

The Stakeholder Onboarding Model: Addressing the Challenges of Multi-Stakeholder Onboarding

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Abstract. Today, more and more digital services get designed to address multi-stakeholder challenges easing transactions and communication along supply chains. Here, it is essential that the digital services address the underlying challenges and satisfy all relevant stakeholders sufficiently. Especially, the multi-stakeholder onboarding is essential as a *problem-digital service fit* by itself does not guarantee the support and adoption of all stakeholders. Given the stakeholders' unique roles and responsibilities they all pose different needs and requirements complicating the onboarding process. To ensure that the essential stakeholder requirements are met, we propose the adoption of the Stakeholder Onboarding Model (SOM) when designing multi-stakeholder projects, such as digital services. It is a step-by-step guide towards designing attractive and customized digital services to the network at question. The SOM adopts and combines the Actor-Network Theory (ANT) and Stage-Gate Model (SGM) towards a continuous improvement and reflection cycle. It is intended to guide the stakeholder management process from the design to the implementation of the digital solution. This paper adopts and evaluates the SOM with a practical use case from port logistics. Subsequently, its usefulness, applicability, and generality get discussed leading to the first iterations of the SOM.

1 Introduction

Digitalization is a fundamental driver for innovation in historically grown industries, such as logistics [1]. Digitalization of logistics results in various benefits such as increased efficiency, productivity, safety, and sustainability (see [2–5]). However, due to strong competition in logistics, there is limited sharing of information or collected data resulting in disadvantageous phenomena, such as the bull-whip effect, and affecting every stakeholder of the supply chain [6, 7]. In port logistics, for example, the logistics companies' fierce competition leads to the unwillingness to share operational data, which is a major barrier to efficient port processes, such as efficiently managing the port capacities [8–10]. Another barrier to digital transformation is inertia, as path dependence hinders digital technologies [11, 12]. Similarly, Vial [11] adds that the resistance from employees towards new digital solutions hinders digitalization and innovation, especially in maritime logistics industries [13].

To look past these factors seen as threats, stakeholders need to be aware of the benefits that occur when participating in a more digital solution. These can be cost savings, reduced environmental impact, energy savings, as well as public relation benefits [2, 8]. The introduction or expansion of communication technologies is an inevitable process of the

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development of supply chain structures [15]. In port logistics, compatibility between the port's systems and those of the shipping companies is cited as an important aspect [2]. For instance, implementing digital services that act as central infrastructure are seen as a major enabler of digital industry transformation. Furthermore, the inter-organizational alignment and stakeholder involvement in an early stage is essential for successfully implementing digital services that are widely used and accepted [8–10].

However, little research exists, that addresses and analyses multi-stakeholder complexity and alignment when aiming at digital service-driven industry transformations. To address this gap, this paper proposes the Stakeholder Onboarding Model (SOM) and adopts and evaluates it with a use case. The use case develops a digital platform matching the demand and supply of logistical transports of a European domestic port. It is part of the Silicon Economy¹ project which is a government funded project aiming at digitalizing the European logistics industry via open source-based software solutions. The focus lies on ensuring that the design and implementation of the digital platform fits the stakeholders' different needs. This is crucial as the digital platform is only useful and successful if all stakeholders are successfully onboarded and adopt the offered digital services. To give the paper a clear research objective, it answers the following research question:

RQ: How to onboard and align essential multi-stakeholders when designing digital services?

The paper is structured as follows: Section 2 discusses the concepts of Digital Platform Ecosystems and Stakeholder Management. Section 3 explains the applied ANT and the SGM. Then Section 4 presents the derived SOM. Section 5 applies SOM to the use case. Section 6 summarizes the contributions before the paper finalizes with a conclusion in Section 7.

2 Theoretical Background

2.1 Digital Services and Platform Ecosystems

Digital services are defined as services that are fully performed by a technical system with the purpose of retrieving digital information [16]. In many digital services, physical resources are linked to digital data to efficiently coordinate them [21, 22]. Recently, (digital) services, such as cab rides or data analytics, are offered via digital platforms [17]. Digital platforms “capture, transmit, and market data, including personal data, over the Internet” [15, 16]. The digital platform’s value is determined by the interactions between the different participating actors, such as platform owners, providers, and consumers, which form the platform’s ecosystem [23, 24]. In digital platform ecosystems, value is no longer created exclusively through physical goods, but by offering new digital services easing transactions and collaboration. Digital platforms are particularly present in the European logistics sector, as they represent an annual turnover of EUR 1120 billion [23]. For example, stakeholders in road freight transport can benefit from digital platforms offering one infrastructure integrating and connecting different digital services [20, 21]. However, to be useful digital services need to address and successfully integrate all relevant stakeholders of the targeted processes to ensure continuity and thus leverage the potential of the digital service.

¹<https://www.silicon-economy.com/en/>

2.2 Multi-Stakeholder Network

Stakeholder management was developed in the 1984 by Freeman [26]. He defines stakeholders as “any group or individual who can affect or is affected by the achievement of the firm’s objectives” [26, p.25]. The strategic approach was used to organize a company’s public relationships and to monitor the risks arising from unsatisfied stakeholders. The core message of the method is to prevent escalation, which can result from diverging interests [27, 28].

In the 1990s, multi-stakeholder networks gained attention [29]. The theory introduces a network analysis that considers the interests of multiple interdependent stakeholders and the activities of organizations [30]. The trigger for the development of the network paradigm were the consequences of the globalization processes. Here, many environmental, economic, and social problems could not be solved at the national level anymore [31]. Multi-stakeholder networks can address these problems and assume the role of voluntary and non-governmental institutions driving decision-making and their implementation [29].

Roloff define “multi-stakeholder networks as any group or individual who can affect or is affected by the solution of the problem addressed by the network” [29, p.314]. Multi-stakeholder networks can be found in many issue-oriented forums, as several published case studies by Hager and Wagenaar [32] and other sources demonstrate [27].

Complex issues often force many stakeholders to cooperate with each other even though they are skeptical or even opposed to the idea. The focus of consideration is neither a company nor a stakeholder group, but rather a problem that is relevant for all involved stakeholders. Often multi-stakeholder networks are initiated because a conflict is expected, or a problem has resulted in an open conflict between actors [27]. Here, the challenge is to integrate multiple stakeholder perspectives by identifying all interests and not just the interests of individual or dominant stakeholders [29, 33]. Only by motivating and integrating all relevant stakeholders the new processes, e.g., enabled by digital solutions, can be a success. To address this challenge and guide the initiators we propose the SOM. The SOM gets introduced in Section 4 and is a step-by-step support guiding the transition from individual stakeholders towards a multi-stakeholder network, e.g., orchestrated and aligned via a holistic digital solution like a digital platform.

3 Methodology

The paper aims at deriving and testing the SOM. It is intended to complement today’s approaches towards designing and developing digital solutions by emphasizing the importance of the stakeholder management along the process. Even functional digital services can fail, if the essential stakeholders are not integrated or refuse to take part and adopt the digital solution.

The SOM builds on the logic and benefits of the ANT and the SGM which both get briefly introduced in the following two sub-sections. The ANT describes how individual stakeholders stepwise form and/or become part of a network to address a specific problem together. In contrast, the SGM complements the ANT by introducing regular reflections challenging the stakeholders to decide whether the project/network formation shall proceed, get adapted or killed. In sub-section 3.3 we introduce the paper’s overall methodological approach when designing the SOM.

3.1 Actor Network Theory

The ANT was developed “by the Paris School of Social Science Knowledge” [34 p.317], whose main representatives are Law [35], Latour [36] and Callon [37].

The ANT examines the network built by actors and the dynamics behind it. It analyses how to form networks, the associations behind them, how to connect networks and integrate the actors. It also examines how to maintain a resilient network and represent all interests equally [38, 39]. The applied principle of generalized symmetry addresses the possibility that non-human and human actors are similarly involved in the network and can be characterized in the same way [40]. Mutch [41] considers that the theory supports the idea of human-created artifacts and natural objects having real properties. Here, the real properties explain the weakness or relative consistency of the network [42]. Different from many other social theories, the ANT not only considers the theoretical concepts but also focuses on the methodology. Thus, elements that are observed in the real world must be identified in empirical research as well [43].

The following four phases: Problematization, Interessement, Enrolment, and Mobilization [44] “constitute the different phases of a general process called translation, during which the identity of actors, the possibility of interaction and the margins of manoeuvre are negotiated and delimited.” [44 p.203].

The initiator is the key actor in the network who has the initiative and drives the process of change with the help of the other actors [45]. The first phase of translation is the *problematization*, in which actors are selected who are in alignment with the interests, demands, and goals of the initiator. The initiator formulates the problem in his own words. He identifies the relevant actors and shows why and how the problem affects them [40, 45]. Further, he defines strategies for solving the underlying problem and the point of passage. The Obligatory Passage Point (OPP) is “a situation that has to occur in order for all actors to be able to achieve their interests as defined by the” [45, p.56] initiator. Due to these responsibilities the initiator is the essential actor of the network [45].

The *interessement* deals with the concept of convincing heterogeneous actors that the previously defined interests of the initiator are aligned with their own interests [40]. Through strategic compromise, conviction, and translation, the conditions for their involvement are negotiated and their newly defined roles are accepted [40, 46].

Once the interessement is successfully completed, the *enrolment* begins. In this phase, the actors accept their assigned roles in the newly created actor-network. After an agreement has been reached between the actors, they commit themselves to be included in the collective memory of the social system with an inscription [38, 42].

The network grows by strengthening existing stakeholder ties or connecting to new stakeholders via e.g., political persuasion or new benefits due to new technologies offering improved human-machine interaction. The stability of the network is maintained by constant attention [46].

The last phase of translation is the *mobilization*. Here, the initiator has to represent and maintain the goals and interests of the network as they were discussed and decided at the OPP. This establishes and strengthens the legitimacy of the initiator [46]. By adding and/or removing actors the function of the network could be disrupted [38].

3.2 Stage-Gate Model

The SOM also integrates elements from the Stage-Gate Model (SGM). This model was developed by Cooper and aims to guide new projects from the idea stage to the launch [47]. In addition, it also can be applied to development processes by making them more efficient [47]. The individual elements are Stages and Gates, thereby Stages designate individual stages in a product development cycle and Gates the control points, which are to be passed after each Stage [47]. Only if the before determined criteria and control questions, called Deliverables, get presented and are considered as sufficiently fulfilled the development process can be continued [47]. At each gate it gets decided whether a project receives the

“Go” into the next stage, a “Recycle” verdict asking to re-do and thus improve the results of the last stage or gets “killed” as its presented results are not sufficiently promising to invest further time and resources [48]. These are queried by the deliverables, which are processed by the initiator [47]. One criticism of the SGM is that the world is evolving very quickly and therefore it can be difficult to keep up [50]. By using a continuous and iterative improvement process in this paper, this criticism is countered, and a flexible model is created.

3.3 Methodological Approach

When designing digital services, it is essential to ensure that all relevant stakeholders are on board. This means addressing and integrating them in a way that they are motivated to take part. Here, it is essential to integrate all stakeholders who are necessary to make the digital service work. The successful integration will only be successful if all stakeholders achieve benefits outweighing their costs.

To ensure that this essential aspect is not overlooked in the design and development stages of, e.g., digital services, we aim at designing the SOM particularly addressing this challenge. This model builds on and combines the ANT and SGM logic. The SOM shall be adopted in conjunction with the “normal” digital service development process.

The SOM gets introduced and explained in Section 4. We presented the initial version of the SOM to an industry expert who challenged the SOM and provided feedback asking for additional clarifications and detail, complementing questions and methods which got incorporated into the first iteration of the SOM (see Figure 1 and Table 1 – already including the feedback from the first iteration). For example, the expert emphasized the importance that the initiator clarifies his motivation and designs a clear project vision. Here, he proposed to ask the initiator and stakeholders to back their vision and goals with corresponding metrics and key performance indicators. This strengthens the commitment of the stakeholders and ensures that they stay on track as it allows to measure the success of the project. In addition, we also added complementing questions, e.g., “Is there resistance toward the approach from individual stakeholders?” in gate A of the SOM. This question aims at identifying barriers heads on enabling the project partners and especially the initiator to address them before committing to the project. For the enrolment stage we received the feedback that next to requirements and feature lists concrete mock-ups, prototypes, and/or minimum viable product (designs) are necessary to move towards a transparent, tangible, and shared understanding of the digital solution and its impact for the individual stakeholders. To answer the research question, we selected the interpretative case study as methodological approach [51]. Thus, in Section 5 we adopt SOM to the paper’s use case. The interpretative case study approach is particularly useful to bring large and complex amounts of data such as project documents and interview findings into a meaningful structure [38]. All gathered feedback and identified directions for future research are discussed in Section 6.

4 Stakeholder Onboarding Model

4.1 The Stakeholder Onboarding Model’s Logic

In this section we introduce the SOM which is shown in Figure 1. Building on the stage-gate logic it integrates stages and gates. The gates after each stage ensure regular reflections and educated decisions and progress along the process. Here, the initiator evaluates whether the project passes the gate and enters the next stage or whether it needs to re-do the current stage as it failed the gate’s requirements or even gets killed due to missing potential.

An initial trigger starts the adoption of the SOM. The trigger itself is an impulse significant enough to initiate a change process. Given the trigger the initiator must define the metrics for evaluating the progress at each of the four gates and at the end of the process to ensure that it can measure and evaluate the success along the way.

The four stages of the SOM were derived from the ANT. The trigger leads to the first stage, the problematization, which aims to identify the problem and the relevant stakeholders to address the problem. Subsequently, at gate A the findings and progress of the problematization stage gets checked. Only if all four reflection questions can be satisfactorily answered and fulfill the initiator's pre-set metrics, the project is allowed to enter the interessement stage. If not, the problematization stage either can be re-done if the ones in charge identified potential or gets already stopped to prevent wasting further resources (a similar logic also applies to the following three gates).

The goal of the interessement stage is to gather the stakeholders' diverse motivations and requirements for participation. Here gate B checks if all required stakeholders were identified and whether they all agree to their individual benefits and obligations. If this is the case, they all pass the OPP and commit to this project.

Once the project successfully passes gate B it enters the enrolment stage. At this stage it is the goal to identify a possible solution to the problem, for example an initial digital service design. This initial design then gets challenged with regards to its compatibility with the stakeholders' different expectations and requirements. At gate C two reflection questions help to evaluate whether the objectives of this stage could be met, i.e., all stakeholders should be convinced that they benefit from and support the digital solution design.

Only if this is the case, the project progresses to the mobilization stage. In the mobilization stage it needs to be clear how the solution will look like, and which features it should contain. This is checked with two questions in gate D. If this last gate was successfully passed, the developed digital solution gets launched. Given the rigorouslyness of the process it should be clear that the developed solution solves the problem(s), includes all relevant stakeholders, and covers the respective requirements.

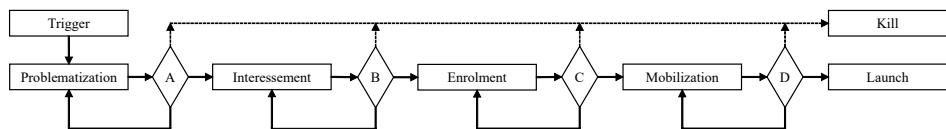


Fig. 1. The Stakeholder Onboarding Model

4.2 The Process Steps of the Stakeholder Onboarding Model

Before starting the project, the initiator must consider whether the SOM is appropriate for the trigger and the problem, and whether sufficient time and financial resources are available to work with an internal team or whether external support is needed. In addition, the initiator should establish upfront criteria for the three commands at the gates. For example, the project will be terminated if the project duration exceeds the specified project time or budget. Another important point is the communication between the individual stakeholders and the project team. The stakeholders should be in continuous exchange to establish and maintain a shared understanding among all stakeholders.

After the trigger has initiated the project's start and the framework for the project has been defined, the project starts with the first stage of the SOM. Table 1 shows a more detailed view of the four stages and the four gates of the SOM and the supplemented launch-stage with its subsequent continuous improvement cycle.

Table 1. Stakeholder Onboarding Model – Guiding Questions

Problematization
What is the initiator's (overall) vision?
What is the problem/challenge to be addressed?
Which stakeholders are relevant to address the problem successfully?
Why are these stakeholders relevant for the project? Describe the (unique) roles & responsibilities.
Are there additional (sub-)problems which also need to be addressed to achieve the desired results?
Gate A
Is the vision understood and shared by all stakeholders?
Can you identify resistance toward the approach from individual stakeholders?
Does the vision address the trigger?
Does solving the defined problem enable the initiator's vision?
Interessement
What is the motivation/benefit for the different stakeholders to participate in the project?
What are the pre-conditions/requested features of the different stakeholders to adopt the solution?
Gate B
Were all/only necessary stakeholders identified?
Could all requirements/conditions of the multi-stakeholders sufficiently be met?
Do all stakeholders go through the OPP (e.g., agree and support the initiator's vision and strategy)?
Enrolment
What are the essential requirements ensuring that the solution fits the problem (e.g., a digital service design)?
Are the pre-conditions/requested features of the different stakeholders compatible?
Can you ensure that all stakeholders are sufficiently satisfied to adopt the solution (e.g., shared agreement)?
Gate C
Does the solution design fit and satisfactorily address the problem?
Do all necessary stakeholders agree with and support the solution design?
Mobilization
How does the solution look like (prototype development)?
Which features does the digital service include?
Gate D
Are all features satisfactorily implemented?
Are the stakeholders satisfied?
Launch
Continuous Improvement Cycle - The continuous search for further improvement potentials: Are the users satisfied? What can/should be improved? Why? Do the others agree?

The stages and their respective guiding questions intend to serve as a guide to successfully address and integrate multiple stakeholders, e.g., when developing complex new solutions that address multiple stakeholders simultaneously, such as digital services. In Section 5.2, we evaluate the fit and usefulness of the SOM for our use case. The SOM aims to successfully engage all stakeholders at an early stage of digital service development by considering their requirements and needs to ensure broad acceptance and adoption of the digital service. In addition, the SOM defines the respective roles and responsibilities of the stakeholders when solving the underlying problem.

Gate B, after the interressement, has a special function in our model as it represents the OPP. According to ANT, this point is originally located in the problematization. We placed the OPP after the interessement-stage to ensure a detailed understanding of the underlying problem and the unique challenges of the different stakeholders. This allows to derive stakeholder-specific requirements and pre-conditions which must be met to ensure that the stakeholders support and adopt the digital service. To give this project a chance for success all stakeholders must pass this point and agree with the initiator's vision and strategy [45].

We added the launch and the continuous improvement cycle to highlight that digital solutions are never done. Rather digital solutions offer continuous optimization potentials. To leverage the potential, it is essential that the stakeholders reflect their satisfaction on a continual basis and design, develop and integrate further features along the way.

5 Use Case – Port Transfer

5.1 Use Case Description

The port is considered the main hub of all intermodal logistics, handling containers from a wide variety of origins and forwarding them by truck, train, and/or ship, as well as handling the import and export of goods [3, 13]. Competitive actors of a port include shippers, freight forwarders, and ocean carriers [13, 14]. Factors that increase the port's attractiveness are the port's location and connectivity, performance, fees, and existing infrastructure [13, 14]. In general, there are challenges for ports, such as competition within the port community or the lack of automation of operations [23].

The following case study focuses on a Port Transfer optimization project, which was initiated in collaboration with the Silicon Economy Logistics Ecosystems (SELE). SELE is a government funded project aiming at digitalizing the logistics industry via dedicated open-source software solutions [52]. Our use case addresses a large European domestic port. It observed heavy traffic (trigger) and aims at optimizing port transfers within the port area by avoiding empty runs (vision). Here, the initial solution idea was a digital service making demand and supply of port transfers transparent and easing their transactions. This is particularly necessary and challenging due to the diverse group of stakeholders operating the port area. The data required for the case study was taken from the documentation of interviews and project reports. After the project was completed, we conducted two interviews with the project manager to clarify open questions during the processing of the case study. The interviews were divided into five parts. The first block dealt with general questions about the project and the process flow. In the other blocks, specific questions were asked about each stage of the ANT. The duration of each interview was 60 minutes.

In the port transfer use case, the port together with the SELE development team is the initiator. Before the project starts with the first stage, the initiator must define criteria determining when the projects "proceeds", gets "killed", or "recycled". In the following we adopt the SOM when analyzing the case study.

5.2 Use Case – Adapting the Stakeholder Onboarding Model

Problematization: Due to the dynamic development of global freight traffic and the consequent growth of the port area, traffic loads are generated on the port site and in the peripheral road network. As a result of the fast growth, many processes and systems are outdated and not optimized. The multiplicity of communication systems causes inefficient utilization at the terminals. Another problem is the highly competitive pressure between the many different stakeholders and insufficient communication between them, which in turn leads to a lack of transparency.

The port's role as initiator is to make processes run more efficiently and thus avoid empty runs, among other things, so that all stakeholders are satisfied. The vision of the initiator is to optimize the process of empty runs with the help of a digital service. In addition, the initiator handles the communication between the project team and the stakeholders. The initiator identified three stakeholders who are relevant for addressing the problem: the shipping companies, the transport companies, and the terminal operators.

Trains and ships get unloaded at the terminal at which they arrived. From here some containers are further transported to the customers and other actors to different terminals. The dispatcher plans these journeys and transmits them to the forwarder. In addition, each terminal has an empty container depot; if the volume of the depot is exceeded, a fee is charged. Consequently, terminals instruct the forwarders to move the excess containers to other terminals. Another reason for the repositioning of containers are the shipping companies. They initiate empty container repositioning because they want to have them on their premises. If a container does not reach the shipping companies in time, the stakeholders being in possession of the container at that point in time must pay a fine. This can be either the freight forwarders or the terminal operators.

Empty runs are difficult to manage and time-consuming, some of the terminals surveyed are willing to avoid them and focus on this as a core business. Still, other terminals do not see the need to reduce empty runs, because they perceive empty runs as a source of income.

After the problem has been analyzed and the relevant stakeholders have been identified the project gets challenged in the first reflection gate - gate A - of the SOM. Here, the initiator must question and evaluate whether he sufficiently convinced the required stakeholders of the underlying problem's urgency and his corresponding project vision.

At this gate the focus lies on communicating, explaining, and convincing the stakeholders of the problem, vision, and strategy, e.g., in this case the design of a digital platform easing the demand-supply transaction of container transports. Since all stakeholders were cooperative, the initiator was able to convince them sufficiently.

To pass to the next stage, the initiator revised the control questions of stage A. Thus, the initiator perceived his project vision to address the initial trigger and the derived first solution proposal, here the digital service, to match his vision. In addition, he set metrics to subsequently measure success. After the initiator sufficiently answered the questions of gate A, the project could proceed with a “go”-decision to the second stage.

Interessement: The second stage of the SOM, refers to the motivation of the stakeholders and is intended to answer the questions *why the stakeholders should adopt the digital service* and *how to motivate them to participate*. Once the motivation of the various stakeholders has been clarified, their pre-conditions for adopting the digital solution must be identified.

The terminals schedule up to 100 orders in one day. The planning is done for the current day or at most for the following day. The dispatchers create a route plan “in their heads” without documenting it. The processing priority is to first process the transports for customs clearance and then the empty runs. Attempts are made to transport empty containers on return

trips, but that does not always work. Forwarders are informed about their orders via mobile phone or email. Normally, the one who replies the fastest gets the order.

Terminal operators wish for a tool where they have a better planning overview. Ideally, they would like to see which containers are on the arriving ships and the location they need to be unloaded. Currently there is a discrepancy between the system information and the loaded containers on the ships. In addition, the terminal operators need another tool to which also the forwarding agents need to have access to plan the container journeys. This tool should allow to view and accept orders.

The initiator also expects that the digital service helps to reduce the long waiting times at the terminals since the terminals are operated with various freight forwarders. At peak times, there are long waiting times and consequently traffic jams at the terminals. Another motivation for the freight forwarders to adopt the service is the pre-set daily turnover to be achieved. However, they often miss this target due to the long waiting times at the terminals.

Once the interessement-stage is completed gate B follows. It is a fundamental gate for the SOM because it incorporates the OPP. For the progress of the SOM, it is important that all stakeholders pass the OPP. This is established once all stakeholders share the initiator's overall vision. To achieve that it is necessary that all stakeholders understand and agree that the proposed changes at the port are needed to ensure the competitiveness of the port and to address the issue of empty runs.

To pass the OPP it is particularly important that the initiator talks to the freight forwarders and the terminal operators who are satisfied with the status-quo and do not see any need for change. Without the participation of these stakeholders the project cannot move to the next stage. In this use case, the initiator had separate discussions with these stakeholders to understand their hesitance and define terms convincing these stakeholders of the benefits of becoming part of the vision. After these conversations, all stakeholders could be convinced and supported the vision enabling the "go" to enter the next stage.

Enrolment: In this stage the initiator has to identify and analyze the needs, requirements and barriers of the individual stakeholders. To ensure that the desired digital platform supports the efficient utilization of all capacities, it has to provide all required information with regards to time, quantity, weight, etc. of the planned container shipments to optimize the demand and supply. If stakeholders already use tools with similar or partial solutions, it needs to be checked whether they can be linked to the planned digital platform to avoid parallel structures.

Competition between individual forwarders and shipping companies is a major point of conflict. Here, the forwarders only agreed to join the platform, if their pre-condition that the platform does not display prices is met. This should prevent that small price changes determine the assignment of the transports. This compromise ensured that the forwarders and terminals were able to come to terms with the establishment of the platform.

A general requirement of all actors was that the platform gets operated by a neutral and independent entity. To reduce potential barriers of successfully adopting the digital service, usability, and its availability in several languages, e.g., to accommodate (foreign) drivers, is mandatory. An app for mobile devices with direct push notifications is desirable. There are no requirements for the digital solution from the ship owners' side.

Before proceeding to the final stage, the initiator reflects the solution design in gate C. For example, he checks whether the stakeholders' requirements fit the digital solution and its intended purpose. Overall, the stakeholders' demands on the digital service are not in conflict with addressing the underlying problem of optimizing port transfers and thus reducing empty runs. All stakeholders necessary for the success and lever of the digital service were cooperative once their requirements were integrated. No further persuasion was needed, as all stakeholders benefit from reducing empty runs. These requirements were clarified based

on the conducted interviews and informed the digital platform design. In addition, at the time of the project, there were no other digital platforms that needed to be considered for implementation. After answering the gate's questions, the next "go" was given.

Mobilization: After analyzing the problems and the requirements of the stakeholders in the previous stages, the mobilization-stage focusses on the development of the digital service. In nine sprints, two developers created a digital platform according to the requirements of the stakeholders. On this platform, orders of a terminal and the available trucks are displayed. All dispatchers have access to the system and can edit orders and add information. The transport orders are transmitted to the transport company via app. The driver confirms completed orders through the system.

After completing the digital service, the initiator reflects in gate D, whether all stakeholders are satisfied with the solution and its features. The implementation of the digital service increased the transparency of the processes and thus enabled optimization potentials benefitting all involved stakeholders. The dispatcher of the terminal has a clearer overview of which containers are on the ships improving his planning. Even the planning of transshipments can now be done via the digital platform instead of using Excel lists. In addition, forwarders benefit from improved planning accuracy when using the tool. In gate D, the last "go" is given, followed by the launch of the service.

Launch: After the digital service is launched, a continuous improvement process takes place. Once the service runs for a few months, another feedback interview with all involved stakeholders will be held. With the feedback from the stakeholders, the service will be continuously improved and extended.

Further functions that could be added to the platform in the future would be route optimization, where for example containers can be displayed that can be additionally loaded on the route, but also congestion experiences if the shortest route is overcrowded. In addition, the live tracking of the container could be implemented, so that all actors involved have an overview of where the container is currently located.

6 Contributions and Limitations

The design and development of digital services in multi-organizational environments remain a relatively untapped research area. The proposed SOM sheds light on the underlying development processes as it gives guidance on how to onboard the relevant stakeholders to ensure the digital service's successful design and implementation. Based on the SOM, the project initiator can identify relevant design steps to solve the problem and provide a digital service fitting the requirements of all relevant stakeholders. As the initiator focuses on his own interests, it is important to include the other stakeholders in the executive project team to eliminate conflicts of interest between the individual actors. Also, the responsibilities for the operation and maintenance of the digital service need to be clarified. By ensuring early stakeholder involvement, the initiator increases the digital service's acceptance and success in the future. Therefore, the SOM can serve as a guideline for developing valuable digital services for its relevant stakeholders.

Importantly, adopting SOM nudges initiators to consider and to integrate the relevant stakeholders early. While it might feel too early to address specific questions of the SOM like "what are the benefits and barriers of the individual stakeholders" already in the interessement stage it prevents that new digital solutions get designed and implemented which will not get adopted by the required stakeholders. As soon as individual stakeholders being part of the problem to be addressed do not participate the full intended lever of the digital solution cannot be achieved. Thus, while it is difficult to answer all these questions in

detail it is success-critical for the project to address them and to identify potential barriers early.

The adoption of the SOM prevents that stakeholders, their roles and responsibilities, and their needs and pre-conditions get overlooked by over emphasizing the vague idea of the overall problem and the corresponding vision for a solution. This further prevents wasting time and resources in projects which cannot be successful due to missing stakeholder onboarding and their successful integration.

However, the SOM is subject to certain *limitations*. For example, the SOM has only been implemented and tested with one use case based on one example. The use case is an ongoing project so that no final conclusions can be made. Thus, we propose that the SOM gets tested, evaluated, and iterated with additional use cases in further research. These can be use cases which start, are already ongoing, or even terminated as the SOM can be used as support and reflection model. In addition, the case study reports on an ongoing project so that no final conclusions can be made. However, as the SOM is iteratively designed, it can capture unfinished as well as terminated projects.

In terms of *scientific contributions*, our research approach serves as a starting point for the systematic analysis of projects that aim at developing digital services in a multi-stakeholder environment. Since research on multi-stakeholder networks is still limited, we provide a first concept with the SOM that grasps the complexity of creating and managing such networks. Our results can serve as a blueprint for the creation of multi-stakeholder networks when designing digital artifacts, such as digital services or platforms.

With regards to *practical contributions*, this paper offers guidance to companies in a wide range of industries that exhibit complex networks for value creation. Thus, practitioners can use the SOM to solve industry-specific problems involving multi-stakeholders. This can be e.g., intra-organizational and inter-organizational process optimizations via (new) digital services. In addition, the regular feedback loops ensure that the right problem gets addressed and solved involving all relevant stakeholders.

Through *future research*, the general SOM can be transferred to other industries, such as e.g., the automotive or manufacturing industry. For example, the SOM could serve as basis to systematically capture and describe multi-stakeholder projects, such as the Silicon Economy or Gaia-X. The SOM can be adapted to various use cases by adding use case-specific questions. Future research could enhance the concept, for example, by adding an additional column to Table 1 displaying useful methods and tools that support the respective stages. Likewise, a rough timeline could provide a better overview of how much time is needed or planned per stage.

7 Conclusion

In this paper, the SOM was developed to assist the initiator of e.g., new digital services requiring multi-stakeholder integration in the stakeholder management and stakeholder onboarding process. The SOM consists of 23 questions divided into four stages and four gates.

We derived the stage-gate logic from the SGM. The ANT acts as guiding instance for defining the questions in the different stages. Each stage is followed by a gate challenging the results with reflective questions. Depending on the answers and findings of the stages the project either passes the gate with a “Go”, or the stage needs to be redone “Recycle” or even gets “Killed” due to missing results. After the project has completed the last gate, the launch follows. After the launch, we suggest entering a continuous improvement cycle consisting of four questions which need to be posed in regular intervals to ensure that the digital solution sustainably fits the stakeholders and the changing environment.

The questions of the SOM provide a guideline to support the initiator during the project to consider all stakeholders and their respective needs. To motivate the stakeholders to participate and adopt the digital solution, the requirements and wishes must be considered.

The use case and feedback by an industry expert demonstrated the applicability and usefulness of the SOM. While answering some questions in detail might be difficult it is essential to ensure the success and adoption of the project and its digital solution. If the required stakeholders, their interests and pre-conditions stay undefined or get addressed too vaguely, it cannot be ensured that they get sufficiently met to convince all stakeholders to participate potentially leading to failed initiatives. Here, we suggest investing into greater transparency from the start to enable a shared understanding and allow for detailed iterations. This might complicate and lengthen the project management, but without it failure is pre-programmed.

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