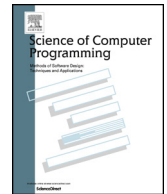




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Are you of value to me? A partner selection reference method for software ecosystem orchestrators



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ABSTRACT

Software ecosystem orchestrators have insufficient insight and lack academic guidance in the partner selection criteria and methods available to aid them in their partner selection process. Therefore, orchestrators fail to vet, select, and engage suitable partners for their software ecosystem. Through six case studies with software orchestrators, we extract six industry methods for partner selection. Using situational method engineering, we create PALERMO: the PARTner seLECTION Reference MethOd, which is subsequently evaluated by three different experts in the context of three more case studies.

The method is composed and described using method engineering, and a list of partner selection criteria. Together, the method and list of criteria aid orchestrators in organizing and optimizing the partner selection process. The evaluation of the method in three extensive case studies, shows that the method is complete, effective, useful, and easy to use.

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1. Introduction

There are large intricate networks of organizations forming around software platforms, known as Software Ecosystems (SECOs). We define a SECO as: “a set of actors functioning as a unit and interacting with a shared market for software and services, together with the relationships among them [56].” Software Ecosystem (SECO) orchestrators are entities “that provide a standard or platform technology that provides a fundament for (part of) the ecosystem [53]”. For them, competition is increasingly about who has the best platform, product, and accompanying software ecosystem, instead of solely product-based competition [19]. The ecosystem’s success is as much about the collaborative offering of products and services to a group of customers, as it is about inherent network effects [78]. The inability of a software vendor to function in a SECO has already led to healthier SECOs and even the demise of some, such as Nokia’s operating system Symbian and BlackBerry OS.

In a SECO, there are different kinds of actors that influence its health [100]: niche players creating niche solutions for niche markets, platform providers, orchestrators, etc. It is common for organizations to partner up in SECOs, where both organizations collaboratively achieve more than alone through a contractual partnership. Examples of partnerships are out-sourcing relations, niche app developers posting their apps in app stores, and strategic agreements about two organizations collaboratively solving a market problem or seizing a market opportunity.

Apple is an example of a SECO orchestrator, that guides and leads software producing organizations to become active players in their SECO. One of the many platforms that Apple manages, is the iOS operating system, which runs on the Apple

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iPhone. There are thousands of niche players building software for iOS, each of which can be considered a partner. Furthermore, Apple has strategic partnerships with some of its larger partners, such as Facebook, Rovio Games, and Microsoft. There are also some partners that provide facilities for other partners within the SECO, such as cloud services, crash reporters, and UI testers. Each of these partners has its own influence on the health of the software ecosystem and Apple had to carefully navigate its way through this partner selection process. One of their decisions that had large effects on the industry in this domain, was for instance not to technologically partner up with Adobe around the Flash technology in 2010. This decision to this day has effects on the health of the Flash SECO.

SECO orchestrators thrive, both in sales and profit, when their ecosystem does, as partners create value for the orchestrator's customers by offering additional functionality [5,56]. A concerted management approach towards software ecosystem management is observed by organizations to lead to more complete offerings for customers [52], more 'staying power' for platform orchestrators [20], and eventually even to higher revenues [83].

We define software ecosystem health as longevity and a propensity for growth. We hypothesize that an ecosystem's health can be influenced through a proficiency in partner selection by SECO orchestrators, especially as one partner can contribute more to the software ecosystem's health than others [40]. There is concrete evidence for this as well, such as Plakidas et al. [82], who quantitatively show that both small and large contributors provide value to the ecosystem, and Kabbelijck and Jansen [60], who show that particular lone-wolf contributors can provide equal value to an ecosystem as contributors who play different roles in the ecosystem.

Presently, there are no structured methods available that support SECO orchestrators in performing the partner selection process and we are of the conviction that SECO orchestrators can benefit from a structured approach for partner management, also as indicated by the works of Plakidas et al. and Kabbelijck et al. If such an approach is implemented by an organization, it can better make investment and prioritization decisions for partner management, thereby focusing on the partners that can deliver the most value for the organization [94]. Furthermore, they can use the practices in the method for constant attraction and evaluation of new partners, providing orchestrators with a more organized approach to partner management.

For this work we specifically consider strategically important partners, i.e., those partners that can make the orchestrator's ecosystem significantly more healthy. This health increase can for instance be witnessed when there is a large increase in actors, actors start using the platform more frequently, or actors start generating more revenue in the SECO. Strategic partners require more intensive contacts than partners that are not of strategic importance: they need to find strategic alignment with the orchestrator, sometimes through lengthy negotiations and governance. We exclude two types of partners; partners who are attracted in outsourcing relationships, i.e., who do not wish to retain their own market and product identity and partners who can be attracted semi-automatically, for instance through an app store with standardized contracts. Examples of strategically important partnerships are Microsoft and SAP, Apple and Rovio, and Android and Facebook.

We focus on SECO partners that extend a software platform with software functionality, typically aligning business goals for the orchestrator and partner, and by doing so, adding value to the SECO. The partnering process of SECO orchestrators can be seen from three perspectives. First, the domain of partner acquisition addresses how partners should be attracted, selected, and engaged and these topics are addressed in this article. Secondly, there is the area of broader partner management, which focuses on how an organization must organize its internal infrastructures to accommodate partners optimally, address their requests, monitor their performance, and provide them with a consistent interface to a well oiled organization. This topic is addressed in a related article [96]. Finally, we see partner management on the broader scale of the SECO, i.e., how to organize not one set of partners, but the full set of partners in an ecosystem, from both the technical and the business standpoints. This is discussed in previous work as well [52]. SECO orchestrators lack guidance to aid them in SECO partner selection, a process that demands sufficient effort and resources. However, the majority of SECO orchestrators has limited resources available for their SECO partner selection process.

Goal Statement: To aid SECO orchestrators with their partner selection process, we develop PALERMO: the PARTner seLEction Reference MethOd. PALERMO is developed for SECO orchestrators to help guide their partner selection process. PALERMO defines a step-wise approach to partner selection, including an extensive list of partner evaluation and assessment criteria. A SECO orchestrator can use PALERMO to determine if a potential partner is a fit for the SECO orchestrator's platform ecosystem and therefore should be accepted. This research provides the following contributions to the software ecosystem literature:

1. We provide an overview of partner selection criteria that are, subsequently, ranked by twelve domain experts in six case studies;
2. We use situational method engineering and method comparison to construct, together with domain experts, PALERMO: The Partner Selection Reference Method [14,45,98].

The rest of this article is structured as follows. In Section 2 we present the research methods used for the development of PALERMO, such as the case studies and evaluation interviews. In Section 3 we provide the background of this research and an overview of the domain. Section 4.1 provides an overview of Partner Selection Criteria. Please note that we also present the case findings in Section 4. We describe PALERMO in Section 5. Finally, in Section 6 we present how PALERMO was evaluated through an additional three case studies with software producing organizations. We find that PALERMO is

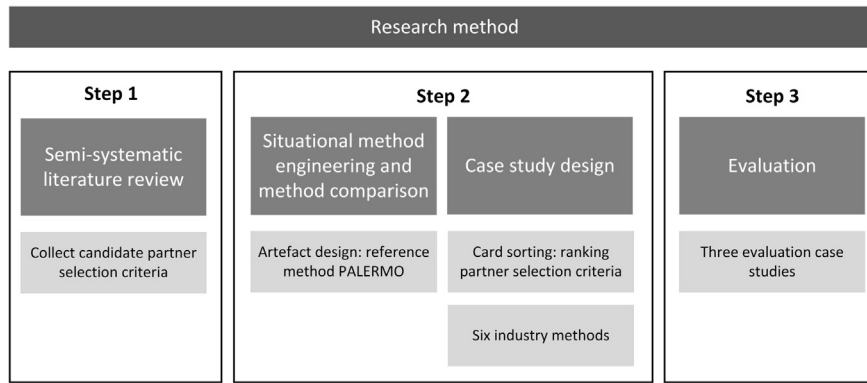


Fig. 1. The research method consists of four main building blocks. Firstly, the semi-systematic literature review to collect candidate partner selection criteria. Subsequently, we use situational method engineering and method comparison to construct a reference method: PALERMO. Thirdly, the case study design has two goals, firstly, to rank the partner selection criteria found in the literature and, secondly, to construct six industry methods which we use to create PALERMO. Finally, three evaluation case studies are conducted to evaluate PALERMO.

complete, effective, useful, and easy to use for platform companies that are looking for a structured method for attracting new partners in their SECO.

2. Research method

This research aims to answer the following question: “How can a reference method be developed to aid software ecosystem orchestrators in vetting, selecting, and engaging SECO partners?” In order to answer the research question, partner selection candidate criteria are extracted from scientific literature. Furthermore, industry methods are extracted from six case studies. Finally, PALERMO is constructed from the case studies and evaluated within three new case study organizations.

This research project involved organizations that are operating in the Dutch market. Multiple case studies are conducted to explore the topic of SECO partner selection. The participating case study organizations operate in different domains and have 30 or more partners in their SECO. Please note that the number of 30 was pragmatically selected.

The research method applied in this research consists of three steps, see Fig. 1. In step 1 of the research method, we conduct a semi-systematic literature review during which we collect candidate partner selection criteria. This marks the end of step 1. These criteria are then subsequently ranked in step 2 as part of the case study design. Besides ranking the partner selection criteria, we construct six industry methods which we then use to create PALERMO. We end step 2 with the reference method PALERMO. Step 3 is devoted to the evaluation of PALERMO. To do so, three evaluation case studies are conducted.

2.1. Literature review

To conduct our search for *partner selection criteria*, we apply a literature review. The protocol can be found in Table 1 and follows the structure proposed by Kitchenham [64]. Table 1 describes the purpose of the literature review, the search strategy, the inclusion and exclusion criteria, the data quality assessment, the synthesis of extracted data, and the query results. According to the work of Kitchenham [64] the literature review in our research can best be described as a semi-systematic literature review, because not all components of a systematic literature review are present. Our search strategy could be expanded using more search terms and more sources, the data quality assessment is not rigorous enough, and all steps are undertaken by just one researcher. This can be ascribed to time limitations. The results from the semi-systematic literature review can be found in section 4.1.

2.2. Situational method engineering and method comparison

In order to construct PALERMO, we use situational method engineering and method comparison. A situational method is a method tuned to a specific situation [13]. For our research, a method is designed that aids a SECO orchestrator to determine whether a partner is a valuable addition to their SECO. We apply the technique of method comparison [45] to compare the six industry methods in order to construct PALERMO.

PALERMO is a reference method that is modelled in a Process-Deliverable Diagram (PDD) [97]. In a PDD, the process view (based on a UML Activity Diagram) is shown on the left-hand side. On the right-hand side, the deliverables corresponding to the activities are shown (based on a UML Class Diagram). A PDD is accompanied by two tables, an activity table that specifies the activities in the PDD and a concept table, specifying the concepts used in the PDD. Furthermore, a list of evaluation and assessment criteria is provided that organizations can use when employing PALERMO.

Table 1
Protocol for the semi-systematic literature review based on the work of Kitchenham [64].

Component	Description
Purpose	This semi-systematic literature review has a goal to collect candidate partner selection criteria.
Search strategy	<p><i>Search terms</i> The search terms applied are: partner(schip) selection, SECO partner selection, and software ecosystem partner selection.</p> <p><i>Resources</i> Google Scholar is used as database for the search queries.</p> <p><i>Search queries</i> 1. ("partner selection") OR ("partnership selection") AND ("criteria") OR ("method"); 2. ("SECO partner selection") AND ("criteria") OR ("method"); 3. ("software ecosystem partner selection") AND ("criteria") OR ("method").</p> <p><i>Search limits</i> All hits from the search queries are analyzed.</p>
Study selection criteria	<p><i>Inclusion criteria</i> 1. The candidate criteria are measurable and some form of value can be assigned to the criterion; 2. The candidate criteria are applicable to the software industry, meaning they are used to measure or characterise: a) a partner or a partner's organization that offers a software product; b) a partnership between partner and SECO orchestrator resulting in adding a new software product to the SECO; c) a partner's software product.</p> <p><i>Exclusion criteria</i> 1. Candidate criteria focusing on other markets than the software industry, such as manufacturing or services providers. For example production speed or labour conditions; 2. Candidate criteria focusing on other markets than the European or Northern-American market. For example criteria for emerging markets such as Africa.</p>
Study quality assessment	All studies that matched the following criteria were excluded: 1. the study was not in a peer-reviewed journal or conference proceedings; 2. the study suffered from obvious language issues; 3. the study was a position paper.
Synthesis of extracted data	Candidate criteria are grouped and compared for overlap. If the latter is the case, they are merged into one criterion.
Query results	46 articles were collected based on the queries ran applying the inclusion criteria previously stated. After executing the quality assessment, 4 articles were removed from the initial set resulting in a final set of 42 articles. The queries were performed January 2019.

2.3. Case study design

A case study design should be considered when: (a) the focus of the study is to answer "how" and "why" questions; (b) you cannot manipulate the behaviour of those involved in the study; (c) the researcher wants to cover contextual conditions because the researcher deems these relevant to the phenomenon under study. In order to define and construct our case study design, we apply the guidelines by Runeson and Höst [88].¹ We conducted six case studies. For each case study, first, two individual interviews are conducted. After the individual interviews are conducted, processing time is scheduled in order for the researcher to analyse the data and develop an initial industry partner selection method based upon the results of the two individual interviews. The aforementioned initial method is then evaluated in one verification interview with both employees present.

2.3.1. Preparation for data collection

We adhere to the Case Study Protocol by Pervan and Maimbo [81], as is suggested by Runeson and Höst [88]. The case study organizations used for our research are gathered using convenience sampling [76]. Convenience sampling involves drawing samples that are both easily accessible and willing to participate in a study [93]. The network of the researchers is used to select potential organizations to participate in the case studies. In order to select case study organizations that optimally suit our research, we use the following inclusion criteria:

- organizations that offer a software product that comes with a platform ecosystem in which partners can place their application that can be bought by customers;
- organizations that employ more than 100 people;
- organizations that offer a platform that can be bought and used in the Netherlands;
- organizations that have a platform SECO that can be classified as a large ecosystem in the number of partners that are part of the SECO since a platform becomes more attractive when more customers use it and more suppliers provide complementary products and/or services [41].

We chose to adhere to a minimum of 30 partners for the following reason. When an orchestrator has to select and engage 1, 2, 5 or 10 partners, this can be achieved without a structured partner selection approach. However, when the

¹ Please note that the case study data can be found here: <http://dx.doi.org/10.17632/zcm4c3tj6x.1>.

number of SECO partners increases, it becomes more and more difficult for the SECO orchestrator to successfully vet, select and engage new partners.

Each case study was initiated by phone or email to gauge potential interest from the case study organization to participate in our research. When the interviewees were enthusiastic and willing to participate, an overview of the research objective as well as the case study setup was given, explaining what is expected from them. To prepare for the interviews, the researcher conducted an online investigation into the case study organization, during which, when available, the partnership programs were studied.

2.3.2. Data collection

The average duration of the interviews was 75 minutes and took place at the respective organizations' headquarters or via digital communication. For each case study organization, either the SECO orchestrator and partner manager or senior partner manager were interviewed. The interview was recorded using an audio recorder. During the interview, the interviewer took notes and provided the interviewee with pen and paper to write information down or make drawings when deemed necessary. The results were processed within 24 hours after the interview.

For each case study, first, two individual interviews are conducted for each case study organization. For these interviews, two main themes with corresponding notes are identified. These are later used for data analysis. The following themes are used: *partner selection criteria* (the partner selection categories) and *partner selection method* (main- and sub-activities, and corresponding deliverables). The researcher collects data for the first theme by means of a card sorting exercise.

The goal of the card sorting exercise is for the interviewees to create a ranking in the partner selection criteria presented to them. We chose for card sorting because the researcher can clearly capture the rationale behind the ranking, it enables interaction between the researcher and interviewee, and it creates variety during the interviews; the interviewee does not only have to answer questions presented by the researcher.

A key aspect with regards to card sorting is to consider how to analyse the data gathered from the card sorting exercise [86,92]. Fincher and Tenenberg [32] state various card sorting data analysis techniques, varying from manual analysis to statistical analysis when the researcher possesses a larger data set. We selected manual analysis for our research.

During the card sorting exercise, each interviewee is asked to sort categories of cards, deemed from most to least desirable and applicable to their partner selection process. These categories vary in the number of cards per category. The interviewee is not allowed to move cards between the categories. In case the interviewee is not willing to participate in the card sorting exercise, the particular case study organization he represents is not considered when analysing the results.

The interviewee is allowed to rank multiple cards at the same level, for example, rank multiple cards at position 1. After the interviewee finished ranking a card sorting category, the interviewee is asked to give their rationale for the particular ranking. The researcher creates, for each category of cards, a top 3 of cards deemed most desirable and applicable with regards to partner selection. A top 3 is chosen because the card sorting category partner's knowledge assets consists of five cards meaning a top 5 exists anyway since the category consists of five cards. The analysis of the results is executed as follows:

- The cards will be assigned their value based upon their ranking within a particular category. In case there are multiple cards ranked on the same position, these cards are assigned the same value, for example, three cards are ranked at position 1, all three cards get value 1 assigned. The values that normally would have been assigned to these cards (value 2 and 3), expire;
- For each card, the researcher counts the number of times the card is ranked at the same position, for example, five times at position 1, three times at position 2 etcetera;
- All rankings at position 1 are multiplied by three, position 2 by two and position 3 by 1; all multiplications are added up;
- In case of a draw, the distribution of the rankings is decisive;
- In case of still a draw, a shared position within the top 3 is assigned.

Summarising, when analysing the results two main factors need to be considered, first, assigning the correct value to each of the cards, and secondly, analysing the results based upon the rules defined above.

After the individual interviews are conducted, an interview with both employees present is conducted. During this interview the focus is on analysing the similarities and differences (and the underlying rationale) between the two interviews. During this interview, one partner selection method representing the partner selection process for the particular organization is created.

2.3.3. Case study organizations

Six case study organizations participated. One organization has been made anonymous at their request. They vary in their product offering: FinTechComp offers a digital banking platform to their customers whereas SAP offers enterprise application software. They also differ in their size, for example, SAP has 96000 employees whereas AFAS has 450. One must note that the partner selection methods developed for Salesforce and Centric refer, respectively, to Salesforce Benelux & Nordics and Centric HR & Payroll. For SAP, we focus on SAP Build partnership in PartnerEdge. PALERMO is evaluated by means of three

Table 2

Overview of the case study organizations that participated in our research. The cases under the line are those that participated in the evaluation of PALERMO.

Organization	Product/service	Year founded	Year ecosystem founded	Number of employees	Number of ecosystem partners
FinTechComp	Digital banking platform	2003	2015	700	70
Exact	Exact Online	1984	2012	1400	200
AFAS	AFAS Software	1996	2009	450	210
SAP	Enterprise Application Software	1972	1989	96000	35
Centric	Centric HR & Payroll	2000	2018	4300	30
Salesforce	CRM Software & Cloud Computing Solutions	1999	2005	35000	120
Onguard	Credit & Debtor management	1994	2017	130	15
SnelStart	Bookkeeping software	1984	1990	140	90
RetailComp	Retail software	2004	2017	50	10

case studies, one organization has been made anonymous at their request. An overview of the case study organizations is given in Table 2.

Although the fact that the role of the interviewees within their organization differ, they all have, either a background in, or are involved with software development. Also, all of them are involved with the partner selection process within their organization. For Onguard we have interviewed their ecosystem manager and senior partner manager, for SnelStart one of the owners and for RetailComp a product manager.

2.3.4. Data analysis

This research is of an exploratory and qualitative nature. One major benefit of qualitative data is that it focuses on naturally occurring phenomena in their natural environment [73]. In any form of qualitative research, uniformity of method in data collection contributes greatly to the rigour of method and validity of results [73]. To strengthen reliability and validity [88] we apply both data triangulation as well as methodological triangulation. The interview data was reviewed by two of the three authors. To analyse the results, both within-case and cross-case analysis is applied [106]. Within each case, the different viewpoints from the interviewees on partner selection and relevant criteria are analysed and merged into one partner selection method per case study. To do so, we apply thematic analysis [39]. Cross-case analysis is applied to analyse the similarities but also the differences between cases. This to create one overarching partner selection method. During the evaluation case studies, using the method fragments gathered during the case study, the participants of the evaluation case studies develop a reference partner selection method, which is a method tuned to a specific case [13].

2.4. Evaluation

In studies of an exploratory nature, evaluating the created artefact is a key part of the research method [43]. A researcher should evaluate an artefact using a set of criteria that are based on the context of the artefact implementation [43]. Based upon the work by Peffers and Hevner [43,80], an observational evaluation method is selected, namely, a case study. During the case studies, the artefacts constructed, are the six industrial partner selection methods. These are analyzed and generalized into a generic method, which is subsequently evaluated with three evaluation case studies.

In order to evaluate PALERMO, a set of evaluation criteria is used. Prat, Comyn-Wattiau and Akoka [84] provide a taxonomy of evaluation criteria. The evaluation criteria that have been selected for this research from the taxonomy provided by Prat et al. [84] are listed in Table 3. Since PALERMO is not evaluated when applied in practice but evaluated as if the method was to be applied in a real-word case, the evaluation criteria are phrased as *perceived* criteria, i.e. how do the interviewees perceive PALERMO.

The rationale behind the selection of evaluation criteria from the work of Prat et al. [84] is as follows. First, we focus our evaluation on the effectiveness, completeness and usefulness of PALERMO as if the method is used in a day to day operation. Based on these main evaluation goals, we selected seven evaluation criteria. Secondly, we solely focus on PALERMO, not on a fit with another artefact such as, for example, an IS architecture. Thirdly, we are not focused on the performance of the artefact, such as accuracy, reliability or robustness. Finally, we do not focus our evaluation on the learning capability and scalability of the artefact, i.e. the capability of the artefact to be scalable in the amount of potential partners the artefact can verify to determine if a potential partner is a match for the SECO orchestrator.

3. Background

First, we motivate how a software vendor and partner benefit from a SECO, and why they, respectively, should launch and join a SECO. We end by introducing, in Table 4, an overview of partner selection candidate criteria, identified during the literature review.

Table 3

Evaluation criteria selected from Prat et al. [84]. These criteria are explicitly addressed with the evaluation case study participants.

Evaluation criteria	Definition
Effectiveness	Prat et al.: the degree to which the artefact achieves its goal in a real situation. For this research: the degree to which the SECO orchestrator achieves their goal of selecting the partners that are an optimal fit for SECO, both commercially and technically.
Operational feasibility	Prat et al.: evaluates the degree to which management, employees and other stakeholders, will support the proposed artefact, operate and integrate it into their daily practice. For this research: the degree to which the SECO orchestrator and their staff make use of the method in their daily practice.
Economic feasibility	Prat et al.: evaluates whether the benefits of the proposed artefact would outweigh the costs of building and operating the artefact. For this research: do the benefits gained during the partner selection process, by using the partner selection method, outweigh the costs of implementing the partner selection method in the daily practice of the SECO orchestrator.
Usefulness	Prat et al.: the degree to which the artefact positively impacts the task performance of individuals. For this research: the degree to which the method positively impacts the daily task of partner selection performed by the SECO orchestrator and their staff.
Ease of use	Prat et al.: the degree to which the use of the artefact by individuals is free of effort. For this research: the degree of difficulty for the SECO orchestrator and their staff to use the method, this includes getting to grips with the method, implement the method in their daily practice and modify the method; update, add, remove activities and/or concepts.
Completeness	Prat et al.: the degree to which the activity of the artefact contains all necessary elements and relationships between elements. For this research: the degree to which the method is complete; all relevant and required activities and concepts are included in the partner selection method.
Modifiability	Prat et al.: the ease with which the artefact can be changed without introducing defects. For this research: the degree of difficulty to which the SECO orchestrator and their staff can modify the method without interrupting the flow of the method.

3.1. As a software vendor, why do I want to launch a SECO?

Kaistinen [61] lists several benefits for a software vendor to launch a SECO, that can be summarised in two main benefits. First, having a partnership with various partners enables a software vendor to offer a platform portfolio to their customers with basically no limits. The aforesaid results in an increase of their customer base, as partners deliver missing functionality required by the customer that in turn attracts new customers [55]. Secondly, when a software vendor offers a platform SECO around their product, partners that have a rare skill set can join the SECO and offer their product to customers. It provides the software vendor with access to these skills and enables co-innovation or the potential for acquisition of a particular partner in order to secure their unique skill set for the future. Iansiti and Levien [49] mention that “if a SECO orchestrator continually improves their platform SECO, they ensure their own survival and prosperity.” Besides an increased change of business survival, a SECO is a powerful source of competitive advantage for an orchestrator. According to Williamson and De Meyer [99], an orchestrator may reap the benefits of economies of scale by creating a platform ecosystem. Resulting in a lower investment required than if the orchestrator would try to offer the functionality itself.

3.2. As a partner, why would I want to join a SECO?

When a partner joins a healthy SECO, this leads to an increase in individual sales [17] and access to a larger customer base [85]. Another benefit is that the SECO orchestrator shares knowledge with its partners [48], with the goal of improving SECO health. Barbosa and Alves [8] state that joining a SECO generally results in a decrease of costs for a partner as well as knowledge being shared between partners. Joshua, Alalo, Okololie and Awodele [58] found additional benefits: improved requirement analysis and a decrease in development costs. Bech [9] mentions that a SECO orchestrator closely collaborates with their partners. The aforementioned can be seen as benefit for both the SECO orchestrator and the partner since the partner can learn from the SECO orchestrator and improve, and extend their product enabling the partner to offer a better product to their customers. Lantz and Weijden [67] state two additional benefits: better scalability and less resources required. In other words, a SECO's health can steadily improve with an effective partner selection process. Molenaar, van Vliet, Beelen and Jansen [74], identified two additional benefits. First, when a partner joins a SECO they improve their credibility as customers perceive the SECO orchestrator as a trustworthy organization. Secondly, it increases the visibility of the partner as they can benefit from the SECO orchestrator's marketing channels.

3.3. Partner selection candidate criteria

For an organization partner selection can achieve access to resources, capabilities, and competencies [23,28,68,95,104]. When selecting partners, an organization should apply a partner selection strategy or method [27]. Robson and Pant, Yu [77, 87] state that, although an organization wants to maximise the value captured from a partnership, an organization should strive for a partnership in which partners and organization benefit equally. This makes it for a partner more attractive to enter into a partnership with the organization. By capturing too much value, the risk occurs of ecosystem exhaustion and

the exodus of partners, which can result in the collapse of the ecosystem. In this section, we introduce an overview of partner selection candidate criteria. These criteria were found in the literature during a semi-structured literature review. In order to collect criteria that are applicable to the software (ecosystem) domain we defined a set of inclusion criteria, see Table 1. The partner selection criteria that we identified in the literature are listed in Table 4. We define the following categories of candidate partner selection criteria:

- **Partner's characteristics**, contains criteria that a SECO orchestrator applies to describe and test the general characteristics of a potential partner;
- **Partner's capabilities**, contains criteria that describe the capabilities a SECO orchestrator looks for in a potential partner's organization and employees;
- **Partner's product**, encloses the criteria a SECO orchestrator looks for in a potential partner's product; criteria that describe characteristics of the potential partner's product and criteria the partner's product must meet;
- **Partner's knowledge assets**, contains criteria that describe the business and technical knowledge assets the potential partner has at its disposal;
- **Partner's sales capabilities**, sales capabilities a SECO orchestrator looks for in a potential partner; capabilities that enable a potential partner to sell their product;
- **Orchestrator perspective**, criteria the SECO orchestrator looks for in a potential partner from their organization's perspective.

Summarising, we have identified categories into which the found partner selection criteria can be broken down. The majority of the partner selection criteria can be found in the first category, partner's characteristics. See Table 4 for the overview of the identified partner selection candidate criteria.

3.4. Partner selection methods

In the previous section, partner selection candidate criteria have been introduced that can be used by a SECO orchestrator to determine if a potential partner is a valuable addition to the SECO. Besides partner selection criteria, as stated in Table 1, we look in the body of scientific literature for partner selection methods. No literature has been found that was specifically tailored to partner selection methods in the software industry or software ecosystems. However, we did find some literature that describe a (partial) partner selection method.

Emden, Calantone, and Droge [30] introduce a theory that can be used for partner selection. They distinct three main phases. The first phase, technological alignment, can give managers ideas about opportunities for collaboration. Secondly, strategic alignment, which defines the goals of the organization and how the organization wants to achieve those goals. Finally, relational alignment, is concerned with whether the partner is a match for our organization.

Emden et al. [30] puts emphasis on technological alignment. Long term orientation, a partnership for the long term is just only part of phase 3, this can be seen as odd, since as an orchestrator or any organization that initiates a partnership with a partner, wants to make sure that this partnership is for the long term; to ensure business continuity for their customers.

De Boer, Labro and Morlacchi [22] define four main phases in their partner selection process: problem definition, formulation of criteria, qualification, and choice. In the first phase, it is decided if the organization wants to initiate new partnerships, is there a need for new partners? If this is the case, the organization formulates the criteria the potential partner has to meet. In the third phase, the partner undergoes the partner selection qualification. In the last phase, the organisation makes a choice and determines if she wants to initiate a partnership with a new partner. If there are multiple potential partners offering the same functionality, the organisation must choose between partners.

Huang, Wong and Wang [46] created a partner selection method, showing the process from criterion definition to a preferred list of partners. First, the organization defines the criteria that it uses for the partner selection process. Based on these criteria, an initial list of potential partners is composed. Next, the "hard decision criteria/requirements" for the potential partner are evaluated. This leads to a new list, as some partners may drop off the initial list. Subsequently, the soft factor evaluation process is executed. These criteria focus on the cooperation potential and long-term relationship between the organization and its partners. This process delivers a preferred list of potential partners.

Please see section 8.2 for the comparison of the previously stated methods with PALERMO. This because we describe PALERMO in section 5 and therefore the reader is not yet familiar with PALERMO in the current section.

4. Case studies and the six industry methods

In this section we present six descriptive case studies conducted to gather information on partner selection in software ecosystems. First, we present the top 3 for each of the Partner Selection Criteria categories. Secondly, for each case study, we present the rationale behind launching their ecosystem. This to provide the reader with more background information on how the six organizations perceive their software ecosystem and why they invest in their ecosystem; how does the ecosystem generate added value to their organization. Thirdly, we summarize the case study findings and introduce three types of partner selection (*inbound*, *outbound* and *hybrid*) and subsequently provide a set of overarching activities for each of the three types of partner selection. In the next section, we introduce PALERMO based on the case study results.

Table 4

Overview of partner selection candidate criteria as identified in the literature review.

Partner selection candidate criteria	Literature source
Partner's characteristics	
Trustworthiness A partner must be trustworthy, honest, transparent, and fulfil its obligations	[4,12,18,21,29,34,63,65,87,90,91]
Reputation and credibility The potential partner's reputation and credibility in the market is a key indicator for the orchestrator how the potential partner is perceived by their customers	[12,21,26,34,69,89,91,103]
Collaboration history In case an orchestrator has previous collaboration experience(s) with a partner, this can influence the orchestrator's decision to initiate a new collaboration with that particular partner	[18,21,57,69,91,103]
Collaboration goals The orchestrator's and partner's goals for initiating a partnership should match	[4]
Culture compatibility To facilitate smooth collaboration, the orchestrator's and partner's national and corporate culture must be aligned	[12,16,18,34,36,87,103,108]
Objective alignment In order to make a partnership work, the orchestrator's and partner's objectives for the partnership should match	[12,79,103]
organization structure and size This can influence the partnership between the partner and the orchestrator. For example, an orchestrator may not want to collaborate with small partners	[18,21,36]
Financial KPIs For an orchestrator, it is vital to know the current financial position of the potential partner before initiating a partnership	[21,26,36,90,91]
Profitability This can influence the partnership. For example, a potential partner not being profitable is not able to invest in their product	[18]
Potential for growth When the potential partner has growth potential in terms of profitability, market share and product offering, an orchestrator can benefit from this	[18]
Content of business plan This shows the orchestrator how the potential partner envisions to sell their product; a vital prerequisite for a partnership to work	[27]
Chemistry in relationship When there is chemistry in the relationship between the partner and orchestrator, they share a mutual and natural liking that will have a positive effect on the partnership	[27]
Transparent & efficient in communication When the partner is transparent and efficient in its communication with the orchestrator, customers and other partners, this helps an orchestrator to gain more from the partnership	[3,4,11,29]
Transparency in intentions This enhances the collaboration between the partner and orchestrator that will flourish the partnership, resulting in higher value created	[11]
Sharing culture If the potential partner is willing to share with the orchestrator, such as expertise or knowledge, this enables both parties to gain more from the partnership	[30,66,91,103]
Willingness to share technical and business knowledge When a potential partner is benevolent to share knowledge with the orchestrator and fellow partners, this will positively effect and enable the ecosystem to flourish	[6]
Willingness to commit to terms & conditions set by the orchestrator An orchestrator wants to ensure that when they enter in an agreement with a partner, the partner will honour the agreement	[11]
Commitment to partnership An orchestrator wants to collaborate with a partner that is fully committed to the partnership and the partner is willing to invest in the partnership	[4,18,34,69,79]
Loyalty to partnership For an orchestrator to invest in a partnership with a potential partner, the orchestrators wants to be ensured that the partner is fully dedicated to the partnership	[11]
Willingness to invest in partnership An orchestrator searches for a potential partner that is willing to continually invest resources to ensure the successful development of the partnership	[3]
Autonomous & independent operation An orchestrator wants their partners to operate autonomously and independently. A partner should try to independently investigate and review issues without causing unnecessary hassle for the orchestrator	[3]
Flexibility in corporate principles When the partner is willing to adjust their principles to facilitate the collaboration, this positively effects the relationship between the partner and orchestrator	[102,103]
Adherence to standard development practices The partner ensures homogeneity within the ecosystem when adhering to standard development practices while developing their product	[3]
Customer satisfaction For an orchestrator, the highest priority is satisfied customers. Without satisfied customers, there is no business	[26,62]
Customer happiness For an orchestrator, the highest priority is happy customers. Without happy customers, there is no business	[26,62]
Partner's capabilities	
Resource availability The resources the potential partner has at their disposal determines to a large extent their short term growth potential	[21,44,65,71,75,90]
Unique competencies A potential partner has to differentiate himself from others	[21,44,103]
The ability to reduce cost through the partnership A collaboration with a potential partner results in a cost reduction on the orchestrator's side	[47,102]
Innovation capabilities An orchestrator searches for an unique product; a product leader. In order for a potential partner to offer something unique to the market innovation is required, this differentiates the partner from others	[3]
Continuous focus on innovation For an orchestrator it is vital that the potential partner continuously focuses on innovating and developing their product	[18]
Management capabilities The potential partner's management style and capabilities influence a potential partnership	[21,103,107]

(continued on next page)

Table 4 (continued)

Partner selection candidate criteria	Literature source
Partner's product	
Quality The partner's product quality is top priority for an orchestrator, the partner's product must be of high quality	[21,91,101,102]
Pricing The price of the partner's product is key for an orchestrator. The price has to be aligned with their product in order to offer the customer a complete product offering for a competitive price	[1,26,62,101,105]
Reliability The partner's product reliability is top priority for an orchestrator, the partner's product must be reliable	[1,105]
Clear and complete documentation Customers want, in case of issues, to have clear and complete product documentation available that guides them in solving the issue	[11]
Data privacy & security An orchestrator searches for a potential partner that values the data privacy & security of their customers, and invests sufficient resources to ensure data privacy and security	[89]
Effective API integration For an orchestrator it is vital that excessive API usage is prevented, in terms of costs and resources. This requires that the potential partner makes effective usage of the API provided	[11]
Development standard When the partner follows unquestionable standards, methods and techniques to develop their product, this ensures homogeneity within the ecosystem	[18]
Continuous improvement When the potential partner continuously improves their product, both bug fixing and development, this ensures that the potential partner stays ahead of the competition	[18]
High-quality customer support When the potential partner offers high-quality customer support to their customers, this has a positive impact on customer satisfaction	[11]
Partner's knowledge assets	
Availability of technical & business in-house knowledge of their own and orchestrator's product For an orchestrator it is vital that the potential partner has the knowledge to develop and maintain their product, and ensures seamless integration with the orchestrator's product	[25,103]
Ownership of intellectual property (IP) For an orchestrator, IP is an indication of the knowledge available, from both technical and business perspective, owned by the potential partner	[2,47]
Ownership of patents For an orchestrator, this is an indication of the intellectual property owned by the potential partner	[2,47,103]
Availability of technical expertise Without the availability of technical expertise within the potential partner's organization, the development process is negatively affected	[15,21,103]
Investment in R&D Investment in R&D ensures sustainable growth of the potential partner	[18]
Partner's sales capabilities	
Access to markets The access the potential partner has to both national and international markets indicates the level of product market penetration and points out the growth opportunities of the potential partner	[27,36,103]
Sales channels available This provides the orchestrator with an indication regarding the means that the potential partner can use to sell their product	[21,72,103]
Sales experience This tells the orchestrator how much sales experience the potential partner has. The potential partner can leverage this experience to sell their product	[21,72]
Customer base The potential partner's customer base can give the orchestrator opportunities for expansion. In case the potential partner has a large customer base, the potential partner likely has customers that are not yet orchestrator's customers	[21]
Availability of market knowledge This is a key indicator for the orchestrator to what extent the potential partner knows the market. An orchestrator can benefit from this to enter together with the potential partner new market(s) or market segment(s)	[21,34,69,91,103]
Market share This provides the orchestrator with a picture of the potential partner's current opportunities, which the potential partner can further expand	[103]
Market coverage This tells the orchestrator the level to which the potential partner currently caters the market	[103]
Customer diversity This provides an indication for the diversity of the customer base of the potential partner	[103]
Partner's network The orchestrator gains access to the partner's network through the partnership. This network can result in opportunities for the orchestrator	[4,12,37]
Orchestrator's perspective	
Loose connections with competitors An orchestrator can prefer their partners not to have strong connections with the orchestrator's competitors	[37]
Multi homing An orchestrator prefers/not prefers potential partner that develop cross-platform capabilities	[89]
Open for co-opetition In case a potential partner is open for co-opetition, the potential partner is open to co-develop functionality with the orchestrator. This collaboration does not interfere with their other business activities	[89]
Potential for co-development In case the orchestrator wants to co-develop a product with a potential partner, the potential partner has the capabilities and characteristics required to develop functionality together	[44,71,75]
Portfolio complementarity The potential partner's product has to be complementary with the orchestrator's product	[89]
Partnership ROI A potential partnership must reap financial benefits for the orchestrator	[18]
Recommended by others An orchestrator gets to know potential partners by word of mouth advertising, having the opportunity to verify if a potential partner is a match. Both customers and partners can recommend a potential partner	[63]
Know-how of local regulations When a potential partner has knowledge and experience on local regulations, this can help the potential partner to develop and sell their product	[21,69]

4.1. Partner selection criteria

For each of the Partner Selection Categories, the top 3 is based upon the results of the card sorting exercise, executed by the twelve interviewees representing the six case study organizations. Direct quotes from the interview transcriptions were used to support the findings. These quotes, provided by the two representatives of each organization have been interpreted as the voice of their organization as a whole, or, when explicitly stated in the case study introduction section, for a limited branch of their organization. Quotes have been translated from Dutch to English by the researchers.

4.1.1. Partner's characteristics

For Exact commitment to partnership is mutual shared trust between the partner and orchestrator. One employee phrased it as *"you have to be able to rely on each other, have a common goal."* AFAS interprets commitment to partnership as *"the partner has to be really committed to certain agreements; if you conclude an agreement with us, you stick to it."* Salesforce sees commitment to partnership as a partner that wants to fully invest in a partnership, one Salesforce employee phrased it as *"an organization that wants to fully cooperate with Salesforce, very interesting!"* Commitment to a partnership has to come from two ways, not just from the partner. The aforesaid is expressed by one SAP employee as *"... is very important, both from our side as the partner's. Sometimes you have to do things that are not completely in line with your own interests but it is in the interest of the partner or customer."*

The interviewees ranked customer satisfaction and customer happiness on respectively the second and third position in the top 3. The two criteria are closely related according to the majority of the interviewees. AFAS states that *"you want happy customers, that's number 1. Make sure your customers are satisfied and happy."* For Centric the customer comes first, *"together with our partners we serve our customers."* Satisfied customers do not only *"remain a customer for longer and will yield more"* according to one Exact employee but also *"are earlier prepared to adopt innovations and buy new software, creating additional revenue"* according to one SAP employee.

4.1.2. Partner's capabilities

One AFAS employee mentioned *"I think innovation is important, that what they do is innovative, I like that. That makes me enthusiastic; I want to think if you (partner) can innovate and move in that market."* A Centric employee mentioned that *"by bringing something unique to the market, you're ahead of your competitors. To do so, you need these two capabilities, innovation capabilities and continuous focus on innovation."* However, just by having an innovative product when you join a SECO is not sufficient as is stated by one of the FinTechComp employees, *"partners have to keep going forward so innovation is crucial and has to remain crucial."* The previous statement is supported by both Centric employees stating that *"we want a product leader so innovation is important."* Both Salesforce employees mentioned that since they are *"one of the most innovative companies in the world"* according to Forbes [33], they mention that *"the Salesforce innovative DNA has to match with that of a potential partner. Innovation is our thing, we find innovation very important and expect it from our partners."*

Closely related to innovation is the number 2 in the top 3, unique competencies. One Exact employee stated that *"both the people and resources the partner has at its disposal is very important to us."* For FinTechComp, they go in business with a partner because the partner has something unique *"otherwise, the partner is the same as everybody else so why a partnership then?"* The aforementioned view is shared by AFAS, *"you have to add something additional, something unique."* We end with one SAP employee stating that *"... are definitely important, you bring business or industry knowledge together with product knowledge."*

Continuous focus on innovation is placed by the interviewees on the third position in the top 3. The interviewees state that continuous focus on innovation is closely related to innovation capabilities, the rationale given for previous stated criterion is therefore valid for the criterion continuous focus on innovation.

4.1.3. Partner's product

In this category, the interviewees placed reliability and quality respectively on the first and second position in the top 3. One Exact employee mentioned *"from my point of view, it has to be a top partner who is and delivers a reliable product, we don't want issues."* Their colleague supports his statement by mentioning that *"reliability and quality are our top priority."* Both AFAS employees agree with their counterparts at Exact, stating that *"the partner's product must always be available and of high quality."* One AFAS employee added to the previous that *"for me it's important that the partner's product is reliable, the amount of data that is pulled back and forth between our product and the partner's product must be transparent."* For all case study organizations reliability is vital. However Salesforce does not directly use the criterion in their partner selection process since their platform ensures 24/7 up-time. One SAP employee: *"if you're not reliable, this is annoying in a partnership."*

For FinTechComp it is key that partners *"can easily integrate their product using APIs."* Both Exact employees add to the previous that *"a partner needs a proper working API integration, not just working but also effective."* For Exact this is the *"common denominator"* why they initiate a partnership with a partner. Both AFAS employees mentioned that *"partners have to assure a proper working API connection."* One AFAS employee mentioned that *"an effective API integration makes sure we're in control"*, by which he means that if the connection is properly established, AFAS knows which data is pulled back and forth and can intervene in case issues arise.

4.1.4. Partner's knowledge assets

Technical expertise and in-house knowledge are prerequisites in order to make a partnership successful. One FinTechComp employees puts it as *"... has to be there, otherwise no deal."* For AFAS, the two criteria are of high importance with regard

to the partner's knowledge assets, stating that *"if the partner has in-house knowledge and also the technical expertise to develop and maintain something, very important. If not, it costs us lots of time and in case something goes wrong, it takes much more time to fix it."* One AFAS employee added to the aforementioned that *"the partner must have in-house knowledge with regards to both their product and our platform"* and that without technical expertise, in case of an escalation, *"it completely goes wrong."* Besides issues in case of an escalation, the lack of technical expertise is also seen as an inhibitory factor, one Exact employee stating that *"without technical expertise, it slows everything down."* Adding to the previous, their colleague states that partners who outsource their technical expertise is partially fine, however, it functions also as an inhibitory factor to development, *"it simply works too slow."* In the previous category, partner's product, effective API integration has been discussed. One Centric employee mentioned that *"in order to have a proper integration between our platform and the partner's product, knowledge and technical expertise are definitely required."*

In the paragraph above, in-house knowledge and technical expertise has been identified as something of a technical nature. However, business knowledge is key to possess, as can be seen from the following statement made by one Salesforce employee, *"in-house knowledge, is not so much about only technical knowledge, business knowledge is vital as well."*

All organizations agree that R&D is a prerequisite to be successful. Centric describes it as *"with a proper working R&D department, you can become really successful as a company."* Exact puts it as *"R&D is important, not just for us but also for the partner, to become better in what they do."* For a partner but also for an orchestrator, R&D is not only required to become better and grow but also to survive. The previous statement is supported by a quote from one AFAS employee stating that *"if a partner does not develop and keep evolving and investing in R&D, the partner has a short life in the software market."*

4.1.5. Partner's sales capabilities

All interviewees were unanimous in the fact that the customer base of the partner is the most desirable partner selection criterion for them. The partner's customer base can lead to opportunities for the orchestrator to expand their current customer base. Exact phrases this as *"when the partner has a large customer base, there is a lot of potential for us."* Both FinTechComp employees share the aforementioned vision, stating that *"the more customers they have, the better. The focus is on the customer base, I want to know which customers you have and what's the potential for FinTechComp."* One AFAS employee mentioned that *"its beneficiary and easy for us when a partner has a customer base in which we have few customers."* their colleague mentioned that *"it's valuable to us when a partner has customers because you then you start collaborating with a known brand in the market."* For Centric, the customer base is a selection criterion to verify if the potential partner is not a new entrant in the Dutch market, *"it must not be a new entrant in the Netherlands."* One Salesforce employee mentioned that *"the customer base is very important for me. Are they existing Salesforce customers?"* Their colleague added to the previous that *"if the partner has a large customer base, they will likely have customers in a market segment in which we are not yet active."*

Market share comes second and is closely related to customer base. Both are relevant to estimate the success rate for a potential partner. One Salesforce employee phrased it as *"the most important is the chance of the partner succeeding. That starts with what the partner has already in the market, which they can optimise and further expand."*

On the third position the interviewees ranked market coverage. According to FinTechComp *"the customer base, market share and market coverage must be in conjunction with each other."* Adding to the previous, Exact mentions that *"if a partner has a large customer base, they have in the majority of the cases good market coverage."*

4.1.6. Orchestrator perspective

One Salesforce employee mentioned that *"portfolio complementarity is key"*, whereas one FinTech employee stated that, *"if there is no complementarity, there is no need for a discussion."* For both Centric employees, *"portfolio complementarity is 1, no discussion."* AFAS phrases it as *"the partner's product has to be an addition to our product offering, this is the most important."* Finally, Exact stated that *"portfolio complementarity is key, it has to be complementary with our software."*

Besides portfolio complementarity, there must be a financial incentive for both the SECO orchestrator and the partner to initiate a partnership. As one FinTech employee states *"the ROI has to be there, simple."* The previous point is shared by Exact where both employees are convinced that the partnership ROI has to be there in order to make it *"a win win for both parties"* and Exact *"has to make money with the partnership."* The latter is shared by Centric *"ROI, are you go going to make money with the partnership? If not, we do not initiate the partnership."* According to one SAP employee, partnership ROI *"is important for partnership continuity."*

The top 3 ends with recommended by others. One SAP employee mentioned that *"recommended by others is always a good thing, that you know potential partners due to word of mouth, you get an impression of a potential partner."* FinTechComp adds to the previous that it is a test for them to see if their customers would be interested in a partnership between FinTechComp and a particular potential partner, *"creates a bit of a pull whether the clients are actually interested."* For AFAS, recommended by others means that current partners advise AFAS to partner up with certain new partners. One employee mentioned that *"partners are very active within different market segments, if they tell us a certain partner is really an addition to AFAS, then we look in-depth into such a recommended partner."* Exact shares AFAS' viewpoint, but from the perspective of their customers, stating that *"if customers recommend a partner, there is a good chance of this partner being in our app center."* For Centric, besides getting to know a potential partner, recommended by others helps to gain market traction, *"it creates trust in the market if you partner up with a known brand."*

Table 5

Summary of the top 3 partner selection criteria for each category. The value assigned between brackets is the corresponding card sorting score and was identified by analysing the results from the card sorting exercise part of the six initial case studies.

Category	Position 1	Position 2	Position 3
Partner's characteristics	Commitment to partnership (19)	Customer satisfaction (16)	Customer happiness (16)
Partner's capabilities	Innovation capabilities (22)	Unique competencies (19)	Continues focus on innovation (17)
Partner's product	Reliability (18)	Quality (14)	Effective API integration (13)
Partner's knowledge assets	In-house knowledge (28)	Technical expertise (27)	Investment in R&D (15)
Partner's sales capabilities	Customer base (21)	Market share (16)	Market coverage (15)
Orchestrator perspective	Portfolio complementarity (29)	Partnership ROI (18)	Recommended by others (11)

4.1.7. Summary partner selection criteria

We summarise this sub-section by means of Table 5 in which, for each partner selection criteria category, the top 3 of selection criteria indicated by the interviewees as most desirable for that particular category, are presented. For each criteria, the value assigned is listed to show the distance between the top 3.

4.2. Rationale behind launching ecosystem

In this sub-section we describe for each of the case study organisations their rationale for launching their ecosystem and We support this rationale by various quotes given by the interviewees

4.2.1. Case 1: FinTechComp

For FinTechComp, the rationale behind launching their ecosystem is as follows. First, brand alignment: *“to be known due to the relationship with other brands.”* Secondly, partnerships between partners and FinTechComp that originate due to FinTechComp platform SECO, have strategic value: *“partner's products are complementary to our platform, together we offer a proposition to our customers, who can go faster and know that FinTechComp is their trusted advisor regarding which partners you should or shouldn't use.”* Thirdly, as FinTechComp *“we offer certain capabilities and functionality, however, we cannot offer everything, this is were partners come in.”*

4.2.2. Case 2: Exact

As mentioned by the interviewees, *“the rationale behind the ecosystem is three-fold; offering missing functionality, reselling and stickiness.”* Exact Online is standard software. For some customers the functionality offered within Exact Online is too limited. To be able to serve these customers as well, Exact launched their platform SECO. Partners offer solutions that offer *“added value to our customers but also to our software.”* Finally, stickiness. As was mentioned by the interviewees, *“the more customers are connected with partners, the more stickiness you generate. The aforementioned is very beneficiary for commercial purposes.”*

4.2.3. Case 3: AFAS

For AFAS, their platform SECO is *“a very important part of our product offering.”* AFAS launched their platform SECO with the goal to offer additional functionality to their customers; *“We offer standard functionality that is sufficient for 90%, the last 10% is offered by our partners.”* Which is vital For AFAS because it enables them to offer a complete proposition to their customers.

4.2.4. Case 4: SAP

The rationale for launching the SAP ecosystem is mainly due to capacity issues. The main rationale behind the SAP ecosystem is to build an ecosystem to provide consultancy services to SAP customers: *“SAP simply doesn't have enough capacity to serve all our customers in their consultancy needs.”* Alongside the previous introduced ecosystem, SAP launched the Build ecosystem, which is the focus for our research. In the Build ecosystem, with partners *“...we do co-development which can be in specific industry solutions or in the core of certain modules.”* One of the interviewees added to the previous that *“partners are vital to achieve growth, growth trough and with partners.”*

4.2.5. Case 5: Centric

“Together you are stronger than alone.” is the main rationale for Centric to launch their ecosystem. The HR & Payroll market is large, consisting of various domains in which niche players operate, serving specific target customer groups. The market continually evolves, *“if you want to build all the demanded functionality yourself, you start with a major backlog.”* To prevent this, Centric HR & Payroll collaborates with partners to offer an extensive platform offering to their customers.

4.2.6. Case 6: Salesforce

“The most important element is that we cannot and do not want to do everything ourselves.” Furthermore, the interviewees added, *“you have to make use of the strengths of others, you cannot be strong in everything yourself.”* Building on the latter, one interviewee added *“as company you can not approach the entire market, you're good at one product, for Salesforce this is mainly CRM related; CRM & sales & marketing. Salesforce can simply not offer all functionality within the aforementioned product portfolio.”*

4.3. Case study findings

For each case study organization an industry partner selection method was constructed, based upon two individual interviews and verified by both interviewees during an expert-analyst collaboration interview [35]. With regard to the six industry partner selection methods constructed, the following conclusions can be drawn. First, the distinction between *inbound*, *outbound* and *hybrid* partner selection:

- *Inbound*: a potential partner contacts the SECO orchestrator to request a partnership;
- *Outbound*: a SECO orchestrator approaches potential partners to gauge their interest to become a partner;
- *Hybrid*: a combination of both types, potential partners approach the SECO orchestrator (*inbound*) and the SECO orchestrator approaches potential partners (*outbound*). For example, the SECO orchestrator applies *inbound* partner selection in a market segment where the SECO orchestrator has a strong market position, and *outbound* partner selection in a market segment where the SECO orchestrator builds their presence. Imagine an ERP vendor operating in two different market segments; the construction and retail market. In the latter it has built a large presence over the years whereas in the first, it just started its presence with no market share yet. Therefore, in the first it has build brand awareness and market share, other organizations want to work together with the ERP vendor (*inbound*). In the other segment, few organizations know the ERP vendor and therefore the ERP vendor has to approach other organizations if they are interested in working together (*outbound*).

Secondly, in case *inbound* partner selection is applied, we can distinguish the following overarching activities:

- **Verify potential partner**: the SECO orchestrator receives a request for a partnership with a potential partner, either from an internal or external source. When the request is received, the verification process of the potential partner is initiated, the potential partner is verified based on various criteria to decide if the potential partner is a match for the SECO orchestrator. Examples of such criteria are: added value for customers, commercial potential, complementary to platform, willingness to invest, technical knowledge, and common customers;
- **Engage partner**: In case of a match, the potential partner is onboarded in the ecosystem, the partnership between the SECO orchestrator and the partner is now officially initiated. We can divide the aforementioned process roughly into two main processes: commercial and technical onboarding. During the commercial onboarding, all the relevant sales & marketing information is created such as information about the partner's application for customers and the pricing model. The main objective for the technical onboarding is to build a connection (for example by means of an API) between the partner's application and the SECO orchestrator's platform. Before the partner's application can go live, an application review is executed; the application is validated. Part of validation process is a security check to validate if the partner's application meets the security standards set by the SECO orchestrator. After the application review, the partner shows a demo of their application and if no further issues occur, the application goes live.

Thirdly, in case of *outbound* partner selection, we can distinguish the following overarching activities:

- **Identify potential partner**: based on missing capabilities identified in the current SECO orchestrator's platform offering or based upon market knowledge, potential partners that can offering these missing capabilities, are identified;
- **Verify potential partner**: is similar to the corresponding activity of *inbound* partner selection resulting in a shortlist of potential partners from which one or more partners are selected whom, in the successive activity, are onboarded;
- **Engage partner**: is similar to the corresponding activity of *inbound* partner selection.

Finally, in case *hybrid* partner selection is applied, we can identify the following activities. First, the identify potential partner activity, which is similar to the **identify potential partner** activity described above. The previous stated activity results in a shortlist of potential partners from which one or more partners are selected, whom, are onboarded in the **engage partner** activity. In case a potential partner requests to become a partner, the **identify potential partner** activity is skipped and the partner selection process starts with the **engage partner** activity.

5. PALERMO: the SECO PARTner seLECTION Reference MethOd

We start by introducing the SECO Partner Selection Method which can be found in Fig. 2. The accompanying concept table can be found in Table 6. The SECO Partner Selection method is based upon, and summarises the findings obtained from the six industry methods that have been constructed during the case studies and contains the main activities, sub-activities and concepts relevant for a SECO orchestrator to shape and execute their partner selection process. In case *outbound* partner selection is chosen, the SECO orchestrator applies all three activities. *Inbound* partner selection consists of the same activities minus the first activity since the SECO orchestrator does not have to identify potential partners.

In the first activity, **identify potential partner**, the SECO orchestrator identifies missing capabilities in their current platform portfolio. In order to realise these capabilities, the SECO orchestrator conducts market research to identify potential

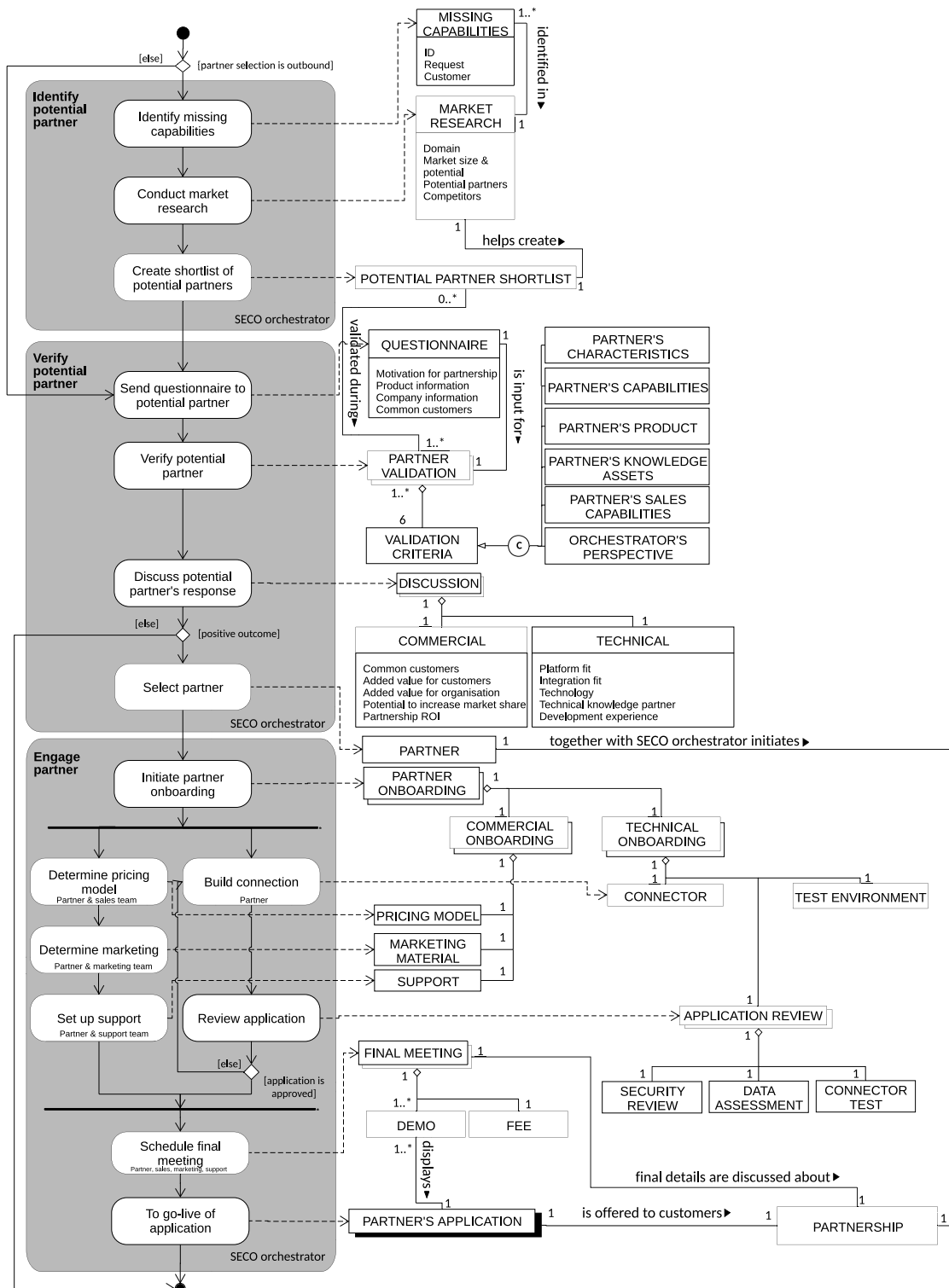


Fig. 2. PALERMO follows the process (left) and deliverable (right) convention [14]. By following this method, software ecosystem orchestrators more efficiently attract partners that contribute most to the health of the ecosystem.

Table 6
PALERMO CONCEPT table.

Concept	Description
MISSING CAPABILITIES	Describes the capabilities that are currently missing in the product offering of the SECO orchestrator.
MARKET RESEARCH	The SECO orchestrator conducts MARKET RESEARCH to identify potential partner's that can release the MISSING CAPABILITIES identified by the SECO orchestrator. Part of the MARKET RESEARCH is to identify possible competitors of the potential partner. The SECO orchestrator should include them in its MARKET RESEARCH.
POTENTIAL PARTNER SHORTLIST	The earlier identified potential partners and its competitors are merged into a POTENTIAL PARTNER SHORTLIST, the potential partners on this list are validated in the verify potential partner activity.
QUESTIONNAIRE	Contains the questions that are given to the potential partner to answer in order for the SECO orchestrator to determine if the potential partner would be a valuable addition to the software ecosystem. This includes the motivation for the PARTNERSHIP, product and company information, and common customers.
PARTNER VALIDATION	The SECO orchestrator verifies if the potential partner is a match by applying the VALIDATION CRITERIA.
VALIDATION CRITERIA	Contains the criteria used to validate a potential partner. See Table 4 for the overview of partner VALIDATION CRITERIA.
PARTNER'S CHARACTERISTICS	Contains VALIDATION CRITERIA that a SECO orchestrator applies to describe and test the general characteristics of a potential partner.
PARTNER'S CAPABILITIES	Contains VALIDATION CRITERIA that describe the capabilities a SECO orchestrator looks for in a potential partner's organization and employees.
PARTNER'S PRODUCT	Encloses the VALIDATION CRITERIA a SECO orchestrator looks for in a potential partner's product; criteria that describe characteristics of the potential partner's product and criteria the partner's product must meet.
PARTNER'S KNOWLEDGE ASSETS	Contains VALIDATION CRITERIA that describe the business and technical knowledge assets the potential partner has at its disposal.
PARTNER'S SALES CAPABILITIES.	Sales capabilities a SECO orchestrator looks for in a potential partner; capabilities that enable a potential partner to sell their product.
ORCHESTRATOR'S PERSPECTIVE	VALIDATION CRITERIA the SECO orchestrator looks for in a potential partner from their organization's perspective.
DISCUSSION	During the COMMERCIAL and TECHNICAL DISCUSSION it is discussed if a potential partner is really an addition to the SECO orchestrator's product.
COMMERCIAL	During this DISCUSSION elements such as, but not exclusively, the potential partner's common customers, added value to customers, and partnership ROI are discussed.
TECHNICAL	During this DISCUSSION elements such as, but not exclusively, the platform and integration fit, their technical knowledge, and development experience are discussed.
PARTNER	Organizations that make the SECO orchestrator's ecosystem significantly more healthy; i.e. add value to the ecosystem.
PARTNER ONBOARDING	Describes the procedures to effectively integrate a new partner into the ecosystem. Consists of COMMERCIAL and TECHNICAL ONBOARDING.
COMMERCIAL ONBOARDING	Contains the commercial aspects of the PARTNER ONBOARDING. This includes the PRICING MODEL, MARKETING MATERIAL, and SUPPORT.
PRICING MODEL	Contains pricing information for the PARTNER'S APPLICATION. Information such as a free trial edition and subscription price.
MARKETING MATERIAL	Contains marketing information for the PARTNERSHIP e.g. sales documentation.
SUPPORT	The partner sets up support to help customers with issues and questions about the PARTNER'S APPLICATION. SUPPORT can be offered by either the partner, the orchestrator or by both.
TECHNICAL ONBOARDING	Contains the technical aspects of the PARTNER ONBOARDING. This includes the CONNECTOR, APPLICATION REVIEW, and TEST ENVIRONMENT.
CONNECTOR	Describes the integration between the PARTNER'S APPLICATION and the SECO orchestrator's platform, e.g. via an API.
APPLICATION REVIEW	Consists of the SECURITY REVIEW, DATA ASSESSMENT, and CONNECTOR TEST.
SECURITY REVIEW	Contains the procedures to verify if the PARTNER'S APPLICATION adheres to the security standards set by the SECO orchestrator.
DATA ASSESSMENT	Describes which data is used by the PARTNER'S APPLICATION, why this data is used, and what kind of data protection (e.g. data policy) is offered by the partner to their customers.
CONNECTOR TEST	Describes the procedures to test if CONNECTOR works properly.
TEST ENVIRONMENT	Provided to the partner to test if the CONNECTOR works properly.
FINAL MEETING	Describes the elements of the last meeting before the PARTNER'S APPLICATION goes live and can be used by customers.
DEMO	The partner provides a DEMO of their application to various stakeholders within the SECO orchestrator's organization e.g. sales, marketing and support department.
FEE	Describes the amount of money the partner has to pay in order to have their application running in the ecosystem.
PARTNER'S APPLICATION	The product the partner offers to SECO orchestrator's customers.
PARTNERSHIP	Contains the details of the collaboration between the partner and the SECO orchestrator.

partners that can realise the previously identified missing capabilities. This activity ends with a shortlist of potential partners.

The second activity, **verify potential partner**, has a goal to verify if a potential partner is a match for the SECO orchestrator platform ecosystem and, therefore, should be onboarded in the SECO. In order to determine if a potential partner is a match, first, the SECO orchestrator sends the potential partner a questionnaire in which the potential partner has to provide more information about their organization, product and partnership intentions. Subsequently, the SECO orchestrator verifies if the potential partner is a match by applying partner validation criteria. These criteria are presented in Table 4. An important aspect during this and successive sub-activity is to access the influence on the ecosystem's health if the potential partner should join. For example, too much partners in the ecosystem offering the same functionality could potential have a negative influence on the software ecosystem's health. In this case, more is not always better. Subsequently, does the orchestrator estimates that the partner joining the ecosystem in turn attracts new customers? After the SECO orchestrator applied it's partner selection criteria, which is clearly defined process with a start and end point, the SECO orchestrator dis-

cusses the potential partner's response. During the discussion, both the commercial and technical elements of a partnership with the potential partner are discussed, such as, but not exclusively, the potential partner's current customers, the earnings the SECO orchestrator can gain from the partnership, and the platform and integration fit. Afterwards, the SECO orchestrator selects a potential partner from the potential partner shortlist and initiates the third activity, **engage partner**.

In order to onboard the partner, various sub-activities have to be executed that can be divided into two categories. During the **commercial onboarding**, the partner, together with the sales team and SECO orchestrator, determines the pricing model that will be applied for the partner's application. Subsequently, marketing material is created after which support is set up. During **technical onboarding**, the goal is to build the connection between the partner's application and the SECO orchestrator's platform. The partner is provided with a test environment to test if the connector works properly. When the aforementioned connection is realised, the application is reviewed. Part of the application review is to test if the connector works properly, to execute a security review to verify if the partner's application adheres to the security standards set by the SECO orchestrator, and to do a data assessment; which data is used by the partner's application, why is this data used, and what data protection is offered by the partner to their customers.

When the partner's application is approved, a final meeting is scheduled in which the partner shows a demo of their application to various stakeholders within the SECO orchestrator's organization such as the sales, marketing and support department. During the final meeting, the fee is discussed the partner has to pay in order to have their application running in the ecosystem, for example in an app store. If no further issues occur, the partner's application goes live.

6. Evaluation results

During the three evaluation case studies, the interviewees construct an industry method for each case study organization. To do so, they are first presented with a choice: inbound, outbound or hybrid partner selection. After their decision is made, the interviewees are presented with the six industry partner selection methods constructed during the case studies. The interviewees are asked to select the relevant method fragments they want to use as foundation to construct the industry method for their organization's partner selection method. To do so, the activities, the sub-activities and corresponding concepts are presented to the interviewees. After the interviewees selected all the relevant activities and subsequently the sub-activities, they are allowed to include sub-activities from different activities and insert those in the activities they previously selected. Secondly, they are allowed to exclude sub-activities that are part of the activities they selected. Important during this process is the rationale behind the interviewees' decision to include and exclude certain sub-activities. When this process is finished, all selected sub-activities are merged with the previously selected activities and the industry method is constructed. When the industry method is constructed, the interviewees apply the evaluation criteria by Prat et al. [84]. When the evaluation case study is finished and the results are processed, we applied a colour coding consisting of three colours, red, orange and green to indicate how the interviewees perceived the evaluation criteria by Prat et al. [84].

- **Green**, in case the interviewee(s) did fully agree with a particular evaluation criterion;
- **Orange**, in case the interviewee(s) did partially agree with a particular evaluation criterion or is not sure that when the method would be implemented, the criterion would be achieved;
- **Red**, in case the interviewee(s) did not agree with a particular evaluation criterion.

Please note that as none of the interviewees openly disagreed with an evaluation criterion, the colour red is not used in Table 7.

6.1. Onguard

For Onguard, the rationale behind launching their ecosystem is as follows, *"in order to offer the complete order to cash proposition to the market, we need partners. This to meet customer demand."* Onguard *"believes in the value of an integrated ecosystem"* by ensuring seamless integration between their platform and the partner's product. According to both Onguard employees, for Onguard the main benefit of their ecosystem is that *"you create a larger market, you can offer a broad range of solutions to your customers and subsequently, funnel back towards your own product."*

Currently, Onguard does not apply a structured partner selection method. Each request received from a potential partner is assessed individually. The majority of their partners do approach Onguard to initiate a partnership, from this we can conclude that their partner selection method type would be *inbound*. The interviewees describe their current approach to partner selection as follows: first, the potential partner sends a request to Onguard to initiate a partnership, this request is sent via a form on the Onguard website. This request is received by the Onguard marketing team who forwards the request to the lead partner manager who manages the Onguard partner team. Subsequently, the lead partner manager approaches the potential partner to discuss a potential partnership. During these discussions, both the commercial as technical part of a partnership are discussed. However, no formal approach is used during these discussions.

Both Onguard employees explicitly stated that, however, Onguard is currently not using a formal approach to partner selection, Onguard desires a method to guide them in their partner selection process. Currently, Onguard is working on developing their API platform. When this platform is live, Onguard wants to enable partners to connect their application

with Onguard and by doing so, offer a more extensive platform portfolio to their customers. When their API is live, Onguard wants to apply a formal partner selection method.

The researcher and both employees walked through the six industry partner selection methods with emphasis on *inbound* partner selection; case 2, 3 and 4. Both Onguard employees stated that they want to use case 2 and 3 as basis for their partner selection method.

Onguard receives a request from a potential partner to initiate a partnership with Onguard. When this request is received, this marks the beginning of the partner selection method. The method starts with the **verify potential partner** activity. First, the partner's request is processed and the potential partner receives the partner selection questionnaire in which the potential partner has to provide more information about their organization, describe their additional functionality for Onguard customers, list common customers, and describe their Onguard platform knowledge. Next, the partner team has a discussion within their organization if the sales & marketing department know the potential partner and see commercial potential in a partnership with this particular partner. When the outcome of this discussion is positive, a meeting is scheduled with the potential partner. During this meeting, the partner's response is discussed and it's determined if the potential partner is a match for Onguard. In case of a match, the second activity in the partner selection method is initiated which is the **run trial partnership** activity.

By executing this activity, Onguard wants to try out if a partnership with the partner is fruitful, both for their customers as for Onguard. During this activity there are two main perspectives, the commercial and technical perspective. The commercial perspective focuses on added value offered to customers and can have one of three outcomes: customers are not using the functionality provided by the partner or customers identify the functionality offered as additional value, however, the partner is not the right party to offer this particular functionality, or the customers identify both the functionality and the partner as added value. The technical perspective focuses on the integration between the partner's application and Onguard. Is the integration technical feasible? Does the API connection works as desired? To develop a proper working connector, the partner is supported to build the API, for this Onguard develops an API instruction manual. In case the partnership is fruitful, both from a commercial as technical perspective, the partnership is expanded and intensified; the functionality offered to customers is broadened.

In the third and final activity, **engage partner**, the partnership between Onguard and the partner is further formalised. First, the connector is tested, does everything works properly? Subsequently, the partner's application is reviewed. The focus of this application review is the customer data that is exchanged between Onguard and the partner's application. Another key aspect is the security review of the partner's application, does the application adheres to the security standards set by Onguard. After this review, one final meeting is arranged, in which the partner shows a demo of their application to Onguard. Various department (sales, marketing, support) delegates are present during this meeting. When no further issues occur, the application is approved and goes live.

6.2. SnelStart

For SnelStart, the main value of their ecosystem is that *"SnelStart can combine the value (functionality) that we are good at with the value offered by other companies, our partners. We do not have to invest in functionality that is already there and that applies to our partners as well. By bundling the functionality, you can create much better solutions for your customers."*

SnelStart does currently apply a structured partner selection method. Their partner selection method is both *inbound* and *outbound*, however, the majority of new partners are acquired via *inbound* partner selection, therefore the industry method created will be focused on *inbound* partner selection.

When the SnelStart partner team receives a request from a potential partner, they determine if the potential partner is an interesting partner that can add value to the SnelStart platform offering. To do so, first, the potential partner has to fill in a questionnaire on the SnelStart website. Subsequently, the SnelStart partner team applies various criteria such as: what functionality does the potential partner offer, does this functionality adds value to SnelStart's platform portfolio, the number of potential customers, what is the strategic position of the potential partner in the market, what is the marketing value of the potential partner, the quality of the support offered by the potential partner and the potential partner's business model. In case the partner team determines that is it interesting for SnelStart to collaborate with the potential partner, i.e. bring together a proposition to market, the partner team further onboards the partner. During this onboarding, there are two main perspectives, the commercial and technical perspective. There are two main objectives for the commercial perspective, first, to register the partner's application in the SnelStart's appstore and to make sure that customers are able to get the partner's application quickly and easily to work. For this a step-by-step plan is provided to customers. Secondly, the sales & marketing team determines the desired business case and marketing for the particular partner which can either be standard or personalised marketing. The technical perspective focuses on developing and testing, for example the efficiency and security of the API connection between SnelStart's platform and the partner's application. When both perspectives are realised, the partner is an official SnelStart certified partner and is added to the SnelStart partner page.

The researcher and the SnelStart employee walked through the six industry partner selection methods with emphasis on *inbound* partner selection; case 2, 3 and 4. The SnelStart employee stated that he wants to use case 2 and 3 as basis for the partner selection method.

The method starts with the SnelStart partner team that receives a request from a potential partner to initiate a partnership with SnelStart. When this request is received, this marks the beginning of the partner selection method. The method

starts with the **verify potential partner** activity. Subsequently, the partner team contacts the potential partner to acquire more information about the potential partner and their organization, and to verify if the potential partner adds value to the SnelStart's platform portfolio for SnelStart's customers. When this is the case, the partner team conducts an intake, during this intake it is determined whether added value can arise from a partnership with the potential partner. When the intake is concluded positively, the second activity and final activity is initiated, namely, **engage partner**.

During this activity, there are two main perspectives, the commercial and technical perspective. These perspectives are executed simultaneously. The commercial perspective starts with the SnelStart partner and marketing team together with the partner, to determine, first, the precise added value of the partnership between SnelStart and the partner to SnelStart customers. Secondly, the pricing model for the partner's application is determined. The next sub-activity is to register the partner's application in the SnelStart's appstore. Key is to create a step-by-step plan for customers how they get the partner's application quickly and easily up and running. Finally, the support structure is set up. During the technical perspective, the main sub-activity is to realise the integration between SnelStart's platform and the partner's product, via an API. In order to realise this integration, the development teams from both SnelStart and the partner arrange a meeting and discuss how the integration is realised. After this meeting, the API connection is build and tested. When the sub-activities in both perspectives are finished, a meeting is organised in which the API connection is tested by means of a functional technical check and the partner shows a demo of their product to SnelStart. During this meeting various SnelStart stakeholders are present such as the partner team, the customer service team, the sales & marketing team and account managers. During this meeting, it is determined if the partner's application can go live. When the partner's application is approved, the partner's application goes live and can be used by customers.

6.3. RetailComp

For RetailComp their ecosystem *"helps us to create value for our customers in a faster and better way without the need for us to build this functionality ourselves."*

Currently, RetailComp does apply a structured partner selection method. This method is initiated by the product management team, who identify missing capabilities in the current platform portfolio and, subsequently, identify the potential partners that are active in the market that could fulfil these missing capabilities. This approach can be identified as *outbound* partner selection. Subsequently, the sales department approaches the identified potential partners and initiates a discussion with these partners. The most important part in this discussion is to discuss pricing and how the price relates to the functionality that is being offered by the potential partner. The RetailComp employee stated that during this discussion, various selection criteria are applied, such as, how easily can the potential partner offer value (functionality), which functionality is offered, and the price of this functionality. In case the sales department finds a match in a potential partner, the technical integration between RetailComp's platform and the partner's functionality is realised. Part of this integration is to define the scope of the integration; which functionality does RetailComp wants to integrate with their platform. A key aspect is to prioritise the functionality to be realised. When this is achieved, RetailComp and the partner run a pilot/proof of concept. When this pilot is perceived positively by the customer, the integration is further expanded.

The researcher and the RetailComp employee walked through the six industry partner selection methods with emphasis on *outbound* partner selection; case 1 and 5. The RetailComp employee stated that he wants to use case 1 as foundation for the partner selection method.

The method starts with the **conduct internal research** activity. First, the missing capabilities are identified. For each missing capability, RetailComp decides if they want to realise the capability themselves or that they identify potential partners that can realise the capability. In case of the latter, the second activity, **scan market**, is initiated.

This activity starts with the identification of potential partners that can realise the missing capabilities identified in the previous activity. Part of this process is to identify potential competitors. In order to validate the potential partners to come to a potential partner shortlist, partner validation criteria are applied. The RetailComp employee takes over four of the five selection criteria stated by FinTechComp, namely, complementary to platform, solution for customer, core capability, and the commercial aspect. He adds to the previously stated criteria the three criteria we mentioned above, price, which functionality delivered and how easily is the value delivered. This activity ends with a shortlist of potential partners.

In the third activity, **start discussion**, discussions are initiated with the potential partners that are on the potential partner shortlist. The main goal of these discussions is to become further acquainted with the partner, explore partnership intentions, show a demo and further discuss the commercial aspect of the partnership. In case the commercial aspect has been identified as fruitful for RetailComp, the technical integration is initiated. This marks the beginning of the fourth and final activity, **engage partner**.

The final activity starts with the signing of a partnership contract. Subsequently, the integration between RetailComp's platform and the partner's functionality is realised. The next sub-activity is to set up the support structure. When this has been realised, a pilot/proof of concept is being held. The feedback that is received during this pilot is processed, resulting in the final product. This product can be sold to customers.

6.4. Summary of evaluation results

In this section, we summarise the evaluation results found during the three evaluation case studies. We can distinguish the use of two different method types, *inbound* and *outbound* SECO partner selection. Onguard and SnelStart selected *inbound* partner selection and followed the methods applied by Exact and AFAS to construct their industry method. The industry method constructed by Onguard differs from Exact and AFAS in the following ways:

- Onguard added an additional activity: **run trial partnership**. In case a potential partner is a match, Onguard wants to try out if the partnership with the partner is fruitful for both their customers and their organization before the partnership is expanded and intensified. The aforementioned activity has not been identified in the methods applied by Exact and AFAS, in case a potential partner is a match, the onboarding (**engage partner**) activity is directly initiated. A potential explanation for the aforementioned could be, that these two organizations are better equipped (experience, method, criteria, trained ecosystem staff, lessons learned from mistakes made) to estimate if a potential partner is a match, and if a partnership is fruitful for their customers and their organization;
- More explicit sales & marketing departments approval. The two Onguard employees stated that the sales & marketing departments have to give their approval in order for a potential partner to be onboarded. All organizations that apply *inbound* partner selection, Exact, AFAS and SAP, do involve their sales & marketing departments to determine if a potential partner is match, however, the three organizations do not state this explicitly in their partner selection method.

The industry method constructed by SnelStart differs from Exact and AFAS in the following ways:

- SnelStart mentioned that in part of the **engage partner** activity, the commercial perspective, SnelStart determines the precise added value of the partnership with the partner. AFAS discusses the added value in the first activity, **verify potential partner**;
- SnelStart mentioned that they determine the pricing model of the partner's application. This sub-activity is not discussed in the method applied by Exact and AFAS. SAP does determine the pricing model used for the partner's application;
- SnelStart arranges a meeting between their development team and the partner's development team in the **engage partner** activity to discuss how the integration between SnelStart's platform and the partner's product via an API is realised. Exact and AFAS do not arrange such a meeting, they provide the partner with their API and enable the partner to ask for support when developing the API connector;
- SnelStart, similar to Exact, involves various stakeholders, such as the customer service team and account managers, in the final meeting in which it is determined if the partner's application can go live. The aforementioned approach differs from AFAS, such a meeting is not part of their partner selection method.

RetailComp selected *outbound* partner selection, and selected the method applied by FinTechComp to construct their industry method. The industry method constructed by RetailComp differs from FinTechComp in the following ways:

- RetailComp decides in the **conduct internal research** activity if they want to realise the missing capability themselves or identify a partner who can realise the missing capability. The previous activity is not included in the method applied by FinTechComp;
- Similar to Onguard, RetailComp puts more emphasis on sales & marketing approval. Before the technical integration is started in the **engage partner** activity, the commercial aspect has to be identified as fruitful by the sales & marketing department. In the partner selection method applied by FinTechComp, the commercial and technical perspectives are discussed concurrently, and afterwards, one or more partners are selected to be onboarded. The rationale behind discussing the two perspectives sequential is that RetailComp does not want to spend resources on discussing or initiating the technical integration before the commercial aspect of the potential partnership has been identified as fruitful by the sales & marketing department and therefore, the green light has been given to onboard the partner;
- RetailComp starts the **engage partner** activity with signing a partnership contract, similar to Centric HR & Payroll, whereas FinTechComp executes the aforementioned sub-activity at the end of the activity;
- Before RetailComp releases the final product, they run a pilot/proof of concept. FinTechComp did not include such a proof of concept in their partner selection method, Centric HR & Payroll did. They realise a technical integration and enable partners to give feedback and afterwards, the feedback is processed, similar to RetailComp and the final product goes live. One note to make is that RetailComp focuses mainly on customer feedback whereas Centric HR & Payroll did not include customer feedback in their partner selection method.

The three organizations evaluated PALERMO positively. PALERMO enables them to find a suitable partner that offers additional functionality to their customers. PALERMO provides a complete and structured approach to SECO partner selection and involves the departments that are relevant. In case elements (activities, sub-activities or concepts) are missing from PALERMO, the case participants said they felt free to tailor PALERMO to their needs. Due to the low costs for implementing

Table 7

Prat's [84] evaluation criteria are evaluated in the three evaluation case studies, at the companies Onguard, SnelStart, and RetailComp.

Evaluation criteria	Evaluation result
Perceived effectiveness	<p>"All required aspects are present with regard to partner selection; both the commercial and technical aspect. The method also includes the partner validation part. We can reach our goal, selecting the partners that offer additional functionality to Onguard customers" Onguard</p> <p>"The method maps out how a company approaches partner selection. A company can use the method as a template; a company wants to acquire partners for their ecosystem, this is how you approach partner selection. It is a very nice and useful template, the activities and sub-activities you have to perform apply to every company" SnelStart</p> <p>"Yes, the method is fit for it's purpose, a suitable partner can be found using this method. The method is in line with our business processes. However, some sub-activities are more implicitly executed within our company and are currently not made that explicit as we saw in the method" RetailComp</p>
Perceived operational feasibility	<p>"When we would implement this method, we definitely use the method in our daily practice of partner selection. The method clearly structures the partner selection process and raises support for the work we do as partner team. The method includes all departments within our organization that must be involved with partner selection, such as marketing, sales, and consultancy" Onguard</p> <p>"The method contributes to systems thinking within a company. It will prove to be an aid in ensuring everyone is on the same page" SnelStart</p> <p>"The process of partner selection puts pressure on sales and product management. It can be a difficult process, you need the right people to bring the process to a successful conclusion. The method indicates which people are required for partner selection, both for the commercial and technical perspective" RetailComp</p>
Perceived economic feasibility	<p>"The method we created is an internal method, an internal approach to partner selection. The costs to realise the implementation of such a method are low whereas the benefits are high; the method offers a structured partner selection approach. Definitely economic feasible" Onguard</p> <p>"The method is a small investment, the benefits clearly outweigh the costs. The benefits are creating a structure within a company describing the partner selection process, training new colleagues and offering transparency to partners; potential partners know the conditions they have to meet in order to become a partner" SnelStart</p> <p>"Definitely. In case there is no commercial benefit, the technical integration is not started and the partner selection process is terminated" RetailComp</p>
Perceived usefulness	<p>"Definitely. The method generates a clear structure for the partner selection process and includes the relevant steps to be taken as part of this process" Onguard</p> <p>"I am convinced that if all your employees follow the same method, you create clarity within your organization. The constructed method certainly contributes to this, the method clarifies the partner selection process. Also, you can apply data analysis/business intelligence, for example, how many partners are in which activity of your selection process, how many are waiting to enter the selection process etcetera" SnelStart</p> <p>"Yes the method is useful. The method provides clarity on the partner selection process, what actually is mostly an implicit process, the approach is not written in stone" RetailComp</p>
Perceived ease of use	<p>"Easy to use. The method is like a manual on how we approach partner selection" Onguard</p> <p>"Definitely. Employees must be able to read diagrams but you expect that from your employees. However, the explanation attached to the method is key, how did you come up with the method, what are the thoughts behind it. A method alone is not sufficient" SnelStart</p> <p>"Yes, the method does not contain difficult tasks, just a matter of doing. However, it remains a PDD. Colleagues might not grasp the idea behind it or find such a diagram useful" RetailComp</p>
Perceived completeness	<p>"If we look at the method now, all concepts and activities we deem relevant with regard to partner selection are present. However, we can only be completely sure when we use the method for a longer time period" Onguard</p> <p>"Definitely, all activities and concepts are present in the method created" SnelStart</p> <p>"Seems complete to me. Important to note is that there is a clear relationship between sales "approval" and the start of the technical realisation. Without approval, the technical integration is not initiated" RetailComp</p>
Perceived modifiability	<p>"Elements can relatively easy added or removed from the method. For example, an extra sub-activity that you showed us from case 4, if we want to add such a sub activity, we can do this fairly easy" Onguard</p> <p>"Yes. You can easily insert a sub-activity in the method when required or, for example, merge sub-activities" SnelStart</p> <p>"There are few dependencies in the method, tasks can be easily added. Looks good" RetailComp</p>

PALERMO, PALERMO is perceived to be economic feasible. The activities and sub-activities that are part of PALERMO are easy to use. One note to make is the use of a PDD to construct PALERMO, not all employees that are involved with SECO partner selection might find such an approach useful. Also, a method alone, for example a PDD, is not sufficient, the explanation attached to the method is key for people involved in SECO partner selection to fully understand and to be able to extract the maximum value from the method. The employees of the three evaluation case studies applied the selected evaluation criteria by Prat et al. [84]. The evaluation results can be found in Table 7.

7. Validity

In this paper, we outline PALERMO: the PARTner SELECTION Reference MethOd, which intends to provide a method for orchestrators to partner up with an optimal set of software producing organizations in its own SECO. PALERMO has been designed with the idea in mind that an orchestrator has limited resources, many partners to choose from, and that some

partners contribute more to the health of a software ecosystem than others. This study was two-pronged, hence we discuss the validity of the exploratory case studies that have been conducted and the validity of the subsequent design study that led to the design and evaluation of PALERMO. We follow the ACM SIGSOFT Empirical Standards for the evaluation of our research (<https://arxiv.org/abs/2010.03525>).

7.1. Validity of the descriptive case studies

PALERMO itself has been extracted from six industry case studies, following the Case Study Protocol by Pervan and Maimbo [81]. The case studies are both of a descriptive and evaluative nature, where we extract PALERMO and evaluate our list of partner selection criteria. Multiple case studies have been performed, which should increase the precision of the results due to data triangulation [88]. This approach appeared most suitable, as there were very few methods found in literature that fit the peculiarities of the software industry well.

During the case studies we made sure that the interviewees understood the topic of our research, by providing them with a case protocol, including common concepts, such as partner selection criteria and SECO, early on in the interview. In this way, we made sure that internal validity was covered in the case studies and expert interviews and that the interviewees were (1) treated equally, (2) reached a consensus on terms and concepts, and (3) followed a structured procedure for data collection.

7.2. Validity of the design study

We could have invested our time into performing a more traditional design science project, where we would not have taken method engineering as a starting point. If we had taken this route, however, we would have had to synthesize our own way of extracting, analyzing, and designing a new method. As method engineering is a well proven and reliable approach and our research questions could easily be answered using it, method engineering proved to be a usable tool in our research tool box.

The validity of PALERMO is threatened by inconsistencies in the creation process, poor validation of the method itself, and superior rival methods. Please also note that a constituent of PALERMO is a list of partner selection criteria, that has been gathered with a semi-structured literature review. A weakness of the semi-structured literature review is that it was carried out with only one source, Google Scholar. Also, more search terms could have been used to gather data, and the data quality assessment is not rigorous enough. Finally, all steps are undertaken by just one researcher.

External Validity and Generalizability The main question we try to answer regarding generalizability, is whether PALERMO can be applied by practitioners and researchers in other contexts than the relatively limited domain of software in the Netherlands. First, we believe PALERMO can be applied by orchestrators with more than 100 employees and over 30 partners. It is not hard to imagine that orchestrators have many more partners (Microsoft reports 64.000 cloud partners in 2021, for instance), but we hypothesize that by scaling the partner management team, partnering can also be scaled.

Another external validity threat is our limitation to just focus on Dutch orchestrators. While the Dutch market for software and services is well connected and Dutch companies typically collaborate overseas due to a small home market, there may be influences from locality. A set of overseas case studies is needed to generalize beyond Dutch borders.

More research should be conducted to observe organization's partner selection processes over a longer time period to investigate if, and how their SECO partner selection process and method evolves and matures. Furthermore, we want to observe effects on SECO health from the decisions made in partner selection. Thirdly, more case studies should be conducted to expand the overview of partner selection criteria applied by SECO orchestrators in their partner selection process.

Reliability and Dependability Finally, we address whether the process of this study could be repeated and would lead to similar results. The case materials and intermediate data are publicly available in Mendeley Data (see: <http://dx.doi.org/10.17632/zcm4c3tj6x.1>) and one could, if a similar procedure is followed, come to the same conclusions as we drew. However, due to the complexity of the domain, some terms may still be construed as ambiguous and another researcher may not extract precisely the same concepts as in the Concept Table 6.

As future work, the internal validity of the method can be tested further with more case companies. One of the aspects that stood out in the evaluations was the perceived ease of use; could a new case participant easily adopt the method? How easy is the method to understand? Can the method be customized to situational factors and should this be allowed? Obviously, there is a call for more case studies here, not only to improve internal validity, but perhaps even more to extend external validity.

8. Discussion

During our case studies an interesting question arose: "what constitutes perfect health in a SECO?" As the method aims to make orchestrators more effective at creating healthy software ecosystems, it is a natural direction to follow the complete orchestration process. The orchestrators have limited resources and must allocate them to the different partners. Even if a partner can detract the slightest bit of value from the ecosystem, it could be eliminated from the ecosystem.

One limitation of our research is that we have looked at relatively traditional software companies when looking at the business model and style of working. We do not claim generalizability towards open source organizations, as we have not looked at such organizations in our case studies. However, as the open and closed dichotomy is becoming less prevalent [54], we would not be surprised that in an open source organization that is backed by a commercial entity, the processes described in this work are also relevant. However, such a generalization requires more empirical research, and we see it as future work.

An interesting question that came up in the evaluation of this article is whether we can offer quantitative inclusion and exclusion criteria for new partners with the case materials in hand. While this could be beneficial, the participants in this study commented on this copiously. One of the participants at OnGuard, for instance, implied that partners would rarely fit all the inclusion criteria that they had set and if they did fit those, they would not be interested in becoming a partner. For this reason, the partner development manager indicated that he often had to go by his 'gut feeling' when deciding whether a new partner would be admitted to the partner program or not.

Another interesting reply came from an employee at Exact, who implied that there should only be three of the same types of extensions in their app store, and those that came later would be screened more intensively. However, it was also made clear that for some businesses, such as invoice scanning, it would be exclusionary to customers to exclude some of these, while the benefits of not including them was minor. Obviously, these judgements are subjective and largely dependent on the situation of the orchestrator and the partner in time, rendering it practically impossible to make these decisions objective. In future work it may be beneficial to evaluate unsuccessful partnerships and determine whether their investment warranted their risk and rewards. Until then, the usage of automated decision support systems, for instance, will not be productive or efficient [31].

8.1. Insights

This paper presents a further definition of a complex process in the orchestration of software ecosystems. While the larger domain of orchestration and governance has been elaborated on extensively ([3,38,59]), the more operational aspects of software ecosystems management, orchestration, and governance are still being researched. Lately, many of these domains have begun to be uncovered, such as Software Ecosystems Governance Maturity [52], API management maturity [70], and the creation of a first software ecosystem [10]. We can safely conclude that while the domain is getting sufficient attention from researchers, we must remain aware of the ways in which we can still contribute to this domain. While there is an increasing body of knowledge for organizations to improve their software ecosystems with, we must also make advances on the theoretical side, such as on competition, partner-to-orchestrator interface modelling, ecosystems modelling, and value modelling. For more information on research challenges in the domain, we point to the research agenda of De Reuver et al. [24].

One of the larger questions is how we can best measure the impact of partners on SECO health. Typical extension partners will provide extensions that simply make the platform of the orchestrator more valuable to end-users. An example of such an extension is scan and recognition functionality for invoices which extends functionality offered by an orchestrator's ERP product (for example SAP). However, there are also such partners that provide applications that make life easier for partners to develop extensions. For example, a partner offering a low-code platform to fellow partners to help them develop applications that can be offered to end-users. These partners do not directly add value to the end-user perspective, but can add significant value to the overall SECO. It is our goal to further research these relationships in the future, to obtain an even better insight into which partners are most important to (the value created in) the SECO, the orchestrator, and the end-user. Using the health indicators defined in previous work [40,50], it would be an interesting effort to find which partner categories influence which health metric most.

As the research in the domain is maturing, so are its methods. While in early work the methods of case studies, design science, and method engineering were still relatively new, these methods are now becoming prevalent in software ecosystems studies. Each of these methods, however, relies on further definition and specification of the method, and creation of tools that support the method. It is striking, for instance, how little support tools are available for making extracted methods Findable, Accessible, Interoperable, and Reusable (FAIR). On the positive side, this work could not have been written without the ACM SIGSOFT Empirical Standards, which are now providing scientists with a solid and somewhat rigid basis for evaluation of artifacts. We encourage the community to apply these standards, but also to keep creating new standards and tools for the advancement of science.

8.2. Comparing PALERMO to alternative partner selection methods

Emden et al. [30] mentions technological alignment in their work which is similar to the technical discussion, part of the **verify potential partner** activity. Both have the same goal: to make sure the partner's application can be properly integrated in the SECO and with the SECO orchestrator's product. However, PALERMO describes in more detail which aspects the SECO orchestrator should take into account when discussing the technical integration with the partner's application. Strategic alignment has some similarities with the *identify missing capabilities* sub-activity. The SECO orchestrator has defined goals in the form of missing capabilities in their current product portfolio. Emden et al. [30] defines strategic alignment as the goals of the organization and how the organization wants to achieve those goals. The SECO orchestrator has defined missing

capabilities that it wants to achieve by attracting one or more partners that fulfil those missing capabilities. The last phase described by Emden et al. [30], relational alignment, can be found in PALERMO by means of the partner validation criteria, both determining if a potential partner is a match for the organization.

The method proposed by De Boer et al. [22] follows the same flow as PALERMO. Both start with identifying the need for new partners. If so, they both validate the potential partner by means of partner validation criteria. Next, the organization determines if the potential partner is a match. This is where the method by De Boer et al. [22] stops and PALERMO continues. Part of PALERMO is the partner onboarding whereas De Boer et al. [22] do not mention this in their method.

Huang et al. [46] focus on partner selection criteria in their method, where partner validation criteria are defined and applied to come to a list of potential partners. The onboarding of the potential partners, however, is not part of their method whereas this is clearly part of PALERMO.

8.3. Future work

The domain of partner selection and management in software ecosystems is still under development and requires more attention. In this article we have taken a relatively operational approach towards partner selection and we are operating under the assumption that the organization is dedicating sufficient resources towards it. We did this, knowing full well that this strategic decision of itself can be challenging for the organization to find sufficient support for [51]. More work is required on the strategic decisions that orchestrators need to make to become orchestrators to begin with.

We also want to conduct more case studies of organizations that apply PALERMO. We want to extend our work in three directions. First, we aim to study more organizations that operate outside of the Netherlands. Secondly, we want to explore organizations that work at a larger scale, i.e., thousands of partners rather than hundreds. Finally, we want to study open source orchestrators, to explore whether their processes are similar or different to the work presented in this article. With these case studies, we also hope to identify situational factors [42] that enable us to customize methods for particular organizations, based on those factors. We want, for instance, to distinguish between organizations operating locally and internationally, because this may have an effect on the methods they can apply to attract and engage new partners.

Finally, we are currently conducting several projects where we study how partners are typically managed by orchestrators. Such projects include the tools that are used to enable partners [7], the ways in which organizations can open up to accommodate partners [54], and methods for becoming more mature as orchestrators in managing partners [52,96].

9. Conclusion

This research contributes to the software ecosystems literature by providing an overview of SECO partner selection criteria, which are validated and ranked by twelve domain experts in the context of six case studies. Secondly, six industry partner selection methods have been constructed that are applied by SECO orchestrators in the Dutch market to aid them in their SECO partner selection process. Finally, our research provides a new approach to SECO partner selection by applying the technique of method engineering to the domain of SECO partner selection, resulting in PALERMO, which aids a SECO orchestrator in their partner selection process.

The six industry partner selection methods found were evaluated by means of three evaluation case studies. For each case study, a method was extracted from the interviews. The interviewees identified an additional activity in the inbound partner selection approach. For outbound partner selection, two additional sub-activities were identified. For both method types, the interviewees put more emphasis on sales & marketing approval. Their approval is required before the partner is further engaged, i.e. the technical integration between the orchestrator's platform and that of the partner is initiated. Subsequently, PALERMO was evaluated by means of a set of evaluation criteria. All three case study organizations concluded positively on PALERMO, as the reference method enables their organizations to find a suitable partner by means of a structured approach that is easy to use, involves the departments that are relevant to SECO partner selection, and is deemed economic feasible.

PALERMO contributes to a better understanding of SECO partner selection and provide SECO orchestrators with a structured approach. In the early phase of a platform ecosystem, SECO orchestrators can structure their partner selection process based on the activities, sub-activities and corresponding concepts identified in this research. The overview of selection criteria can be used by SECO orchestrators to determine if a potential partner is a match for their software ecosystem and organization. When the platform ecosystem is more mature, i.e. more partners have joined the ecosystem, SECO orchestrators can evaluate their SECO partner selection method by comparing it to the methods applied by the organizations that participated in this research.

CRedit authorship contribution statement

Luc Beelen: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Slinger Jansen:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Sietse Overbeek:** Conceptualization, Methodology, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- [1] R. Abratt, Industrial buying in high-tech markets, *Ind. Mark. Manage.* 15 (1986) 293–298.
- [2] A.K. Al-Khalifa, S. Eggert Peterson, The partner selection process in international joint ventures, *Eur. J. Mark.* 33 (1999) 1064–1081.
- [3] C. Alves, J. Oliveira, S. Jansen, Software ecosystems governance - a systematic literature review and research agenda, in: *ICEIS 2017-Proceedings of the 19th International Conference on Enterprise Information Systems*, 2017, pp. 26–29.
- [4] R. Angeles, R. Nath, An empirical study of EDI trading partner selection criteria in customer-supplier relationships, *Inf. Manag.* 37 (2000) 241–255.
- [5] J. van Angeren, J. Kabbedijk, S. Jansen, K.M. Popp, Partnership characteristics within large software ecosystems, in: *Proceedings of the Third International Workshop on Software Ecosystems*, 2011.
- [6] A. Baars, S. Jansen, A framework for software ecosystem governance, in: *International Conference of Software Business*, Springer, 2012, pp. 168–180.
- [7] K. van Baarsen, S. Jansen, S. España, Measuring tool and resource maturity in developer ecosystems, in: *9th International Workshop on Software Ecosystems, IWSECO 2017*, 2017, p. 88.
- [8] O. Barbosa, C. Alves, A systematic mapping study on software ecosystems, in: *Proceedings of the Workshop on Software Ecosystems*, 2011, pp. 15–26.
- [9] H.P. Bech, *Building Successful Partner Channels*, TBK Publishing, 2015.
- [10] Í. Belo, C. Alves, How to create a software ecosystem? A partnership meta-model and strategic patterns, *Information* 12 (2021) 240.
- [11] A. Benlian, D. Hilkert, T. Hess, How open is this platform? The meaning and measurement of platform openness from the complementors' perspective, *J. Inf. Technol.* 30 (2015) 209–228.
- [12] P.E. Bierly III, S. Gallagher, Explaining alliance partner selection: fit, trust and strategic expediency, *Long Range Plan.* 40 (2007) 134–153.
- [13] S. Brinkkemper, Method engineering: engineering of information systems development methods and tools, *Inf. Softw. Technol.* 38 (1996) 275–280.
- [14] S. Brinkkemper, M. Saeki, F. Harmsen, Meta-modelling based assembly techniques for situational method engineering, *Inf. Sci.* 24 (1999) 209–228.
- [15] G. Büyükoçkan, O. Feyzioğlu, E. Nebol, Selection of the strategic alliance partner in logistics value chain, *Int. J. Prod. Econ.* 113 (2008) 148–158.
- [16] S. Cartwright, C.L. Cooper, The role of culture compatibility in successful organizational marriage, *Acad. Manage. Perspect.* 7 (1993) 57–70.
- [17] M. Caccagnoli, C. Forman, P. Huang, D. Wu, Co-creation of value in a platform ecosystem: the case of enterprise software, *Manag. Inf. Syst. Q.* (2012) 263–290.
- [18] S.H. Chen, H.T. Lee, Y.F. Wu, Applying ANP approach to partner selection for strategic alliance, *Manag. Decis.* 46 (2008) 449–465.
- [19] M. Cusumano, Technology strategy and management: the evolution of platform thinking, *Commun. ACM* 53 (2010) 32–34.
- [20] M.A. Cusumano, *Staying Power: Six Enduring Principles for Managing Strategy and Innovation in an Uncertain World (Lessons from Microsoft Apple, Intel, Google, Toyota and More)*, Oxford University Press, 2010.
- [21] T. Das, I.Y. He, Entrepreneurial firms in search of established partners: review and recommendations, *Int. J. Entrep. Behav. Res.* 12 (2006) 114–143.
- [22] L. De Boer, E. Labro, P. Morlacchi, A review of methods supporting supplier selection, *Eur. J. Purch. Supply Manag.* 7 (2001) 75–89.
- [23] M. De Reuver, H. Bouwman, T. Haaker, Capturing value from mobile business models: design issues that matter, in: *BLED 2008 Proceedings*, 2008, p. 37.
- [24] M. De Reuver, C. Sørensen, R.C. Basole, The digital platform: a research agenda, *J. Inf. Technol.* 33 (2018) 124–135.
- [25] H. Dekker, A. Van den Abbeele, Partner selection, knowledge acquisition and interfirm governance design, in: *American Accounting Association 2008 Management Accounting Section Meeting Paper*, 2007.
- [26] G.W. Dickson, An analysis of vendor selection systems and decisions, *J. Purch.* 2 (1966) 5–17.
- [27] A.M. Doherty, Market and partner selection processes in international retail franchising, *J. Bus. Res.* 62 (2009) 528–534.
- [28] L. Dong, K.W. Glaister, Motives and partner selection criteria in international strategic alliances: perspectives of Chinese firms, *Int. Bus. Rev.* 15 (2006) 577–600.
- [29] G. Duysters, G. Kok, M. Vaandrager, Crafting successful strategic technology partnerships, *R & D Manag.* 29 (1999) 343–351.
- [30] Z. Emden, R.J. Calantone, C. Droge, Collaborating for new product development: selecting the partner with maximum potential to create value, *J. Prod. Innov. Manag.* 23 (2006) 330–341.
- [31] S. Farshidi, S. Jansen, R. de Jong, S. Brinkkemper, A decision support system for software technology selection, *J. Decis. Syst.* 27 (2018) 98–110.
- [32] S. Fincher, J. Tenenberg, Making sense of card sorting data, *Expert Syst.* 22 (2005) 89–93.
- [33] *Forbes, The world's most innovative companies 2018*, <https://www.forbes.com/innovative-companies/>, 2018.
- [34] M. Franco, Partner selection criteria in cooperative agreements: influence from contextual factors, *Int. J. Bus. Environ.* 3 (2010) 267–291.
- [35] T. Gavrilova, T. Andreeva, Knowledge elicitation techniques in a knowledge management context, *J. Knowl. Manag.* 16 (2012) 523–537.
- [36] J.M. Geringer, *Joint Venture Partner Selection: Strategies for Developed Countries*, Praeger, 1988.
- [37] A. Giessmann, K. Stanoevska-Slabeva, Business models of Platform as a Service (PaaS) providers: current state and future directions, *J. Inf. Technol. Theory Appl.* 13 (2012) 31.
- [38] R. Gorwa, What is platform governance?, *Inf. Commun. Soc.* 22 (2019) 854–871.
- [39] G. Guest, K.M. MacQueen, E.E. Namey, *Applied Thematic Analysis*, SAGE Publications, 2011.
- [40] E. den Hartigh, M. Tol, W. Visscher, The health measurement of a business ecosystem, in: *Proceedings of the European Network on Chaos and Complexity Research and Management Practice Meeting*, 2006, pp. 1–39.
- [41] E.d. Hartigh, W. Visscher, M. Tol, A.J. Salas, Measuring the health of a business ecosystem, in: *Software Ecosystems: Analyzing and Managing Business Networks in the Software Industry*, Edward Elgar Publishing Ltd., 2013.
- [42] B. Henderson-Sellers, J. Ralyté, P.J. Agerfalk, M. Rossi, *Situational Method Engineering*, Springer, 2014.
- [43] A. Hevner, S. March, J. Park, S. Ram, Design science in information systems research, *Manag. Inf. Syst. Q.* 28 (2004) 75–105.
- [44] M. Hitt, M. Dacin, E. Levitas, Borza Arregele, Partner selection in emerging and developed market contexts: resource-based and organizational learning perspectives, *Acad. Manag. J.* 43 (2000) 449–467.

- [45] S. Hong, G. van den Goor, S. Brinkkemper, A formal approach to the comparison of object-oriented analysis and design methodologies, in: *Proceedings of the Twenty-sixth Hawaii International Conference on System Sciences*, IEEE, 1993, pp. 689–698.
- [46] Huang, Wong, Wang, A two-stage manufacturing partner selection framework for virtual enterprises, *Int. J. Comput. Integr. Manuf.* 17 (2004) 294–304.
- [47] Huang, Wu, Decision model for partnership development in virtual enterprises, *Int. J. Prod. Res.* 41 (2003) 1855–1872.
- [48] T. Hutzschenreuter, J. Horstkotte, Knowledge transfer to partners: a firm level perspective, *J. Knowl. Manag.* 14 (2010) 428–448.
- [49] M. Iansiti, R. Levien, Creating value in your business ecosystem, *Harv. Bus. Rev.* 3 (2004) 68–78.
- [50] S. Jansen, Measuring the health of open source software ecosystems: beyond the scope of project health, *Inf. Softw. Technol.* 56 (2014) 1508–1519.
- [51] S. Jansen, Opening the ecosystem flood gates: architecture challenges of opening interfaces within a product portfolio, in: *European Conference on Software Architecture*, Springer, 2015, pp. 121–136.
- [52] S. Jansen, A focus area maturity model for software ecosystem governance, *Inf. Softw. Technol.* 118 (2020) 106219.
- [53] S. Jansen, S. Brinkkemper, A. Finkelstein, Business network management as a survival strategy: a tale of two software ecosystems, in: *Proceedings of the First International Workshop on Software Ecosystems*, 2009, pp. 34–48.
- [54] S. Jansen, S. Brinkkemper, J. Souer, L. Luinenburg, Shades of gray: opening up a software producing organization with the open software enterprise model, *J. Syst. Softw.* 85 (2012) 1495–1510.
- [55] S. Jansen, M.A. Cusumano, Defining software ecosystems: a survey of software platforms and business network governance, in: *Software Ecosystems: Analyzing and Managing Business Networks in the Software Industry* 13, 2013.
- [56] S. Jansen, A. Finkelstein, S. Brinkkemper, A sense of community: a research agenda for software ecosystems, in: *31st International Conference on Software Engineering – Companion Volume*, 2009, pp. 187–190.
- [57] T. Jarimo, I. Salkari, S. Bollhalter, Partner selection with network interdependencies: an application, in: *Working Conference on Virtual Enterprises*, Springer, 2006, pp. 389–396.
- [58] J. Joshua, D. Alao, S. Okolie, O. Awodele, Software ecosystem: features, benefits and challenges, *Int. J. Adv. Comput. Sci. Appl.* 4 (2013).
- [59] M. Jovanovic, D. Sjödin, V. Parida, Co-evolution of platform architecture, platform services, and platform governance: expanding the platform value of industrial digital platforms, *Technovation* (2021) 102218.
- [60] J. Kabbedijk, S. Jansen, Steering insight: an exploration of the ruby software ecosystem, in: *International Conference of Software Business*, Springer, 2011, pp. 44–55.
- [61] J. Kaistinen, *Partner ecosystems in enterprise software: cause and effect of the business model from vendor, partner and customer perspectives*, 2017.
- [62] G. Kannan, A.N. Haq, Analysis of interactions of criteria and sub-criteria for the selection of supplier in the built-in-order supply chain environment, *Int. J. Prod. Res.* 45 (2007) 3831–3852.
- [63] S.N.L.C. Keung, N. Griffiths, Towards improved partner selection using recommendations and trust, in: *International Workshop on Trust in Agent Societies*, Springer, 2008, pp. 43–64.
- [64] B. Kitchenham, *Procedures for Performing Systematic Reviews*, vol. 33, Keele University, Keele, UK, 2004, pp. 1–26.
- [65] S. Kraus, F. Meier, T. Niemand, et al., In search for the ideal cooperation partner: an experimental study, *Rev. Manag. Sci.* 12 (2018) 1025–1053.
- [66] K. Kreiner, M. Schultz, Informal collaboration in R&D. The formation of networks across organizations, *Organ. Stud.* 14 (1993) 189–209.
- [67] M. Lantz, O. Weijden, *Software Ecosystem Governance and Participation: A Case Study at Axis Communications AB*, 255/2013, 2013.
- [68] H.C. Lau, E.T. Wong, Partner selection and information infrastructure of a virtual enterprise network, *Int. J. Comput. Integr. Manuf.* 14 (2001) 186–193.
- [69] N.A.C. Mat, Y. Cheung, H. Scheepers, Partner selection: criteria for successful collaborative network, in: *ACIS 2009 Proceedings*, 2009.
- [70] M. Mathijssen, M. Overeem, S. Jansen, Source data for the focus area maturity model for API management, *CoRR*, arXiv:2007.10611, 2020.
- [71] J. Meffert, A. Swaminathan, Management's next frontier: making the most of the ecosystem economy, in: *McKinsey Insights*, 2017.
- [72] Metallo, Agrifoglio, Schiavone, Mueller, Understanding business model in the internet of things industry, in: *Technological Forecasting and Social Change*, 2018.
- [73] M.B. Miles, A.M. Huberman, *Qualitative Data Analysis: An Expanded Sourcebook*, SAGE Publications, 1994.
- [74] S. Molenaar, M. van Vliet, L. Beelen, S. Jansen, Business as usual? On the nature of relationships in enterprise software platform ecosystems, in: *Proceedings of the International Workshop on Software-Intensive Business: Start-ups, Ecosystems and Platforms*, CEUR-WS, 2018.
- [75] K. Möller, A. Rajala, Rise of strategic nets - new modes of value creation, *Ind. Mark. Manage.* 36 (2007) 895–908.
- [76] J.M. Morse, Sampling in grounded theory, in: *The SAGE Handbook of Grounded Theory*, 2010, pp. 229–244.
- [77] V. Pant, E. Yu, Getting to win-win in industrial collaboration under co-competition: a strategic modeling approach, in: *International Conference on Business Informatics Research*, 2018, pp. 47–66.
- [78] G.G. Parker, M.W. Van Alstyne, Two-sided network effects: a theory of information product design, *Manag. Sci.* 51 (2005) 1494–1504.
- [79] J. Partanen, K. Möller, How to build a strategic network: a practitioner-oriented process model for the ICT sector, *Ind. Mark. Manage.* 41 (2012) 481–494.
- [80] K. Peffers, M. Rothenberger, T. Tuunanen, R. Vaezi, Design science research evaluation, in: *International Conference on Design Science Research in Information Systems*, Springer, 2012, pp. 398–410.
- [81] G. Pervan, M. Maimbo, Designing a case study protocol for application in IS research, in: *Proceedings of the Ninth Pacific Asia Conference on Information Systems*, PACIS, 2005, pp. 1281–1292.
- [82] K. Plakidas, S. Stevanetic, D. Schall, T.B. Ionescu, U. Zdun, How do software ecosystems evolve? A quantitative assessment of the r ecosystem, in: *Proceedings of the 20th International Systems and Software Product Line Conference*, 2016, pp. 89–98.
- [83] K. Popp, R. Meyer, Profit from software ecosystems: business models, ecosystems and partnerships in the software industry, in: *BoD-Books on Demand*, 2010.
- [84] N. Prat, I. Comyn-Wattiau, J. Akoka, A taxonomy of evaluation methods for information systems artifacts, *J. Manag. Inf. Syst.* 32 (2015) 229–267.
- [85] T. Rickmann, S. Wenzel, K. Fischbach, Software ecosystem orchestration: the perspective of complementors, in: *20th Americas Conference on Information Systems*, 2014.
- [86] J. Ritchie, J. Lewis, C.M. Nicholls, R. Ormston, et al., *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, SAGE Publications, 2013.
- [87] M.J. Robson, Partner selection in successful international strategic alliances: the role of co-operation, *J. Gen. Manag.* 28 (2002) 1–15.
- [88] P. Runeson, M. Höst, Guidelines for conducting and reporting case study research in software engineering, *Empir. Softw. Eng.* 14 (2009) 131.
- [89] M. Schrieck, M. Wiesche, H. Krmar, Design and governance of platform ecosystems-key concepts and issues for future research, in: *European Conference on Information Systems*, 2016.
- [90] R.H. Shah, V. Swaminathan, Factors influencing partner selection in strategic alliances: the moderating role of alliance context, *Strateg. Manag. J.* 29 (2008) 471–494.
- [91] M.Z. Solesvik, P. Westhead, Partner selection for strategic alliances: case study insights from the maritime industry, *Ind. Manag. Data Syst.* 110 (2010) 841–860.
- [92] D. Spencer, T. Warfel, *Card sorting: a definitive guide*, <http://boxesandarrows.com/card-sorting-a-definitive-guide/>, 2004.
- [93] C. Teddlie, F. Yu, Mixed methods sampling: a typology with examples, *J. Mixed Methods Res.* 1 (2007) 77–100.
- [94] A. Tiwana, *Platform Ecosystems: Aligning Architecture, Governance, and Strategy*, Elsevier, 2013.

- [95] H. Traitler, H.J. Watzke, I.S. Saguy, Reinventing R&D in an open innovation ecosystem, *J. Food Sci.* 76 (2011) 62–68.
- [96] P. van Vulpen, S. Jansen, S. Brinkkemper, The orchestrator's partner management framework for software ecosystems, *Sci. Comput. Program.* 213 (2022) 102722.
- [97] I. van de Weerd, S. Brinkkemper, Meta-modeling for situational analysis and design methods, in: *Handbook of Research on Modern Systems Analysis and Design Technologies and Applications*, IGI Global, 2009, pp. 35–54.
- [98] I. van de Weerd, S. de Weerd, S. Brinkkemper, Developing a reference method for game production by method comparison, in: *Working Conference on Method Engineering*, Springer, 2007, pp. 313–327.
- [99] P.J. Williamson, A. De Meyer, Ecosystem advantage: how to successfully harness the power of partners, *Calif. Manag. Rev.* 55 (2012) 24–46.
- [100] J. Wouters, J. Ritmeester, A. Carlsen, S. Jansen, K. Wnuk, A seco meta-model, in: *International Conference on Software Business*, Springer, 2019, pp. 31–45.
- [101] Wu, D. Barnes, A literature review of decision-making models and approaches for partner selection in agile supply chains, *J. Purch. Supply Manag.* 17 (2011) 256–274.
- [102] Wu, D. Barnes, A dynamic feedback model for partner selection in agile supply chains, *Int. J. Oper. Prod. Manag.* 32 (2012) 79–103.
- [103] Wu, Shih, Chan, The analytic network process for partner selection criteria in strategic alliances, *Expert Syst. Appl.* 36 (2009) 4646–4653.
- [104] D. Wu, O. Baron, O. Berman, Bargaining in competing supply chains with uncertainty, *Eur. J. Oper. Res.* 197 (2009) 548–556.
- [105] W. Xia, Z. Wu, Supplier selection with multiple criteria in volume discount environments, *Omega* 35 (2007) 494–504.
- [106] R.K. Yin, The case study crisis: some answers, *Adm. Sci. Q.* 26 (1981) 58–65.
- [107] Y.X. Zhong, H. Ren, Partner enterprises selection for innovation alliances: a reviews perspective, *Int. J. Res. Stud. Sci. Eng. Technol.* 2 (2015) 8–16.
- [108] R.K. Zutshi, W.L. Tan, Impact of culture on 'partner selection criteria' in East Asian international joint ventures, *Int. Entrepreneurship Manag. J.* 5 (2009) 369–393.