



# Stakeholder involvement in software system development – Insights into the influence of product-service ratio



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## ARTICLE INFO

### Article history:

Available online 12 June 2015

### Keywords:

Software  
Development  
Stakeholder  
Financial service  
Product-service system

## 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. In this study, stakeholder involvement in the development of financial service software system is examined, as software has been integral to the delivery of financial services. Two projects are selected for their varying degrees of product and service content. Both teams used an adapted stakeholder identification framework developed for the healthcare industry to identify stakeholders and their involvement need in the development projects. The suitability of this framework for financial service software development, and the differences in stakeholders for the development of new software systems of dissimilar product-service mix are discussed in the paper. Four insights into the influence of product-service ratio in stakeholder involvement are gained in the perspectives of product quality, relationship management, product support by customer, and service delivery process.

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## 1. Introduction

Modern service delivery is likely to be dependent on complicated software systems. This is especially true in the financial service industry. Software system has been identified as design intensive, abstract, symbolic, and intellectually complex [1]. It is therefore not surprising to see the abundance of software development methodology that is proposed to handle the frequent changes of software system requirements driven by the changing business and technology environment [2,3]. For this purpose, Agile Software Development (ASD) has been widely adopted [4] by industry, despite the short of empirical evidence from academic research [5]. In ASD, the interaction between developers, sponsors and users is found to be very important [2,6]. 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 [7,8]. Some other studies have shown customer involvement improves only internal operational measurements but not

market performance [9], or have no impact at all [10]. As a result, no conclusion can yet be drawn [11]. All in all, the growing importance, complexity and usability demands require software development teams to work closely with the upcoming users, customers and domain experts. In view of this, it is important to investigate the topic of stakeholder involvement in new software system development.

In this study, a product is something of independent existence and can be stocked while preserving its identity [12]; a service is something that relies on the interactions between the producer and the consumer [12,13]; a product-service system (PSS) is a commercial offering that comprises products and services to jointly fulfill a user's needs [14]. 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 involvement 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.

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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 does stakeholder involvement differ with the ratio of the product-service mix?

Following this introduction, Section 2 presents the four-level stakeholder identification framework and the characteristics of healthcare and financial industries pertaining to new development. Section 3 presents the research methodology and Section 4 presents the results of the study. These are followed by the discussions of findings in Section 5. Finally, the last section concludes the study and discusses its limitation.

**2. 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.

*2.1. 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 [11]. Many researchers have summarized the views on who a stakeholder is from a company's perspective, e.g. Ref. [15]. One definition is that stakeholders are those who have legitimate claims on the company [16]. Another definition is that stakeholders are groups or individuals who can affect or are affected by the company's objectives [17]. In this study, Freeman's definition [17] 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 [18,19]. 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 [20].

*2.2. 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. Refs. [17,21,22], and for incorporating stakeholder interests into enterprise planning, e.g. Ref. [15]. A dynamic theory of stakeholder identification and salience [23] 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 [24]. This framework is inspired by the Moore's literature [25] of business ecosystem, extended enterprise, and core business [26]. As seen in Fig. 1, the four levels are: business environment, offering, product, and service delivery. Table 1 shows the stakeholder identification framework developed for the healthcare industry.

As seen in Table 1, apart from the last four stakeholder groups in the service delivery level, the stakeholders listed are not specific to



Fig. 1. Four levels of stakeholders (adapted from Ref. [26]).

the healthcare industry. Moreover, the cases used to develop this framework have included at least four software system development projects in the healthcare information and communication technology (ICT) sector [26]. Therefore, 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.

*2.3. Characteristics of healthcare and financial industries*

The healthcare and financial service industries share some

**Table 1**  
Stakeholder identification framework for new PSS development in the healthcare industry (extracted from Ref. [24]).

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

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