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Participatory Design of Participatory Systems for Sustainable Collaboration: Exploring Its Potential in Transport and Logistics

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Abstract: Challenges involving economic, environmental, and societal aspects necessitate organisations in business networks to collaborate. The scientific problem central to this paper is the difficulty of building sustainable collaborations. The research question is how to support organisations in building sustainable collaborations in their business relationships. This paper presents a new socio-technical approach to this end, i.e., PDPS (an acronym for Participatory Design of Participatory Systems) and explores its potential in a case study. PDPS is a value-based approach to the participatory design of participatory systems. Such socio-technical systems enable people working in different disciplines, departments, and organisational levels to create sustainable relationships supported by distributed information and communication technology. In a participatory system, participants gain trust, engagement, and empowerment to self-organise actions that produce results they could not have achieved alone. Following PDPS, participants collectively explore challenges in their relationship, define a joint value-based mission, and create a continuous process of self-organisation to fulfil this mission. In a case study, PDPS supported two Dutch business partners in solving recurring transport and logistics issues in retail store refurbishment projects. Turning their traditional business processes into participatory ones led to new solutions for sustainable transport and logistics, more joint business, and more profit. PDPS differs from other approaches in its involvement of all participants in a business relationship, its focus on shared values, and its capacity for creating a continuous process of self-organisation to fulfil a joint mission. This paper may support researchers, practitioners, and organisational policymakers interested in building sustainable collaborations in business networks.

Keywords: business networks; collaboration; complex systems; design thinking; participatory design; self-organisation; sustainability; systems thinking; value-sensitive design

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1. Introduction

In the world of supply chain management, companies transport, store, distribute, and deliver products [1]. They form business networks, coordinating activities to manage the supply chain and achieve their goals [1]. These socio-technical networks with intertwined social and technical aspects [2] operate in a volatile, uncertain, complex, and ambiguous world [3].

Challenges involving economic, environmental, and societal aspects necessitate organisations in business networks to collaborate, as the complexity of such challenges exceeds the capabilities of an individual organisation [4]. Cross-actor participation, cross-coordination, and cross-sector cooperation are essential [5]. Collaboration entails formal and informal agreements between stakeholders (customers, employees, partners, end-users, citizens, etc.). These agreements are often supported by (virtual) entities to regulate roles and responsibilities [1]. In a collaboration, stakeholders interact and jointly create ways to act or decide on issues according to shared norms [6].

The scientific challenge central to this paper is building sustainable collaborations [6]. In supply chain management, failure is often due to focusing on financial objectives, geographic borders, and working with other companies based on past track records alone [7]. Furthermore, research shows failure can occur due to a lack of trust and fear of sharing sensitive information [8,9]. Other factors that hinder multi-stakeholder collaboration are divergent visions and interests, inadequate planning and project management, ineffective organisation among stakeholders, problems of communication and a lack of information, and socio-political, economic, and territorial conditions [10].

Several other factors determine the success of the collaboration between business partners, such as interpersonal connections in partnerships [11], power relations between participants [12,13], and strategic visualisation [14], as well as information exchange, opportunities to reduce costs, and access to new markets [13]. The capacity for coordination [15] and, depending on the industry, using enabling technologies for the cross-company optimisation of material flows and resource utilisation [16] also play a role.

The central research question in this paper is how to support organisations in building sustainable collaborations in their business relationships. This paper contributes to science with a novel approach and a case study. The research in this paper builds upon earlier research into participatory demand and supply [17].

2. Materials and Methods

Figure 1 shows the research framework for this paper. The heart is the 'buffer zone', a dynamic, contextual space and set of practices for action research into sustainable collaboration building within complex and changeable settings [18]. This buffer zone comprises theory and practice [19] to develop and test an approach affecting business networks, relationships, and processes in practice.

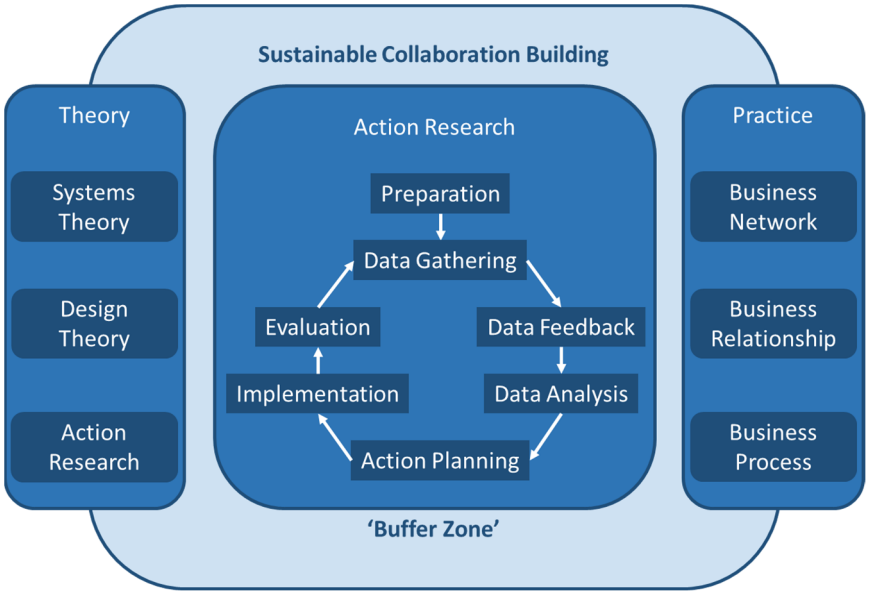

Figure 1. Research framework.

There are three research foundations for this paper. The first foundation is systems theory. To tackle a complex challenge in a business network, stakeholders need to co-create a shared understanding of the network in its environment, shared values, and a joint mission based on these values. This requirement calls for systems thinking [20], combined with reflection, to assimilate the perspectives of others [21].

Complex systems theory (e.g., [22]) considers systems with emergent and non-predictable (i.e., non-linear and dynamic) behaviour resulting from people's behaviours and interactions. Socio-technical approaches provide a socio-technical systems perspective on human and organisational outcomes by assessing social, psychological, environmental, and technical

systems as a whole (e.g., [22]). The pillars of collaboration are governance (to make decisions jointly), administration (to move from governance to action), alignment with organisational goals, and mutual-benefit interdependency [5].

Successful collaboration depends on multiple values such as trust [5,23], engagement [24], empowerment [25], adaptability [26], the ability to self-organise [27], and emergence [27]. Participatory systems can provide these values [28]. Supported by distributed information and communication technology, these socio-technical systems promote trust, engagement, and the empowerment of participants to self-organise actions that produce results they could not have achieved alone [28].

The second foundation is design theory. To increase the support and acceptance of complex systems, designers engage in value-sensitive design, seeking to account for human values throughout the design process [29]. Values are relevant for evaluating the worth or goodness of the options or systems being considered, thus forming the basis for defining design requirements [30]. Through participatory design, designers seek to involve all stakeholders in the development process [31,32] to meet their needs and comply with shared values [33]. Designers and stakeholders agree on a problem focus and create and implement solutions [34], committing to actions within a complex environment [35].

Design thinking supports stakeholders in co-creating changes within their companies and business networks [36,37]. Combining systems thinking and design thinking into system-led design enables designers and stakeholders to understand complex systems, emphasise the connections and relationships within systems, include multiple perspectives, and identify interventions with a significant impact [38,39]. To better understand complex and future-oriented issues [40], they engage in research through design [41], an approach to scientific inquiry that takes advantage of the unique insights gained through design practice. It prescribes a repetitive cycle of creating an artefact, exploring its use with potential users, and reflecting on this user experience [40].

The third foundation is participatory action research, where researchers and practitioners focus on implementing solutions to enable changes through knowledge development [42]. They share the power to determine solutions for changes [43], empowering participants to realise them [44]. All types of action research may enhance relevant, rigorous empirical management studies and serve as a framework reference for active collaboration between researchers and practitioners [45]. Having researchers facilitate an ongoing reflection and dialogue within organisations furthers a high commitment of participants to the research effort, eventually resulting in rigorous and relevant outcomes for theory and practice [45].

Action research is executed in a series of empirical case studies to develop and test an approach to building sustainable collaborations. The steps followed in action research are (freely after [19]):

1. **Preparation.** Define the context and purpose, analyse the feasibility of the research, identify the constraints and limitations, build trust between researchers and practitioners, and commit to the research.
2. **Data Gathering.** Collect data through interviews, reading, and observation.
3. **Data Feedback.** Organise the findings arising from the data.
4. **Data Analysis.** Contextualise and interpret the findings to prepare for action planning.
5. **Action Planning.** Schedule activities and assign roles and responsibilities.
6. **Implementation.** Implement and facilitate the planned actions.
7. **Evaluation.** Measure the impact of the implemented actions and learn.

With theory and practice coming together in participatory action research, researchers and practitioners develop and test an approach to building sustainable collaboration. The following highlights different insights on sustainable collaboration in different scientific disciplines.

Research on sustainable natural resource management [46] mentions four conditions: (1) an interdependent involvement of stakeholders, (2) the development of a shared problem definition; (3) the coordination of actions on all levels; and (4) orientation toward a shared

strategy. It is vital for the stakeholders to co-construct a social learning process in an emerging community of practice [46].

Research into inter-organisational public service integration [47] considers collaboration, targeting long-term relationships. Its purpose is to create something new or to change existing systems—an endeavour subject to high risk that may yield high rewards. Members in the relationship generally have highly interdependent goals and close links, share power, and move outside traditional functional areas.

Research into university–community partnerships [48] has identified five elements of successful collaboration: (1) common goals and the reciprocal recognition of value and expertise; (2) diversity and interdisciplinarity; (3) open integration; (4) dynamic interaction; and (5) asset enhancement. The fifth element assumes transformational (rather than transactional) relationships, with goals and expectations restricted to realistic outcomes given the resource constraints.

Research into supply chain integration [49] describes strength, scope (width), depth, and duration as four strongly interconnected dimensions of collaboration in supply chain integration projects. Managing these four dimensions simultaneously and systematically is critical; it is essential to implement suited integrative activities and technologies (strength) with the right partners (scope), with the right professionals in the companies (depth), and at the right time (duration).

A systematic review of collaboration behaviour in sustainable agri-food supply chains [50] reveals ten key factors: joint efforts, sharing activities, collaboration values, adaptation, trust, commitment, power, continuous improvement, coordination, and stability. These factors help establish and assess the quality of a supply chain collaboration.

3. Results

This section describes the PDPS approach (an acronym for Participatory Design of Participatory Systems) and a case study.

3.1. An Approach to Building Sustainable Collaborations

This section introduces the principles, phases, and activities of PDPS, a socio-technical approach to building sustainable collaborations to solve complex issues in business networks.

3.1.1. Principles and Phases

Figure 2 shows the main principles of PDPS. The first principle is that participants co-define shared values and co-create a value-based mission and shared understanding to handle incomplete and uncertain information. The second principle is that participants co-define problems and co-create concepts and solution designs to navigate an unknown solution space.

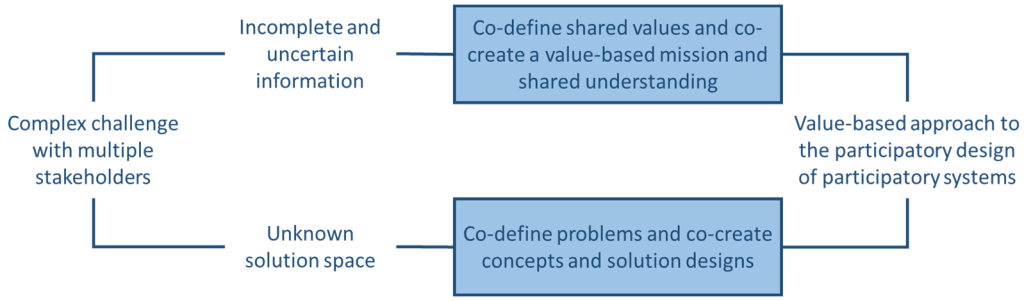

Figure 2. Main principles of PDPS.

For the application of PDPS, organisations facing a complex challenge in their business relationship delegate people from all disciplines, departments, and organisational levels who experience this challenge in their (daily) work. PDPS distinguishes five non-sequential phases that participants traverse iteratively, in principle, for the duration of their business relationship (see Figure 3):

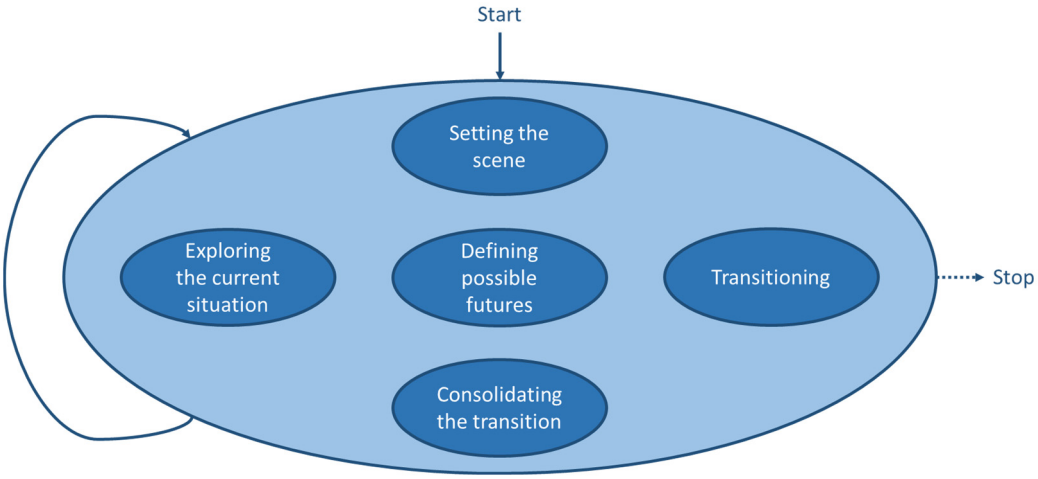

Figure 3. The flow of phases in PDPS.

1. **Setting the scene.** Get to know each other, increase situational awareness, and reach a consensus on the need for change. In other words, co-construct an initial shared understanding of the business network, shared values, and a value-based mission. It is vital in this phase to build trust between researchers and practitioners. See Appendix A.1 for questions asked to set the scene and Appendix A.2 for explanations about different types of systems thinking.
2. **Exploring the current situation.** Examine and analyse the current state of the business network, as well as resources and governance. See Appendix A.3 for questions asked to explore the current situation.
3. **Defining possible futures.** Define characteristics of the desired state of the business network and possible actions to get there. See Appendix A.4 for questions asked to define possible futures.
4. **Transitioning.** Transform the business network by executing planned actions to reach the desired state. See Appendix A.5 for questions asked to define transitions.
5. **Consolidating the transition.** Assess the impact of transitioning to a continuous process of self-organising changes and move forward to the next complex challenge to tackle together.

In setting the scene, participants co-construct an initial shared understanding of their business network in its environment, shared values, and a value-based mission. In exploring the current situation and defining possible futures, participants produce data about the current state, possible futures, and the desired state regarding:

1. The environment of the business relationship:
    a. Micro-environment state and trends: the network of business partners.
    b. Meso-environment state and trends: the market and competition.
    c. Macro-environment state and trends: an analysis of political, economic, social, technological, environmental, and legal factors [51].

2. The business network itself, from a value-based design perspective (extending [52]):
    a. Values.
    b. Function.
    c. Behaviour.
    d. Structure (social, ICT, and technical).
3. Resources for the business network:
    a. Tangible assets.
    b. Non-tangible assets.
4. Governance of the business network:
    a. Formal governance (e.g., goals, policies, contracts, and management).
    b. Informal governance (e.g., corporate cultures).

Participants produce data about the transition's schemes, pathways, and roadmaps in transitioning. Finally, in consolidating the transition, participants volunteer evaluations, lessons learned, insights, and ideas and decide whether to explore other values.

3.1.2. General Way of Working in Phases

In sessions (e.g., interviews and workshops), participants of all the disciplines, departments, and organisational levels involved explore, define, and redefine their business network. Facilitators structure and guide the process towards agreed-upon goals but do not volunteer content.

At the start of a workshop, the facilitators first introduce the purpose and goals, the process, and the activities. The central part of each workshop is a series of assignments for participants. They work in diverse groups (disciplines, departments, organisations, ages, backgrounds, etc.) that provide an inclusive environment where all participants feel welcome and valued for their contributions (e.g., [53]). Each group operates independently, drawing, writing (e.g., on flip-over boards), and reporting findings, ideas, insights, and conclusions to other groups after completing an assignment.

The facilitators share recordings produced during sessions (e.g., audio, videos, and photos) with participants through a social network app. They also share additional information and questions for participants. At the end of each session, they ask participants to provide their opinion on the session in a survey. They visualise the survey results and discuss them with the participants.

3.2. Case Study

Researchers have developed and explored the potential of PDPS in real-life cases in Iran, Indonesia, India, and the Netherlands, concerning manufacturing, transport and logistics, and agriculture. The longitudinal case study featured in this paper focuses on two Dutch companies and their business relationship. The choice to feature this case study is pragmatic: part of the source data is in English, whereas in the other cases, it is in a native language only.

The business relationship concerns the transport and logistics of materials in retail store refurbishment projects (see Figure 4). Throughout this case study, the customer will be named C, the retail store refurbishment company S1, and the transport and logistics company S2.

3.2.1. Challenges

Transport and logistics are essential in many supply-chain networks. Sustainable transport is challenging, for instance, in cities [54–56]. Which challenges are prominent may depend on the geographical focus. For example, those for the Scandinavian region are customer priorities, organisational complexity, network imbalance, and technical and legislative uncertainties [57].

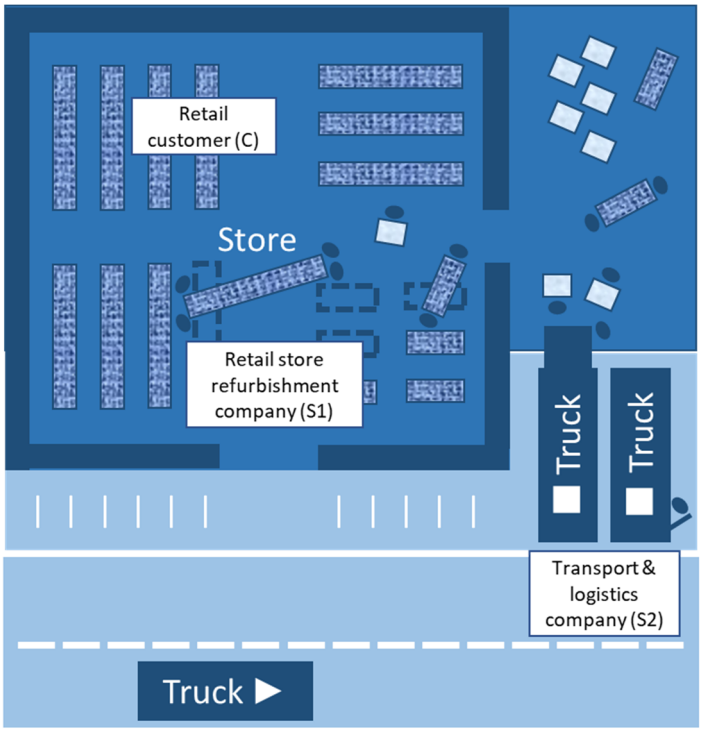

Figure 4. Top view of a retail store site with refurbishment work and transport of materials taking place.

Stakeholder interaction in participatory transport planning is complex [58]. Researchers have identified indicators for sustainable transport planning [59], considered the roles of stakeholders [60], and they have developed analysis frameworks [61] and policies [62,63]. In this case study, the companies were interested in solving recurring transport and logistics issues in retail store refurbishment projects, which led to the realisation of sustainable solutions for transport and logistics.

3.2.2. Period

The longitudinal case study covered six years, from 2013 to 2017, during which (university and company) researchers and representatives of the two companies met periodically. Figure 5 shows a Gantt chart with the eight stages in the case study.

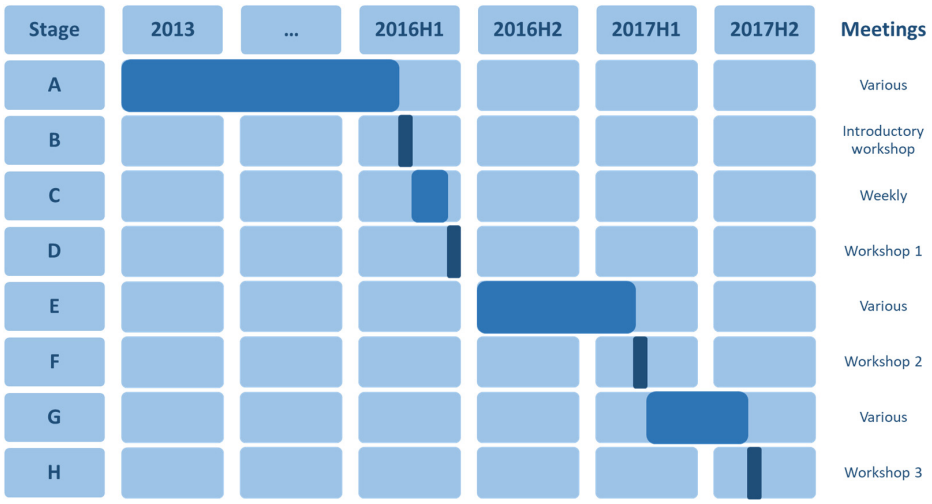

Figure 5. Gantt chart of the meetings in the case study. Dark-blue rectangles signify workshops.

Representatives from the two companies and (university and company) researchers held meetings to get to know each other and conduct interviews. Participants were selected and invited by their companies to attend three workshops. Researchers conducted interviews and acted as facilitators of the workshops. They guided the process, stimulated and explained where necessary, but did not interfere in the group processes. Each workshop started with a short introduction to the purpose and activities of the PDPS phases. In the workshops, the participants noted their findings on paper (e.g., A3 worksheets). They used social media apps and group collaboration apps to support this process, including posts of pictures of the outcomes of discussions (of the A3 worksheets).

3.2.3. Stage Results

Stage A—Various Meetings

Between 2013 and March 2016, the researchers had three meetings with the management team of the transport and logistics company. The goal was to get to know each other and develop a mutual understanding of the PDPS approach in the business situation, focusing on the objectives and the execution process. The researchers interviewed several employees of this company for the same purpose.

See Appendix A.1 for the questions posed to the management team. These questions regarded the current situation, the desired situation, and transitioning.

Stage B—Introductory Workshop

The purpose of a one-day introductory workshop in March 2016 was to demonstrate the suitability of PDPS to solve problems in daily business through collaboration. All the PDPS phases were related to this workshop, from setting the scene to consolidating the transition.

Set-up. The workshop hosted six participants, all of whom were employees of the transport and logistics company: a planner, the financial director, the head of the technical service (repair unit), the general director, the sales manager, and the planning manager. The participants solved a practical issue using a systems-thinking approach facilitated by a step-wise process. The participants in two mixed groups worked on the same assignments based on information about the practical case collected beforehand. The agenda of the workshop was as follows:

1. Describe a practical case.
2. Interpret the situation (with practical group activities).
3. Formulate requirements of a solution for the practical case.
4. Design a solution for the practical case (with practical group activities).
5. Implement the designed solution (with practical group activities).
6. Conclusion.

The facilitators kept time, facilitated the discussion, and stored questions and explanations on a social media app. The participants shared the results on a social media app. The activities and materials included:

1. A presentation to introduce PDPS and communicate a roadmap for the workshop:
    a. Introduction.
    b. Practical case description.
    c. Introduction to systems thinking (see Appendix A.2).
    d. Designing a solution for the practical case.
    e. Consolidation of the designed solution.
2. Each practical group activity started with a set of questions illustrating the concepts. The participants used paper and a colour marker pen to write down their findings and thoughts.
3. The workshop had two streams in parallel: a physical stream and an online stream. The facilitators took photos of the session activities and took pictures of the flip-over sheets used (see Figure A1). With the participants, they used a social media app to

share information online during the workshop. The participants also used a social media app for their evaluation and final remarks.

4. For an a posteriori interpretation of the results, the facilitators recorded the workshop using two video cameras in opposite corners of the meeting room.

Evaluation. The participants gave feedback on the introductory workshop using a social media app. The main remarks were as follows:

- "This approach developed a better view of the complexity and the kind of expertise involved".
- "Nice to work in a group setting with all stakeholders, learn a lot, very helpful to define the problem better".
- "Different disciplines bring in different perspectives and raise another level of awareness".
- "Seeing the complexity in the communication network and the inefficiency of the current network".
- "This one session gave more answers than two years of discussion".

Stage C—Weekly Meetings

After the introductory workshop, weekly meetings were held (both physical and virtual) between the top management and researchers to discuss and develop the PDPS approach. The management team decided to test the PDPS approach to improve the business relationship with another company.

This second company specialises in retail store refurbishment projects. These projects are unique and involve stakeholders with different perspectives and interests. The companies did not know of a comprehensive approach they could use to address the challenges in their business relationship, and they were willing to partake in testing PDPS. The PDPS phase related to these meetings was setting the scene.

Stage D—Workshop 1

The fourth stage of the case study consisted of a two-day workshop in June 2016. The PDPS phases related to this workshop were exploring the current situation, defining possible futures, and transitioning.

Set-up. Eight employees from the two companies participated. From one company, a driver, a customer service employee, a planner, and the director participated. Two planners, a local support coordinator, and the distribution centre manager from the other company also participated. They focused on (i) understanding their business relationship's challenges, context, strengths, and weaknesses, (ii) defining possible futures, and (iii) devising rules of play and the means to move from the present to the desired situation. The researchers facilitated the workshop.

Findings on exploring the current situation. To explore the current situation of the business relationship between the two companies, the participants focused on the questions presented in Appendix A.3. The workshop revealed an entanglement of relations between the two partners and the number of viewpoints involved.

Figures A2–A7 show the results of the two mixed groups. For instance, group 1 formulated goals such as (economy) running more refurbishment projects and (ecology) using longer and heavier trucks. Group 2 envisioned running at least 45 projects a year, (supplier 1) being the best retail store builder, and (supplier 2) offering the best transport solution regarding corporate social responsibility.

To analyse the behaviour of the business relationship, the facilitators introduced a novelty that was not in PDPS before. They asked the participants to indicate the current and desired strengths of the social and technical values of their business relationship:

1. For each value of the business relationship, the participants agreed on the meaning of a minimum and maximum strength.
2. The participants volunteered to give individual scores for different values, on a scale from 1 to 10, for the current and the desired state of the business relationship.

3. The facilitators categorised the individual scores by the company (S1 and S2).

Table 1 shows the assessments of the social values of the business relationship, as shown in Figure A8. For a particular value, c: x_{low}-x_{high} denotes the scores ranging from x_{low} to x_{high} given by the participants from company c to this value. If the highest score x equals the lowest score x, then the score range x-x is denoted as x. For example, the participants from company S1 gave scores of 5 and 7.5 for empowerment in the current state, and scored 9 in the desired state. The participants defined a score of 0 as no autonomy and 10 as autonomy within the rules of play.

Table 1. Assessments of the strength of social values in workshop 1 (source: Figure A8).

Value	Meaning	Current State	Desired State
Trust	0: Controlling everything 10: Letting it go	S1: 6 S2: 7	S1: 8 S2: 9
Unity	0: Pursuing own goals 10: Pursuing a common goal	S1: 7–8 S2: 7	S1: 9 S2: 8
Empowerment	0: No autonomy 10: Autonomy within the rules of play	S1: 5–7.5 S2: 5.5	S1: 9 S2: 9
Accountability	0: No ownership of problems 10: Multi-ownership of problems	S1: 5–8 S2: 4–9	S1: 9 S2: 9
Engagement	0: No interest 10: Interest beyond own circle of influence	S1: 3–5 S2: 4–7	S1: 10 S2: 10
Presence	0: No involvement 10: Team player	S1: 7 S2: 7	S1: 8 S2: 8

Remarks on Table 1:

- Some scores for the same value were significantly different, both within the two companies and between the companies (e.g., taking responsibility and engagement).
- The participants generally assigned lower scores to social values in the current state than in the desired state.
- Compared to the current state, the scores of the two companies were closer (or even equal) to each other for the desired state.

Table 2 shows the assessments of the technical values of the business relationship, as shown in Figure A9. The notation is the same as in Table 1.

Table 2. Assessments of the strength of technical values in workshop 1 (source: Figure A9).

Value	Meaning	Current State	Desired State
Coherence	0: Actions and means are not aligned 10: Actions and means are fully aligned	S1: 3 S2: 5	S1: 8 S2: 8
Synchronisation: Emptying a retail store	0: Nothing is done on time 10: Everything is done on time	S1: 3–4	S1: 7
Synchronisation: Installing a retail store	0: Nothing is done on time 10: Everything is done on time	S1: 9 S2: 8–9	S1: 9 S2: 9
Robustness	0: We immediately change the plan in case of problems 10: We stick to the plan in case of problems	S1: 9 S2: 9.5	S1: 9 S2: 9.5
Resilience	-	-	-

Table 2. *Cont.*

Value	Meaning	Current State	Desired State
Flexibility/Adaptiveness	0: We stick to the plan no matter what 10: We change the plan to get a problem solved	S1: 10 S2: 7–8	S1: 10 S2: 9
Agility/Transformability	0: No action is taken in case of a change 10: Optimal action is taken in case of a change	S1: 8 S2: 6	S1: 9 S2: 9

Remarks on Table 2:

- The two companies gave different scores to all the values for the current state except for presence, and these were sometimes higher and sometimes lower than the other company.
- The participants generally assigned lower scores to technical values in the current state than in the desired state.
- Compared to the current state, the scores of the two companies were closer (and, for most values, equal) to each other for the desired state.
- The participants from one company did not give scores for the value of synchronisation in emptying a retail store.
- The participants did not give scores for the value of resilience, which was a deliberate choice.

Findings on defining possible futures. To explore possible futures in terms of possible solutions and actions, the participants focused on the questions listed in Appendix A.4. Figure A10 shows screenshots of the flip-over sheets with the results. For instance, one possible solution to the synchronisation problem was extending the time window for the arrival of a truck at a retail store's site from 30 to 45 min. The action proposed was that a logistics planner would inform project leaders to make the extended time window the new standard.

Findings on transitioning. The participants focused on the questions listed in Appendix A.5 to explore the means to transition. They defined the rules of play and the means to move from the current to the desired situation. Figure A11 shows screenshots of the flip-over sheets with the results. For instance, the crews for loading and unloading trucks should all have a supervisor.

Evaluation. Figure A12 shows images of the workshop evaluation by the two groups. The participants reported gaining awareness that it takes a lot to run a successful project. Furthermore, they gained trust in each other. They stated that they learned the following:

- The value of getting to know the people of both companies better.
- How the two companies were organised.
- The importance of communication.
- The impact of planning on location.
- The need for both organisations to be involved extensively in projects, reserve more time and (back-up) resources for a project, improve internal processes, share more information (both internally and externally), and elaborate opportunities.

Stage E—Various Meetings

At the second workshop in March 2017, the participants reported that there had been noticeable changes in the business relationship since the first workshop. These positive changes had the following tangible and intangible results:

- More types of projects.
- More projects (leading to a turnover increase of thirty per cent).
- Better mutual understanding.
- Better communication.
- More mutual trust.
- More engagement.

- Empowerment.
- The participants declared that these changes were the result of self-initiated transitioning.

Stage F—Workshop 2

The sixth stage of the case study consisted of a one-day workshop in March 2017. The PDPS phases related to this workshop were exploring the current situation, defining possible futures, and transitioning.

Set-up. There were eight participants: (i) two planners, a local service coordinator, and the distribution centre manager from one company; (ii) a driver, two customer service employees, and the director from the other company. Most of them also participated in workshop 1. The researchers facilitated the workshop.

The participants worked in two mixed groups, A and B. They explored the current situation and defined possible futures for the business relationship based on the questions listed in Appendices A.3 and A.4. Furthermore, they devised the rules of play and the means to move from the current to the desired state based on the questions listed in Appendix A.5. The facilitators translated the keywords in the questions into Dutch so that all the participants could understand.

Findings on exploring the current situation. To explore the current situation of the business relationship between the two companies, the participants focused on the questions presented in Appendix A.3. Figures A13–A17 show pictures of the flip-over sheets that the two groups produced. For instance, they listed the resources for the business relationship, such as trucks, trailers, drivers, project leaders, planners, and tools to load and unload. Each group also drew a network of the persons acting in the business relationship and their relations.

The participants assessed their business relationship's behaviour by scoring the current and desired strength for the same values as in the first workshop. This time, the facilitators categorised the scores by the group, not the company. Table 3 shows the assessments by the groups of the business relationship's social values, as shown in Figure A18. The notation is the same as in Table 2. For example, the participants of group A gave scores of 7 and 9 for mutual trust in the current state, and they scored a 9 in the desired state. They defined a score of 0 as controlling everything and a score of 10 as letting everything go.

Table 3. Assessments of the strength of social values in workshop 2 (source: Figure A18).

Value	Meaning	Current State	Desired State
Trust	0: Controlling everything 10: Letting it go	A: 7–9	A: 9
	0: No role, no responsibility * 10: 100% role and responsibility *	B: 8	B: 8
Unity	-	-	-
Empowerment	0: Nobody thinks along and decides * 10: Everybody thinks along and decides *	A: 7	A: 9
	0: I don't want to do anything and use no opportunity * 10: I want to do everything and use every opportunity *	B: 9	B: 8
Accountability	-	-	-
Engagement	0: Companies not working as colleagues/a team * 10: Companies working as colleagues/a team *	A: 7	A: 10
	0: No engagement at all * 10: 100% engagement *	B: 8	B: 8
Presence	-	-	-

* This definition differed from the one in workshop 1.

Remarks on Table 3:

- The groups only assigned scores to mutual trust, empowerment, and engagement. It is unknown why they did not give scores to unity, taking responsibility, and presence.
- With one exception, both groups defined the meanings of the minimum and maximum scores for each value anew. It is unknown why they did not assume the meanings already defined during workshop 1 and why the groups did not adopt the same new meanings.
- Group A assigned significantly different scores for the same value in the current and desired state, whereas group B did not, with one exception. The reason may be that the groups assigned different meanings to the minimum and maximum scores.
- Group B assigned a lower score for empowerment in the desired state. In the current state, the group members made no related remarks.

Table 4 shows the assessments of the two groups for the technical values of the business relationship, as shown in Figure A19. The notation is the same as in Table 3. For example, group A scored robustness a 7.5 in the current state and a 9 in the desired state. They defined a score of 0 as no coordination and 10 as proper coordination and choosing the right solution.

Table 4. Assessments of the strength of technical values in workshop 2 (source: Figure A19).

Value	Meaning	Current State	Desired State
Coherence	-	-	-
Synchronisation: Emptying a retail store	-	-	-
Synchronisation: Installing a retail store	-	-	-
Robustness	0: No coordination * 10: Proper coordination and choosing the right solution *	A: 7.5	A: 9
	0: - 10: Fixed, clear agreements *	B: 9	-
Resilience	-	-	-
Flexibility/Adaptiveness	0: One way of working * 10: Ask questions, and don't close your eyes for minor adaptations *	A: 9	A: 10
	0: - 10: Minor adaptations are made quickly, without losing the basis *	B: 9	-
Agility/Transformability	0: Fixed * 10: Open and constructive *	A: 8.5	A: 10
	0: - 10: Significant changes and risks are accepted by both parties and seen as a common challenge *	B: 8	-

* This definition differed from the one in workshop 1.

Remarks on Table 4:

- The two groups only assigned scores to the robustness, flexibility/adaptability, and agility/transformability values. It is unknown why they did not give scores for coherence and synchronisation. The participants also did not score resilience.
- Both groups defined the meanings of the minimum and maximum scores anew.
- Why group B did not score values in the desired state is unknown.
- With one exception, the groups gave different scores for the same value in the current state.

Findings on defining possible futures and transitioning. To explore possible futures and the means to transition, the participants focused on the questions listed in Appendices A.4 and A.5. Figure A20 shows pictures of the flip-over sheets the two groups produced. For example, one of group A's ideas was to create a handbook for drivers on a project with the rules of play in a location. In addition, group B took the reduction in empty kilometres (i.e., the number of kilometres a truck drives without being fully loaded) into the scope of the business relationship's function.

Evaluation. At the end of workshop 2, the participants reported having gained trust (in each other), engagement, and empowerment. Figure A21 shows the evaluations of the two groups. What they learned was as follows:

- Communication is key.
- How to make a project successful.
- How the two companies were organised.
- To look with fresh eyes at your own company.
- By making people enthusiastic, you can achieve more.
- Think in a better way about the administration of the other company.
- By following a structured approach, the business relationship improved.

Stage G—Various Meetings

In preparation for the third workshop, the researchers wrote a business report summarising the outcomes of the first two workshops and a draft transition scheme for the desired changes. The PDPS phase related to this preparatory work was transitioning.

The transition scheme consisted of two parts, one for the social aspects and one for the technical aspects of the business relationship. Figures A22 and A23 show these two parts. For each value, the scheme described focal points, actions to achieve these points, the means or resources needed to carry out these actions, and a responsible person.

For example, to empower employees, an onboarding programme for drivers was proposed, requiring very concrete examples of the desired behaviour through videos, work instructions, a handbook, and checklists. One person would be responsible for producing the handbook, and another for creating the checklists. For speed and agility, trucks must be well equipped to hook up trailers quickly, requiring company S2 to check the trucks and company S1 to check the trailers.

Stage H—Workshop 3

The researchers organised a workshop to develop a transition scheme based on the outcome of the first two workshops, zooming in on what exactly should change, how, when, and who would be responsible. The PDPS phases related to this workshop were transitioning, consolidating the transition, and (re)setting the scene.

Set-up. The participants were the two managers of the two companies who had participated since the beginning. See Appendix A.5 for the questions asked. The participants addressed the following topics:

1. Confrontation with the integrated outcome of earlier workshops.
2. The selection of issues considered crucial for improving the business relationship.
3. An analysis of these issues.

Findings. The participants reflected on past events, developments, and results. Indicators of the presence of a continuous process of self-organising changes in the two companies were as follows:

- For every project, the team members set up a social media app group to share information for which they took full responsibility.
- The project team members frequently shared relevant information and good practices with others in their companies.
- The workshop participants developed a handbook about how to apply PDPS.

Furthermore, the participants worked on the transition scheme. Figures A24 and A25 show the results of the previous two workshops on exploring the current situation and defining possible futures, with the annotations the participants made during the workshop.

Finally, the participants reset the scene. A large customer of one of the two companies acquired another company in a neighbouring country. The participants said this would likely entail more refurbishment projects in a different business environment. They redefined their shared values in their business relationship: in addition to effectiveness, quality and efficiency, they added employee satisfaction. They stressed the importance of communication between employees, including handbooks and checklists.

Evaluation. The participants remarked that leaders mattered for successful collaboration; when leaders were absent or inactive, it changed the intensity and quality. Furthermore, the participants asked the researchers to make PDPS more practical, i.e., less time-consuming, hands-on, less complicated, and instantly applicable in different situations in daily practice.

4. Discussion

This paper introduced PDPS, a value-based approach to the participatory design of participatory systems and explored its potential in a case study. This section presents the benefits of PDPS, compares PDPS with other approaches, describes the implications, discusses the limitations of our research, and provides directions for further research.

4.1. Benefits

This paper's research question was how to support organisations in building sustainable collaborations in their business relationships. In response, this paper introduced a value-based approach to the participatory design of participatory systems. PDPS is an approach that supports organisations in building sustainable collaborations in their business relationships. The characteristics of this approach are as follows.

Firstly, PDPS actively involves people from different disciplines, departments, and organisational levels with a role in the business relationship. Supported by social media apps, they can easily communicate and share information.

Secondly, PDPS focuses on shared values. Participants agree on the meaning of business-related values that provide common ground to define a joint mission, explore their current situation, and define possible futures for their business relationship. Focusing on shared values enables participants to think about their work relationships and interdependencies rather than their positions and power.

Thirdly, PDPS activates participants to create a continuous process of self-organisation to fulfil their joint mission. Through a participatory design process, participants demonstrate gaining trust, engagement, and empowerment to take ownership of complex issues in their business relationship and undertake joint action.

4.2. Interpretation of the Results

This paper showed that PDPS can support researchers and practitioners in building sustainable collaborations to solve complex issues in business networks. Its application empowers organisations in a business network to create new answers to challenges they have in common. The case study highlighted in this paper demonstrated that the employees of the two business partners were able to:

- Identify their challenges.
- Define a shared mission.
- Develop a shared understanding of the importance of specific values.
- Grade the strength of the values in the current and desired situation.
- Self-organise actions to lift the strength of the values to the desired level.

The business partners took a leap of faith to apply the novel approach under development. Their trust in the capabilities of the researchers, themselves, and each other resulted in them being able to tackle the complex challenges in their business network in a new way. Turning traditional business processes into participatory business processes in the joint projects led them to move beyond traditional values such as economic growth and to develop sustainable solutions for transport and logistics.

The case study showed that focusing on values worked well in terms of describing and improving behaviour in a business relationship. Agreeing on the meaning by themselves, the participants scored the strength of qualitative values such as trust, engagement, and empowerment. Furthermore, they proposed and executed actions, leading to different scores between the subsequent workshops, showing improvement.

The emergence of different forms of self-organisation and collaboration during the workshops, but primarily after the workshops in daily practice across different disciplines, departments, and organisational levels, was shown to work. It resulted in a change in company culture: the employees strove to maintain and improve their relationships, align their daily activities, and simultaneously increase efficiency and sustainability.

Using PDPS changed how the participants interacted and thought about their business relationship. They focused on relationships and interdependencies in their work rather than on their positions and power. They embraced the situation to improve and align daily business processes, leading to better results. The business leaders understood the implications of the approach, namely that it mandated their complete commitment and another way of delegating responsibility within the companies, and they deployed the approach on their own in new situations.

4.3. Comparison with Other Approaches

Researchers have developed different thinking approaches to tackle complex challenges: systems thinking, design thinking, and value-focused thinking. Section 4.3 compares PDPS with these approaches.

4.3.1. Systems Thinking

Systems thinking is about how systems work, what makes them produce results, and how to improve their performance [64]. Policymakers and practitioners have used systems thinking to address environmental, political, social, and economic challenges [64] in different domains.

One example is that of collective action. Collective action focuses on the self-organisation and self-governance of common-pool resources in a viable way, allowing users to supply themselves with new rules, commit to them, and monitor each other's compliance [65]. There are eight design principles [65]:

1. Clearly defined system boundaries and authorised users.
2. Rules tailored to local conditions.
3. Collective-choice arrangements.
4. The mutual monitoring of system conditions and user behaviour.
5. Mutual graduated sanctioning.
6. Quickly accessible, low-cost conflict-resolution mechanisms.
7. Minimal official recognition of the rights of users to organise their institutions.
8. The application of design principles 1 to 7 in multiple layers for nested organisations.

Table 5 shows the relation between the phases of PDPS and the design principles of collective action.

Table 5. Relationship between phases of PDPS and design principles of collective action.

Phase	PDPS	Collective Action
1	Setting the scene	Minimal official recognition of the rights of users to organise their institutions
2	Exploring the current situation	-
3	Defining possible futures	Clearly defined system boundaries and authorised users; tailored rules; collective-choice arrangements
4	Transitioning	The mutual monitoring of system conditions and user behaviour; mutual graduated sanctioning; quickly accessible, low-cost conflict-resolution mechanisms.
5	Consolidating the transition	-

Critical systems thinking [66] is another approach to handling general complexity. Its four pillars are systems thinking, critical awareness, pluralism, and improvement. The four stages of CSP (an acronym for Critical Systems Practice) supporting this way of thinking are [66]:

1. Explore the problem situation.
    a. View the problem from different systemic perspectives (with the central values between brackets):
        i. A machine (coherence, efficacy, and efficiency).
        ii. An organism (viability, resilience, and adaptability).
        iii. A culture (effectiveness, free thinking, and conflict resolution).
        iv. A society or environment (inclusion, equality, and sustainability).
        v. A set of interrelationships (causality between actions and consequences).
    b. Identify primary issues (requiring urgent attention) and secondary issues (that can wait).
2. Produce an appropriate intervention strategy.
    a. Choose an approach.
    b. Choose an appropriate methodology.
    c. Choose suitable models and methods.
    d. Structure, schedule, and set objectives for the intervention.
3. Intervene flexibly.
    a. Stay alert to the evolving situation (and return to stage 1 if necessary).
    b. Monitor the intervention strategy (and return to stage 2 if necessary).
4. Check on progress.
    a. Evaluate the improvements achieved.
    b. Reflect on the intervention strategy.
    c. Discuss and agree on the next steps.

Table 6 shows the relationship between the five phases of PDPS and the four stages of CSP.

Table 6. Relationship between phases of PDPS and stages of CSP.

Phase	PDPS	Critical Systems Practice
1	Setting the scene	-
2	Exploring the current situation	Explore the problem situation
3	Defining possible futures	Produce an appropriate intervention strategy
4	Transitioning	Intervene flexibly
5	Consolidating the transition	Check on progress

Sensemaking is a third approach related to systems thinking. It focuses on the ways people deal with ambiguity: searching for meaning, settling for plausibility, and moving on [67]. Sensemaking tends to occur when the state of the world is not as expected or when

what is happening is or has become unintelligible [67]. Organisation emerges through sensemaking, not the other way around [67]:

1. To make sense of a situation, people look first for known reasons, enabling them to proceed.
2. If this turns out to be problematic, they then either identify substitute action or deliberate further.

Table 7 shows the relationship between the phases of PDPS and sensemaking.

Table 7. Relationship between phases of PDPS and sensemaking.

Phase	PDPS	Sensemaking
1	Setting the scene	Yes
2	Exploring the current situation	Yes
3	Defining possible futures	Yes
4	Transitioning	-
5	Consolidating the transition	-

Theory U is a fourth approach that takes a systems-thinking perspective. This theory aims to support organisations in thinking about a system's personal, relational, and institutional aspects [68]. The theory advocates a journey through five stages to change a system intentionally [68]:

1. **Co-initiating.** Form a core group of key players in a system that can uncover their common intention.
2. **Co-sensing.** Experience the system from a new perspective.
3. **Co-inspiring.** Reflect on the system by accessing deeper levels of knowing.
4. **Co-creating.** Explore the future of the system by doing, using rapid-cycle prototyping.
5. **Co-shaping.** Evolve, sustain, scale, and repeatedly assess changes across the system.

Table 8 shows the relationship between the phases of PDPS and the stages of Theory U.

Table 8. Relation between phases of PDPS and stages of Theory U.

Phase	PDPS	Theory U
1	Setting the scene	Co-initiating
2	Exploring the current situation	Co-sensing; co-inspiring
3	Defining possible futures	Co-creating
4	Transitioning	Co-creating
5	Consolidating the transition	Co-shaping

4.3.2. Design Thinking

Design thinking is an approach to innovation that solves complex problems in a human-centred way at the intersection of technical feasibility, economic viability, and desirability by users [36]. Design thinking follows four rules [36]:

1. All design activity is ultimately social, so take a human-centric point of view.
2. All design is re-design, so understand first how needs have been satisfied in the past.
3. There should always be room for ambiguity, so experiment and allow free thinking.
4. Making ideas tangible always facilitates communication, so create and test prototypes.

Understanding, improving, and applying design thinking in practice entails a five-stage iterative design process [36]:

1. (Re)define the problem.
2. Find needs and benchmark.
3. Generate ideas.
4. Create a prototype.
5. Test the prototype and learn.

Table 9 shows the relationship between the five phases of PDPS and the five stages of design thinking.

Table 9. Relationship between phases of PDPS and stages of design thinking.

Phase	PDPS	Design Thinking
1	Setting the scene	(Re)define the problem
2	Exploring the current situation	Find needs and benchmark
3	Defining possible futures	Generate ideas
4	Transitioning	Create a prototype
5	Consolidating the transition	Test the prototype and learn

4.3.3. Value-Focused Thinking

Value-focused thinking focuses on values before considering alternatives that might achieve them, leading to better decisions [69]. A three-stage approach [70] proposed for designing and implementing a value-driven change in an organisation distinguishes:

1. **Diagnosis and design.** This stage is to understand the problem areas and inform the design of the following stages, together with employees representing various levels, functions, and locations.
2. **Analysis and recommendation.** This stage is to thoroughly review and analyse the data and knowledge assimilated in the first stage to design an organisational change approved by the organisation's leadership.
3. **Execution and change management.** This stage is to execute and manage the approved change, considering the concerns and challenges that employees have put forward.

Organisational values enable employees to identify with the specific professional context and build in organisational proximity [70]. Organisational proximity creates better grounds for professional collaboration, producing better results while overcoming existing organisational barriers.

Table 10 shows the relationship between the phases of PDPS and the three stages of value-based thinking.

Table 10. Relationship between phases of PDPS and stages of a value-based thinking approach.

Phase	PDPS	Value-Based Thinking
1	Setting the scene	-
2	Exploring the current situation	Diagnosis and design
3	Defining possible futures	Analysis and recommendation
4	Transitioning	Execution and change management
5	Consolidating the transition	-

4.4. Limitations

Case studies provide a means to collect empirical evidence on the feasibility of an approach such as PDPS. At the same time, case study results can be hard to replicate and generalise. Furthermore, they may be expensive, time-consuming, and subject to researcher bias and the Hawthorne effect (i.e., the tendency of individuals to modify their behaviour when they know they are being observed, e.g., [71]). However, they provide insights into the applicability of an approach in practice.

Further research is required to investigate whether the findings and contributions of PDPS apply to other business contexts than those in the case studies in our research. In addition, further research needs to validate the contributions of our research for business relationships involving more than two organisations, end customers [72], other types of organisations (e.g., public institutions and communities), and other types of organisational cultures (e.g., hierarchical, creative, and competitive). Furthermore, the number of interviews, the criteria for selecting interviewees, the number of workshop participants,

the criteria for selecting participants, the duration of workshops, and the time between workshops may all affect the results.

4.5. Directions for Future Research

The focus of this study was on a single business relationship; a relationship between two businesses. A business relationship in a network is a dynamic connection between business, ecological, and social partners, allowing for social innovation [73]. For instance, transitioning to climate-neutral economies, managing demographic shifts, and maintaining freshwater supply and food security are global challenges requiring sustainable collaboration between many parties [74]. Exploring the potential for PDPS to support the emergence of new forms of interaction and organisation across a network is a topic for future research.

Another challenge for future research is to understand the necessary conditions for application. This paper mentioned some of these conditions, namely trust, the willingness of the participants to change, and managerial support for change. Understanding these conditions will enable businesses to know when they can best apply PDPS and when not.

Furthermore, research is needed to explore ways to measure the success of self-organised initiatives and interventions over time. Measurement will provide insight into how PDPS has enabled change and self-organisation to emerge. Measurement would also inform participants on which topics or subjects they should focus on in the emerging communities of practice [75].

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Research Ethics Committee of TU Delft (protocol code 2755; 17 February 2023).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The fully anonymised data presented in this study are available in the Appendix A.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Appendix A.1. Questions for Interviews

The mission in the current situation:

1. How do you define 'service level'? What are the various aspects of 'service level'?
2. How do you evaluate the current service level from your point of view?
3. How do you define efficiency? What are the influential factors on efficiency?
4. How do you evaluate the current efficiency level?

Social interactions in the current situation:

1. How do you define your responsibility?
2. To whom are you related? On who do you depend? Who depends on you?
3. What are your business relationships (e.g., negotiation, joint decision-making, cooperation, collaboration, conflicts, reconciliation, etc.)?

4. How are your relationships? How do you evaluate them? What do you think of them? How do you feel about them?
5. When are you related to others? How long do your relationships last?
6. How often do you repeat your relationships?
7. Where are you related to others (physical, virtual)?
8. How do you evaluate relations with the business partner(s)?

Technical interactions in the current situation:

1. What is your role? What are your actions (e.g., ordering, information sharing, services, financial transactions, etc.)?
2. What actions influence yours? What actions are influenced by yours?
3. When do you do your actions? How long do they take? How often do you repeat them?
4. Where do you do your actions?
5. How do you evaluate actions with business partners?

The mission in the desired situation:

1. What do you think of the service level in the desired situation?
2. What do you think of the efficiency in the desired situation?

Social interactions in the desired situation:

1. Social interactions between you and others (regarding quality, time, and place)?
2. Social interactions with business partners (regarding quality, time, and place)?

Technical interactions in the desired situation:

1. Actions between you and others?
2. Actions with business partners (regarding quality, time, and place)?

Pathways for transitioning:

1. How can we improve performance in terms of social interactions?
2. How can we improve performance in terms of technical interactions?

Participation in transitioning:

1. What do you think of the present level of participation in improving performance (relations, actions, time, place)?
2. How can participation improve performance (relations, actions, time, place)?
3. How can we create participation in improving performance?

Appendix A.2. Introduction to Systems Thinking

1. Soft systems thinking
    a. Decentralised governance to accomplish the mission.
    b. Participants accept a role and make local decisions.
2. Hard systems thinking
    a. Distributed resource orchestration to accomplish the mission.
    b. Participants search, plan, and control resources required for their actions.
3. Socio-technical systems
    a. A network approach to accomplish the mission.
    b. Participants relate themselves to the network and act accordingly.
4. Open systems
    a. Taking internal and external dynamics into account to accomplish the mission.
    b. Participants have comprehensive local knowledge about internal and external dynamics influencing them.

5. Dynamic systems
    a. A resilient solution (e.g., robust, agile, and flexible) to accomplish the mission.
    b. Participants, if necessary, respond to changes immediately and rationally because of more local comprehensive knowledge about the dynamics.

Appendix A.3. Questions on the Current Situation

1. What is the current micro-environment, and what are its trends?
    a. The network of business partners.
2. What is the current meso-environment, and what are its trends?
    a. Market.
    b. Competition.
3. What are the current macro-environment forces and their trends?
    a. Political.
    b. Economic.
    c. Social.
    d. Technological.
    e. Environmental.
    f. Legal.
4. What is the current function of the business network?
    a. Values.
    b. Mission.
    c. Vision.
    d. Objectives.
5. What is the current behaviour of the business network?
    a. Participation:
        i. Trust.
        ii. Engagement.
        iii. Empowerment.
    b. Resilience:
        i. Robustness.
        ii. Adaptiveness.
        iii. Transformability.
6. What is the current structure of the business network?
    a. Social.
    b. IT.
    c. Technical.
7. What are the current resources for the business network?
    a. Tangible assets.
    b. Intangible assets.
8. How is the governance of the business network currently arranged?
    a. Rules.
    b. Regulations.
    c. Contracts, arrangements, etc.
    d. Cultural elements.

Appendix A.4. Questions on Possible Futures

1. What is the desired micro-environment?
    a. The network of business partners.
2. What is the desired meso-environment?
    a. Market.
    b. Competition.
3. What are the desired macro-environment forces?
    a. Political.
    b. Economic.
    c. Social.
    d. Technological.
    e. Environmental.
    f. Legal.
4. What is the desired function of the business network?
    a. Values.
    b. Mission.
    c. Vision.
    d. Objectives.
5. What is the desired behaviour of the business network?
    a. Participation:
        i. Trust.
        ii. Engagement.
        iii. Empowerment.
    b. Resilience:
        i. Robustness.
        ii. Adaptiveness.
        iii. Transformability.
6. What is the desired structure of the business network?
    a. Social.
    b. IT.
    c. Technical.
7. What are the desired resources for the business network?
    a. Tangible assets.
    b. Intangible assets.
8. What is the desired governance of the business network?
    a. Rules.
    b. Regulations.
    c. Contracts, arrangements, etc.
    d. Cultural elements.

Appendix A.5. Questions on Transitioning

To get to the desired state:

1. What needs to change?
2. How can we do that?
3. When should it happen?
4. Who should do it, and what is the commitment?

Appendix A.6. Introductory Workshop

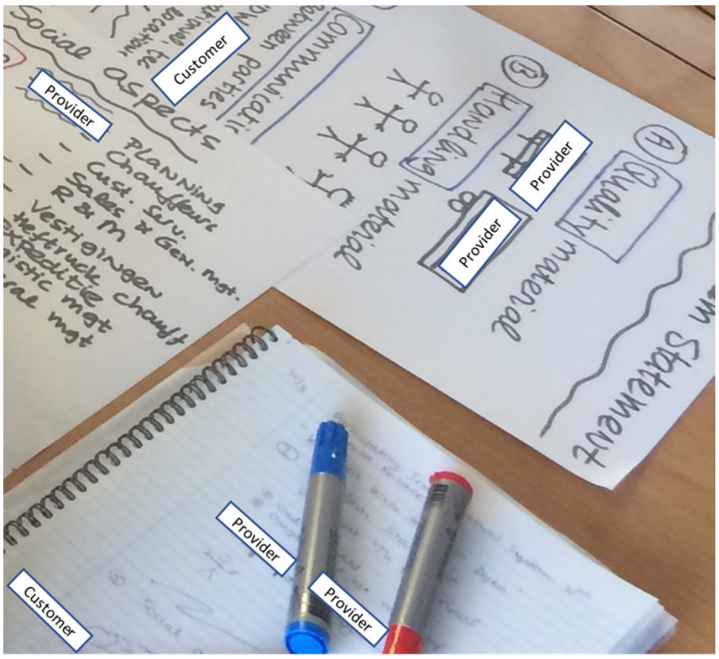
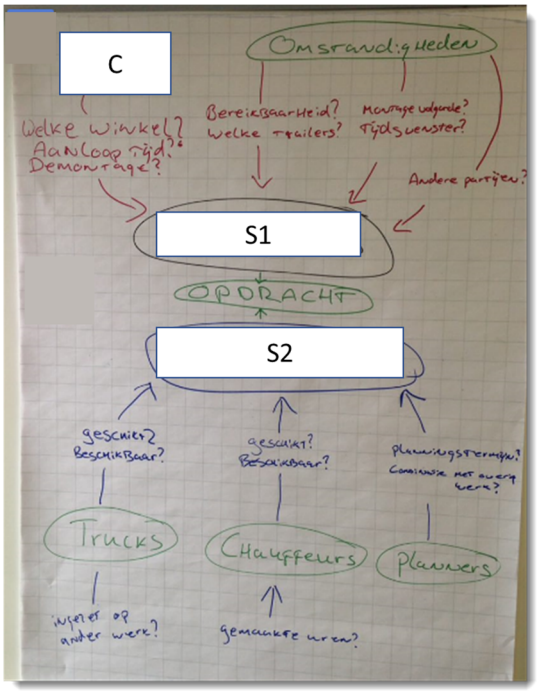


Figure A1. Some of the flip-over sheets produced in the introductory workshop (with texts in Dutch and English and names covered for privacy reasons). (Original photo taken by one of the facilitators during the workshop).

Appendix A.7. Workshop 1



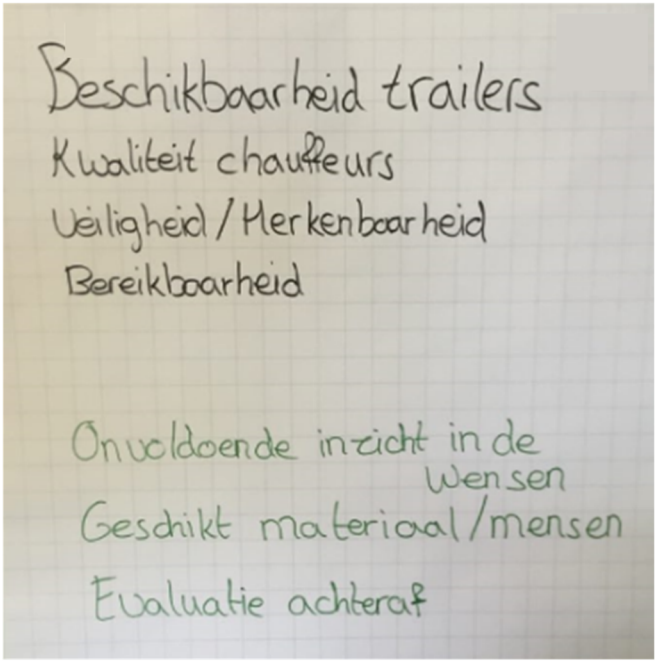


Figure A2. *Cont.*

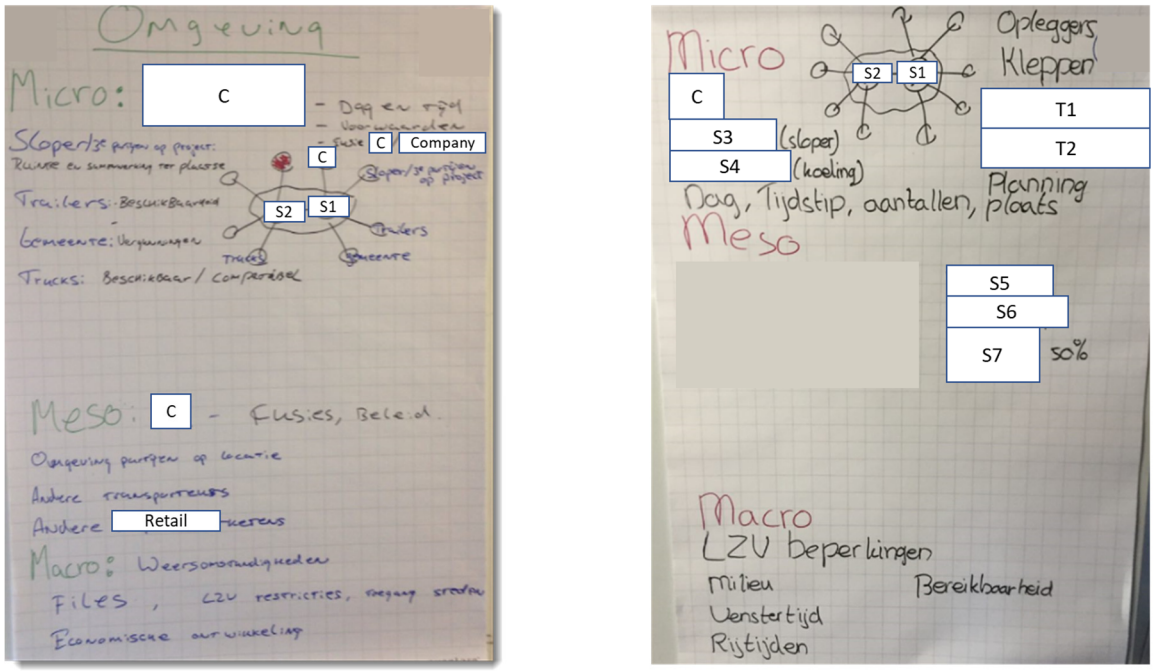


Figure A2. Flip-over sheets produced in workshop 1 on the current environment of the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side. Texts are in Dutch, and names are covered for privacy reasons. The label 'C' denotes the customer in the business relationship, and the labels starting with 'S' denote suppliers and competitors in the business relationship. (Original photos taken by one of the facilitators during the workshop).

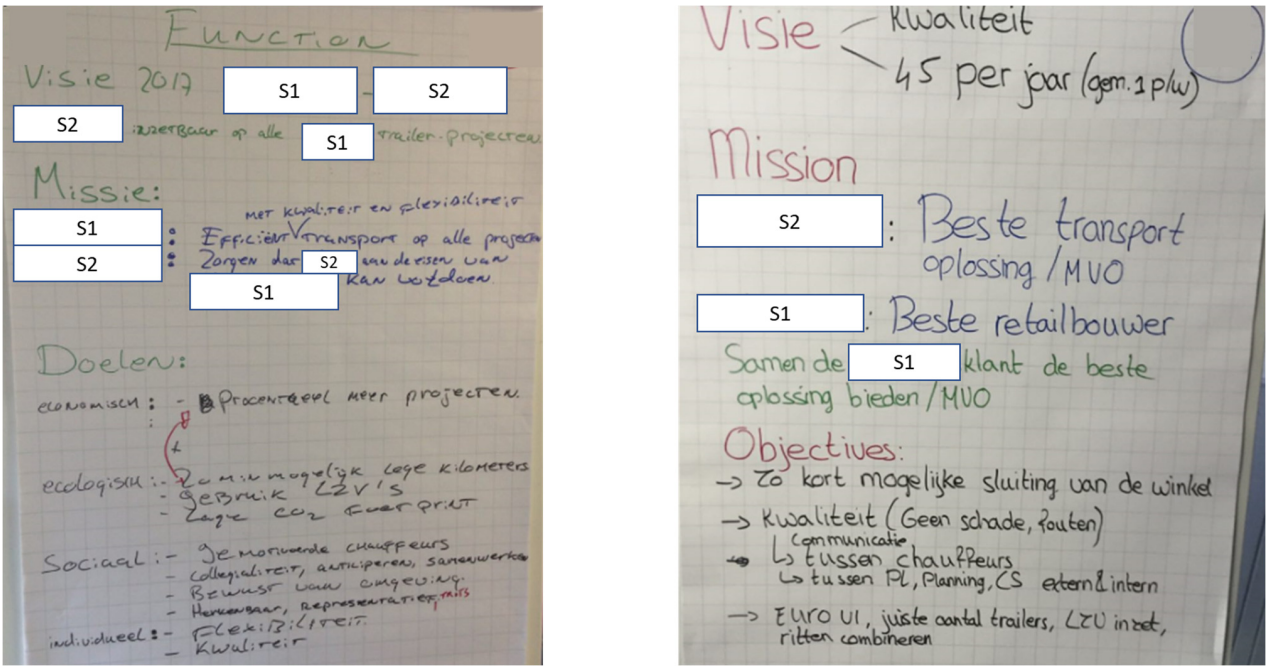


Figure A3. Flip-over sheets produced in workshop 1 on the current function of the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side. Texts are in Dutch, and names covered for privacy reasons. The label 'C' denotes the customer in the business relationship, the labels starting with 'T' denote truck brands, and the labels starting with 'S' denote the suppliers in the business relationship (S1 to S4) and their competitors (S5 to S7). (Original photos taken by one of the facilitators during the workshop).

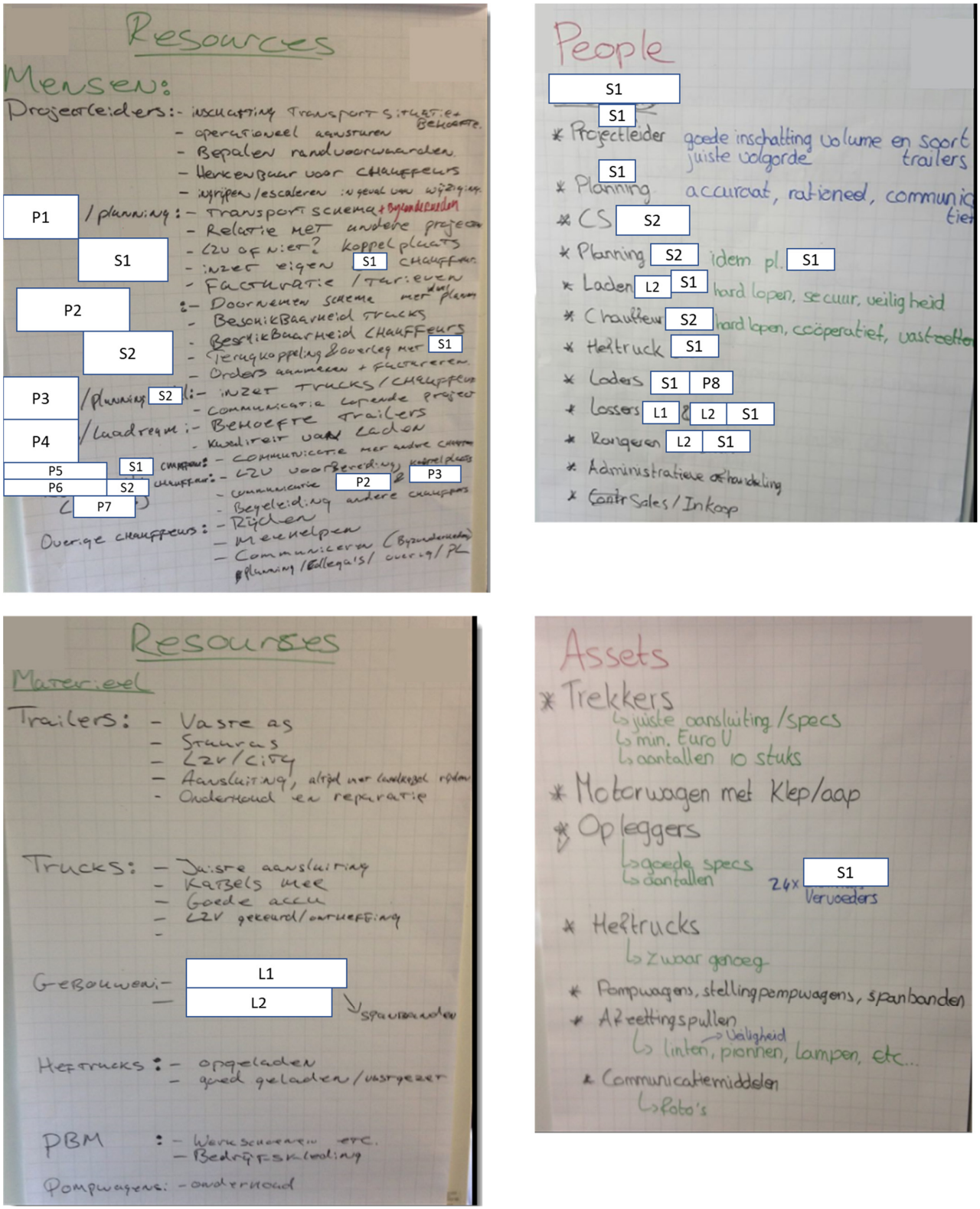


Figure A4. Flip-over sheets produced in workshop 1 on the current resources in the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side. Texts are in Dutch, and English and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, the labels starting with 'P' denote persons acting in the business relationship, and the labels starting with 'L' denote the supplier locations in the business relationship. (Original photos taken by one of the facilitators during the workshop).

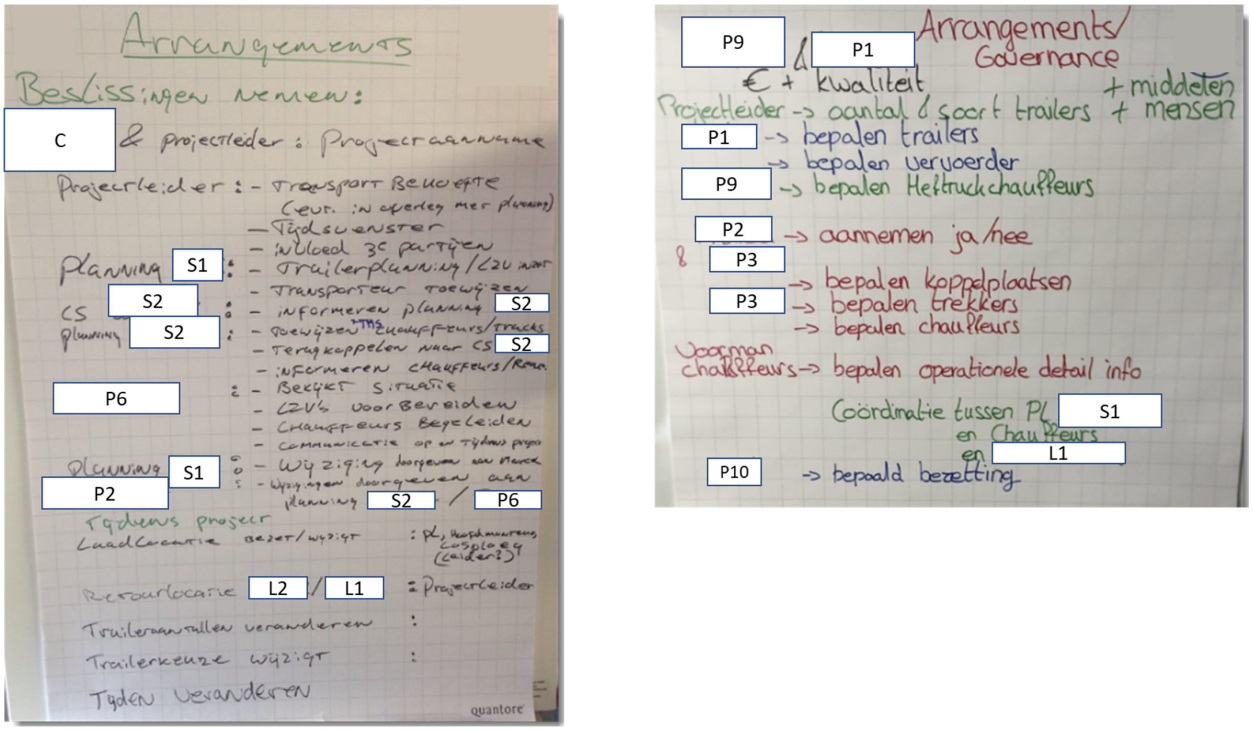


Figure A5. Flip-over sheets produced in workshop 1 on the current arrangements in the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, the labels starting with 'P' denote persons acting in the business relationship, and the labels starting with 'L' denote the supplier locations in the business relationship. (Original photos taken by one of the facilitators during the workshop).

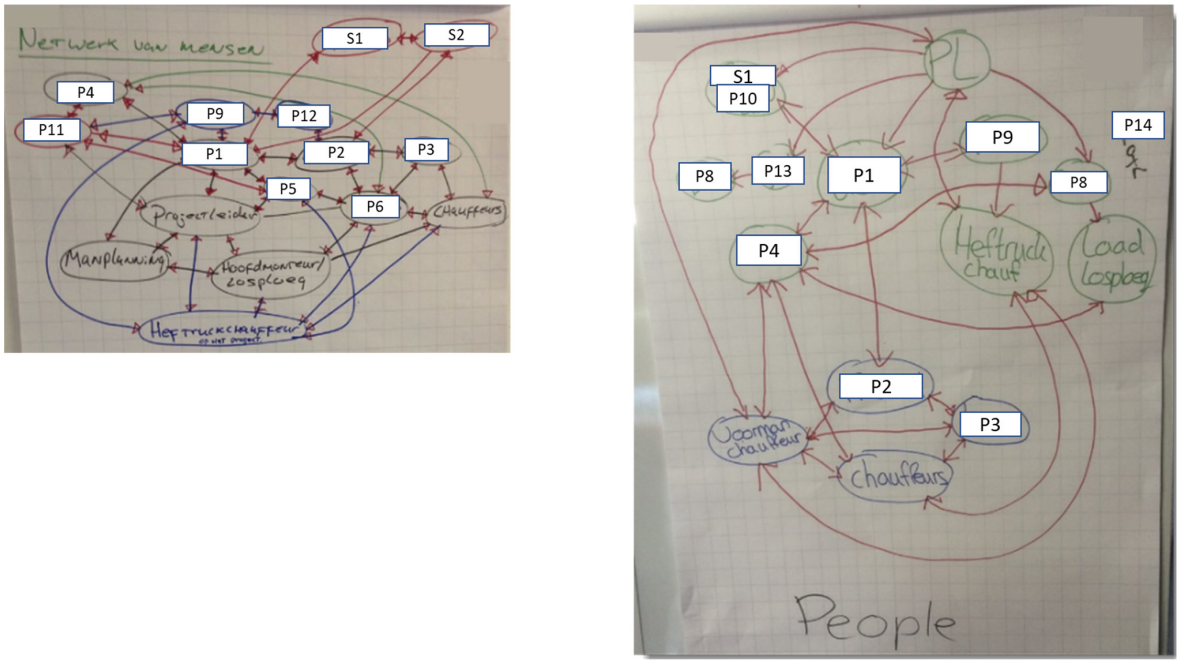


Figure A6. Flip-over sheets produced in workshop 1 on the current people network in the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side.

Texts are in Dutch and English, and names are covered for privacy reasons. The label 'S1' denotes one of the suppliers in the business relationship, and the labels starting with 'L' denote the locations in the business relationship. (Original photos taken by one of the facilitators during the workshop).

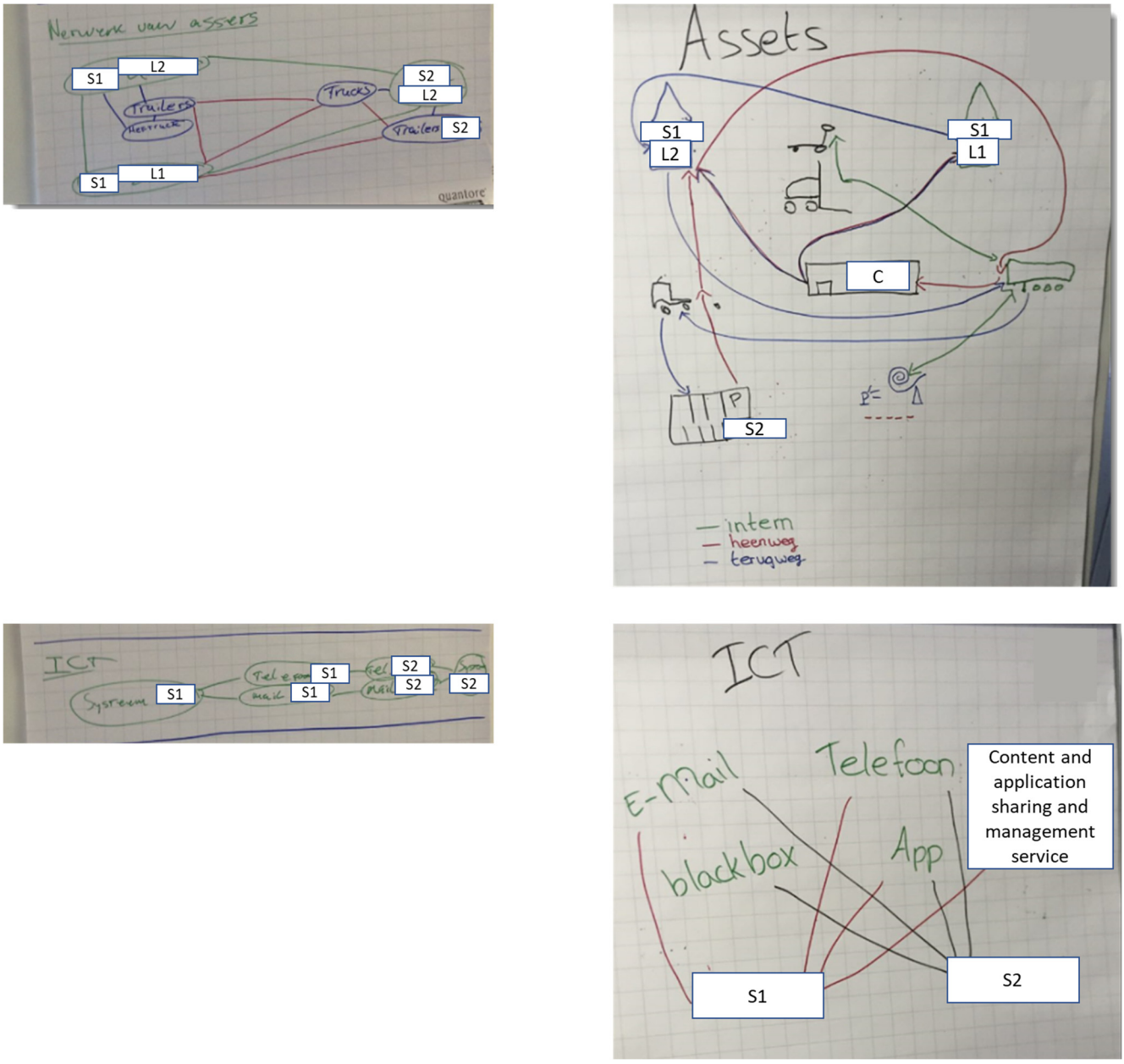


Figure A7. Flip-over sheets produced in workshop 1 on the current asset and ICT networks in the business relationship. Group 1's results are on the left-hand side and group 2's results on the right-hand side. Texts are in Dutch and English, and names are covered for privacy reasons. The label 'C' denotes the customer in the business relationship, the labels starting with 'S' denote the suppliers in the business relationship, and the labels starting with 'L' denote the supplier locations in the business relationship. (Original photos taken by one of the facilitators during the workshop).

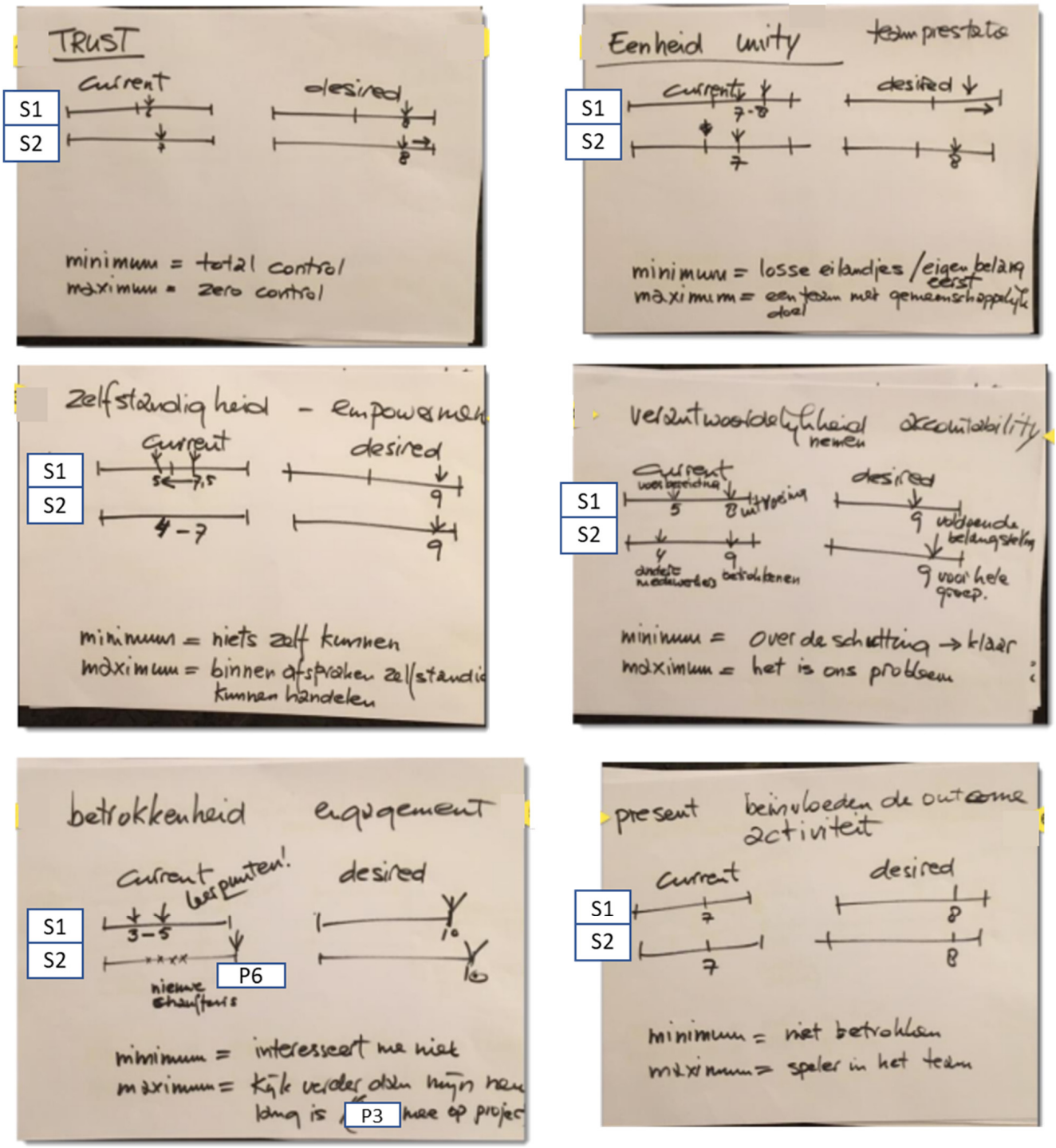


Figure A8. Flip-over sheets produced in workshop 1 on assessments of the current and desired social values for the business relationship. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original photos taken by one of the facilitators during the workshop).

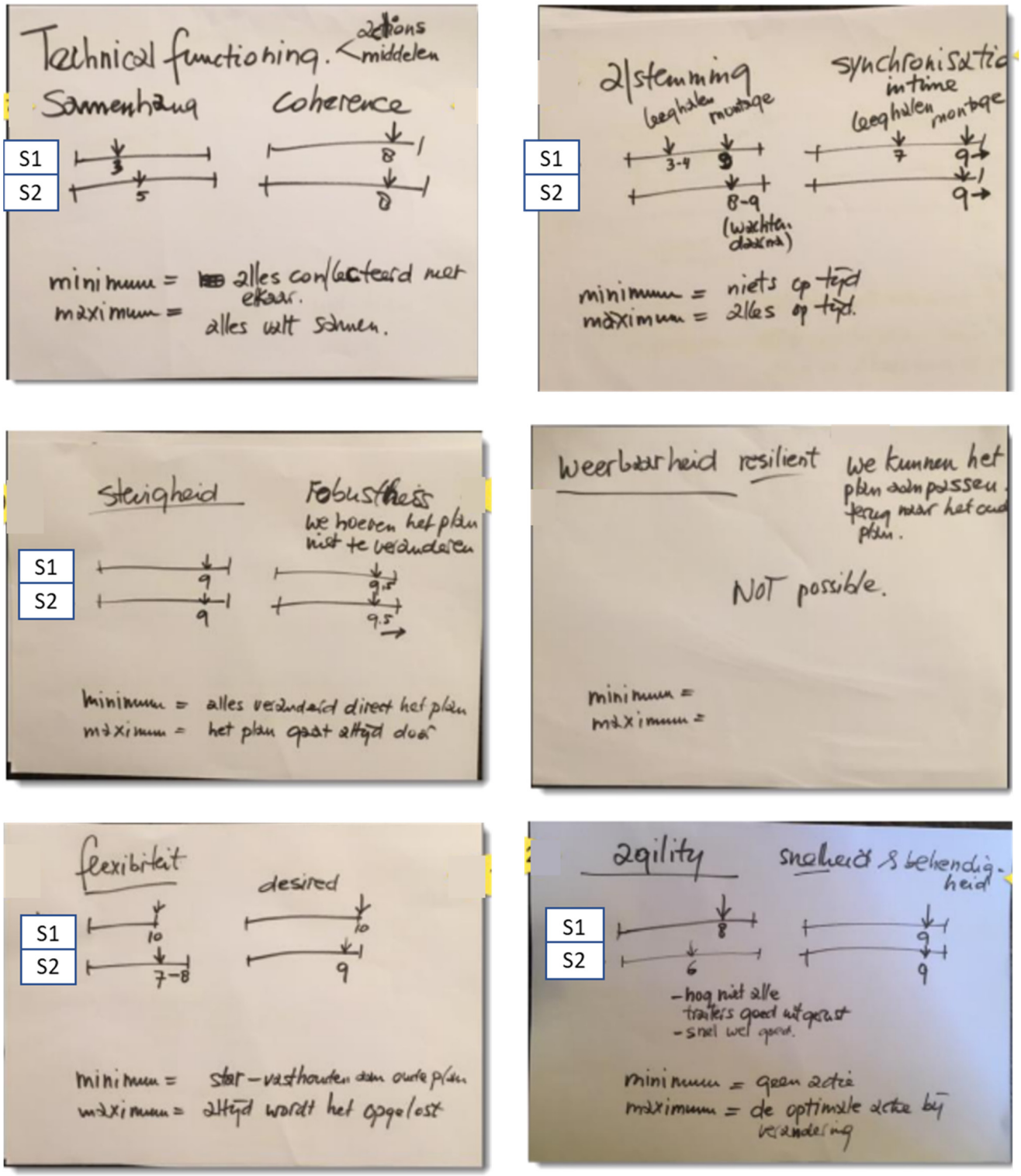


Figure A9. Flip-over sheets produced in workshop 1 on assessments of the current and desired technical values for the business relationship. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship. (Original photos taken by one of the facilitators during the workshop).

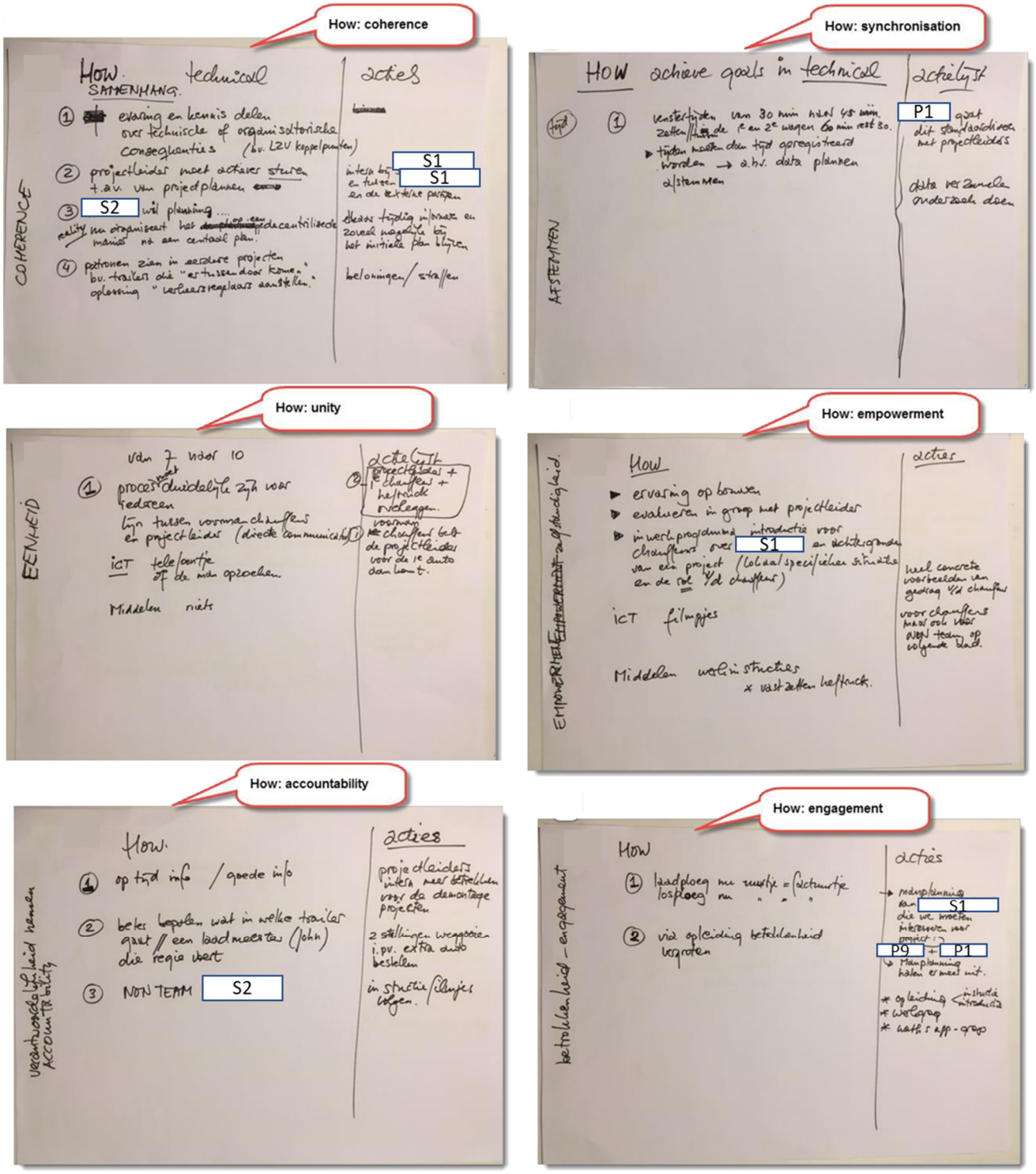


Figure A10. Flip-over sheets produced in workshop 1 on possible futures of the business relationship. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship. (Original photos taken by one of the facilitators during the workshop).

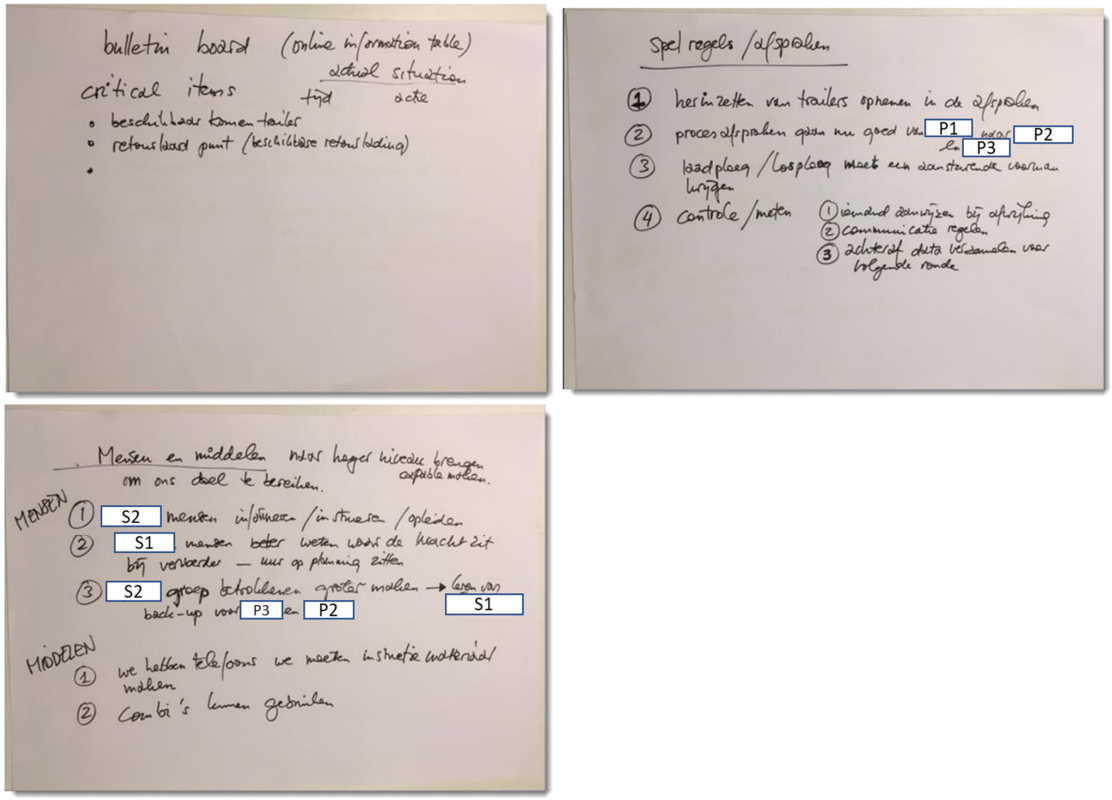


Figure A11. Flip-over sheets produced in workshop 1 on actions to reach desired states of the business relationship. Texts are in Dutch and English, and names are covered for privacy reasons. Clockwise from top-left to bottom-right: bulletin board, rules of play, and people and means. The labels starting with 'S' denote the suppliers in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original photos taken by one of the facilitators during the workshop).

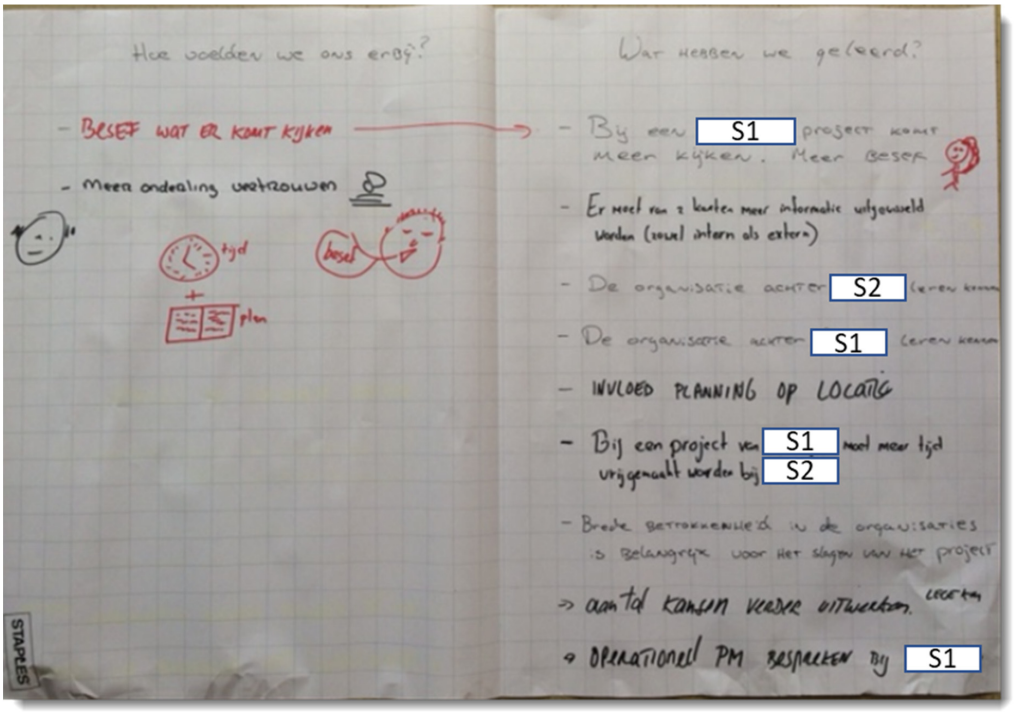


Figure A12. *Cont.*

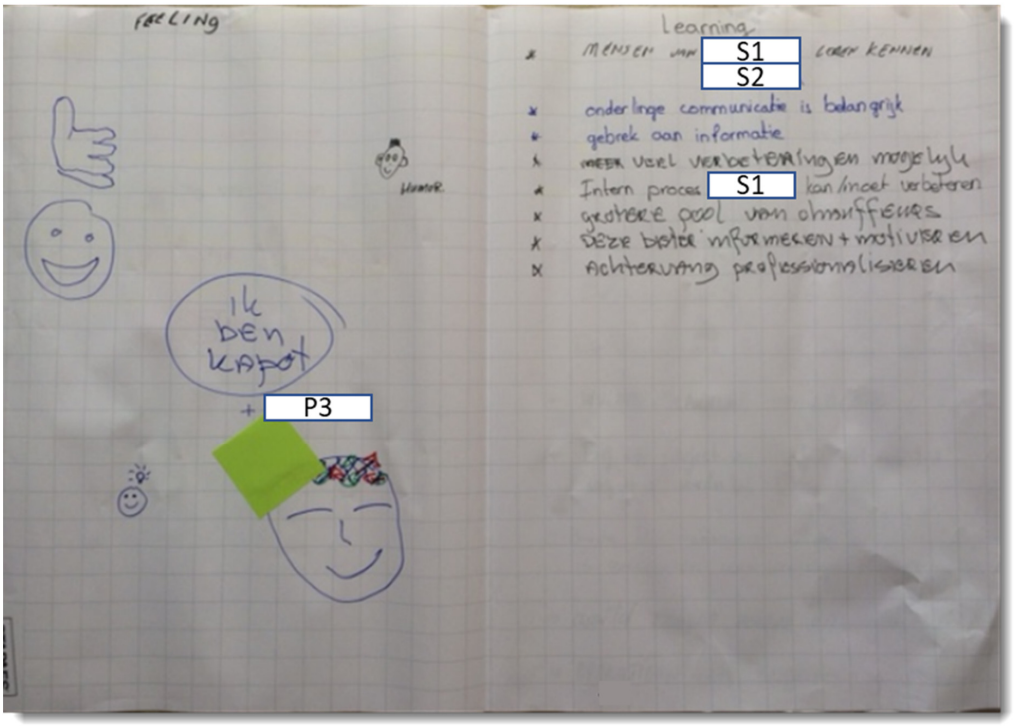
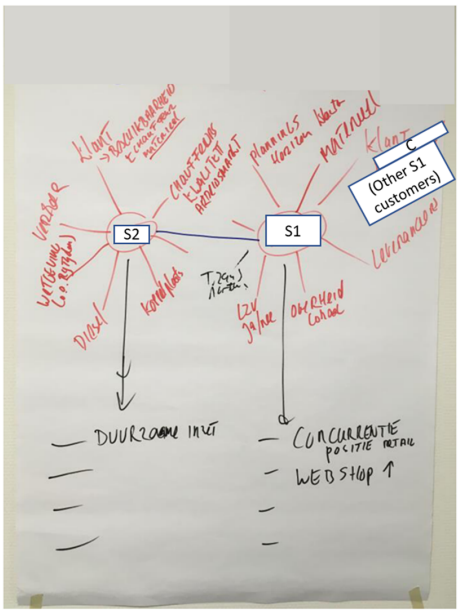


Figure A12. Flip-over sheets produced in workshop 1 on the workshop evaluation by the participants. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, and the label 'P3' denotes a participant. (Original photos taken by one of the facilitators during the workshop).

Appendix A.8. Workshop 2



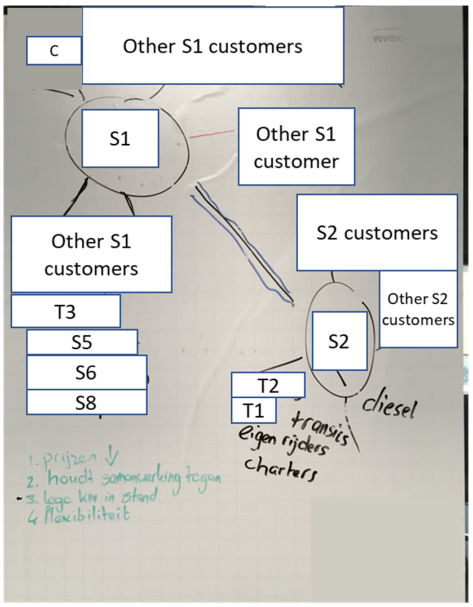


Figure A13. *Cont.*

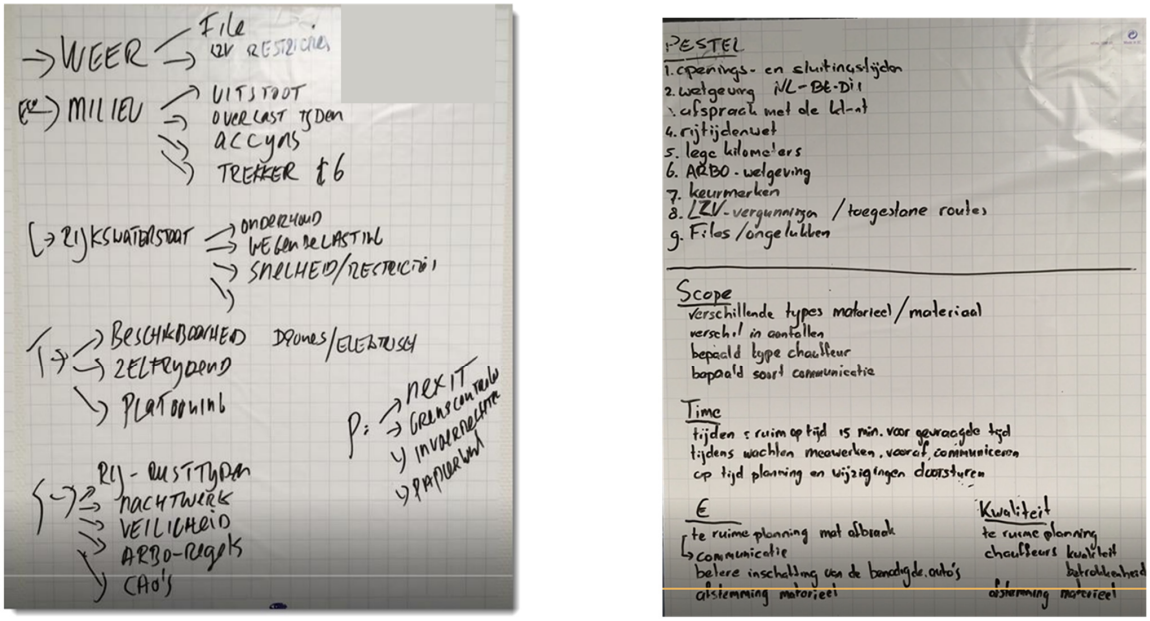


Figure A13. Flip-over sheets produced in workshop 2 on the current environment of the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch, and names are covered for privacy reasons. The label 'C' denotes the customer in the business relationship, the labels starting with 'S' denote suppliers and competitors in the business relationship. (Original photos taken by one of the facilitators during the workshop).

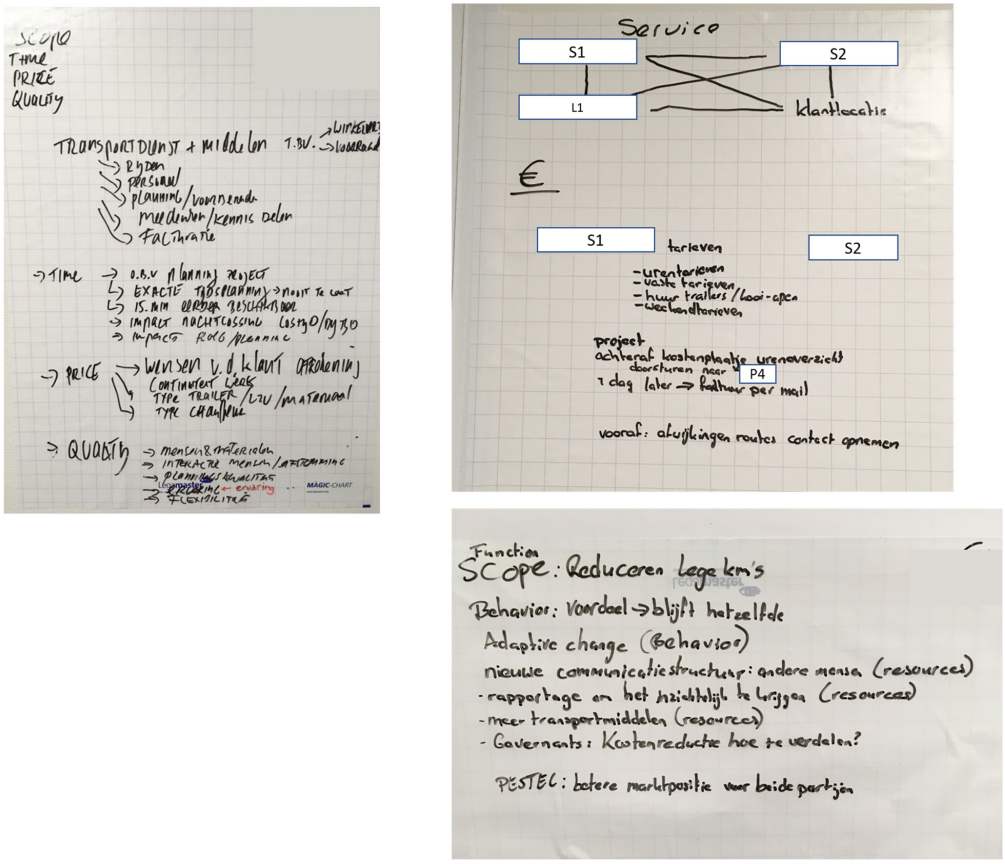


Figure A14. Flip-over sheets produced in workshop 2 on the current function of the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side.

Texts are in Dutch and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, and the label 'P4' denotes a person acting in the business relationship. (Original photos taken by one of the facilitators during the workshop).

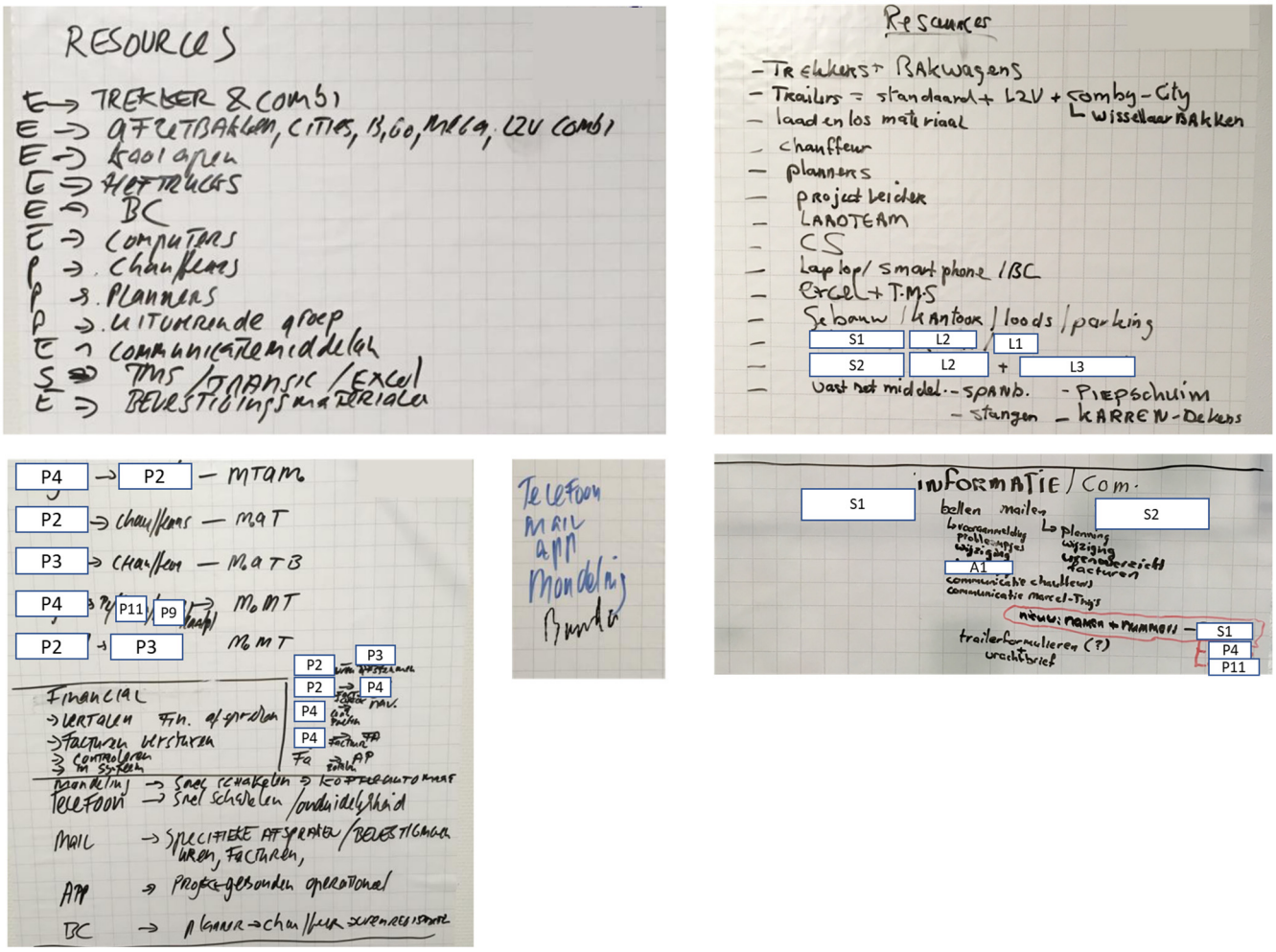


Figure A15. Flip-over sheets produced in workshop 2 on the current resources in the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote the suppliers in the business relationship, the labels starting with 'L' denote supplier locations in the business relationship, the labels starting with 'P' denote persons acting in the business relationship, and the label 'A1' denotes a social media app. (Original photos taken by one of the facilitators during the workshop).

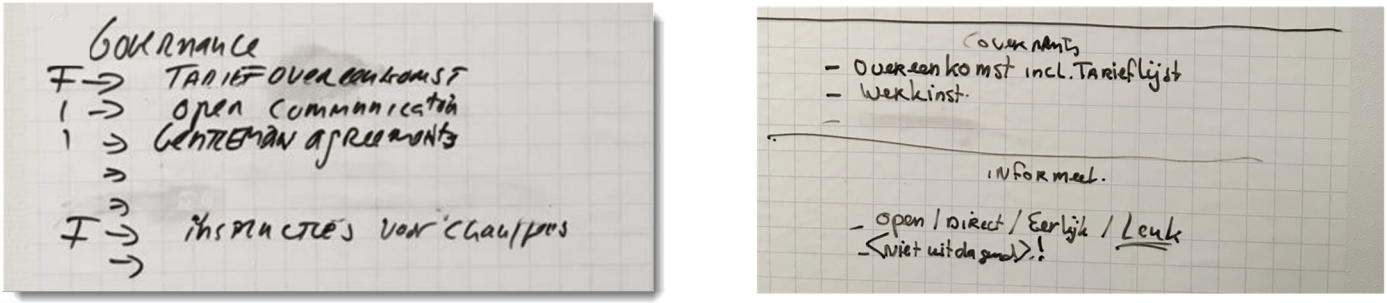


Figure A16. Flip-over sheets produced in workshop 2 on the current arrangements in the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side.

Texts are in Dutch and English. (Original photos taken by one of the facilitators during the workshop).

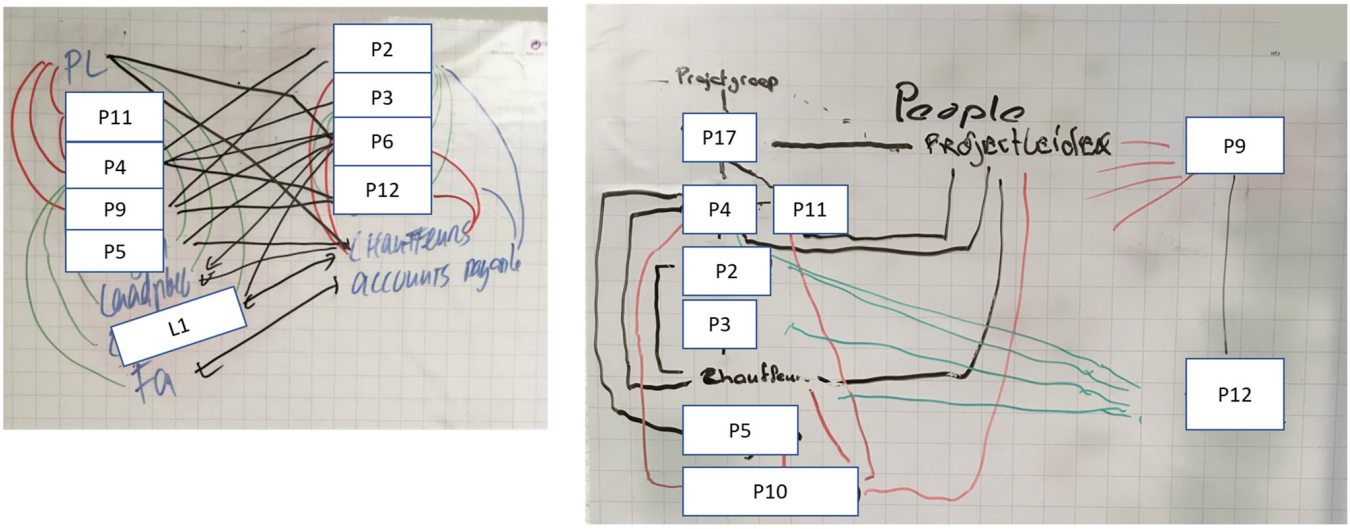


Figure A17. Flip-over sheets produced in workshop 2 on the current people network in the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch, and names are covered for privacy reasons. The labels starting with 'P' denote persons in the business relationship, and the label 'L1' denotes a supplier location in the business relationship. (Original photos taken by one of the facilitators during the workshop).

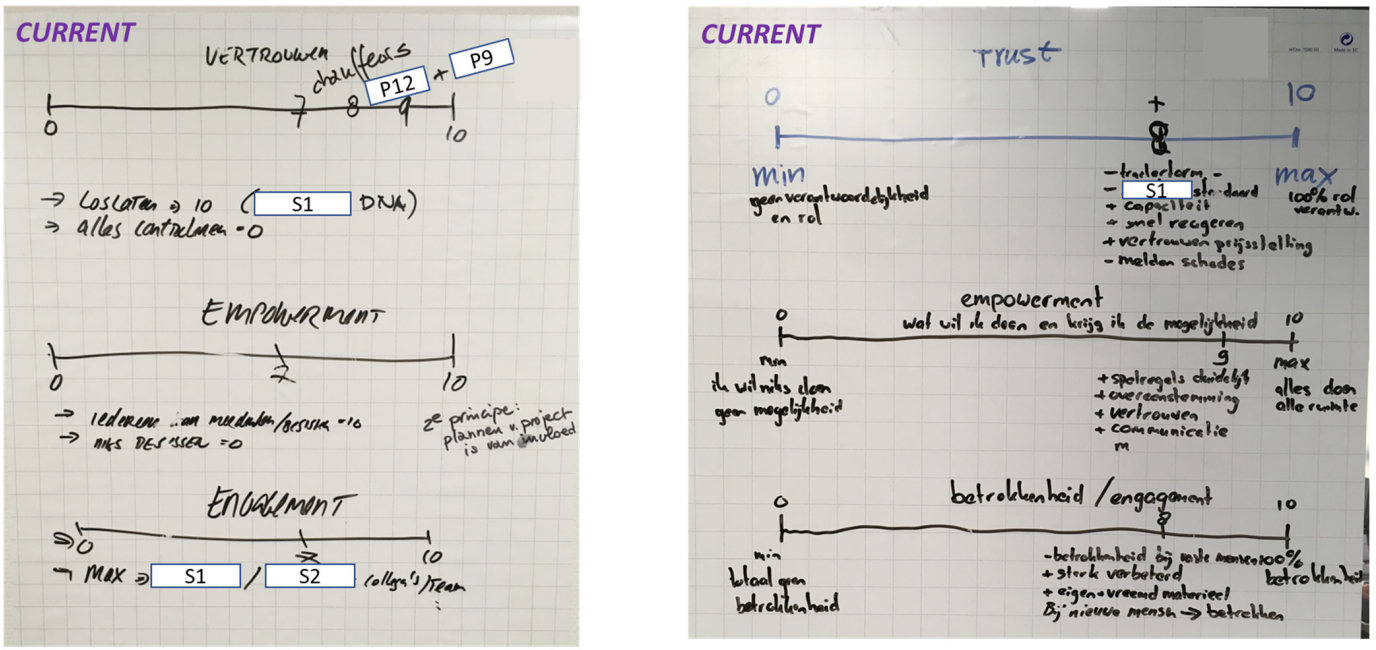


Figure A18. *Cont.*

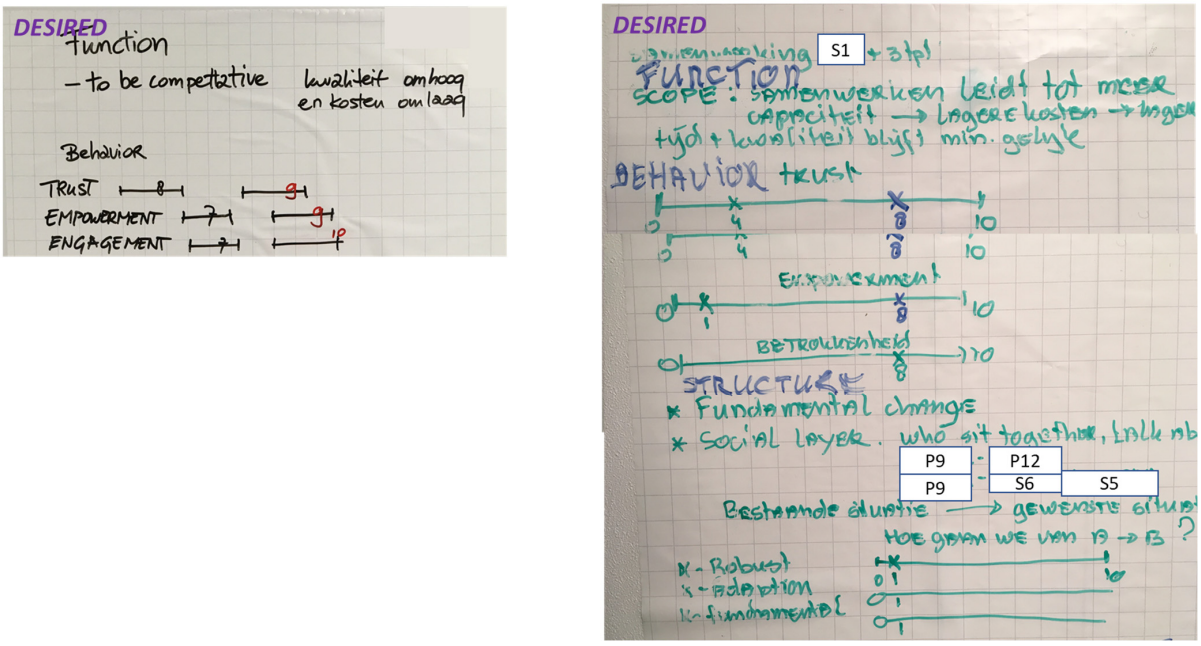


Figure A18. Flip-over sheets produced in workshop 2 on assessments of the current and desired social values for the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote suppliers and competitors in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original photos taken by one of the facilitators during the workshop).

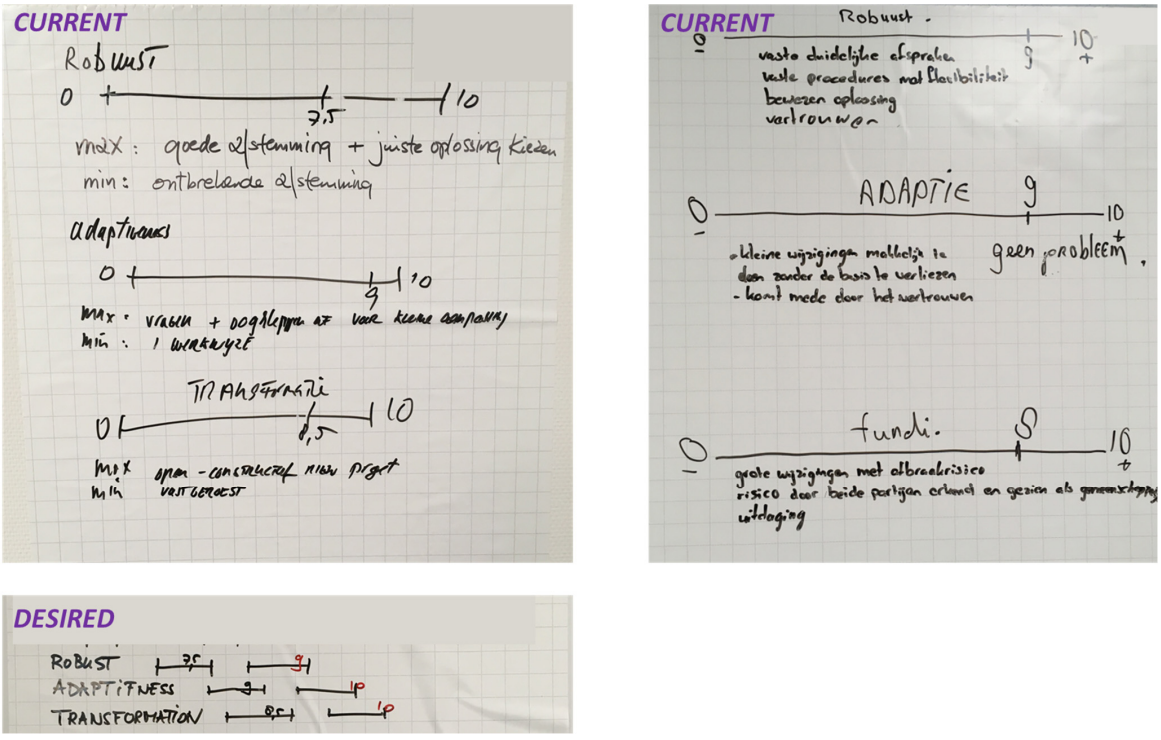


Figure A19. Flip-over sheets produced in workshop 2 on assessments of the current and desired technical values for the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch and English. (Original photos taken by one of the facilitators during the workshop).

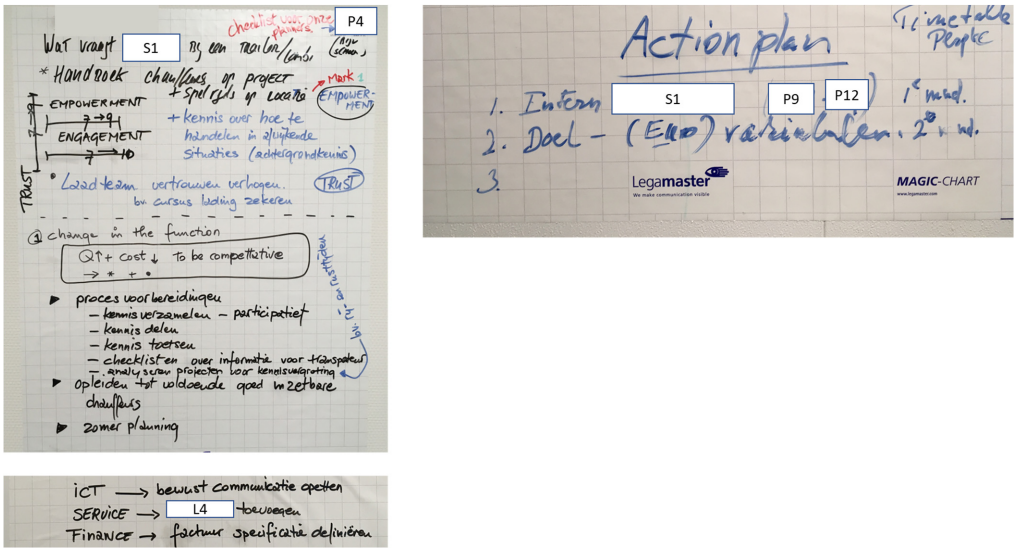


Figure A20. Flip-over sheets produced in workshop 2 on actions to transition to desired states in the business relationship. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'P' denote persons acting in the business relationship, the label 'S1' denotes a supplier in the business relationship, and the label 'L4' denotes a supplier location in the business relationship. (Original photos taken by one of the facilitators during the workshop).

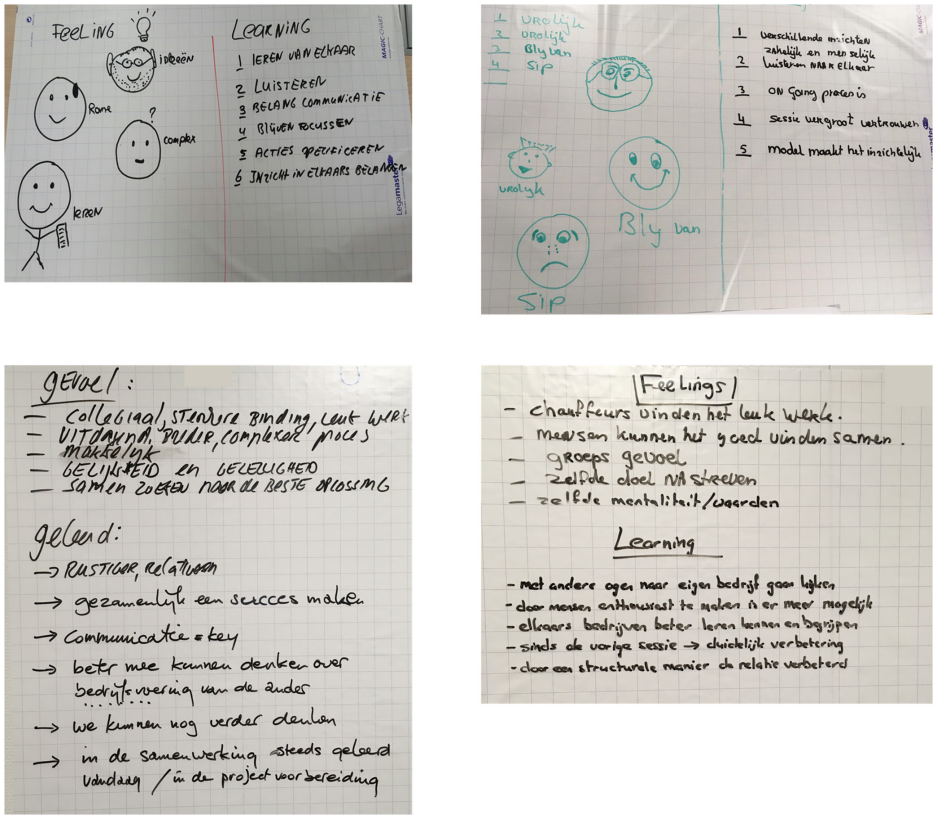


Figure A21. Flip-over sheets produced in workshop 2 on the workshop evaluation by the two groups. Group A's results are on the left-hand side and group B's results on the right-hand side. Texts are in Dutch and English. (Original photos taken by one of the facilitators during the workshop).

Appendix A.9. Preparation of Workshop 3

Item	speerpunten / focal points	acties / actions	middelen / resources	when	wie / whom
Vertrouwen	1. Ruis elimineren 2. Informatie delen; terugkoppeling geven; zorgen dat betrokkenen geïnformeerd zijn 3. Spelregel: ieder pakt zijn rol >> empowerment 4. Zorgen voor flexibiliteit bij het inzetten van mensen en materieel 5. Laadteam meer zelfvertrouwen geven	1. app-groepen per project 2. P1 communiceert met de voorman-chauffeur 3. Afwijkingen melden 4. Foto's en maten ter illustratie 5. De groep gekwalificeerde chauffeurs vergroten naar 24 6. Het aantal geschikte trekkers uitbreiden naar 12 7. "Ja, het wordt geregeld"	>> telefoons met camera's >> telefoons met A1 of A2 >> genoeg trekkers met hefschotels >> getrainde chauffeurs		
Eenheid / samenhang van 7 naar 10	1. het proces in een project moet duidelijk zijn voor iedereen 2. een directe communicatielijn tussen voormanchauffeur en de projectleider	1. vorm en spelregels bedenken voor communicatie tussen projectleider, voorman-chauffeur, heftruck-chauffeur; bijvoorbeeld: de voormanchauffeur belt de projectleider voordat de 1e auto aankomt.	niets speciaals		
Zelfstandigheid / in staat zijn	1. ervaring opbouwen 2. evalueren in de groep met de projectleiders 3. inwerkprogramma voor chauffeurs met een goed introductie op de achtergrond van S1 en de kenmerken van de projecten (lokaal-specifieke situaties en introductie op de rol van de chauffeur 4. les over vastzetten van de heftruck	Heel concrete voorbeelden maken van het gewenste gedrag voor chauffeurs maar ook voor medewerkers die niet direct deelnemen aan projecten (NON-team) 8. Cursus lading zekeren organiseren	filmpjes werkinstructies handboek checklists		P9 : handboek P4 : checklists
Verantwoordelijkheid nemend	1. goede info en op tijd informeren 2. beter bepalen wat in welke trailer gaat; plus een laadmeester die de regie voert P15 3. Medewerkers bij S2 die niet deelnemen aan een project wel voldoende informeren	1. projectleiders van S1 meer betrekken voor de organisatie van de demontage projecten 2. stellingen weggooien ipv een extra auto inzetten 3. Discard better propositions bets instead of an extra car			
Betrokkenheid	1. S1 laad/losploegen nu gericht op uurtje = factuurtje; 2. via opleiding betrokkenheid vergoten	1. Manplanning P8 interesseren voor projecten (Manplanning haalt er meer uit) 2. goede opleiding samenstellen 3. alle betrokkenen deel laten nemen aan introductie programma	> werkgroep > A2 groep		1. P9, P1 2. P9 P16 3. P9 P12
Present	niet gedefinieerd	1. Intern S1 Time talk met betrokkenen 2. Doel (Eko) variabelen	1e maand 2e maand		P9 en P12

Figure A22. Spreadsheet prepared for workshop 3, with a draft transition scheme for social aspects. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote suppliers in the business relationship, the labels starting with 'A' denote social media apps used in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original spreadsheet prepared by the facilitators before the workshop).

Item	speerpunten/ focal points	acties/ actions	middelen/ resources	when	wie/ whom
Samenhang	1. Ervaring en kennis delen over technische en organisatorische consequenties (bv LZV koppelpunten) 2. Projectleider moet actiever sturen mbt de projectplannen 3. S2 zou het liefst het huidige decentrale projectplan omgezet zien naar een centrale projectplanning 4. Eerdere projecten analyseren en hierin patronen vinden; bv het effect van trailers die 'ertussendoor komen', of bv het effect zien van 'verkeersregelaars'	1. Zorgen voor project samenhang intern bij S1 en tussen S1 en externe partijen 2. Elkaar tijdig informeren en zoveel mogelijk bij het initiële plan blijven 3. Spelregels voor belonen en straffen			
Afstemming	1. Venstertijden van nu 30 minuten naar 45 minuten verlengen; tussen de 1e en de 2e wagen de venstertijd op 60 minuten zetten 2. Eerdere projecten analyseren op venstertijden en hieruit een goede strategie destilleren	1. P1 gaat een plan voor de venstertijden met de projectleiders maken 2. Data verzamelen en onderzoek doen			
Stevigheid	niet gedefinieerd				
Weerbaarheid	niet gedefinieerd				
Flexibiliteit	niet gedefinieerd				
Snelheid/be-hendigheid	1. Trekkers goed uitrusten om daarmee voldoende snel te kunnen schakelen 2. Sneller leren; bv bij vragen direct bellen/ overleggen met de voorman-chauffeur	1. S2 inventariseert het materieel 2. S1 inventariseert de schakelbaarheid aan de S1 trailers			

Figure A23. Spreadsheet prepared for workshop 3, with a draft transition scheme for technical aspects. Texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote suppliers in the business relationship, and the label 'P1' denotes a person acting in the business relationship. (Original spreadsheet prepared by the facilitators before the workshop).

Appendix A.10. Workshop 3

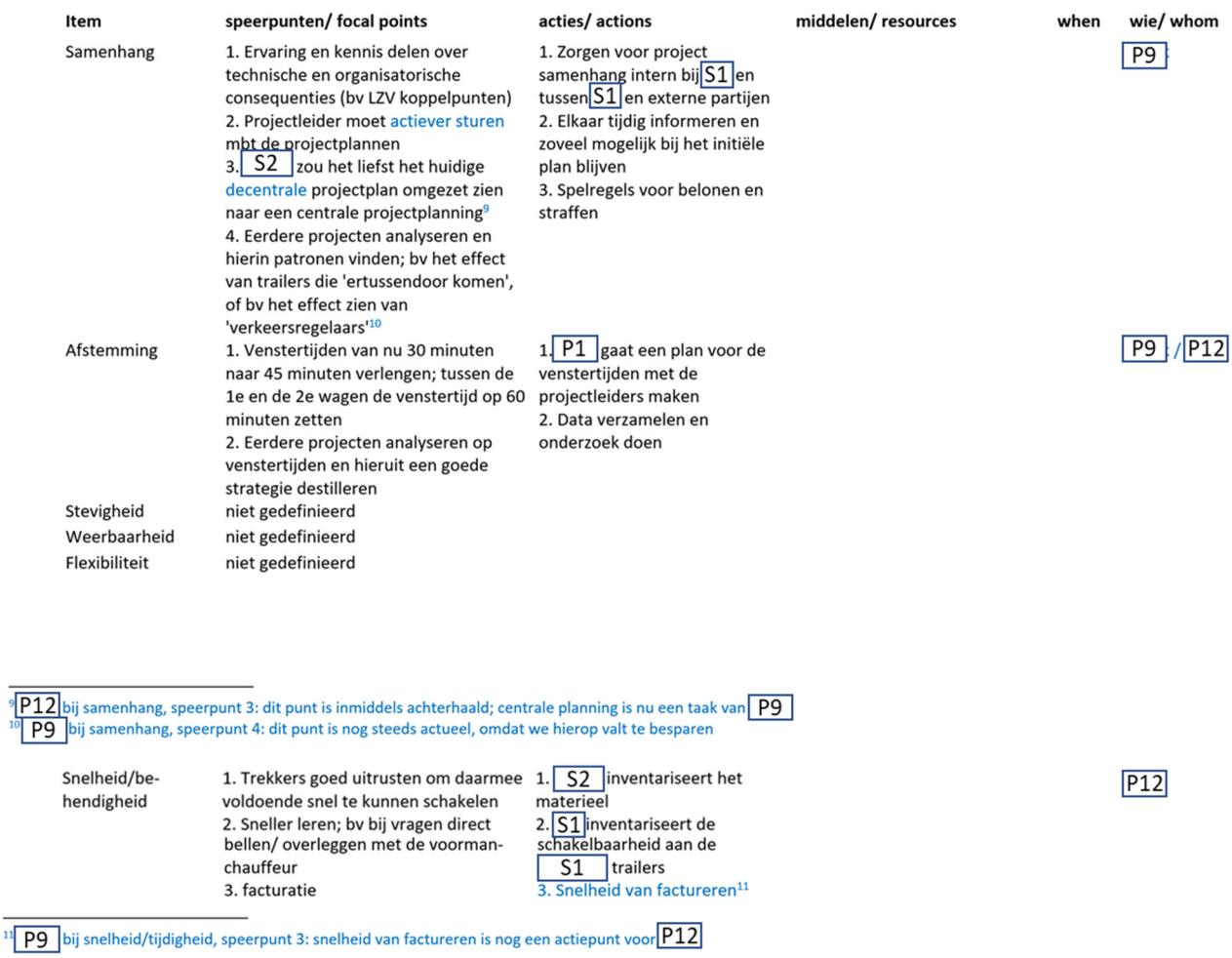
Item	speerpunten / focal points	acties / actions	middelen / resources	when	wie / whom
Vertrouwen	1. Ruis elimineren 2. Informatie delen; terugkoppeling geven; zorgen dat betrokkenen geïnformeerd zijn 3. Spelregel: ieder pakt zijn rol >> empowerment 4. Zorgen voor flexibiliteit bij het inzetten van mensen en materieel 5. Laadteam meer zelfvertrouwen geven	1. app-groepen per project[2] 2. P1 communiceert met de voorman-chauffeur 3. Afwijkingen melden 4. Foto's en maten ter illustratie 5. De groep gekwalificeerde chauffeurs vergroten naar 24 6. Het aantal geschikte trekkers uitbreiden naar 12[3] 7. "Ja, het wordt geregeld" 8. Koppels vormen die elkaars werk over kunnen nemen	>> telefoons met camera's >> telefoons met A1 of A2 >> genoeg trekkers met hefschotels >> getrainde chauffeurs >> nog niet gekwalificeerde chauffeurs (moet bekend zijn)		P9 / P12
Eenheid / samenhang van 7 naar 10	1. het proces in een project moet duidelijk zijn voor iedereen[4] 2. een directe communicatielijn tussen voormanchauffeur en de projectleider	1. vorm en spelregels bedenken voor communicatie tussen projectleider, voorman-chauffeur, heftruck-chauffeur; bijvoorbeeld: de voormanchauffeur belt de projectleider voordat de 1e auto aankomt. Projectleider niet altijd aanwezig, wel 'bouw-manager'. 2. de organisatie van de regerende afspraken op de opdrachtbon opnemen	niets speciaals		P12 / P9

[2] P9 bij vertrouwen 1, actie 1: App groepen zijn geregeld, maar als P2 afwezig is, loopt alles anders.
[3] P9 bij vertrouwen 1, actie 6: Het aantal geschikte trekkers is gerealiseerd.
[4] P9 bij samenhang 2, speerpunt 1: We moeten nog steeds werken aan het wat en waarom in projecten. Vorige week zijn 2 nieuwe chauffeurs gestart in een project die onvoldoende waren voorbereid.
[5] P9 bij zelfstandigheid, speerpunt 1: leerpunten uit evaluaties moeten via P4 naar P2

Zelfstandigheid / in staat zijn	1. ervaring opbouwen[5] 2. evalueren in de groep met de projectleiders[6] 3. inwerkprogramma voor chauffeurs met een goed introductie op de achtergrond van S1 en de kenmerken van de projecten (lokaal-specifieke situaties en introductie op de rol van de chauffeur[7] 4. les over vastzetten van de heftruck	1. Heel concrete voorbeelden maken van het gewenste gedrag voor chauffeurs maar ook voor medewerkers die niet direct deelnemen aan projecten (NON-team) 2. Cursus lading zekeren organiseren	Filmpjes (P16?) werkinstructies. Inzet vaste chauffeurs handboek checklists		P9 handboek P4 checklists P16
Verantwoordelijkheid nemend	1. goede info en op tijd informeren 2. beter bepalen wat in welke trailer gaat; plus een laadmeester die de regie voert P15 3. Medewerkers bij S2 die niet deelnemen aan een project wel voldoende informeren	1. projectleiders van S1 meer betrekken voor de organisatie van de demontage projecten 2. stellingen weggooien ipv een extra auto inzetten[8] 3. aantal benodigde auto's beter inschatten			P9
Betrokkenheid	1. S1 laad/losploegen nu gericht op uurtje = factuurtje; 2. via opleiding betrokkenheid vergoten	1. Manplanning P8 = hoofd demontage met eigen werkstijl) interesseren voor projecten (Manplanning haalt er meer uit) 2. goede opleiding samenstellen 3. alle betrokkenen deel laten nemen aan introductie programma	> werkgroep > A2 groep		1. P9, P1 2. P9 P16 3. P9 P12
Present	niet gedefinieerd				
		1. Intern S1 Time talk met betrokkenen 2. Doel (Eko) variabelen	1e maand 2e maand		P9 en P12

[6] P9 bij zelfstandigheid, speerpunt 2: Slim acteren op belangen van projectleiders: door chauffeurs die op tijd zijn en een actieve houding hebben
[7] P9 bij punt zelfstandigheid, speerpunt 3: het inwerkprogramma voor nieuwe chauffeurs moet beter: Nieuwe chauffeurs moeten weten wie wat wanneer doet.
[8] P9 bij punt verantwoordelijkheid, actie 2: we schatten het aantal benodigde auto's nog steeds niet goed in

Figure A24. Spreadsheet produced in workshop 3 with a draft transition scheme for social aspects. Annotations are in blue, texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote suppliers in the business relationship, the labels starting with 'A' denote social media apps used in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original spreadsheet produced by the facilitators during the workshop).



Item	speerpunten/ focal points	acties/ actions	middelen/ resources	when	wie/ whom
Samenhang	1. Ervaring en kennis delen over technische en organisatorische consequenties (bv LZV koppelpunten) 2. Projectleider moet actiever sturen mbt de projectplannen 3. S2 zou het liefst het huidige decentrale projectplan omgezet zien naar een centrale projectplanning[9] 4. Eerdere projecten analyseren en hierin patronen vinden; bv het effect van trailers die 'ertussendoor komen', of bv het effect zien van 'verkeersregelaars'[10]	1. Zorgen voor project samenhang intern bij S1 en tussen S1 en externe partijen 2. Elkaar tijdig informeren en zoveel mogelijk bij het initiële plan blijven 3. Spelregels voor belonen en straffen			P9
Afstemming	1. Venstertijden van nu 30 minuten naar 45 minuten verlengen; tussen de 1e en de 2e wagen de venstertijd op 60 minuten zetten 2. Eerdere projecten analyseren op venstertijden en hieruit een goede strategie destilleren	1. P1 gaat een plan voor de venstertijden met de projectleiders maken 2. Data verzamelen en onderzoek doen			P9 / P12
Stevigheid	niet gedefinieerd				
Weerbaarheid	niet gedefinieerd				
Flexibiliteit	niet gedefinieerd				
Snelheid/be-hendigheid	1. Trekkers goed uitrusten om daarmee voldoende snel te kunnen schakelen 2. Sneller leren; bv bij vragen direct bellen/ overleggen met de voorman-chauffeur 3. facturatie	1. S2 inventariseert het materieel 2. S1 inventariseert de schakelbaarheid aan de S1 trailers 3. Snelheid van factureren[11]			P12

[9] P12 bij samenhang, speerpunt 3: dit punt is inmiddels achterhaald; centrale planning is nu een taak van P9
[10] P9 bij samenhang, speerpunt 4: dit punt is nog steeds actueel, omdat we hierop valt te besparen

[11] P9 bij snelheid/tijdigheid, speerpunt 3: snelheid van factureren is nog een actiepunt voor P12

Figure A25. Spreadsheet produced in workshop 3 with a draft transition scheme for technical aspects. Annotations are in blue, texts are in Dutch and English, and names are covered for privacy reasons. The labels starting with 'S' denote suppliers in the business relationship, and the labels starting with 'P' denote persons acting in the business relationship. (Original spreadsheet produced by the facilitators during the workshop).

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