Conceptualizing and Measuring Perceived Service Complexity

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Abstract

This study focuses on the notion of Perceived Service Complexity (PSC). PSC captures 'the difficulty to assimilate the service delivery process, as perceived by frontline employees (FLEs)' and is conceptualized and measured through the development and validation of a multidimensional construct consisting of three factors (Task-Related, Customer-Derived and 'Service Nature'-Derived Complexity). The findings add to the organizational frontline literature and advance scholarly understanding of how aspects of FLEs' working environment shape their ability to assimilate the service delivery process and successfully perform their roles during their interactions with customers. Based on these findings, managerial practice can be informed of the distinct elements that shape FLEs' perceived service complexity as well as of its ramifications for designing successfully service delivery systems for different types of services.

Keywords: Perceived service complexity, frontline employees, scale development

1. INTRODUCTION

Today, service industries are becoming increasingly competitive and unpredictable due to the increased variety of services offered, the ongoing introduction of radical innovations and, most importantly, more sophisticated and diversified customer needs and preferences (Brooker *et al*. 2012; Chen *et al*. 2014). In such a dynamic environment, service providers struggle to optimize their service delivery process, which remains a key determinant of their market performance (Iyer *et al.* 2014). The design and implementation of service procedures constitute the key components of a successful service delivery process (Teixeira *et al.* 2012), especially for firms whose frontline employees (FLEs) are directly involved in the delivery, promotion and sale of service offerings to consumers (Clark *et al*. 2000; Kostopoulos *et al.* 2012). A critical but relatively unchallenged aspect of successful service design and implementation is associated with the understanding of complexity's impact on the service delivery process, which is rooted in service interactions (Shostack 1987) and has important implications for the experience of both sides of the service encounter (i.e. FLEs and customers) (Braun and Hadwich 2016; Mikolon *et al.* 2015).

Firm-wise, service complexity enables operational efficiency in the service design process (Jan Angelis and Thompson 2007), through adjusting service delivery according to the degree of complexity of the service delivered (e.g. Wang *et al.* 2014). Regarding customers, high service complexity can hamper their service experience, due to the increased cognitive effort required on their behalf to complete such interactions (Holm *et al*. 2012; Mikolon *et al.* 2015). Nevertheless, the impact of service complexity on the FLEs' side still remains unchallenged, despite that they strive to balance between conforming to standardized role requirements and managing the variation of customer needs (Aksin and Masini 2008). In such circumstances, the outcome of the

service encounter can be affected, as FLEs' ability to perform can be compromised from complex service offerings. This is due to the increased effort required which results in greater cognitive demands from individuals, reducing their capacity to info-processing (Vohs *et al.* 2008). Nevertheless, service complexity is viewed either from an intra-organizational perspective where its benefits and costs in internal exchanges are assessed (e.g. Braun and Hadwich 2016) or is treated as an operational feature of service delivery assessed through objective proxies, such as the number of intermediate steps (e.g. Martínez-Tur *et al.* 2001).

Hitherto, some challenges for organizational frontline emerge from this discussion. First, the lack of knowledge about FLEs' perceived complexity prevents line managers from ascribing lower service performance to work overload or other contextual factors, which is vital in performance-based services. Second, high levels of service complexity might require the development of more detailed job descriptions and more customized training on the tasks that FLEs need to undertake. As a result, service organizations cannot accurately act upon the negative outcomes of FLEs' perceptions of service complexity without scrutinizing their perceived job demands due to service complexity and thus its impact on their service delivery efforts needs to be charted (Braun and Hadwich 2016; 2017).

Echoing these challenges, this study aims to expand prior conceptualizations of service complexity and provide an exhaustive view of perceived service complexity for the service encounter reality, by introducing an FLE-based conceptualization of complexity, namely Perceived Service Complexity (PSC). PSC captures '*the difficulty to assimilate the service delivery process, as perceived by FLEs*'. Drawing on the job demands-resources and the job characteristics frameworks, this study advances the service management literature in shedding light on how aspects of FLEs' proximal working environment shapes their ability to assimilate

the service delivery process and perform successfully their roles during their interactions with customers. On this basis, three key objectives are set: a) to develop a comprehensive conceptualization of PSC and identify its main underlying dimensions, b) to develop and empirically test a parsimonious, valid and reliable scale to measure PSC and c) to assess the criterion validity of a formative model to describe PSC and its impact on its two well-established consequences, (i.e. role clarity and job performance).

The next section presents the conceptualization of PSC and the extensive literature review on which it is based. The sections that follow present the formative model developed to measure PSC, as well as the research design and data analysis for the two studies conducted to test the model's validity. The final section offers a discussion of the findings and some directions for future research.

2. LITERATURE REVIEW

2.1 From Service Complexity to Perceived Service Complexity

Service complexity is a characteristic related to the success of a new service (De Brentani 1989) as well as the sustainability of an existing one (Surprenant and Solomon 1987; Danaher and Mattsson 1998). Existing definitions of service complexity mostly adopt an operational view of the construct's meaning (e.g. Silvestro *et al*. 1992; Kreye *et al.* 2015). Work in the operations management literature assesses the complexity of a service on the basis of process outcomes differentiating between service complicatedness and difficulty (Soteriou and Chase 1998; De Castro Lobo *et al*. 2010; Kreye *et al.* 2015). Work in organizational behaviour mostly focus on the complexity of the tasks employees have to carry out and rarely explore service complexity from the service provider's point of view (Chen *et al.* 2001; Braun and Hadwich 2016). In a similar vein, the marketing literature often treats service complexity as an objective service

attribute, which remains the same for a given service, regardless of employees' perceptions of it (e.g. Shostack 1987; Braun and Hadwich 2016). Recent work also considers service complexity from a customer perspective and explores its impact on customers' experience with the firm (Mikolon *et al.* 2015; Balaji *et al.* 2017).

The aforementioned conceptualizations rarely address the impact of service complexity on FLEs' ability to perform during the service encounter, which largely determines customers' view of the firm, especially in performance-based services (Gounaris and Boukis 2013). FLEs' ability to perform is not only affected by tangible role determinants, such as structural job characteristics, but it is also shaped from intangible ones, such as the mental effort required on their behalf when delivering the service (Gillison *et al.* 2016). Capturing these determinants of service complexity is vital, as it remains individually experienced; the same level of objective complexity within a service process may have a varied mental and psychological effect on different FLEs. For instance, the actual number of intermediate steps in a service delivery process, which is a determinant of its complexity (Shostack 1987), does not precisely capture the degree of complexity that each FLE perceives. Hence, its actual impact on the delivery process cannot be accurately assessed without considering both tangible and intangible aspects of the service delivery process that determine FLEs' perceptions of complexity.

In understanding service complexity, prior research has utilized the cognitive capacity framework (Lalwani 2009) to explain how customer value is affected from service complexity (Mikolon *et al.* 2015). Yet, a solid theoretical understanding of how FLEs experience service complexity is still missing from the literature. This is of paramount importance for the accurate measurement of perceived complexity and the identification of managerial practices to deal with it. The present study advances an FLE-based conceptualization of service complexity which caters for FLEs' perceived difficulty to assimilate the service delivery process. Drawing on the

Job Demands-Resources framework (Demerouti *et al.* 2001), PSC is viewed as a job demand which impairs FLEs' performance, due to the higher levels of cognitive effort required on their behalf to meet role requirements (Bakker *et al*. 2005). Next, the theoretical underpinning for this construct is analytically discussed and each of its three underlying dimensions is established (Figure 1).

Place Figure 1 about here

2.2 Identifying the Dimensions of PSC

Despite several studies in the literature conceptualizing service complexity from an operational viewpoint (e.g. Aksin and Masini 2008) or an internal supplier perspective (e.g. Braun and Hadwich 2016; 2017), none of them incorporates FLEs' views, despite that they are the key stakeholders affected from service inseparability during service delivery. Following an extensive review of the concept across the OB, services and operation literatures, three major dimensions underlying PSC emerge: *Task-Related Complexity, Customer-Derived Complexity* and *Service Nature-Derived Complexity*. These three dimensions represent the input of the three main sources of complexity, as conceptualized in the extant literature, for FLEs; first, the way the service is designed by the service provider (Chase and Tansik 1983); second, the input from external participants (i.e. the customers) (Dagger *et al*. 2009) and, third, the effect from the nature of the service itself, which cannot be adjusted by the service provider or customers (Laroche *et al*. 2001; 2004).

2.2.1 Task-Related Complexity

Task-related complexity captures FLEs' perceived complexity of the task in hand, which remains a key source of complexity in service delivery. The aspects of task-related complexity should not

only be measured objectively (e.g. actual duration of the service delivery), but also by capturing FLEs' views of the process (e.g. how long they perceive the duration of service delivery). The theoretical underpinning of this factor lies on job design theory (Hackman and Oldman 1976), which suggests that employees can be motivated through the optimal design of their jobs along five elements (i.e. variety, identity, significance, autonomy, feedback). As organizations strive to encourage high job motivation through enhancing jobs along these elements, task-related complexity is also affected. For example, increased job variety increases the complexity of the service as a range of sub-processes must be designed and undertaken, which in turn require a variety of additional resources (Chase and Tansik 1983).

Traditional marketing or operations management literature focus on the *number of tasks* involved in the delivery of the service and the *difficulty* of their execution (e.g. Andaleeb and Basu 1995; Germain *et al*. 2001; Martínez-Tur *et al.* 2001). This work is in line with definitions of *task complexity* in the pertinent literature that consider a job task complex when it involves a large number of difficult steps (e.g. Chen *et al.* 2001). In general, service delivery processes that comprise several difficult tasks (e.g. hotel accommodation) are perceived as more complex by all parties involved than those which require fewer and easier tasks (e.g. ticket purchase) (Kostopoulos *et al*. 2012). In fact, this is the theoretical argument with regard to a system's complexity: complex systems consist of many elements that interact with each other in ways that heavily influence the probability of later non-predictable events (Amaral and Uzzi 2007).

What is also important is the extent to which discrete steps during service provision are different from each other (i.e. task variety) (Lightfoot and Gebauer 2011); in a service setting, intermediate steps often differ significantly, and additional sub-processes must be designed and implemented, which in turn require a greater variety of organizational resources and employee

skills (Chase and Tansik 1983; Kreye *et al.* 2015). Thus, diverse employee training and development processes need to be adopted, and different equipment acquired, which increases FLEs' perceptions about the complexity of the service (Devlin 2001). Taking flight services as an example, the tasks involved are so disparate that a significant number of varied tasks need to be completed by staff (e.g. customer service, safety control, check-in), and this adds further complexity to the service.

Another task-related aspect that determines service complexity is the duration of the execution of the tasks. Pertinent literature is replete with studies that consider the duration of each intermediate step in the service delivery and the overall waiting period for the customer to be major indicators of complexity (e.g. Rafiq and Ahmed 1998; Holm *et al*. 2012). Although *duration* is related to each task's difficulty, diversity and interdependence with other tasks is not solely determined by these three factors and hence it stands on its own as a unique task attribute (Silvestro *et al*. 1992); the more time FLEs spend on a task, the lower their cognitive alertness becomes, which increases their perception of complexity (Mikolon *et al.* 2015). The above discussion suggests that task-related complexity can be determined by FLEs' perceptions of four elements related to the tasks FLEs need to carry out: *a) the number of tasks, b) the difficulty of tasks, c) the variety of tasks and d) the duration of tasks.*

2.2.2 Customer-Derived Complexity

Customer-derived complexity is the complexity arising from customers' participation in the service delivery (Rafiq and Ahmed 1998; Mikolon *et al.* 2015). In principle, the delivery of a service becomes more challenging for FLEs when *customers participate* heavily in the process (Dagger *et al*. 2009; Dong et al. 2015); hence, services involving more intense customer

participation, such as health care or education, are more complex than those in which low interaction exists between FLEs and customers, such as fast-food outlets or car repair services. Therefore, the intensity of service interactions should be considered a determinant of customer-derived complexity.

Customers' participation also adds to the complexity of a service because their behavior is often *unpredictable* (Surprenant and Solomon 1987), something that increases the heterogeneity of the service. Low predictability of customer behavior makes it difficult for service providers to plan and execute the service delivery process (Hjort *et al.* 2013). When FLEs have a less clear picture on what to expect during the service encounter, it enhances their uncertainty, making the service appear as more complex. Hence, service interactions become more perplexing, which requires FLEs to display a mix of task-, relationship-, and self- focused behaviors (Bradley *et al.* 2013) which increase the degree of service complexity FLEs perceive.

Another source of complexity is the degree to which the service offer can be customised (Silvestro *et al*. 1992). Holm *et al*. (2012), regard service complexity as a function of '*the degree of variation in service needs and requirements that invoke differential activities on an organization across customer-facing functions"* (p. 394). As more options (alternative scenarios) become available to customers, a wider variety of actions are included in the service delivery. As a result, the service plan includes more parameters, which increase the complexity of the service significantly (Rafiq and Ahmed 1998). This is why services such as car registration, which involve specific and predictable customer actions, are considered simple, whereas services such as legal advice services are considered more complex (Buckley 2003). Therefore, the variation of customer needs is expected to influence FLEs' perceived service complexity.

Another source of customer-derived complexity pertains to the simultaneous presence of many customers (Holm *et al*. 2012). When FLEs deal with many customers at once, they find it more difficult to execute the tasks involved in service delivery (Hoffman and Turley 2002; Ng *et al*. 2007). For example, therapists view group therapy as a more complex process than one-to-one consultation. Similarly, a bartender will find it much easier to deal with one customer's order than multiple customers' requests at the same time. The simultaneous presence of many customers impairs FLEs' ability to predict customers' potential behavior and depletes their resources quicker (Singal 2008). In light of the above discussion, customer-derived complexity can be determined from: *a) the intensity of customer participation, b) the predictability of customer behavior, c) variation in customer needs* and *d) the simultaneous presence of multiple customers during the service encounter.*

2.2.3 'Service Nature'-Derived Complexity

The marketing paradigm suggests that services are axiomatically more difficult to grasp than products due to their intangible nature (Shostack 1987; Lovelock 1983). This study asserts that PSC is also determined by FLEs' ability to understand the service, which derives from the imprecise and intangible nature of service interactions (Simon and Usunier 2007). Thus, the third dimension of PSC is 'Service Nature-Derived' Complexity, which reflects the cognitive difficulty that the nature (type) of the service poses for FLEs.

The first source of 'Service Nature-Derived' Complexity is mental intangibility, or the extent to which a service is difficult to grasp mentally (Laroche *et al*. 2001; 2004). Mental intangibility can impair cognitive understanding and generate associated difficulties for all individuals involved in a service encounter. Hence, it should be considered a determinant of complexity

(Devlin 2007). For instance, higher education is a more mentally intangible service than a business loan; therefore, it is viewed as more complex by the staff involved, although the individual tasks required are not necessarily more difficult.

In addition to mental intangibility, there is the generality of a service, which derives from its nature and is determined by its *obscurity*; that is how general and/or specific an individual perceives a particular service (Laroche *et al*. 2001). More abstract services are those that cannot be easily identified by precise definitions, features and/or outcomes (Laroche *et al*. 2004). Therefore, it is reasonable to assume that abstract services are viewed as more complex by FLEs: for example, psychotherapy, which is *the process of dealing with a person's mental or emotional problems through conversation*, is a more abstract service than a haircut.

Another source that underlies the nature of a service pertains to the amount of knowledge required by FLEs to fully understand the nature of that service (Andaleeb and Basu 1995; Devlin 2007). Services for which FLEs need significant knowledge or intellectual capital in order to fully understand them (e.g. technologically advanced or medical services) will be perceived as more complex than services which do not carry such a requirement. Therefore, the PSC of the former will be higher.

Finally, FLEs' inability to get a complete overview of the service process as a whole is another source of 'service nature'-derived complexity (Swanson and Kelley 2001). In many cases, FLEs have an explicit idea only about the phase of service delivery they are involved in, being unaware of other important components of the service offering (Lings and Brooks 1998). Often, FLEs have low visibility or limited understanding of some aspects of the services process which makes it more challenging for them to fully understand the service. For example, in the case of air transportation, ground staff do not have a clear picture of the in-flight service and vice

versa for flight attendants. In summary, PSC can also be determined by the nature (type) of the service, which is reflected on four elements: *a) mental intangibility, b) generality, c) knowledge requirements and d) incomplete overview.*

2.3 A Formative Model of Perceived Service Complexity

This study conceptualizes Perceived Service Complexity (PSC) as a multidimensional, second-order construct with three formative, first-order factors (*Task-Related Complexity*, *Customer-Derived Complexity* and *'Service Nature'-Derived Complexity*).

As such, the model is a reflective one at the first order, as three latent factors emerge, which are reflected upon their indicators. The first latent factor is task-related complexity, which is reflected upon the number of tasks, the difficulty of tasks, the variety of tasks and the duration of tasks; the second one is customer-derived complexity, which is reflected upon the intensity of customer participation, the predictability of customer behavior, the variation in customer needs and the simultaneous presence of multiple customers and the third factor is 'service nature'-derived complexity, which is reflected upon mental intangibility, generality, knowledge requirements and incomplete overview. The reason for this level of the model being reflective is that each complexity dimension is an underlying concept that has an effect on its indicators (Bollen and Lennox 1991); in other words, each latent (complexity) factor determines its indicators and not vice versa (Diamantopoulos *et al.* 2008). In contrast, at the second order, the three factors form, rather than reflect, the overall construct of PSC. As this is the first time that PSC is conceptualized as a multidimensional, second-order construct, some arguments are presented to support the view that the model is a formative one at the second order.

2.3.1 Covariance between the Indicators

In this theoretical conceptualization, the indicators for the three factors of PSC are not necessarily related to each other: for instance, some services are considered complex because of the difficulty of the associated tasks, while others are complex as they involve high customer participation and multiple service scenarios from which customers can choose (Silvestro *et al.* 1992). Thus, some services with high task-related and low customer-derived complexity (e.g. technical support, public prosecution) are equally complex as services with low task-related and high customer-derived complexity (Buckley 2003). Similarly, many services are complex due to their nature, even though their task-related and customer-derived complexity is low (e.g. financial services) (Devlin 2007). It becomes evident, therefore, that the significance of the correlations between the three factors of complexity cannot, theoretically, be predicted: a reflective model would assume correlations between indicators, whereas such an assumption cannot be made for a formative model (Law *et al*. 1998; Diamantopoulos *et al*. 2008). This signifies that overall, PSC can be better explained by a formative than a reflective model.

2.3.2 Direction of Causality from Construct to Factors

The direction of causality in a second–order, formative model moves from factors to construct, whereas in reflective models the opposite is evident (Diamantopoulos and Winklhofer 2001). Following the conceptualization of PSC in this study, changes in FLEs' perceptions of the three factors (task-related complexity, customer-derived complexity and 'service nature'-derived complexity) lead to changes in their overall perceived complexity: when one of the complexity factors increases, so does the overall complexity of the service. However, when FLEs' perceptions on the overall service complexity change, this does not necessarily mean that their

perceptions of any other factor will change; in fact, it is just as likely that there will be a change for only one or two of the factors, since the three are not necessarily interrelated. Consequently, the direction of causality moves from the three factors to the overall variable (Diamantopoulos *et al*. 2008).

2.3.3 Interchangeability of the Indicators

In a reflective model, the indicators have similar content and therefore, construct validity will remain the same if a single indicator is eliminated, although the reliability of the construct will suffer (Jarvis *et al*. 2003). In contrast, in a formative model, each factor is only a component of the whole, and the whole becomes incomplete if any components are omitted (Lin *et al*. 2005). In this PSC model, the three factors are theoretically distinct; hence, disregarding one of the three components will change the content validity of the overall service complexity. For instance, if customer-derived complexity is eliminated, the interpretation of the overall complexity and the predictability of the model, in general, will change: the new 'complexity' variable will overlook the 'customer participation' factor, and hence services such as nursing or child protection will be viewed as simple, contrary to how they are commonly perceived (Buckley 2003). Similarly, if task-related and/or 'service nature'-derived complexity are disregarded, then services that are actually quite complex (e.g. financial services) may also be viewed as simple, due to the standardization of the outcome.

2.4 The PSC Scale's Criterion Validity

In order to test the PSC scale's criterion validity, this study followed the recommended process (Churchill 1979; Coltman *et al*. 2008) and examined whether the construct predicts some criterion measures as it is expected to. For that reason, three research hypotheses were developed

within the formative model to test the direct impact of PSC on two variables which, in theory, are direct consequences of PSC (Chung and Schneider 2002; Kauppila 2014). These two variables are role clarity and job performance. They were selected as they constitute the most immediate consequences of high complexity for FLEs while they can remain pivotal in defining customers' experience with the service encounter (Whitaker, Dahling and Levy 2007).

The complexity of a service process has been negatively associated with the degree to which FLEs have a clear picture of their role in it (Chung and Schneider 2002). This is due to the fact that increased complexity leads to higher role conflict and ambiguity and creates confusion among staff, especially in customer-contact posts (e.g. Kauppila 2014). This in turn decreases their ability to serve individual customer needs and may hinder the success of the service provision (Hartline and Ferrell, 1996). Moreover, increased PSC may lead to increased active and latent errors made by FLEs during the service delivery, reducing their performance. On the contrary, when PSC is low, FLEs feel that they have a clear picture on what they are supposed to do and how to do it and therefore they are more likely to perform better (Whitaker *et al.* 2007). The above discussion implies that there is a negative influence of PSC on job performance, which is both direct and indirect through the decrease on FLEs' role clarity. Hence, we formulate the following research hypotheses:

H1: *PSC has a negative effect on FLEs' role clarity.*

H2: *PSC has a negative effect on FLEs' job performance.*

H3: *Role clarity has a positive effect on FLEs' job performance.*

3. RESEARCH METHOD AND DATA ANALYSIS

In order to develop and empirically test a measurement scale for PSC, the recommended scale development process is followed (Anderson and Gerbing 1988; MacKenzie *et al*. 2011). The construct's domain is determined based on an extensive literature review of the notion of complexity in the management, operations and marketing literature which, coupled with a number of interviews, was used to create an initial pool of items (Bigné *et al*. 2002). Two studies were then conducted – study 1 to validate and reliability test the initial factors, and study 2 to empirically test the validity of the formative model that captured the PSC scale – in addition to the hypotheses that were developed to test the scale's criterion validity.

3.1 Item Generation and Content Validity

The first stage is to review the existing literature and establish the PSC construct's domain (e.g. Shostack 1987; Silvestro *et al*. 1992; Laroche *et al*. 2004). The item development for the new construct was based on existing work around the notion of complexity in three relevant disciplines (i.e. management, operations and marketing). As explained in section 2, three major factors, each with four sub-factors, were identified (12 items in total). Following the review, 10 interviews with executives from several service firms (hotels, restaurants) and 13 interviews with management and marketing academics was conducted, leading to the creation of an initial pool of items to capture the underlying elements of each dimension. For each of the 12 elements, three possible items was developed and each item is assigned a Likert-type scale with anchors 1-7 (1=Totally Disagree – 7=Totally Agree).

The list of items, together with the study's overall subject and research objectives, were then given back to the same group of executives and academics who were asked to rank the items based on the degree to which they believe the items are measuring what they intend to (i.e. content validity). With the use of Q-sort tests, the item with the best content validity is selected

for each of the 12 elements and is included in the final research instrument (Jinbo *et al.* 2017). Some items' wording was slightly amended based on the experts' suggestions. At the end of this process, 12 items were included (see Table 1) and 24 were excluded from the final questionnaire. Some indicative items that were excluded from the questionnaire are reported below, as they had lower content validity and/or were not adequately categorized in any dimension by at least two-thirds of the participating experts (Malhotra 1981) are: '*The tasks we have to execute in order to deliver the service vary'*¸ '*The duration of the tasks involved in the service delivery is lengthy', 'Customers' preferences vary and hence there are several alternative ways of serving them'* and '*The service we provide to the customer is very general'*.

3.2 Study 1: Factors' Validity and Reliability Testing

3.2.1 Method

The first study is carried out in order to test the dimensionality of the 12 items (Diamantopoulos and Singuaw 2006). In doing so, four research assistants were employed in major cities in the UK (i.e. London and Leeds) (two in each city) and they initially approached a convenience sample of participants from the aforementioned cities. A restriction was additionally imposed, to draw from participants who work in both low- and high-complexity service providers. Overall, they contacted 319 participants who were eligible for participation in the study and 150 of them finally agreed to participate in the study (the response rate was around 47%). To ensure high control of the sample and accurate screening, research assistants gave each participant a hard copy of the questionnaire and remained present during questionnaire completion, which included the twelve items of the PSC scale. Moreover, participants were asked to complete the questionnaire having in mind one of the services they participate in and to indicate this type of

service. The types of service organizations where the participants were employed vary: approximately 25% of the participants worked in bars and restaurants, 20% in hotels, 15% as teaching personnel in universities, 15% in public services, 10% in banks and 15% for other service providers (e.g. consulting, personal training).

A range of sectors with varying levels of complexity were selected to ensure that different types of services would be considered. Moreover, based on a previously validated service categorization (Danaher and Mattsson 1998), t-test analysis is conducted between respondents from high and low complexity services, which is based on the participants' responses to a single item asking them to rate the extent to which they believe their job is complex. Results indicate that significant differences exist between low and high complexity service jobs ($t=-20.512$, $p<0.001$). With regard to demographics, 36% of respondents are men and 64% were women, and the average age is 34.4 years.

3.2.2 Scale Purification

The first stage of the analysis is to examine whether the PSC scale needed purification, for which the average corrected item-to-total correlations were calculated for all 3 factors and 12 items of the scale. The results showed that no item-to-total correlation is below 0.50 (see Table 1), and thus all items were suitable for inclusion and there is no need for scale purification.

Place Table 1 about here

3.2.3 Factors' Validity and Reliability

To test the unidimensionality, validity and reliability of the three factors in the PSC scale, confirmatory factor analysis (CFA) is applied using AMOS 22 software. Tables 2 and 3 present the results of the analysis, which demonstrate each factor's psychometric qualities. For all three factors, the items' loadings are more than 0.60 (Bagozzi and Yi 1988), the pertinent fit indices

are within the suggested limits (Byrne 2006) and the percentage of their explained variance (average variance extracted, AVE) is higher than 50% and higher than the maximum squared correlation between the three factors (Fornell and Larcker 1981). The three factors are also examined for internal consistency, as reflected by construct reliability, which is assessed through composite reliability (CR) and Cronbach's alpha coefficients. For all three factors, both the composite reliability (Fornell and Larcker 1981) and Cronbach's alpha coefficients (Nunnally 1978) are again substantially high (>0.7 each). These results indicate that all factors have adequate reliability and discriminant validity.

Place Table 2 about here

3.3 Study 2: Testing the Formative Model for PSC

3.3.1 Method

In order to verify the properties of the PSC scale generated in study 1 and test the second-order formative model, study 2 was carried out. Following the approach of study 1, five research assistants were used to reach participants from the same service sectors. To increase speed and capitalize on the personal networks of the research assistants, a snowballing sampling technique was used. Research assistants initially contacted all participants from study 1 and asked for referrals on other participants who were eligible for participation in study 2. Overall, through referrals, 619 FLEs were contacted and asked to complete the study's questionnaire, out of whom 244 agreed to do it (response rate: 39.4%). In all cases the completion of the questionnaire took place via face-to-face interactions with members of the research team. The sample is consistent with the demographic characteristics of study 1: 25.4% of the participants worked in bars and restaurants, 20.9% in hotels, 11.8% in universities, 13.9% in public services, 10.6% in banks and 19.2% for other service providers (e.g. retail banking, personal training); the

demographic profile of the respondents is 33.2% men and 66.8% women, with an average age of 32.13 years. Again, a t-test analysis took place based on the participants' rating on their perceived job complexity; results suggest that significant differences exist between low and high complexity service jobs ($t=-24.182$, $p<0.001$).

All participants completed a questionnaire that included the twelve items of the PSC scale, two items that captured the overall PSC, four items that measured FLEs' role clarity, four items that captured their job performance and some info regarding their demographic profile. In order to capture the latter two constructs, an adaptation to the scales developed by Singh (2000) was employed. Specifically, the items used in the role clarity scale capture the degree to which FLEs have a clear picture about their role (i.e. *'How they are expected to handle the non-routine activities of the job', 'Which tasks they should give priority to', 'How they are expected to interact with the customers'* and *'How they should behave while on the job').* The items used in the job performance scale describe the degree to which FLEs are able to perform (i.e. '*Consistently follow up on promises made to the customers', 'Overall, consistently provide prompt service to all customers', 'Provide accurate information to the customers'* and *'Perform their job reliably and accurately').* Two Likert type items (1=Totally Disagree – 7=Totally Agree) were used to capture FLEs' overall PSC in the formative model and they refer to the degree to which: *"The service they offer to our customers is simple/complex"* and *"The delivery of the service offering is a complicated process"*.

3.3.2 Data Analysis

Construct validation: To confirm the hypothesised structure, the scale for the PSC construct should exhibit properties of a reflective first-order, formative second-order model comprised of three first-order factors: task-related complexity, customer-derived complexity, and 'service

nature‘-complexity. Specifically, each item is forced to load on its intended factor and not allowed to cross-load on other factors. Also, the two items measuring overall PSC were loaded to an overall PSC factor, and two paths emanating from this second-order construct were added to the model (Bollen and Davis 2009). Finally, a path model is developed including three regression paths from the three first-order latent factors to the overall PSC latent factor.

Measurement model: In order to test the validity and reliability of the dimensions, the Anderson and Gerbing (1988) method for scale development is followed: first, unidimensionality was assessed, then both convergent and discriminant validity were determined, and finally, reliability of the scale items is evaluated. The three factor solution was initially tested providing a good fit, as indicated from the following indices (χ2=224.65, Df=51; CFI=0.921; GFI=0.919; TLI=0.916; RMSEA=0.057). Next, the unidimensional model for the 12 items was tested resulting in a chi-square of 354.693, 54 degrees of freedom, indicating relatively poor fit to the data (CFI=0.899; GFI=0.904; TLI=0.892; RMSEA=0.058). Last, the second-order solution with a reflective first level and formative second level showed a good fit with the data (χ^2=514.013; Df=74; CFI=0.929; GFI=0.926; TLI=0.905; RMSEA=0.059). Based on the second-order solution which provided a better fit than the other solutions, a complete list of the 12 items, with the factor loadings for each item is provided in Table 3.

Place Table 3 about here

Preliminary support for convergent validity is found, given that all items loaded highly and significantly on their specified constructs. Moreover, the average variance extracted (AVE) for each construct exceeded 0.50. Following this, a formal evaluation is made of the discriminant validity of the organizational culture profile (OCP) dimensions, using the method outlined by Fornell and Larcker (1981), by comparing the AVE to the squared correlations between the items

included. All AVE values exceeded the squared correlations for each pair, thus displaying adequate discriminant validity (see Table 4).

Following these assessments for validity, the reliability of the scales for each OCP dimension is determined. Reliability is assessed by calculating the construct reliability based on the standardized factor loadings and error variances, as well as Cronbach's alpha: the estimates from both calculations exceeded 0.70 for all dimensions, ranging from 0.728 to 0.839. These results thus suggest that the PSC dimensions meet the requirements for construct reliability. Table 4 provides the AVEs, reliability estimates and correlations for the PSC indicators.

Place Table 4 about here

Formative model: With regard to the second order of the formative model, the standardized estimates of each first-order factor compared to the second-order factors were found positive and significant (see Table 5). This, together with the good overall fit of the two-level mixed model, confirms the hypothesized structure of the scale.

Place Table 5 about here

3.3.3 PSC's Criterion Validity

Before testing the three research hypotheses for PSC's criterion validity, the measurement model was established including the second-order mixed model, which described PSC, along with the influence of PSC on role clarity and job performance; results indicate a good fit of the model (i.e. χ^2=367.95; Df=172; CFI=0.925; TLI=0.908; RMSEA=0.068). Having established the measurement model, the structural model of PSC was assessed, where the construct validity and reliability of the scales used to measure role clarity and job performance were estimated. Table 6 displays the constructs' validity and reliability along with the intercorrelation matrix.

Place Table 6 about here

These results reveal that the model fits the data well (χ^2=860.01; Df=224; CFI=0.926; TLI=0.909; RMSEA=0.065). Moreover, every proposed path in the model is statistically significant (see Table 7): Perceived Service Complexity has a negative influence on FLEs' role clarity (-0.714), confirming H1; similarly, H2 is verified by PSC having a negative influence on FLEs' job performance (-0.543); and finally, role clarity has a positive influence on FLEs' job performance (0.426), confirming H3. Thus, the explanatory power of the model remains quite satisfactory, as 49.2% of the variance of PSC, 50.6% of role clarity and 77.6% of job performance are explained.

Place Table 7 about here

4. DISCUSSION

4.1 Conclusions and Theoretical Implications

Designing and implementing an effective service delivery system presupposes the understanding and assessment of perceived service complexity, especially as perceived from frontline staff whose role is central in delivering the service offering to customers (Barnes *et al.* 2011). Whereas prior research advances operational, internal supplier or structural assessments of service complexity (e.g. Coelho *et al.*, 2011; Braun and Hadwich, 2016), this study advances a conceptualization of PSC from a FLE perspective. A theoretically supported conceptualization of PSC is proposed, uncovering the multi-dimensional formative nature of the construct, in line with prior work which views complexity in different settings (e.g. market complexity) as a formative construct (Diamantopoulos *et al*. 2008). The nomological validity of the PSC construct is also examined, by testing its influence on role clarity and job performance. This work adds to the service management literature and especially to the organizational frontline stream in

confirming perceived service complexity as a suppressor of FLEs' performance and in uncovering its key underlying elements.

The results of the study indicate that FLEs' perceived complexity of a service consists of three conceptually distinct elements. First, task-related complexity corresponds to FLEs' perceived complexity from the structural characteristics of a service process, including the number of tasks involved, the difficulty of tasks, the variety of tasks and the duration of tasks. The task element is emphasized from prior work in the operational management and marketing area (e.g. Aksin and Masini 2008). Second, customer participation also affects FLEs' perceived complexity of the service delivery process. Even though customers are creators of value and often viewed as 'partial employees' (e.g. Smith and Colgate 2007), in practice the integration of customers into service delivery is an arduous task (Vivek, Beatty and Morgan 2012), as extra parameters need to be added to the service system. Parameters such as the intensity of customer participation, the unpredictability of customers' behavior, the need for customization, and the simultaneous presence of many customers during service interactions can amplify FLEs' perceptions on the overall complexity of the service. This finding contributes to the customer co-destruction stream (e.g. Smith 2013; Echeverri and Skålén 2011) by identifying an additional negative consequence from intense customer participation in service encounters which impairs FLEs' ability to perform their role.

The third element of PSC captures FLEs' perceptions on the obscurity of a service. Findings advance current wisdom in setting the nature of the service as a determinant of PSC. In principle, services that are more general and mentally intangible or offer limited visibility of the overall service process are considered more complex. Both customer participation and the nature of a

service emerge as important and uncontrollable sources of perceived complexity, confirming our initial intention to depart from process-based assessments of complexity.

From a theoretical standpoint, this study contributes to the service management stream in two ways. First, it extends the job demands-resources framework in setting perceived service complexity as a job demand of FLEs' performance. PSC emerges as a negative determinant of FLEs' ability to perform during their interactions with customers. This is due to the higher levels of mental effort required on their behalf as well as on the additional fatigue that FLEs suffer from when high PSC is evident. This conclusion builds on recent evidence that service complexity affects other stakeholders' (i.e. customers) cognitive effort required during a service encounter (Mikolon *et al.* 2015). Second, the job demands-resources literature is also expanded in confirming PSC as an additional job characteristic which impairs work motivation. PSC restricts service organizations' ability to design jobs with the aim of providing greater task variety and afford considerable freedom and discretion to the FLE.

The confirmation of the construct's criterion validity provide some additional insights for service scholars and organizational frontline research. Service complexity negatively influences FLEs' role clarity and job performance, extending recent work in the area around the role of complexity for internal service quality (Braun and Hadwich 2016; 2017). Traditional service frameworks that view employee performance as a function of job characteristics need to account for the impact of complexity that derives from the type and nature of different service offerings. Also, some insights around customers' disruptive impact on their exchanges with customers emerge (e.g. Chan *et al.* 2010). Customers' participation in the service delivery process might not always be beneficial, as it increases the complexity of the process and make it harder for

FLEs to perform their role requirements. Hence, perceived service complexity is set as an important parameter of FLEs' performance during the service encounter.

4.2 Managerial Implications

Based on the prior discussion, some important managerial insights emerge for practitioners and store managers. First, an inclusive and robust measurement tool of frontline staff's PSC can be utilized to assess complexity, allowing the better management of service delivery procedures and facilitating FLEs to meet their role expectations. PSC can also prove useful for store managers to assess frontline staff's PSC and gain a more comprehensive understanding of their perceived service complexity and its sources. This construct could prove particularly useful for service organizations that deliver services of varied complexity levels (e.g. hotels, hospitals, universities) where FLEs deal with different levels of complexity given the various services they offer to customers. In such cases, managers should use our conceptualization of PSC to identify the source of perceived complexity and securely choose appropriate management practices to apply (e.g. job re-engineering, increased empowerment).

Another significant contribution of this study to service managers derives from mapping the key sources of perceived complexity for FLEs. The detailed analysis of the factors that determine PSC allows store managers to understand whether it is mostly structurally-driven, job-design related or customer-imposed. In the first case, it is recommended that service providers invest in simplifying the service delivery procedures while maintain operational efficiency. One way to do so would be to reduce the number or the difficulty of intermediate steps in the delivery process; alternatively, one could re-organize the interactions among internal resources and structures, so that the duration of the service delivery be minimized.

In the case where service delivery includes varied types of services or the nature of the service delivered enhances FLEs' perceptions of complexity, action at the job design level should take place. Yield management can reduce the number of people being served simultaneously, or at least ensure that customers who are simultaneously present will have similar needs and preferences. On the same basis, the use of customer relationship management systems, plus customer education programmes, can ensure that customers will play their role as 'partial employees' adequately, ensuring that PSC, due to the intensity of their participation, will remain low. In both cases, a formal service design and the use of effective service blueprints and maps could contribute significantly to this end.

Against the mainstream practice to increasingly engage customers in service activities, firms should also examine whether customer participation in service delivery generates difficulties in FLEs' dealing with customer demands. Incorporating FLEs' viewpoints when designing services processes could be a first step toward this direction. FLEs' inadequate understanding of the service is a major source of PSC. Hence, service companies are advised to invest in accommodating FLEs' suggestions in dealing with customers and highlight the tangible parts of the service and map the intangible ones (e.g. create service maps and blueprints). At the same time, some actions need to take place for the customers' side. For instance, task standardization (or customized standardization), together with generating adequate customer knowledge, should be adopted to reduce both the unpredictability of customers' behavior and the customization requirements.

Following this discussion, service managers should always take into account FLEs' perceived complexity when designing service delivery systems. More importantly, increasing service customization and empowerment strategies should not be applied arbitrarily. Also, offering a

greater service variety needs to be more carefully assessed when developing service delivery protocols, as both might impair FLEs' ability to perform their role successfully.

5. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Findings of the present study should be viewed in the light of certain limitations. A first important limitation pertains to the inclusion of only FLEs' views in the PSC conceptualization; as customers' roles in service delivery is also critical, their point of view could also be incorporated into the PSC scale, and future researchers could collect data from both FLEs and customers in order to understand their interplay. Second, the use of a convenience sample for these studies should render the interpretation of the findings across service settings with caution. Although several service industries and various types of FLEs were included in the samples for both studies, there is a need to gather further evidence to enable generalisability; for that reason, the PSC scale should be tested with caution in different cultural environments. This finding provides an alternative approach to future studies that might examine complexity in different circumstances and settings (e.g. manufacturing process, consumption).

Another methodological limitation pertains to the fact that the twelve sub-dimensions were captured and measured using single items. Future research should explore the possibility of these sub-dimensions being better measured by multi-item scales. This could potential further expand the conceptualisation of PSC and improve PSC scale's accuracy. Finally, another suggestion for future research pertains to the study's scope, which could be broader. The present study is mostly focused on the conceptualization and empirical validation of the PSC notion and not on an examination of the way the PSC construct interrelates with other important organizational or customer variables. Future research could develop and empirically test a conceptual framework

that incorporates PSC together with specific antecedents and consequences, both at an organizational and a customer level. The antecedents of the specific dimensions of PSC could also be examined, along with their influence on the overall PSC construct.

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Figure 1: Conceptual Framework

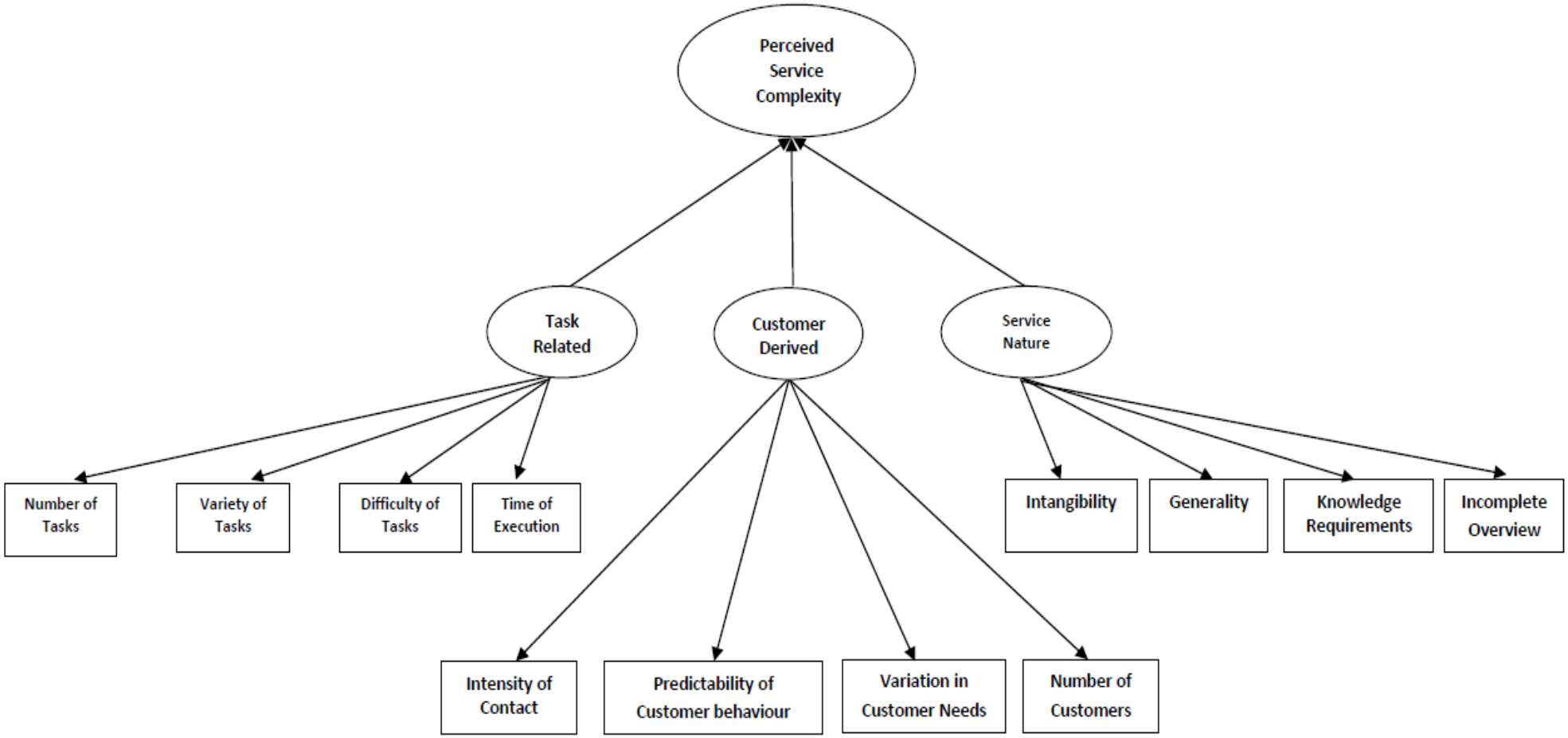

Table 1: *Items' descriptive statistics and standardised factor loadings (Study 1)*

Dimension	Item	Mean	Standard Deviation (SD)	CFA Loading	Item-to-Total Correlation
Task-Related Complexity	The delivery of the service involves the completion of many tasks.	4.35	1.825	0.782	0.720
	The tasks we have to execute in order to deliver the service are very different to each other.	4.26	1.716	0.798	0.736
	The tasks we have to execute in order to deliver the service are very difficult.	4.21	1.649	0.791	0.731
	It takes a lot of time to execute the tasks involved in the delivery of the service.	4.27	1.835	0.849	0.776
Customer-Derived Complexity	Customers participate intensively in the delivery of the service.	4.43	1.530	0.845	0.733
	It is difficult to predict customers' behaviour during the service delivery.	4.47	1.574	0.808	0.724
	There are many alternative ways to serve the customers, depending on their preferences.	4.67	1.561	0.608	0.552
	During our interaction with each customer, many other customers are present.	4.03	1.532	0.785	0.703
'Service Nature'-Derived Complexity	The service we provide to the customers is quite intangible.	4.51	1.370	0.602	0.527
	It requires a lot of knowledge to completely understand the service we provide to the customers.	4.58	1.448	0.746	0.651
	It is difficult for me to explain the service we provide to the customers to someone else, because it is very abstract.	4.37	1.444	0.748	0.647
	Many parts of the service delivery process are not visible to me.	4.43	1.462	0.729	0.616

Table 2: *Confirmatory Factor Analysis for PSC scale (Study 1)*

Factor	CFI	TLI	RMSEA	AVE	CR	Cronbach's alpha	Correlations	
							Task-Related	Customer-Derived
Task-Related	0.999	0.996	0.038	0.649	0.881	0.880		
Customer-Derived	0.999	0.997	0.030	0.588	0.849	0.842	0.358**	
'Service Nature'-Derived	0.985	0.955	0.084	0.502	0.800	0.798	0.471**	0.488**

CFI: comparative fit index; TLI: Tucker–Lewis index; RMSEA: root mean square error of approximation /
**. Correlation is significant at the 0.01 level (2-tailed). * / Correlation is significant at the 0.05 level (2-tailed).

Table 3: *Items' standardised factor loadings (Study 2)*

Dimension	Item	Standardised Loading	Standard Error (SE)
Task-Related Complexity	The delivery of the service involves the completion of many tasks.	0.667	0.129
	The tasks we have to execute in order to deliver the service are very different to each other.	0.510	0.136
	The tasks we have to execute in order to deliver the service are very difficult.	0.671	0.146
	It takes as a lot of time to execute the tasks involved in the delivery of the service.	0.755	-
Customer-Derived Complexity	Customers participate intensively in the delivery of the service.	0.616	0.139
	It is difficult to predict customers' behaviour during the service delivery.	0.804	0.151
	There are many alternative ways to serve the customers, depending on their preferences.	0.827	0.136
	During our interaction with each customer, many other customers are present.	0.791	-
'Service Nature'-Derived Complexity	The service we provide to the customers is quite intangible.	0.680	0.147
	It requires a lot of knowledge to completely understand the service we provide to the customers.	0.446	0.121
	It is difficult for me to explain the service we provide to the customers to someone else, because it is very abstract.	0.868	0.134
	Many parts of the service delivery process are not visible to me.	0.846	-

Table 4: *Results of measurement model assessment and scale statistics (Study 2)*

Factor	CR	AVE	Cronbach's alpha	Correlations	
				Task-Related	Customer-Derived
Task-Related	0.810	0.531	0.728	0.415**	
Customer-Derived	0.846	0.583	0.839	(0.17)	0.642**
'Service Nature'-Derived	0.817	0.527	0.742	0.557** (0.31)	(0.41)

**. Correlation is significant at the 0.01 level (2-tailed) / * Correlation is significant at the 0.05 level (2-tailed).

Table 5: *Regression weights for the second-order formative model (Study 2)*

Standardised Regression Weights	Estimate	SE
Task-Related Complexity → PSC	0.550	0.067**
Customer-Derived Complexity → PSC	0.423	0.056**
'Service Nature'-Derived Complexity → PSC	0.198	0.045**

**. Correlation is significant at the 0.01 level (2-tailed) / *Correlation is significant at the 0.05 level (2-tailed).

Table 6: *Criterion validity test (Study 2)*

Measurement Model and Correlations

	CR	AVE	Cronbach's alpha	Correlations	
				Role Clarity	Job Performance
PSC	-	-	0.871	-0.640**	-0.537**
Role Clarity	0.904	0.654	0.904		0.694**
Job Performance	0.825	0.542	0.823		

**. Correlation is significant at the 0.01 level (2-tailed)/ * Correlation is significant at the 0.05 level (2-tailed).

Table 7: *Standardised regression weights for criterion validity test (Study 2)*

Path	Estimate	SE
PSC → Role Clarity	-0.714	0.197**
Role Clarity → Job Performance	0.426	0.120**
PSC→Job Performance	-0.543	0.244**

**. Correlation is significant at the 0.01 level (2-tailed)/ *Correlation is significant at the 0.05 level (2-tailed)