal collaboration

> **"HORIZONTAL COLLABORATION STARTS WITH TAKING PERSPECTIVE: TAKE THE VIEW OF THE PROPOSED PARTNER."**
>
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1 MOTIVATION

The goal of this research project called Compose 2.0 is to further build on the work that was previously conducted under 'Compose 1.0'. We wish to better understand human behavior under horizontal collaboration in supply chains. Practical experience has shown us that an attractive (financial or environmental) business case is not enough to make collaboration a lasting success. Instead, it is key to understand the underlying human behavior, since after all it are human beings that decide on the starting and continuation of collaborative projects.

The project is relevant because within the existing logistics structures, shippers are not able to closely orchestrate their (extended) supply chain, which leads to inefficient transport flows. In addition to that, more and more shippers realize that collaboration is important and brings benefits in their supply chain operations. The project team ambitions to contribute to this by better understanding in which situations horizontal collaboration can be brought to reality and when not. Only then can a truly collaborative platform be created that identifies hurdles in an early phase and as a result can support to overcome them. This will be achieved by means of literature study, consulting consumer panels through experiments and by asking feedback and experiences from the member companies of evofenedex.

From only an economic frame of reference, it is difficult to predict whether a collaboration project will succeed. With this in mind, in Compose 2.0 we bring together the fields of Operations Research and Social Psychology in a much more intensive and structured way as in Compose 1.0.

2 CHALLENGE

The overall goal of Compose 2.0 is to better understand the role of human behavior in the (lasting) success of horizontal collaboration. That knowledge can be used to much better design collaborative structure and signal potential pitfalls in collaborative initiatives in a much earlier phase. Compose 2.0 will be an applied research project. Tilburg University will lead the project and conduct a major part of the research. The Rotterdam University of Applied Sciences will develop the learning of both 'Compose 1.0' and Compose 2.0 into course material for its students. And finally, evofenedex will bring in knowledge and views from their members to make sure that the research has considerable practical value. The nexus between Operations Research and Social Psychology is a rich source of academic insights that has not been tapped very often yet. Therefore, there are many possible questions to be answered. We will investigate these (and potentially other) questions through literature research, consulting consumer panels, MSc thesis projects, by inquiring evofenedex member companies, and by means of some straightforward coalition games that allow for sharing collaboration benefits with partners, but also with external parties.

The core of our research will be executed by means of experiments and analyzing the results in a data-driven approach in the following way:

- Conceptualize collaborative and competitive behavior by means of experiments among representative selections of the Dutch population. This will be done via the LISS-panel, administrated by CentERdata and is primarily aimed at understanding the socio-psychological dynamics in collaborative decision making. These insights will be used to better design business-to-business collaboration setups in supply chain practice.
- The objective of the panel experiments is to shed light on the effect that personal behavior/personality has on collaboration outcomes, and to better understand bounded rationality in economic/collaborative situations.
- Where possible, the matchmaking tool developed in Compose 1.0 will also be used in the experiments.
- The panel results will be compared with outcomes of experiments with students and practitioners. The analysis will be done by using advanced data-driven techniques to identify relations and dependencies.

The experiments will focus (amongst others) on the following research questions:

- How can collaboration contracts be constructed so that they maximize the probability of lasting success?
- What is the effect of consortium size on collaboration outcome?
- What is the effect of commonly acknowledged external drivers for collaboration, compared to mere economic incentives (for example: a general carbon tax, the Corona pandemic, driver shortages, etc)?
- In which cases is collaboration particularly successful and can we explain this from personal behavior or -incentives?
- Can we conceptualize the results of the panel consultations by means on econometric models?

3 PROJECT APPROACH

Compose 2.0 consists of four work packages which we will briefly introduce here.

1. RESEARCH DESIGN

In the first work package we will bring together the perspectives of operation research and social psychology to define the exact research questions and project goals. Language will have to be standardized, the experiments will be set up, and the literature review will be scoped to make sure that all relevant (multidisciplinary) literature is covered.

Deliverables:
- set up of the collaboration experiment
- set up of the scientific report: behaviourial aspects in horizontal transport collaboration

2. DATA GATHERING

In the data gathering work package, all relevant information will be acquired that is needed to draw conclusions on the impact of human behaviour on collaborative logistics success. Next to the main effort of conducting the experiments with the LISS panel, in this work package we will also conduct the literature review and gather views and insights from practitioners in evofenedex platform.

Deliverables:
- Data set with results from horizontal collaboration experiment with group of professionals and a representative group from the LISS-panel (representing Dutch households)
- scientific report: behaviourial aspects in horizontal transport collaboration

3. ANALYSIS

In WP3 we will analyse the information from all sources in WP2 to generate the insights that are the motivation of Compose 2.0: How does human behaviour impact the success of logistics partnerships and how can this be integrated in improved design of supply chain collaborations. A second element of WP3 is to develop the course materials for bachelor students.

Deliverables:
- Scientific report, with analysis and recommendations based on the data set of work package 2.
- Course material for bachelor students and students of applied research about the principles of horizontal collaboration.

4. FOLLOW-UP

In the final work package we will develop workplans for the further development of the Compose tooling in a more application oriented follow-up project and for turning the mostly academic insights from Compose 2.0 into actionable strategies for the Dutch logistics industry, based on collaboration design that better accommodate human decision and relations. The realisation of the workplan to further develop the tooling is foreseen in a follow-up project, Compose 3.0.

Deliverables:
- Working plan how to continue with the Compose Tooling
- Working plan with recommendations for the Dutch logistics community.

4 RESULTS

Compose 2.0 is aimed at gaining a better understanding underlying human behavior that impacts the success of supply chain collaborations. Although implementation in practice of our results is not in scope of the project, we will develop an actionable plan for this. Overall, we have achieved the following results:

- **Multiple sessions at conferences**
- **Two scientific papers**
- **Educational material for a bachelor minor at a University of Applied Sciences**
- **5 internship thesis projects**
- **Increased collaborative behavior of evofenedex members (supported by applying an experiment)**
- **A workplan for improving the Compose platform.**

These deliverables are available for everyone via the regular ways.

We are convinced that Compose 2 is an important step to reach the goals as formulated in 'Actieagenda topsector logistiek 2020-2023 - Op weg naar een concurrerende en emissieloze logistiek in Nederland'. Our project is mainly focusing on 'Sustainability and supply chain management'. However, the results of our research project cannot be directly translated into reduction in emission or cost. It is a step forward for the Dutch logistics community in the transition towards zero emission. This transition cannot be made at its own, it requires collaboration with others. This Compose 2 project is also a fundamental element for Compose 3, focusing on how to support the community in this transition.

SCIENTIFIC OUTPUT	
Master thesis	5
PhD promotions	0
Scientific publications	2
Scientific seminars, workshops, presentations, etc.	3

RESULTS THE PROJECT IS PROUD OF

1 Tooling to apply logistic experiments from a psychological perspective

2 Educational material to learn students to do projects in horizontal logistic collaboration

3 2 multi-disciplinary scientific papers, written by experts in econometrics and social psychology

4 Proof that 'strength = weakness' holds for horizontal logistic collaboration

5 Proof that 'perspective taking' is really helping and brings benefits in logistic horizontal collaboration.

EXPERIMENT TOOLING

We have created tooling which can be used for applying interactive experiments in the area of collaboration and transition, and can also be applied within the LISS-panel (representing the Dutch community). To our knowledge, such tooling does not exist yet and is very powerful to experiment certain scenario's prior to implementing them in practice.

This tooling is also fundamental for the Compose 3.0 project. We have agreed with Dinalog to reach out to the Dutch government to discuss how this tooling can be used to support their decision making process in new policy rules.

RESULTS FROM OUR RESEARCH HAVE BEEN PRESENTED AT THE FOLLOWING EVENTS:
- Lean & Green Summit, 13 October 2021 (Nanne Schriek, Frans Cruijssen)
- Logistics Innovation Conference, TKI Dinalog, 5 April 2022 (Goos Kant)
- Supply Chaingers Event evofenedex, 7 June 2022 (Goos Kant, Anabela Cantiani, Nanne Schriek)
- LCB Innovation Event, June 28, 2022 (Goos Kant, Anabela Cantiani)

5 EXPERIENCE

Though this was a relatively small project with quite some administration at the beginning and at the end, there was a lot of energy, enthusiasm and innovation. The main reason was this mixed multi-disciplinary team:

- **2 knowledge institutes (Tilburg University and Hogeschool Rotterdam)**
- **partners CenterData and Evofenedex with their own expertise**
- **experts from econometrics and social psychology**
- **internship graduation projects and contribution to events**
- **a mix of deliverables.**

Therefore, we are continuing with this team and approach in our next project, called Compose 3.0.

OPEN INNOVATIE

See also the answer above: the mix of people and expertise delivered a strong contribution to the success of this project. We have hardly seen negative aspects, and we had no negative impact from the COVID-lockdown measurements. We are also discussing opportunities whether we can collaborate in other projects as well. The only negative point is that building all the tooling took much more time than expected, implying that this was a loss-making research project.

DINALOG EN TOPSECTOR LOGISTIEK

There was a very good interaction within the team. During the kick-off, we had a brainstorm meeting in esplanade, the grand Cafe of Tilburg university. new connections in this network are established. We also informed dinalog and connect various times about the progress. As a consequence, we have participated in the lean & green event (date) and the dinalog summit. This topic is also selected to be presented during the logistiekdag 2023 (7 March). We were also invited for a meeting with Topsector Logistiek to discuss the agenda of the future.

Given the interesting team and the good relationships with Dinalog, we decided to keep at least the same team for Compose 3.0. We will continue this direction, with logical update meetings with Dinalog and others, sharing our findings with the community and via various publications.

PLASTIC REDUCTION PROJECT - EVOFENEDEX

Via consortium partner evofenedex we have a strong link towards many shippers in the logistics world. a collaboration topic for these shippers is how to reduce plastics. It is obvious that you need the community to apply this transition. In a project, the motivation were investigated within shippers. The most promising opportunities for horizontal collaboration are analysed and facilitated. Top 4:

- Knowledge sharing
- Co-innovation
- Lobbying within the industry
- Sharing data for benchmarking and improving.

This is a very nice example where horizontal collaboration and human behavior are key to facilitate this transition.

HORIZONTAL COLLABORATION WITHIN AN INDUSTRY AREA

As part of the compose 2.0 project, opportunities are investigated for an industry area (called BIZ Groote polder, Zoeterwoude). These companies share the infrastructure, so there might be room to share more. One of the interesting named impediments to collaboration in a cluster, is not knowing what other companies do and who to contact. This lack of knowledge results in the stranding of initiatives.

As a method to overcome this, one of the respondents opted to create a platform to connect with other BIZ Grote Polder companies. This idea was received with enthusiasm by other respondents and is thereby one of the main recommendations for the board of BIZ Grote Polder. Finally, several additional steps gain benefits by collaboration are proposed. The next step is to define various actions. This opens also new perspectives for Compose: horizontal collaboration can also be applied at industry area level, e.g. to share all kind of equipment, warehousing, electric load charing stations, etc.

6 FUTURE VISION

Nowadays, various transitions are taking place at the same time. Think about globalisation, digitization, flexibility in the labor market, and of course the transition to sustainable transportation. Human behaviour is considerably influencing these transitions. To understand this, experiments by using panels are a good way to understand better the habbits, preferences and underlying motivation.

The results and deliverables of Compose 2.0 are an important foundation for analyzing and accelerating the transitions in the Dutch logistics community.

In Compose 2.0 the focus was on optimizing the collaboration between a closed set of logistic companies, the next step is to understand and guide the transition and collaboration within the logistic system as a whole, towards a more innovative, clean and profitable logistic networks.

NEXT STEPS
We want to build further on this vision during Compose 3.0 in multiple ways:
- Organize 2 PhD's projects (from a social psychology and an econometrics / game theory perspective) to analyse the fundamentals.
- Cooperate with the Dutch government to discuss the opportunity to apply the tooling for experiments with policy rules.
- Make it an applied research: cooperate with Hogeschool Rotterdam to create education material for students and with evofenedex and Smart Freight Centre, to have a connection with the industry market, organize events and internships, etc.

> **"IF WE UNDERSTAND BETTER THE COLLABORATION WITHIN THE LOGISTIC SYSTEM AS A WHOLE, WE CAN GUIDE THEM BETTER IN THE TRANSITION TOWARDS A MORE INNOVATIVE, CLEAN AND PROFITABLE LOGISTIC NETWORKS."**
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7 PROJECT PARTNERS

PUBPLIC PARTNERS

EVOFENEDEX

Shippers organisation with over 10,000 members (mainly production and wholesale organisations) with a great market knowledge and network. evofenedex already participated in Compose 1.0 to deliver market knowledge and organize internship projects for valorization.

HOGESCHOOL ROTTERDAM

Hogeschool Rotterdam (Rotterdam University of Applied Sciences) has good experience in translating the knowledge into education material, which can be used in (minor) bachelor programs.

PRIVATE PARTNERS

CARGILL

Commercial company, specialized in global feed trade. They have a lot of data and transportation costs. They are looking for ways to use the data to become more sustainable, cooperate with carriers and others, forecast the transportation need. They deliver input and knowledge, organize internships and are also part of the Evofenedex Supply Chaingers network.
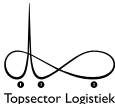
CENTERDATA

This is a non-profit organization, linked to Tilburg University, and specialized in applying questionnaires to their LISS-panel, representing the Dutch community. In this project they created the tooling to apply experiments instead of questionnaires to the LISS-panel.