The Influence of Product and Service Ratio on Stakeholder Interaction in Software System Development

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Abstract--**Software systems have a growing importance in how services are delivered in the present-day. New methods and technologies are constantly introduced for realizing novel services in a wide range of industries. For example, software has been integral to the delivery of financial services. In this study, stakeholder engagement in the development of software systems is examined. Two software development projects are selected for their varying degrees of product and service content. Both teams use an adapted stakeholder identification framework developed for the healthcare industry to identify stakeholders for the new software systems. This paper presents the preliminary conclusion that the adapted stakeholder identification framework is suitable for new financial services software system development. The differences in stakeholders for the development of new software systems of dissimilar product-service mix are discussed in the paper, highlighting four key observations in the perspectives of product quality, relationship management, product support by customer, and service delivery process.**

I. INTRODUCTION

Modern service delivery is likely to be dependent on complicated software systems. This is especially true in the financial service industry. There is no lack of software development methodologies used to handle the frequent changes of software system requirements driven by the changing business and technology environment [1,14]. For this purpose, Agile Software Development (ASD) has been widely adopted [39] by industry, despite the short of empirical evidence from academic research [7]. In ASD, the interaction between developers, sponsors and users is found to be very important [14,30]. Outside of software development, review of previous studies on the impact of customer and end user involvement in new product and service development has reported mixed results. Some studies have reported positive impacts as a result of customer involvement in the development process [13,17]. Some other studies have shown customer involvement improves only internal operational measurements but not market performance [4], or have no impact at all [36]. As a result, no conclusion can yet be drawn [44]. In view of this, it is important to investigate the topic of stakeholder engagement in new software system development.

In this study, a product is something of independent existence and can be stocked while preserving its identity [16]; a service is something that relies on the interactions between the producer and the consumer [16,20]; a product-service system (PSS) is a commercial offering that comprises products and services to jointly fulfill a user's needs [11]. A software system is therefore considered a PSS, as it usually has one or more software products and services that function as a whole to satisfy users' needs.

This paper examines stakeholder engagement in two software system development projects in the financial service industry. The relevant stakeholders are identified using a four-level stakeholder identification framework that is developed for the healthcare industry, and modified for the financial service industry. The proximity of the relevant stakeholders to the development projects is also explored. The suitability of this adapted framework and the impact of the ratio of product-service mix on stakeholders for new software system development are analyzed and discussed.

The research questions addressed in this study are:
RQ1. How suitable is the four-level stakeholder identification framework for identifying stakeholders in new PSS development in the financial service industry?
RQ2. How do stakeholders differ with the ratio of the product-service mix?

Following this introduction, Section II presents a literature review including the four-level stakeholder identification framework and the characteristics of healthcare and financial industries pertaining to new development. Section III presents the research methodology and Section IV presents the results of the study. These are followed by the discussions of findings and limitations in Section V. Finally, the last section concludes and summarizes the study.

II. LITERATURE REVIEW

In this section, the literature of stakeholder definition and theory, stakeholder identification for new product development (NPD) and new service development (NSD) are first reviewed. This is followed by a review of the characteristics of healthcare industry and financial service industry from the perspective of NPD/NSD.

A. Stakeholder definition and theory

The concept of stakeholder has been explored since the 1960s and can mostly be found in management, economics, and policy literature [44]. Many researchers have summarized the views on who a stakeholder is from a company's perspective, e.g. [3]. One definition is that stakeholders are those who have legitimate claims on the company [6]. Another definition is that stakeholders are groups or individuals who can affect or are affected by the company's objectives [10]. In this study, Freeman's definition [10] is adopted: stakeholders for a new PSS development are those who have an interest in or are affected by the new PSS.

Several stakeholder theories have been proposed with the intention to help companies predict behaviors and better manage their stakeholders. Agency theory has been extended to explain the relationships among a company's stakeholders and the behaviors of its managers [15,32]. A stakeholder influence theory developed using the social network analysis approach has also been proposed to predict how a company reacts to its stakeholder's demand [34].

B. Stakeholder identification for NPD and NSD

The reviewed stakeholder identification theories and techniques proposed are at a company's strategy level and not at a NPD/NSD operational level. For example, there are theories for identifying stakeholders and understanding their sources of influence, e.g. [10,19,40], and for incorporating stakeholder interests into enterprise planning, e.g. [3]. A dynamic theory of stakeholder identification and salience [22] has also been proposed. The theory includes the proposal of eight stakeholder identification typologies that are derived from three attributes of power, legitimacy, and urgency.

Recently, a four-level framework for stakeholder identification is proposed for new PSS development in the healthcare industry [43]. This framework is inspired by the Moore's literature [24] of business ecosystem, extended enterprise, and core business [45]. As seen in Figure 1, the four levels are: business environment, offering, product, and service delivery. Table 1 shows the stakeholder identification framework developed for the healthcare industry.

Figure 1: Four levels of stakeholders (adapted from [45])

TABLE 1: STAKEHOLDER IDENTIFICATION FRAMEWORK FOR NEW PSS DEVELOPMENT IN THE HEALTHCARE INDUSTRY (EXTRACTED FROM [43])

Stakeholder level – stakeholder's proximity to ultimate beneficiaries	Stakeholders identified
Business environment	Industry interest group
	Government quality and regulatory agencies or department
	Law & legislation
	Quality standard and guidance
	Domain experts or industry experts
	Media
Offering	Company: management
	Customer: management
	Company: sales
	Company: marketing
	Company: engineering/technical development
	Company: quality & regulatory
	Company: industry / government relationship awareness
	Supplier
	Partner
	Business network
	Competitor
	Reseller / distributor
Product	Customer: product maintenance
	Company: product maintenance
	Customer: information technology support
	Company: information technology support
	Company: product manufacturing
	Company: service parts logistics
	Customer: end users (using product)
Service delivery	Company: service delivery (not using product)
	Customer: service delivery (not using product)
	Patients / Exercisers
	Patient family / Exerciser family
	Care-giving organizations
	Patient's organizations / charities

As seen in Table 1, apart from the last four stakeholder groups in the service delivery level, the stakeholders listed are not specific to the healthcare industry. This framework has the potential to be adapted to be used for new software system development in the financial service industry. However, it is important to first examine the characteristics of the two industries before adapting the framework.

C. Characteristics of healthcare and financial industries

The healthcare and financial service industries share some similarities, but have different areas of complexity. For the purpose of stakeholder identification for new PSS development, the differences in the two industries may impact how the stakeholder identification framework for the healthcare industry (as seen in Table 1) is to be adapted and used for the financial industry. Table 2 provides some facts and comparisons of the background of the two industries. Table 3 compares the characteristics of the two industries from a NPD/NSD perspective.

As seen in Table 2, both healthcare and financial service industries share a number of similarities in their background. Both industries are large in size in terms of percentage of GDP, and many actors are involved and have complex interdependency in the new development process [23,25,38,42,45]. Both industries are regulated, although the financial service industry is arguably less regulated than healthcare.

TABLE 2: BACKGROUND OF THE HEALTHCARE AND FINANCIAL INDUSTRIES

Dimensions	Healthcare	Financial service
Total spend and source of financing	• OECD countries total private and government spend was US$ 5 billion in 2011 [26–28]. • Measured as a percentage of the country's GDP, from 2007 to 2011, excluding the US with a spend of 16-17%, other OECD countries had increased the spend from 8.4% to 9.2% [26–28]. • 70% of the countries had seen a decrease of government funding between 2011 & 2009 [26–28].	• The size of the finance and insurance industry in the US was estimated to be $1.24 trillion or 7.9% of GDP [35]. The peak was 8.3% of US GDP in 2006 [12]. • The effect of the financial industry in the US contributed 32.3% of total corporate profits in the first quarter of 2011 [37]. • The R&D investments of the financial industry had grown almost 480 % between 2001 and 2008, with a slight decrease after 2008 [29].
	Similarities: • Large in size in OECD countries in terms of percentage of country's GDP • Have experienced growth in the last decade and a recent cutback of financing Difference: • The source of financing for Healthcare is a mix of private and government funds/ing	
Industry actors and their dependency	• Different groups of actors, such as government, regulators, insurance companies, patent holders, medical hardware & software suppliers, pharmaceutical suppliers, healthcare service providers, domain experts in different specialties, patients, patient families, and patient support organizations. • These actors have complex dependencies and shared roles and responsibilities in the quality of healthcare service delivery [23,42,45].	• Different groups of actors, such as government, regulators, insurance companies, banks, patent holders, intermediaries, central organizations (e.g. central banks), software suppliers, financial service providers, domain experts (e.g. legal, analysts), business and private customers and consumer support organizations. • These actors have highly complex interdependency and shared roles & responsibilities [25,38].
	Similarity: • Many different groups of actors in the industry who have complex interdependencies and shared roles & responsibilities	
Regulations	• Probably one of the most regulated industries. • Companies must obey local and target markets' government regulations. • Industry also self-regulates in order to mitigate associated risks [23]. • Companies have internal quality and regulatory roles/ functions [45].	• Regulated industry, with a trend of further increasing regulation [38]. • Less regulated when developing product than the healthcare industry, though compliance is considered important. • There are differences from country to country, e.g. Sarbanes-Oxley Act followed in the US for publicly traded companies. • With the latest downfalls, the financial industry is more risk-averse and regulated [8,38].
	Similarities: • Both are regulated industries • Both industries tend to self-regulate • Companies view compliance to government regulations as important Differences: • Healthcare is more regulated than the Financial service, but the latter sees increasing regulation • In terms of new product development, the Financial service is not as regulated as Healthcare	
Note:	GDP = Gross Domestic Product R&D = Research & Development US = United States of America	

TABLE 3: CHARACTERISTICS OF HEALTHCARE AND FINANCIAL INDUSTRIES FROM THE VIEWPOINT OF NPD AND NSD

Dimensions	Healthcare	Financial service
Adoption of new product & service	• Actors are risk-adverse [23]. • Actors are not readily adopting new procedures, technologies and services [23].	• Actors are becoming more risk-adverse as a result of the recent industry downturn, which lowers the adoption of innovations [8,38].
	Similarity: • Currently, actors in both industries are risk-adverse and are slow in adopting new innovations. Difference: • The reason for slow adoption of innovations in the Financial service industry is because of the recent industry performance.	
Trend of new product / service	• Treatments are increasingly patient-specific and patients potentially will greatly benefit from personalized drug therapy [21,23]. • However, personalized drugs may not yet be cost efficient for pharmaceutical companies to develop, and regulators' attitude to its development and application is to be seen [21,23].	• Simpler and more transparent services, new payment options, and more automated financial tools are the upcoming trends [8].
	Differences: • Healthcare's new product and service trend is patient-specific or personalized treatment, which the cost of development is a major concern for companies • Financial service's new innovation are about automated tools enabling simpler services for users, which are possibly less costly to develop	
Interactions between product and service within a product-service system	There are many integration or interacting points within a product-service system [23,45]: • Product-product (e.g. between a medical device and a drug) • Product-service (e.g. between software and training) • Product-user (e.g. between a clinician and software) • Product-infrastructure (e.g. between a medical equipment and the hospital building)	There are many integration or interacting points within a product-service system: • Product-product (e.g. between ERP and invoicing system) • Product-service (e.g. between software and a service provided using it) • Product-user (e.g. between a back-office worker and a software) • Product-infrastructure (e.g. between a system and the Internet)
	Similarity: • Many integration or interacting points within a product-service system	
Note:	ERP = Enterprise Resources Planning	

As seen in Table 3, while actors in the healthcare industry have always been more risk-adverse than those in the financial service industry to adopt new products and services [23], the adverse events in the financial industry are driving actors in the industry to be more conservative [8,38]. For both industries, many integration or interaction points can be identified within a product-service system. One difference between the two industries is the trend of new product and service: the healthcare industry will observe more personalized treatment [21,23], while the financial service industry will observe a more information technology-enabled service that is automated and transparent to users [8].

III. RESEARCH METHODOLOGY

The purpose of this study is to explore how the adapted stakeholder identification framework enables stakeholder identification in new software system development in the financial service industry (RQ1), and how the stakeholders are different for software systems with different product-service mix (RQ2).

Action research is selected to test and generate knowledge with the relevant people [2], that is the new software system development team members in a financial service company, on how the adapted framework works as the process for stakeholder identification (RQ1). It is an appropriate methodology because this study intends to produce practical knowledge for practitioners engaging in NPD/NSD, which is also the primary purpose of action research [33].

In order to focus on comparing the differences in stakeholders for software systems of different product-service mix, two new software system development projects from the same company are selected. The company is a leading provider of customer and asset management services in Europe and has a presence in 11 countries. The projects are both group-wide projects with a pan-European focus, involving stakeholders from offices in all 11 countries. One of the projects is software (a product), and the other one is a system consisting of software (product) components and service components. The two projects are referred to as "pure product" and "product-service" hereafter. The teams identified system components in the preliminary discussions, and the classifications were validated after the stakeholder identification workshops.

The test of the stakeholder identification framework is conducted in workshops facilitated by the same researcher. A worksheet of the stakeholder identification framework, with two columns for capturing which stakeholders are relevant to the development and how close the stakeholders are to the development in terms of frequency of involvement are provided (Figure 2). The term proximity was explained to the teams as stakeholder collaboration intensity, engagement and frequency as well as cooperation intensity. Involvement here refers to activities including: communications between the

development team and the stakeholders, instructions or rules given by the stakeholders to the development team, or stakeholders' participation in development activities.

Figure 2: Stakeholder identification framework worksheet provided to workshop participants

The knowledge about the suitability of the stakeholder identification framework is generated through the action research's cycles of planning, action, and reflection [5]. The workshop preparation and execution processes and the context of the company and participating project teams are documented in order to achieve validity in the findings [5,9]. The workshops are also audio-recorded. The same independent observer is used in both workshops to enhance the quality of the reflection and data analysis.

To evaluate the suitability of the stakeholder identification framework for financial industry, three assessment criteria are borrowed from manufacturing strategy formation process [31]: feasibility, usability, and utility. How well the participants follow the worksheet (Figure 2) is observed as a measurement of the feasibility of the framework. Whether problems are encountered when using the worksheet is noted as an indication of usability of the framework. Utility is whether the framework has achieved its intended benefits for the participants. Discussions with participants during the workshop are noted for the purpose of understanding the utility of the framework. A feedback form is also used to collect comments from the participants on the feasibility, usability, and utility of the framework for stakeholder identification.

To compare the differences in stakeholder for software systems of different product-service mix (RQ2), qualitative and quantitative data [41] from each workshop is used. Quantitative data is captured in the second and third columns of the worksheet (Figure 2). Qualitative data is gathered through observations and the audio-recorded discussions.

The data is analyzed by comparing the commonalities and differences between the two development projects in terms of: (1) stakeholders that are identified as relevant to the project; and (2) the proximity of the relevant stakeholders to the development project. Comparative analysis is selected because the number of study subjects is small enough to handle. Qualitative data is used to verify the findings through triangulation [18]. This was done by comparing the qualitative comments with the quantitative data gathered.

IV. RESULTS

The two software system development projects were classified as follows: the first team was developing a "pure product" and the second was developing a "product-service", according to the definition of this research. This classification was confirmed with the participants during the workshops.

In the workshop with the "pure product" team, there were 6 participants and it took about 22 minutes for the participants to discuss and complete the stakeholder identification framework worksheet, as seen in Figure 2. In the workshop with the "product-service" team, there were 5 participants and it took about 28 minutes to complete the stakeholder identification framework worksheet.

In both workshops, the participants found that some stakeholders were more obviously relevant to the development projects than others. Some of the stakeholders in the framework were identified to be irrelevant to the development projects, but the participants did not identify any stakeholder missing from the framework. Some stakeholders were identified as parties that the development team must listen to, but had no opportunity to influence, such as "Law and Legislation" for the "product-service" team. For the "pure product" team, some stakeholders were identified as parties who would be beneficial to have their involvement, such as "End customers", but had not been successful so far. The identified stakeholders with their proximity rating are shown in Table 4.

As seen in Table 4, a total of 24 stakeholders (75%) were identified to be relevant to at least one of the development projects. Within the 24 common stakeholders, 16 were identified to be relevant for both the "pure product" team and the "product-service" team, five were only relevant for the "pure product" team, and three were only relevant for the "product-service" team.

TABLE 4: STAKEHOLDER GROUPS IDENTIFIED TO THE NEW SOFTWARE SYSTEM DEVELOPMENTS

Level	Stakeholder group	"Pure product" team Rate the stakeholder proximity on a scale from 1 to 10, 1 being not involved, but is affected and 10 being involved daily.	"Product-service" team Rate the stakeholder proximity on a scale from 1 to 10, 1 being not involved, but is affected and 10 being involved daily.
Environment – those in the industry, business, government	Industry interest groups		
	Government Quality and Regulatory Agencies or Department		
	Law & Legislation	3	3
	Quality standard & Guidance	7	
	Domain experts or industry experts		
	Media		1
Offering – those in the organizations involved in the development / operations of the system	Customer's management	5	7
	Company's management	3	2
	Company's sales	4	9
	Company's marketing	2	1
	Company's engineering/technical development	10	10
	Company's quality & regulatory	6	2
	Company's industry/government relationship awareness		1
	Supplier	8	9
	Partner (external & internal partners)	9	7
	Business networks	2	
	Competitors	1	2
	Resellers / distributors		
Product – those in the departments who manage & operate the product	Customer's product maintenance	2	7
	Company's product maintenance	9	10
	Customer's IT support	2	8
	Company's IT support	7	5
	Company's product manufacturing	10	
	Company's service parts logistics	2	
	Customer's end users (using this product)	4	4
	Company's service delivery (delivering service by using this product)	2	10
Service delivery – those who deliver the service or are impacted by it	Company's service delivery (delivering the service but not using this product)		
	Customer's service delivery (not using this product)	3	
	End customers / beneficiaries of the product and/or service		3
	Family of the end customers / beneficiaries		
	For-profit organizations that support end customers / beneficiaries		
	Non-profit organizations / network that support end customers / beneficiaries		

At the Environment level, half of the proposed stakeholders are identified to be relevant for financial software system development. At the Offering level, apart from one stakeholder, that is "Resellers / Distributors", all 12 of the stakeholders in the framework were relevant. At the Product level, the "pure product" team identified all eight of the stakeholders in the framework as relevant, while the "product-service" team identified six of the eight stakeholders at this level as relevant. At the Service Delivery level, only one-third of the proposed stakeholders were indicated as relevant to the development projects.

TABLE 5: RELEVANT STAKEHOLDER GROUPS' PROXIMITY ANALYSIS

| Stakeholder group & Level shown as: E=Environment O=Offering P=Product S=Service Delivery	"Pure product" team Proximity rating	"Product-service" team Proximity rating	Absolute value of the difference in proximity rating & analysis	Average proximity rating; calculated when the difference in proximity rating of common stakeholder group is small or very small (< 4)
P: Company's product manufacturing	10	0	10 – completely different in proximity, only relevant for "pure product"	Only relevant for "pure product"
S: Company's service delivery (delivering service by using this product)	2	10	8 – very large difference, "product-service" found them highly relevant while "pure product" found them almost not relevant	Proximity difference ≥ 4
E: Quality standard & guidance	7	0	7 – large difference, only relevant for "pure product"	Only relevant for "product-service"
P: Customer's IT support	2	8	6 – large difference, "product-service" found them very relevant while "pure product" found them almost not relevant	Proximity difference ≥ 4
O: Company's sales	4	9	5 – medium difference, "product-service" found them much more relevant	Proximity difference ≥ 4
P: Customer's product maintenance	2	7	5 - medium difference, "product-service" found them more relevant	Proximity difference ≥ 4
O: Company's quality & regulatory	6	2	4 – medium difference, "pure product" found them much more relevant	Proximity difference ≥ 4
S: Customer's service delivery (not using this product)	3	0	3 – small difference, only relevant for "pure product"	Only relevant for "pure product"
S: End customers / beneficiaries of product and/or service	0	3	3 – small difference, only relevant for "product-service"	Only relevant for "product-service"
O: Partner (external & internal partners)	9	7	2 – small difference, both quite high proximity, "pure product" found them even more relevant	Average proximity = 8
O: Customer's management	5	7	2 – small difference, both medium proximity, "product-service" found them slightly more relevant	Average proximity = 6
P: Company's IT support	7	5	2 – small difference, both medium proximity, "pure product" found them slightly more relevant	Average proximity = 6
O: Business networks	2	0	2 – small difference, only relevant for "pure product"	Only relevant for "pure product"
P: Company's service parts logistics	2	0	2 – small difference, only relevant for "pure product"	Only relevant for "pure product"
P: Company's product maintenance	9	10	1 – very small difference, both very high proximity	Average proximity = 9.5
O: Supplier	8	9	1 – very small difference, both very high proximity	Average proximity = 8.5
O: Company's management	3	2	1 – very small difference, both quite low proximity	Average proximity = 2.5
O: Competitors	1	2	1 – very small difference, both quite low proximity	Average proximity = 1.5
O: Company's marketing	2	1	1 – very small difference, both very low proximity	Average proximity = 1.5
E: Media	0	1	1 – very small difference, only relevant for "product-service"	Only relevant for "product-service"
O: Company's industry/government relationship awareness	0	1	1 – very small difference, only relevant for "product-service"	Only relevant for "product-service"
O: Company's engineering/technical development	10	10	0 – same, very high proximity (note that these are the workshop participants)	Average proximity = 10
P: Customer's end users (using this product)	4	4	0 – same, medium proximity	Average proximity = 4
E: Law & Legislation	3	3	0 – same, low proximity	Average proximity = 3
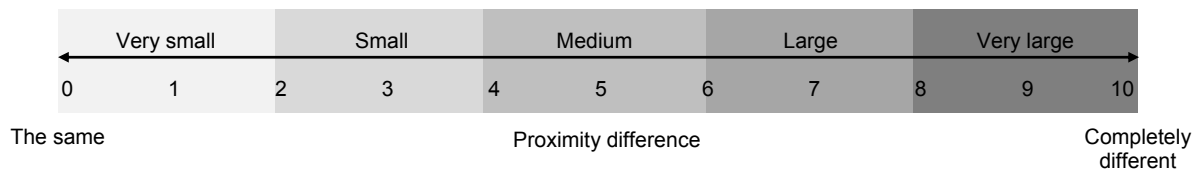
Figure 3: Proximity difference continuum

To understand how the proximity of stakeholders varies with different product-service mix, Table 5 is constructed to compare the level of proximity of the relevant stakeholders. For each relevant stakeholder, an average proximity rating is calculated if both development project teams have given a similar rating to the stakeholder. Proximity difference of less than 4, that is small and very small, is considered as similar in this analysis. Figure 3 shows the proximity difference descriptions used in Table 5 along a continuum of being "the same" at one end and being "completely different" at the other. The stakeholders relevant to the "pure product" and "product-service" development projects are arranged in Table 5 with the largest absolute value of the difference in proximity rating listed first. This arrangement highlights the stakeholders that are found to be most different in terms of proximity. Together with Table 4, patterns of stakeholder proximity are identified, which are to be discussed in Section V.

In terms of the feasibility, usability and utility of the framework, based on the feedback survey collected immediately after each workshop, the "pure product" team had mostly rated the framework as moderately feasible and usable, but of low utility. The "product-service" team had rated the framework as moderate to high degree of feasibility, usability, and utility. Qualitatively, from observations made by the workshop facilitator and the independent observer, both teams were able to follow the framework. Some clarifying questions were asked in both workshops, such as the meaning of proximity, and examples of some listed stakeholders such as Industry Interest Groups. Other than that, it appeared that the framework was usable as a prompt for discussing which stakeholders were relevant to the development projects. Some participants were commenting that some stakeholders would be good to be involved more (e.g. "End customers"), which may indicate that the framework surfaced the need for some stakeholders for the new development.

V. DISCUSSION

The discussion is organized according to the two research questions, which is then followed by the limitations of the findings.

A. Is the adapted four-level stakeholder identification framework suitable for new software system development in the financial service industry? (RQ1)

In general, in both workshops, the participants were able to find all stakeholders to the development projects using the adapted stakeholder identification framework for the financial service industry. There was no additional stakeholder suggested by the participants.

Based on the results of the two workshops, it appears that the stakeholders listed in the stakeholder identification framework for Offering and Product levels are appropriate for new software system development in the financial service industry. However, half of the stakeholders in the Environment level and two-thirds in the Service delivery level were identified to be irrelevant. They may not be applicable to the financial service industry, but it could also be country specific as the participating development teams are both based in Finland. It is too early to draw any conclusion without further testing the framework in other software system development projects within the financial service industry.

Table 6 lists the stakeholder groups that are identified to be irrelevant for either of the two development projects. Initial thoughts on areas that need further investigations are also captured in the table.

TABLE 6: STAKEHOLDER GROUPS IDENTIFIED TO BE IRRELEVANT

Level	Stakeholder group	Initial thoughts on areas to be further investigated
Environment	Industry interest groups	Is it because there are no interest groups for this industry, or not for this specific country?
	Government Quality and Regulatory Agencies or Department	Are there no specific regulations on software quality for this industry, or not for this specific country?
	Domain experts or industry experts	Is this because the software and service does not require specific skill that is so scarce that the company cannot build or acquire the capability?
Offering	Resellers / distributors	This is mainly related to the company's business model, rather than a general condition of the industry.
Service Delivery	Company's service delivery (delivering the service but not using this product)	For these two developments, any service delivered by the company would involve using the software product. How is it in the industry in general?
	Family of the end customers / beneficiaries	Is it because of the nature of the industry sectors that the participating development projects, and not the general financial industry, that family of end customers is not seen as a stakeholder?
	For-profit organizations that support end customers / beneficiaries	Is there no organization in financial service industry to support end customers, or not for this specific country? Or are these not relevant to this specific company?
	Non-profit organizations / network that support end customers / beneficiaries	

As seen in Table 6, the irrelevance of those groups identified at the Environment level could be country-specific, the irrelevance of "Resellers / distributors" at the Offering level is probably company-specific, and the irrelevance of "Company's service delivery (delivering the service but not using this product)" at the Service Delivery level is likely to be development-specific. These stakeholders should be retained in the next adaption of the framework for further testing. However, other unrelated stakeholders at the Service Delivery level: "Family of the end customers / beneficiaries", "For-profit organizations that support end customers / beneficiaries", "Non-profit organizations / network that support end customers / beneficiaries" could be industry-specific, and may be eliminated from the framework in the next workshop.

B. *How do stakeholders differ with the ratio of the product-service mix? (RQ2)*

Four areas are observed in terms of how the product-service mix may have impacted on the stakeholders identified for the development project.

Product quality

First, quality seems to be more of a concern in "pure product" development project. For the "pure product" team, the participants have identified the "Quality standard & Guidance" stakeholder at the Environment level and the "Company's quality & regulatory" stakeholder at the Offering level as stakeholder of medium to high level of proximity (rated 7 and 6 respectively). The participants of the "product-service" team have only identified "Company's quality & regulatory" as a stakeholder, and of minimal level of proximity (rated 2).

Relationship management

Second, it appears that a new "product-service" PSS requires more attention to the relationship with stakeholder groups external to the company, such as government, media, and customers. From the results, only the "product-service" team participants have identified "Media" at the Environment level and "Company's industry/government relationship awareness" at the Offering level as stakeholders, though they are both rated as very low in proximity to the development projects (both rated 1). The "product-service" team participants have also identified "Customer's management" as a stakeholder of medium to high level of proximity (rated 7), while the participants of the "pure product" team have rated this stakeholder at a medium level of proximity (rated 5).

The "product-service" team participants have rated "Company's Sales" as stakeholder of a high level of proximity to the development project (rated 9), while the "pure product" team participants have only rated this group at a low to medium level of proximity (rated 4). The reason could be that the design of how service and product components work together to jointly deliver what customers desire may need more input from sales, or alternatively that sales need to know more about the PSS in order to sell the benefits of the outcome to potential customers.

Product support by customers

Third, it appears that the stakeholders in customer's organization who provide support to the product when it is in use are more relevant to a "product-service" development than to a "pure product". The participants in the "product-service" team have identified "Customer's IT support" and "Customer's product maintenance" at the Product level as medium to high level of proximity to the development project (rated 8 and 7 respectively), while participants in the "pure product" team have identified them as very low proximity (rated 2). This may indicate that when a development has service elements, the development team is thinking from the perspective of the on-going service that is to be delivered by the company, on top of the functionalities of the product.

Service delivery process

Fourth, the stakeholders around the service delivery process seem to be much more relevant for a "product-service" PSS than a "pure product" PSS. The participants in the "product-service" team have identified "Company's service delivery (delivering service by using this product)" at the Product level as stakeholder of a very high level of proximity to the development project (rated 10). The participants in the "pure product" team have identified this stakeholder as very low in proximity (rated 2).

The "product-service" team has also identified "End customers / beneficiaries of the product and/or service" at the Service Delivery level as a stakeholder of low proximity to the development project (rated 3). The "pure product" team has not identified "End customers / beneficiaries" as stakeholder for the development, because the nature of the product is to facilitate debt collection from the 'beneficiaries'. A notable observation is that "Customer's service delivery (not using this product)" is not identified as relevant by the "product-service" team, but is identified as relevant with a low proximity (rated 3) by the "pure product" team. This might be a weakness in the "product-service" team in terms of stakeholder identification, or it might be due to the fact that the service delivery process is under development in parallel with this novel software system. As a rather new venture, there seems to be only a limited number of stakeholders with an overview of the complete service delivery process. Therefore, the "product-service" team works with the most relevant stakeholders, and has to make trade-offs between complexity of the software design and service delivery process design.

To conclude, the four observations about product quality, relationship management, product support by customer, and service delivery process are made with regards to how stakeholders may differ between a "pure product" software system development and a "product-service" software system development. It is also noted that some of the variations in

stakeholder identification may be due to the nature of the software product in the "product-service" development (the "product-service" team): the participants believe that there is no manufacturing activity nor service parts for the software product, and that any service generated is related to the product element in this software system. Therefore, "Company's product manufacturing" and "Company's service parts logistics" are not identified as stakeholders by the "product-service" team. Lastly, "Business networks" at the Offering level was identified by the participants in the "pure product" team to be relevant with very low proximity (rated 2), and not identified as a stakeholder by the "product-service" team. The four observations made cannot explain this difference, and more workshops for software system development in the same industry would be needed for further understanding.

C. Limitations

The study is conducted within one organization and two project teams. The number of subjects is not large enough to generalize the results. However, the participants are working in a very similar setup and are from a similar culture. Therefore, most of the variations in stakeholder co-operation can be judged to originate from the differences in product-service mix. The interpretation of the data collected through workshop observations is subjective and is affected by the researchers' background and knowledge in the industry. Conducting more workshops with software system development projects from similar set-up with different facilitators and observers would be a logical next step of this study.

VI. CONCLUSION

This paper first discussed the suitability of a stakeholder identification framework that is developed for the healthcare industry in order to meet the needs of new software system development in the financial service industry. It appears that while the stakeholders at the Offering and Product levels of the stakeholder identification framework are relevant for software solution development in the financial service industry, only half of the stakeholders at the Environment and Service Delivery levels are relevant. The framework needs further adaptation before applying for further application in the financial service industry.

The paper then presented a comparison between the relevant stakeholders for financial software solution development, for a solution that contains only product elements (a "pure product"), and for one that comprises both product and service elements (a "product-service"). Although only two development projects are involved in the study, observations of how different product-service mix may lead to one stakeholder more relevant and closer to the development team than another stakeholder are made. Four preliminary conclusions are drawn: (1) product quality is more of a concern for "pure product"; (2) managing the

relationship with external stakeholders is more relevant for "product-service"; (3) how customers support the new product when it is in use is more relevant for "product-service"; and (4) the internal stakeholders around the service delivery process are more relevant for "product-service" development.

This study has introduced a new stakeholder identification method for new PSS development in the financial service industry. It has also shown that the ratio of product and service within a PSS may affect how close certain stakeholders are to the new development process. As the preliminary conclusions drawn are based on two PSS developed by the same company, the proposals are limited and cannot be generalized. More workshops on different new PSS development in the financial industry are needed for further investigation.

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