

Context Factors for Situational Service Identification Methods

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Abstract—Service identification is one of the earliest and very crucial activities in a service engineering lifecycle and requires adequate methodological support in order to be successful. Although there are numerous service identification methods to be found in the literature, most of them take a one-size-fits-all approach that fails to acknowledge the broad variety of concrete circumstances that can form the organizational context in which these methods need to be applied. In this paper, we argue that there is a need for configurable service identification methods that can be tailored to their particular application contexts using situational method engineering. As a first step towards this goal, we analyze two explorative case studies and related literature to derive a basic set of relevant context factors that can influence and determine the final configuration of situational service identification methods from available method fragments. Adapting service identification methods to concrete project situations will improve their applicability and lead to a better service design.

Keywords - *Service-oriented architectures; service identification; service analysis and design; situational method engineering; context factors*

I. INTRODUCTION

Service orientation is a highly recognized paradigm in enterprise architecture. There are a number of expected benefits related to service-oriented architectures (SOA) in a technical and in a business-oriented sense. Although the business-oriented benefits, like flexibility, reusability and standardization, are of high importance [1], up to now, development of SOAs is mainly technically driven so that most approaches consider technical aspects in the first place [2].

The Organization for the Advancement of Structured Information Standards (OASIS) defines service-oriented architecture as a “paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains” [3]. Since the generic term “capabilities” can refer to both business functions and application functionalities, this definition supports a holistic SOA view that accommodates for two specific types of services: The term business service describes an autonomous, transformational capability that is offered to and consumed by external or internal customers for their benefit [4]. These services can have different levels of granularity ranging from comprehensive offerings (e.g., purchasing services) to fine-granular services (e.g., address

verifications) [5]. While flexibility and reusability usually increase when services become smaller, performance tends to deteriorate [6]. The second type, software services, enables a close business and IT alignment in order to support business services and thus the agility of organizations [7]. Software services expose application functionalities that can be re-used and composed based on business needs. In order to implement SOAs successfully, an adequate identification of these services is essential.

For the last couple of years many authors have been looking at the identification of services. A distinctive feature of identification approaches is the direction of the analysis. Some authors start from a Business Process Management perspective and follow a so-called top-down approach [8, 9]. Business processes are identified and subsequently broken down to activities. Finally, IT services are designed to support business functionality. In contrast, [10] start from a technical point of view and identify services bottom-up. Based on an asset analysis, e.g., the invocation frequency of certain applications can be analyzed to identify potential services. Usually, neither bottom-up nor top-down approaches are used in their pure form. Thus, many authors advocate hybrid service identification approaches that utilize techniques covering the analysis of both business processes and existing IT infrastructure [11, 12]. A comparison of further approaches can be found in [13].

Interestingly, most existing methods to identify services are based on a “one-size-fits-all” approach (for an overview see [14, 15]), i.e., they do not consider a configuration of methods depending on different circumstances such as the goals or various context factors of an SOA implementation. Even if context factors are considered, the scope of possible configurations is usually very limited [16]. Situational method engineering (SME) offers an opportunity to engineer service identification methods depending on situation-specific context factors of the project at hand. For this purpose, so-called method fragments are configured to methods that are adaptable to different situations.

The objective of this paper is to explore, which context factors affect the selection of method fragments for service identification and how they influence the development of situational methods. A qualitative analysis approach was chosen to analyze data from two case studies inspired by the constant comparative analysis method of grounded theory [17] in order to identify relevant context factors for service identification methods.

The remainder of this paper is structured as follows: In Section 2, scope and methodology of this paper are discussed. Section 3 describes the conducted case studies. The fourth Section will identify relevant context factors and their influence on fragment selection. Finally, Section 5 concludes the paper with a summary, current limitations and an outlook for further research.

II. SITUATIONAL METHOD ENGINEERING IN SERVICE IDENTIFICATION

This paper can be seen as part of a broader research program. The latter results in a comprehensive meta method to configure situational methods for service identification including the description of possible situations and available fragments. Following [18], we assume that “a richer understanding of a research topic will be gained by combining several methods together in a single piece of research or research program” (p. 241). Thus, in our research process, we combine the two research methods *case study research* and *design science research*. Within this context, the identification of context factors through case studies and the construction of a method supported by principles from SME can each be seen as separate research projects. Jointly, they are part of the research program, i.e., the development of a meta method for the configuration of situational methods for service identification (Fig. 1).

Despite the popularity of SOA, there is only little understanding of how to convey all advantages frequently mentioned in related literature. Moreover, little is known about how context factors impact service identification approaches in SOA. This corresponds to a low uptake of empirical research in systems and software development in general [19].

Against this background, we believe that qualitative case study research can make a useful contribution. Case studies are particularly relevant for research in its “early, formative stages” [20, 21] which applies to the field of SOA (see also [22] and [23]). As case studies can be descriptive and explorative in nature, they are supposed to give insights into how context factors influence service identification.

Service identification is one of the earliest activities in a service engineering process, which covers the whole lifecycle of a service. It is of particular importance, as any errors made during this activity can flow through to and build up in the design and implementation phases, which results in increased cost due to necessary rework [24]. A review of service analysis methods in general and service identification in particular by [14] reveals that none of the recently published methods is comprehensive and integrated enough to cover both SOA concepts (business and software services) to an adequate extent. However, as pointed out by the authors, different methods can complement each other and may have specific characteristics that make them more suitable in certain contexts.

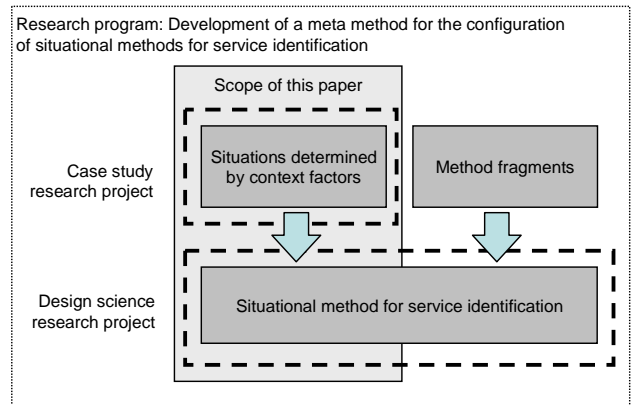


Figure 1. Research projects and research methods

For several years there have been efforts to guide the development of such methods in order to guarantee a high level of quality. To give this guidance is the task of method engineering (ME). ME is a discipline in information systems research meant to “design, construct and adapt methods (...) for systems development” [25]. The most popular approaches to ME [26-29] all identify activities, roles, results and techniques as important elements of methods [30].

Based on the fact that a given method m constructed at the time t_1 cannot fit all conceivable conditions and circumstances when it is used at a future time t_2 , the concept of situational method engineering emerged. The configuration of methods in SME is based on situations, i.e. once a situation is identified, a suitable method is configured. Reference [31] discusses how situations can be described satisfactorily. It concludes that context factors of concrete service identification projects are important for identifying situations in order to configure situational methods.

To provide for the configurability of a method, so-called fragments are constructed and afterwards configured depending on the situation [32, 33]. Reference [34] defines method fragments as “standard building blocks based on a coherent part of a method. A situational method can be constructed by combining a number of method fragments” (p.360). For the purpose of this paper, the notion of method fragment will be defined as any reasonable combination of method elements, i.e., activities, roles, results and techniques. The development of method fragments particularly for the purpose of service identification is part of our research program but out of the scope of this paper (Fig. 1). However, Table 1 will give indications on how the selection of appropriate method fragments is influenced by the context factors identified in Section 4.

Based on two case studies, this paper elaborates on relevant context factors for service identification projects and their influence on the configuration of situational methods. Identifying situations through context factors is thus an important pillar of a meta method that supports the design of methods for service identification.

III. CASE STUDY DESCRIPTIONS

The following case studies describe two SOA implementation projects conducted in Australian companies, namely Suncorp and the Securities Industry Research Centre of Asia-Pacific (SIRCA). The explorative nature of the case studies was meant to discover relevant context factors for the identification of services. At the same time, the significantly diverse settings of both cases opened up a continuum of instantiations for these context factors [35]. At Suncorp, researchers from the Queensland University of Technology (QUT) conducted an action research study. They actively participated in the project and helped test and apply a service analysis and design methodology developed by the researchers. In the second case study, several research methodologies were used. One of the most important sources of evidence have been interviews with SIRCA's employees and researchers from the University of New South Wales (UNSW), which were conducted shortly after the project had been completed. The interviews have been transcribed and analyzed afterwards.

A. Suncorp

In the context of an Australian ARC Linkage project titled "Service Ecosystems Management for Collaborative Process Improvement" (ARC Linkage Grant: LP0669244), some of the authors have developed a comprehensive service analysis and design (SAD) methodology for both business and software services. Thus, the SAD methodology used in this case study follows a hybrid approach to service identification. The first part covers the identification and analysis of business services by detailing, adapting, and consolidating existing service analysis approaches that focus on the business domain of an organization. This part is structured into four distinct phases, each comprising a specific set of activities that may use the outputs of previous phases as inputs. Subsequently, the second part of their approach describes how software services can be identified and analyzed that support business services in order to achieve close business and IT alignment. Similar to the first part of the consolidated approach, this part is structured into distinct phases, each comprising specific activities. A detailed description of the methodology is provided in [36]. The experiences gained through this exercise will build the foundation for the following discussion.

Suncorp is a diversified company in the financial services sector. As one of Australia's leaders in banking, insurance, investment and superannuation focusing on retail customers and small to medium businesses, the Suncorp Group is Australia's sixth largest bank and third largest insurer. The Suncorp case study can be subdivided into three phases as the organization went through different change programs related to their take on service orientation.

The first phase (1) focuses on service identification for integrating different systems. Suncorp had started a Claims Business Model Program some time ago with the intent to identify process improvements that would result in reduced leakage, reduced payments of ineligible claims, and lower handling costs. Suncorp's current systems were not flexible enough to support the required changes [37]. It was then

decided that the new claims process should be implemented in a new insurance claims management system from Guidewire Software, the ClaimCenter application [38]. While the initial implementation was in support of personal home claims, implementation projects for claims in worker's compensation, personal motor, commercial property and others followed. In the ClaimCenter project, integration with a large number of external systems was required and thirteen development teams (including the external vendor and an offshore team) using different development methods had to be coordinated. The project team decided to use an SOA approach to integrate diverse systems such as policy, payments, receipting and claims. A standardization of interfaces was sought to improve reusability [37].

Against this background, the QUT project team came in and presented the consolidated SAD methodology to a solution architecture team from Suncorp's Business Technology group, which started the second phase (2). Suncorp had found that their approach to SOA and service analysis and design was rather ad-hoc and very much driven by bottom-up integration requirements of their pilot projects, potentially lacking strong alignment of the service designs with the business processes:

"The current process that we follow tends to be driven by the functional requirements and data requirements of the consumer. This results in a very entity-driven service in which the consumer of the service needs to understand a lot more about the state and context of the call that they are making." (Suncorp Solution Architect)

A study protocol specified the objectives and the scope of the collaboration as well as the timeframe and the planned deliverables. In a first step, the AR study primarily focused on the identification of software services. The "motor claims" business process was chosen as input for the software service preparation and identification steps of the SAD methodology developed by QUT. To keep the scope manageable, two sub-processes, namely "claims intake" and "assessment" were selected. The researchers were provided with Suncorp's "motor claims" process models on different levels of hierarchy and additional business artifacts including the SOA Roadmap, the Insurance Domain Model and the ClaimCenter Hub System Architecture Specification. Based on this input, the researchers used the service preparation and identification steps prescribed by the SAD methodology for the two sub-processes and produced two reports that included the resulting service designs.

The third phase (3) with Suncorp extended the work that has been done previously, by applying the complete SAD methodology [36]. In particular, as part of a collaboration project between industry and university, three industry students applied the SAD methodology to derive business and software services starting from Suncorp's business strategy and capabilities. The project was driven by the desire to identify software services that not only support processes but also represent constituent elements of business services, which in turn needed to be identified first. Consulting QUT researchers along the project, the three students were able to apply the prescribed methodology and present their results to the business and IT audiences within

Suncorp who largely benefited from the lessons learned of this exercise. A detailed report was provided at the end of the project.

B. SIRCA

In the context of the project “Ad-hoc Data Grids Environments” (ADAGE), researchers at the UNSW implemented a service-oriented architecture for SIRCA. The project aimed at providing researchers an easier retrieval and analysis of heterogeneous data from different sources (grid environment) spontaneously in an unforeseeable fashion (ad-hoc). Neither business processes nor SOA were the core focus of the project. The former were hardly considered at all whereas the latter was chosen as the preferred architectural paradigm of this project. However, services (and their identification) were used as a means to meet SIRCA’s requirements rather than being the subject of analysis themselves.

In ADAGE, services were created based on the available data. This implied a technical understanding of services, which is also reflected by the synonymous use of the terms “service” and “web service” by project team members. Hence, the scope of service identification in this project was limited to software services.

SIRCA provides a huge data repository containing historical financial market data such as news and trading data. Their aim is to supply this data to researchers especially at Australian and New Zealand universities. Thus, their business model is fairly simple and is covered by one business process only.

“Our processes are fairly (...) atomistic. In that way, we are very simple outfit, we are a data repository, we collect lots of data, we do fairly substandard processing to it to normalize it and make it easily accessible. And then people access the data with some fairly straight-forward enterprise in that regard.” (Representative of SIRCA)

SIRCA employees were not thinking in terms of business processes, so that no model was delivered that could have been analyzed in the course of service identification. SIRCA’s management however had some requirements in mind that should be fulfilled by services. Unfortunately, these were not documented, which makes traceability difficult. Requirements were communicated to the project team in scheduled weekly meetings and workshops. Service candidates were identified on the basis of these meetings and prototyped. In an iterative and incremental approach the functionality of these candidates was adjusted to finally meet SIRCA’s requirements. In some cases, services were completely dismissed and new ones had to be created. A close collaboration between SIRCA’s research and development department and UNSW’s project team was a key to ensure the successful identification of services.

SIRCA’s management did not aim at the implementation of an SOA in particular. The idea of services was basically advocated by UNSW’s project team. Thus, there was no know-how on SIRCA’s side as far as SOAs are concerned. On the outset of the project, a funding for three years was provided. At the end of the project in December 2009, funds

for further six months were provided to implement the prototype and make it accessible to SIRCA’s customers.

First and foremost, the search for services was driven by the idea to retrieve and integrate data from different sources. In a second step, project members came up with ideas, which services could support researchers in analyzing data. This included, for example, building time series of financial data, merge data from different sources and visualize events. Only after that the identified and implemented services should be offered to third parties to support their business processes. Clearly, this was a requirements-driven bottom-up approach. Goals included the provision of a graphical user interface (GUI) to customers enabling them to directly invoke services in an ad-hoc fashion to analyze financial market data. This implies a distinct degree of customer interaction which influences the identification of services significantly. Certainly, SIRCA’s case is not a typical example of service identification projects. Because of its rather extreme character it helps to identify possible instances of context factors that usually cannot be found in typical cases.

IV. CONTEXT FACTORS IN SERVICE IDENTIFICATION

In order to engineer situational methods, relevant context factors that determine different categories of situations have to be identified. Hence, in this section we build on the case studies described previously to identify these context factors. The presentation of each context factor is structured as follows. Firstly, observations from the case studies are the basis for identifying context factors. Secondly, findings in related literature are briefly discussed where applicable to support the relevance of the encountered factors. Thirdly, an analysis of how these context factors influence the selection of fragments is conducted. Table 1 summarizes the results.

In SIRCA’s case, all services were clearly meant to be exposed to researchers from associated universities, i.e. to external **service consumers**. A graphical user interface (GUI) provides the opportunity for users to combine these services. Thus, users can choose themselves which services they need to use in order to analyze their data. In Suncorp’s first phase services were identified to integrate system functionalities. Hence, service consumers were purely internal. Functionalities that had to be accessed by using different applications were wrapped and can now be invoked as services. Conversely, the second and third phase aimed at both internal and external service consumers as certain services were intended to be used by end-consumers, internal systems and/or entities such as departments within Suncorp.

As shown in the case studies, services can be provided for different service consumers, e.g. other divisions (internally), third parties (externally) or both. Services can be used to integrate heterogeneous enterprise applications [9, 39] and simplify the access to certain functionalities for staff, i.e. for internal customers only. If this is known a priori, a number of activities and results such as the creation of an inter-organizational service map are not applicable in this situation. Moreover, there might be legal constraints that only apply if services are offered to third parties. Passing on customer data for instance must be permitted by the customer in some countries.

TABLE I. CONTEXT FACTORS AND THEIR INFLUENCE ON FRAGMENT SELECTION

Context Factor	Parameter Value	Influence on Fragment Selection
Service consumer	<ul style="list-style-type: none"> - internal - external - both 	<ul style="list-style-type: none"> - inter-organizational service maps are not applicable for purely internal services - "line of visibility" particularly important for external consumers - data flow analysis combined with legal check for externally provided services
Budget	<ul style="list-style-type: none"> - restrictive budget - generous funding 	<ul style="list-style-type: none"> - fragments supporting strategic aspects might not be used due to a restrictive budget - a generous funding enables comprehensive use of fragments - restrictive budgets often result in the selection of IT-oriented fragments that demand less resources
SOA concepts	<ul style="list-style-type: none"> - business services - software services - hierarchy of services 	<ul style="list-style-type: none"> - BPM techniques and respective fragments are essential for a business service-oriented identification - technical fragments such as asset analysis might be sufficient for the identification of software services - a comprehensive, hybrid approach using fragments with both top down and bottom up techniques is necessary for a hierarchy of services
SOA maturity level	<ul style="list-style-type: none"> - SIMM level 1-3 - SIMM level 4-7 	<ul style="list-style-type: none"> - fragments focused on SOA governance have only little meaning for maturity levels 1-3 - for SIMM levels 4-7 e.g. inter-organizational service maps can be important
Compliance	<ul style="list-style-type: none"> - general laws - industry-specific regulations - internal policies 	<ul style="list-style-type: none"> - all organizations have to ensure compliance with general laws such as consumer data privacy and must use respective fragments when service consumers are outside the company - a fragment that analyzes the necessity of industry-specific approaches should always be used - depending on the industry, additional fragments are needed - if there are internal policies, fragments that e.g. ensure consistent naming of services have to be applied
IT department	<ul style="list-style-type: none"> - existent - not existent 	<ul style="list-style-type: none"> - inputs like architectural concepts are only available from IT departments and restrict the use of method fragments - in the absence of an IT department, fragments are not applicable if they demand roles such as IT administrator
Interaction	<ul style="list-style-type: none"> - customer interaction - employee interaction 	<ul style="list-style-type: none"> - for the interaction with employees, roles prescribed by fragments have to be available - fragments delivering swim lane diagrams and analyzing the "line of visibility" are particularly useful if customer interaction is pivotal

Thus, fragments that demand an analysis of respective laws and regulations are only necessary where such data is passed on to third parties. An analysis of consumer interaction can be important for internal and external service provision. A fragment analyzing the "line of visibility" is much more important if services are exposed to external customers [11] and would add lots of value in cases like SIRCA's. However, they are less relevant in a context as given in Suncorp's first phase.

In both projects the **budget** seemed to play an important role and we perceived that budgeting has a significant impact when it comes to choosing necessary fragments of a method for service identification. Generally, a setting as encountered in SIRCA's case with a budget that allows for an extensive time frame of three years provides the opportunity for a thorough and systematic application of identification methods. You would expect the utilization of many techniques in order to ensure a high quality of implemented services. A detailed analysis of all available strategic and technical documents would be typical in such circumstances. However, in SIRCA's case the absence of such documents naturally dominated the generous time scope and made the application of many techniques impossible. Again, the head of research and development certainly devoted enough resources in SIRCA's case but still failed this broad analysis. The following citation is an excerpt of an interview conducted for the analysis of the ADAGE project.

"We didn't do the asset identification, because we didn't have anyone who knew about that, but if we had then, we would have done it. So you are constrained by the cost it

takes to develop, but also you were constrained by people's skills." (Researcher at the UNSW)

While the first project was funded internally, the second and third phases at Suncorp were basically developed in a collaborative environment between Suncorp and QUT based on mutual in-kind contributions. As such, the phases could be treated as pilots and were not associated with any costs other than research and development project budget for Suncorp. Budget information about the first phase is confidential and cannot be reported here. However, due to the partly academic character of these projects, funding restrictions were not a problem. At Suncorp, this availability of resources was used to apply QUT's identification method diligently.

Literature broadly confirms that the budget has implications on the number of available staff, the time pressure and the possibility to incorporate external help from consultants [40]. The higher the project sponsor's position in the company's hierarchy, the more likely is a generous funding. This allows for a proper analysis especially of strategic aspects and the inclusion of business processes and a comprehensive use of fragments. An initiation of a service identification project by the middle management (which is commonly accompanied by smaller budgets) often results in more pragmatic or technically-driven SOA implementations. Fragments dealing with Business Process Management as well as business process driven approaches (top down) are likely to be omitted in such cases. Instead, technically-oriented fragments analyzing applications and IT functionalities (bottom up) are used since they often promise quicker results. To make up for limited employee skills, a

larger budget is necessary because the company has to rely on external support. If funding is limited, certain fragments cannot be used due to this lack of skills.

Indeed, it is worth discussing if the budget is a factor as such and can be put on the same level as the other factors. In some cases, services might be identified without considering the budget available for their implementation. Only after the service identification process, a prioritization (depending on budget restrictions) is conducted [41]. However, we argue that fragments dealing, e.g., with value analyses are parts of the service identification method. These fragments are more likely to be selected if budget restrictions are tough which qualifies the budget as context factor.

The case studies showed clearly that different understandings of services based on different **SOA concepts** influence the proceeding of service identification significantly. In Suncorp's first phase aiming at the integration of different systems, the underlying technical SOA understanding implied a focus that lay purely on developing reusable software services. As part of the second phase – with a Business Process Management perspective in mind – software services that support business processes or at least sub-processes were the goal of the analysis. The third phase at Suncorp focused on identifying software services that support business services. Rarely, the focus on software services is as clear as in SIRCA's case.

A system integration approach like in Suncorp's first phase concentrated on software services, so that method fragments reflecting a more business-related SOA understanding and targeting the identification of business services were not considered. In the second phase, service identification had to include activities related to the analysis of process models and involved such fragments with not only IT-related, but also business-related staff roles. In Suncorp's third project both SOA concepts have been addressed. If the service identification is limited to a rather technical point of view like in SIRCA's case, the set of method fragments to be considered will be limited. Frequently, a hierarchy of services is the outcome of an identification process [42]. Higher-level services that support business processes compose finer-grained software services that adhere to the technical preconditions of underlying systems and data. In order to achieve this more complex type of an SOA, a broader range of method fragments has to be used complementarily. This is reflected in many hybrid (or "meet-in-the-middle") approaches that can be found in related literature [13, 15].

We observed different degrees of previous experience in the examined cases as far as SOA and service orientation is concerned. Based on this observation, we concluded that the **SOA maturity level** a company has achieved plays a role in the configuration of methods for service identification. SIRCA did not have any services at all when the project was initiated. At Suncorp, SOA maturity can be considered as relatively low. First projects had been conducted in the area of implementing software services. However, these projects did not aim at understanding business requirements and their impact on service-orientation but rather understanding the integration requirements of existing applications. It can be

conjectured that the maturity related to the adoption of service-oriented concepts will increase over time, which will change the scope of the SOA understanding and consequently the way service identification has to be conducted, as can be seen in the two latter Suncorp phases.

The SOA maturity level can be distinguished following the Service Integration Maturity Model (SIMM) by [43]. Levels 1-3 describe a rather low service orientation whereas companies with a SIMM level of 4-7 are more advanced in the field of SOA. If the latter is the case, an analysis of service maps among different divisions of a company can be essential to build an enterprise-wide SOA [44]. A fragment providing such an analysis cannot be sensibly used if there is no service orientation and subsequently (almost) no services. The same is true for all fragments dealing with SOA governance and inter-organizational aspects of SOA. If the SIMM level is low, fragments that deliver, e.g., inter-organizational service maps cannot reasonably be applied. Thus, the selection of appropriate fragments is influenced by the SIMM level of a company.

Compliance issues can arise from both legal obligations and regulatory restrictions as well as from internal policies and may require corresponding service identification method fragments that address these issues. In SIRCA's case no particular regulatory or legal requirements had to be considered. However, the Reuters market data provided by SIRCA must not be used by everyone. It might only be used for academic purposes. The academic institution has to pay a subscription fee to SIRCA to give their employees access to the data. Hence, restricted access to data and the intended use of services must be considered when services are identified. As far as Suncorp is concerned, for example the general insurance reform act and related laws and regulations issued by the Treasury Department of the Australian Government are industry-specific requirements. Since implemented services in Suncorp's case are exposed to customers, confidential treatment of sensitive customer data had to be guaranteed by a proper service design. Furthermore, as already indicated, Suncorp generally follows an agile approach to developing services. Thus, methods related to the identification, design and implementation of services have to comply with the agile paradigm.

In case services are provided to third parties, a fragment that guarantees customer data privacy and security has to be applied. Therefore, interactions with and data flows towards all service consumers have to be analyzed. Certain industries such as banking, insurance or pharmaceuticals have to adhere to additional, stricter regulations and should use respective fragments. Internal policies – such as restrictions on software development methods – can make some fragments inapplicable. Other fragments may be necessary to fulfil for instance internal naming conventions.

In a small company that lacks an **IT department** (like SIRCA), methods have to be adapted to accommodate for this circumstance. Responsibility for IT is commonly distributed all over the company and departments tend to implement isolated IT solutions or so-called silos. Larger organizations like Suncorp are usually structured along the lines of business but have an IT division that takes care of a

company-wide IT architecture and infrastructure. Hence, the existence of a designated IT department and thus the degree of centralization of the IT infrastructure is an important context variable.

On the one hand, a high degree of centralization or the existence of a central division supervising and governing IT implementation throughout a company usually leads to more transparency. Frequently, at least some information on applications and data is readily available. This can be used as input for service identification method fragments. On the other hand, some fragments demand certain roles such IT administrators or newly designed units consisting of business and IT employees (see also [45]). In a small company that lacks an IT department, these method fragments are often not applicable. The company size (frequently considered to have an important influence on SOA implementations [46]) and the geographic scope of operations are thus closely linked to the existence of a central IT department and subsequently not considered as context factors themselves.

Due to the fact that in all cases participation, exchange and contribution of service consumers differed notably, we hypothesized that varying degrees and forms of **interaction** with both customers and employees necessitate the use of different method fragments. In SIRCA's case, for instance, employees are not directly involved in service delivery because the services are very fine-grained and fully automated. The coarser-grained services are, the greater is the possibility that they are only semi-automated or manual and subsequently interact with employees. Customer interaction is of high importance in SIRCA's case because the ad-hoc composition of services is a primary goal.

However, due to their fine-grained nature, services themselves are executed independently from users, i.e., no customer interferes directly in a service. At Suncorp, employees were only involved to showcase the developed methodology and gain information about current practices at Suncorp. As part of the third project, different employees at Suncorp were involved to identify business services.

Getting access to and involvement of business roles was difficult in Suncorp's case but required by the used method fragments. Where this is impossible, a different method configuration is necessary. In general, a customer interaction can be obligatory in some places or can happen "on demand" if required by the service or desired by the customer [47]. In automated services possible customer interaction has to be foreseen and planned for. If customer interaction is a major issue for the identification of services in a situation at hand, related method fragments are crucial for a successful implementation. One example are swim lane diagrams that show interfaces to customers.

All context factors described above were found in the two case studies. Their effect on the selection of method fragments for service identification is summarized in Table 1. Particularly the case study at SIRCA revealed some more potential context factors. Since their relevance could not be observed in the phases at Suncorp, these factors were omitted from the discussion in this paper. Probably, there are interdependencies and relationships between the identified context factors. Analyzing these relationships and identifying

relevant combinations that determine the situational configuration of methods is out of the scope of this paper and will be the focus of future work.

V. CONCLUSION

Not only literature but also experience shows that methods in information systems research should be configurable depending on the situation at hand, i.e., in a situation-specific way. This is also true for service identification methods in service-oriented architectures. In order to support a situation-specific configuration of such methods, situations have to be defined by context factors. The latter determine which method fragments should be used in the course of an identification process. Based on qualitative research using grounded theory, the data of two case studies was analyzed in this paper to identify seven context factors, compare them with existing literature and describe how actual instances of these factors can influence the selection of method fragments. Due to the explorative nature of the two case studies, there is no guarantee that the derived list of factors is comprehensive. Further case studies might reveal other relevant factors. Moreover, the relevance of the identified factors cannot be proven by our case studies. Only the application of a complete situational method to a service identification project could attest their relevance.

As a prerequisite for situational methods, method fragments that can be combined have to be created. Thus, either parts of existing methods have to be identified as feasible method fragments or new fragments have to be created [48]. Designing these fragments to meet the requirements of situation-specific service identification is left to future research. Therefore, it is necessary to investigate which activities, techniques, roles, results and sequences can be combined reasonably. The so designed method fragments have to be configured to suit concrete situations that can be characterized by the context factors identified in this paper. Hereby, interdependencies and influences among context factors have to be analyzed. As mentioned previously, a concrete instantiation of one context factor can dominate other factors in the selection of one fragment over another. When exactly this is the case or how to weigh situational factors to come to a best possible selection of fragments must be elaborated in more detail.

Finally, a comprehensive situational method for service identification needs to be developed. It should define how to configure existing method fragments depending on the situation at hand. The herein identified context factors are critical to identify these situations. In order to evaluate the quality of so configured methods, more case studies should be carried out. In contrast to the two explorative case studies used to derive situational factors, further case studies should apply a newly created situational method to prove its applicability and evaluate its concept.

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