

# A Framework to Assess the Maturity of Customer Involvement in the Service Design of Product-Service Systems

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**Abstract**—This paper develops and investigates a framework for the assessment of customer involvement in the service design process of result oriented product-service systems in order to improve the service offering in a business-to-business (B2B) context. The framework comprises five main criteria and fifteen sub-criteria that contribute to customer involvement in a hierarchy using a maturity grid to highlight the strengths and weaknesses for each criterion. To develop the customer involvement framework, an extensive literature review related to service design, result oriented product-service system (PSS) and customer involvement in service design was carried out. Key factors that significantly influence customer involvement from industry and literature were identified to develop the framework. A major contribution of the developed framework includes a hierarchy of appropriate criteria for assessing customer involvement in the service design process within results oriented PSS; the definition of four maturity levels which are suitable to describe the whole spectrum of customer involvement in the service design process; and finally, The paper concludes by enabling service providers to: take proactive decisions; screen and evaluate new services; improve perceived service quality; and provide barriers against imitation.

**Keywords**—Customer involvement, maturity grid, new service development, result oriented product-service system, service design.

## I. INTRODUCTION

THE last couple of years have witnessed the inevitable importance that the service economy holds. This increased importance of the service economy has also been validated by the World Bank report [1] that shows that about 70% of the boost in gross domestic product (GDP) is attributed to the operations of the service industry.

In a concurrent manner, the rate at which the importance of service industry has increased, the levels of interest in the service research has also incurred a boost [2]. It is documented by the researches that for the sake of developing a highly regarded and undeterred competitive advantage edge, firms have significantly turned their attention towards the development of beneficial frameworks that attempt to add beneficial service related values to the service products [3]. Subsequently, there is an enhanced demand in the service product industry to have add-ons of service provision along with the service products. However, for the firms and businesses to move from service product supplier to the

product service provision, the customer feedback and view cannot be undermined [4].

The term relating to this construct of the provision of service by the product industry is, 'servitization' of the product. This servitization of the product is also referred to as the services that are offering more than the actual product and come with an integrated set of solutions [5]. The most important and essential element of this transition in the service product industry is the long-term relationship of manufacturers and the customers [6].

The focus of the study is thus centered on the level of involvement of the customers in the service designing of the product-service systems (PSS) that are result oriented. Customer involvement is necessary to be assessed because the needs of the customers are required to be articulated and suited according to their preferred design.

The motivation for this research pertinently lies in the importance of the provision of the services in place of products that has become prevalent in the production industry. When the focus of marketers has shifted to the provision of services rather than on the products, the service research and customer involvement have become imminent. The scope of this study is relevant to the understanding of the involvement of customers in the production of the service design within the PSS. The research is found to be limited to the services in the industrial sector serving the Business-to-Business trade (B2B).

## II. LITERATURE REVIEW

### A. Definitions

Service design is defined by the originator of the concept [7], as the design of a product that has a visualized concept that is crucial to the designing of the product. The clear and most applied definition of the design is provided by Danish Design Centre [8] as the process of product and service development that is related to the systemic procedure about the provision of service to the users of the products [9].

Service designing is a core element in the designing of the products that are considered as pertinent to the provision of such products that are accompanied with service tools and options (Fig. 1). Service designing is the planning for the facilitation of the processes that are to provide services of performances along with the product [13]. Service design is the initial stage of carrying out the planning to provide the manufacturers with a margin of creating a service product that

is successful in the market and the intended groups consumers; either B2B or Business to Consumer B2C [14].

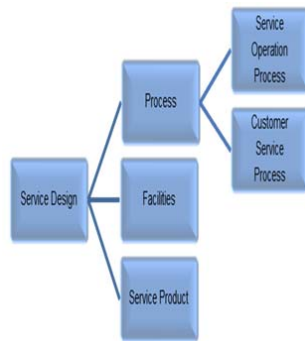


Fig. 1 Service design elements [16]



Fig. 2 The Components of Individual Human Actors [20]

The concept of result oriented PSS is highlighted as an agreement between the customer and the service provider that an outcome will be achieved with no predetermined product involved in the beginning [10].

The term customer involvement is defined by many theorists and academic authors. The aspects they have pointed out in their definitions include the involvement of the users [11], their participation [12], and also the practice of co-development for a product [13]. Customer involvement is a construct that has been defined from various aspects such as a behavioral construct that significantly relates to development of customized [14] and specified product deliver and a developmental construct which is helpful in advancement of the technology according to needs [15].

#### B. Service Design in the Result Oriented PSS

Much effort has been spent on the investigation regarding the fundamental activities of designing services and the designing of the PSS [16]. The result oriented PSS concerns with the manufacturer being held accountable for designing and planning of the tools and thus, taking care of various important product features and customizing it according to the services that are needed. In the important process of the designing services in the PSS, the dimensions of technology and socio-cultural aspects are intertwined [17]. Service designing incorporating the elements from social and cultural aspects is the core elements that differentiate between the

common types of PSS and the result oriented one (Fig. 2). Service design of the result orientated PSS is ascertained to be dependent upon the approaches such as the service management, its marketing, and system designing with relevant information [18].

#### C. Factors Influencing Customer Involvement in Service Design

Research has importantly identified the role and importance of the customer involvement in the process of service development. The inclination of these professional studies has significantly been towards the fact that the customer involvement is an inevitable aspect of the service development process and its success [19], [20].

Among the factors that are known to be influencing the involvement of the customers in the service design process, is the factor of barriers that refrain their involvement in the service design process [21]. Other important factors regarding the customer involvement is documented to be the motivational factor. The motivation levels of the customers in the service designing process are also important for the service design marketers to gauge, so that the designing process is then carried in accordance [22], [23]. It has also been pointed out that the involvement of the customers has indirect positive impacts on the outcome of the service design and its success [24]. Moreover, customer involvement in the service design is also studied and empirically examined in relation with the cross-functional integration between the departments [25]. Another of the significant facet of customer involvement in the designing of service products is related to the beneficial input from the customers' perspectives. It is ascertained that this factor of the customer involvement can be the most advantageous one for designing the PSS. The customers' opinions on the service designing can provide the manufacturers and service providers with new and innovative ideas to improve on the service and product. Contributing for the other side of the picture, [26] asserts that the involvement of the customers is not always beneficial for the service designers and manufacturers; there are certain issues and risks that are involved.

The impacts of the customer involvement in the service designing of the PSS are also fraught with numerous risks as well as benefits. These risks and benefits are important for the assessment conducted by the manufacturers and service providers [27].

With extensive need of research in the product service industry the attention of the professional literature has been drawn to the examination of the understanding of industrial importance of the customer involvement in the SDP.

### III. METHODOLOGY

This section of the study provides the description of research methods and strategies that are in alignment with what the research revolves around. The problem under consideration is the assessment of the levels of involvement of the customer in the service designing processes. Thus, this research spans over the investigation of the related

phenomenon and get insights about the involvement maturity of the customers. The methodological aim for this study is related to the development of a maturity grid which is representative of the levels of customer involvement in the service designing processes.

In consideration with the central tenet of this study, the research approach that is selected for this study is the exploratory one. Explanatory researches are projected to be explaining any situation or problem, along with the explanation of the patterns of relationship existing between the various phenomena [28]. The research methodology of the study is qualitative in nature and anticipates conduction of in-depth analyses of the qualitative data that will be collected through the process of in-depth interview conduction.

The justification of the qualitative research is heavily dependent upon the quality of the data being assessed and that the information collected for the study is in the form of detailed interview, survey questions, or observation that are projected to provide comprehensive amount of information as research data [29].

Data collection procedure for this research study is primarily carried out through important documents available in the professional literature, extensive review of relevant literature, and in-depth interviews. Both these methods of qualitative analyses are significantly utilized to gather relevant information to construct the assessment framework. Interview methods that are employed in the study are utilized due to that they are directly targeting the source of information and is conducted in a comprehensive manner [30]. The interview techniques are significantly known to be providing important inferences between the associated factors and phenomenon that is studied. The inferences drawn from the qualitative interviews are recognized as drawing causal inferences for the sake of highlighting the results [31].

The data collection procedures for this study concerned with the combination of two important sources of data collection, the primary source and the secondary source. The primary source of data collection entailed the conduction of semi-structured interviews, while the secondary data was collected through extensive literature review. For the in-depth interviews, a company was selected after thorough attention and detailed analysis. The company that is chosen is the utility company providing climate control to all the communities in the Middle East. The selected company is one of the major companies known for its functions of district cooling and infrastructure development. The company was selected because the PSS approach was adopted by the company to increase its functions of district cooling with efficiency and sustainability. The number of interviews conducted in the company was 12; and were conducted from the business development, the plant project, the operations, and maintenance manager.

Along with the important task of highlighting the research methods and approaches to be utilized in the study, it is also important to outline the method devised to analyze the data. The qualitative data collected for this study is analyzed through the thematic analyses of the interview questions. It is

considered to be an imperative approach to data analysis as in the thematic analysis; themes and patterns are examined for analysis of the responses that are obtained from the responses of the qualitative interview questions.

#### IV. CURRENT INDUSTRIAL PRACTICE

For satisfying the aim and central tenet of the study, as outlined in the previous section, thematic analysis is carried out for the interpretation of qualitative data gathered from by the conduction of 12 in-depth interviews from different managers of the Company X. This method of the data analysis is employed for the sake of imperative identification, analysis, and the observation of the themes from the research data that was accumulated.

The main purpose of the thematic analysis of the qualitative data collected for this study is to form a framework that outlines the important factors embedded in the construct of customer involvement in the designing of the service products.

Themes are important aspect of analyzing data when the data is in qualitative form. The researcher in this study firstly familiarized with the data, as this step is an important one in the whole process of data analysis and its interpretation. Followed by familiarization step, initial codes for the qualitative data were developed. This step significantly helped in searching concurrent and common themes in the data [33].

Developed themes were then reviewed critically and named for the production of the end report (Fig. 3).

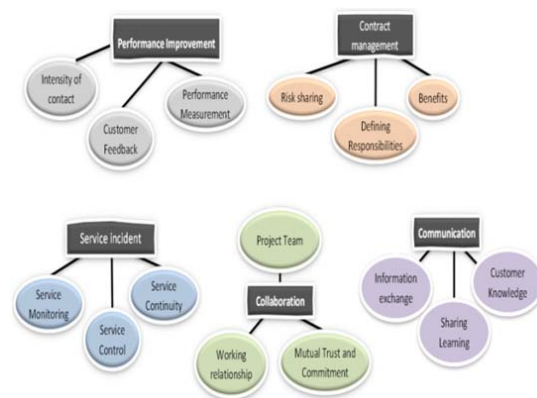


Fig. 3 Developed Thematic Map Showing Five Main Theme

#### V. DEVELOPING THE FRAMEWORK

The framework is extracted from literature review reflecting the view of 32 studies (Table I) ranked in descending order in terms of the total number cited.

In addition to the relevant data on the industrial practice of customer involvement, these two sources were analyzed to form the strong basis of the framework.

By combining the literature review and the qualitative data collected through the interviews, the framework is based upon three important aspects that were poised in the form of questions. These aspects importantly include the several touch points that exist between the service provider and the customer in the SDP, the assessment of the major risks and benefits of

the involvement of customers in the service designing processes, and lastly, the assessment of themes of the qualitative data collected for the study. Five themes were obtained from the qualitative data along with the sub-themes (Fig. 3).

TABLE I  
SUMMARY OF KEY INFLUENCING FACTORS ON CUSTOMER INVOLVEMENT IN  
SDP FROM THE LITERATURE REVIEW

Ranking	Factor	No. of Sources
1	Information Exchange	18
2	Stages of service design process	18
3	Problems and Solutions	18
4	Modes of customer Feedback	17
4	Knowledge Accumulated	15
6	Benefits of customer involvement	14
6	Collaboration	14
8	Creating Value	13
9	Intensity of customer involvement	12
9	Performance improvement	9
9	Customers behaviour	9
9	Top Management	8
13	Working Relationship	8
13	Sharing Learning	8
15	Customer Commitment	7
15	Risk of Involvement	6
15	Motivation	6
18	Objectives	5
18	Mutual Trust	5
18	Service specification	4
18	Service control	4

environment, the people on the project, and numerous other factors.

The third and the most important factors utilized for the development of the framework is the analysis of the themes and subthemes that were observed in the LR and the qualitative data that was analyzed during the course of this study. It is ascertained that although there are a number of maturity models utilized for the sake of being applied in the practical field with all the details that are deemed necessary for them [32]. It is reflected that the development of the framework is dependent upon two major types of models that are known as maturity models. These models are as the Capability Maturity Model (CMM) and Crosby's model of the assessing the maturity known as the Crosby's Quality Management Maturity Grid (QMMG). The research findings and implications are indicative of the fact that that the maturity grid is considered to be the most effective in the assessment of the involvement of the customer in the SDP. The maturity grid is thus used to be an important and pertinent tool for the assessment of the customer involvement. This tool is recognized to be the most efficient and productive in identifying the strengths as well as the weaknesses of the involvement.

#### A. Formation of the Customer Involvement Maturity Grid

The proposed customer involvement in SDP maturity grid extends and updates earlier maturity models by Nagele [33] based on Fraser et al.'s [34] six typical attributes for a maturity grid.

#### B. The Scope of CIMG

This involvement grid of the customer is importantly related to the conduction of other phases. This grid is ascertained to be applied in the areas such as the service provider companies working independently as a tool applied in a self-assessed way. The major decisions are reflected in Table II.

TABLE II  
DECISIONS WHEN DESIGNING CIMG

Methods of application	Driver of application	Focus of model	Respondents	Application
Self-assessment	Internal requirement	Customer involvement in SDP	Management and project team	Independent service providers

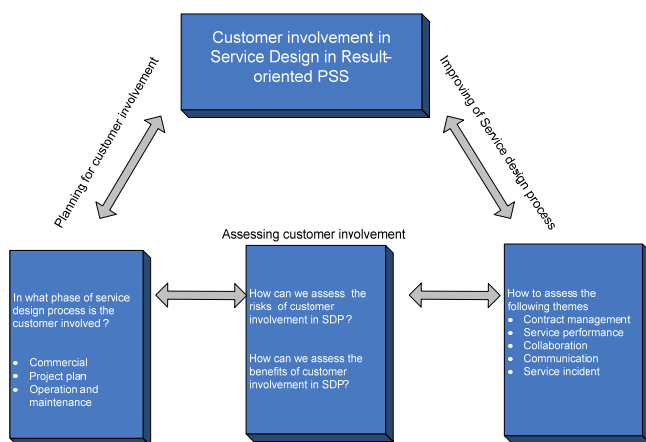


Fig. 4 Framework to Assess Customer Involvement in SDP

The initial and foremost part of the framework for assessment entails the determination of the major touch points existing between the needs or desires of the customers and what industry are providing. It is important for understanding the customer involvement that the service provided is aligned with the customers' core processes. For the sake of determination of these, the manufacturers and the service provider pay attention to the factors such as shared resources, the possessed set of industrial skills, the surrounding

#### C. Customer Involvement Maturity Grid Dimensions

In defining the number of dimensions of CIMG, the researcher sought to find the balance between complexity and simplicity. A maturity grid that is over-simplified may not adequately reflect the complexities of customer involvement and may not provide sufficient meaningful information; while a grid that appears too complicated may limit interest or create confusion. Furthermore, a complicated grid may cause incorrect application.

Most maturity grids can be communicated in a two-dimensional way, where the "y-axis" describes the processes or objects to be measured for maturity and the "x-axis" outlines the degree of maturity. The CIMG consists of three orthogonal dimensions as presented in (Fig. 5). The first

dimension of the CIMG is the five main criteria (contract management-performance improvement - collaboration - communication - service incident) mainly derived from a comprehensive review of the literature and current practice of customer involvement. The other dimensions are the predefined maturity levels ranging from level 1 (low) to level 4 (high). Finally, the third dimension is the three different types of result oriented PSS derived from an extensive literature review of the result oriented PSS and its types.

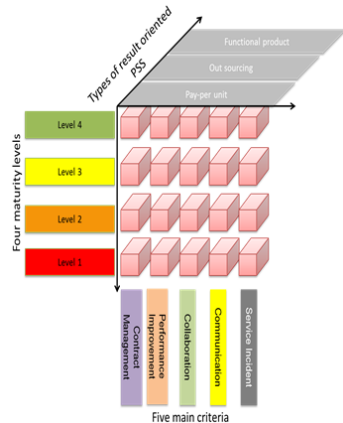


Fig. 5 The Dimensions of CIMG

#### D. Customer Involvement Maturity Grid Levels

The CIMG is the most common and relevant grid that is used for presenting the stages of maturity of the customer involvement while building from the lower stages. There are four levels of maturity degrees defining the varying levels of the involvement of customers in the SDP (Fig. 6).

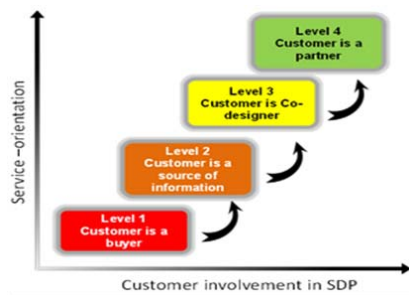


Fig. 6 Maturity Stages of CIMG Model

#### Level 1: Customer Is a Buyer of the Service

In this level of the CIMG framework, the customer is considered to be a buyer and is treated as a partner in design process. In this process, the customer can make suggestions.

#### Level 2: Customer Is a Source of Information

In this level of the CIMG, the customer has more than the role of a passive player giving suggestions. In this phase, there is an active role of customers as they can be seen a pertinent source of information in the SDP.

#### Level 3: Customer Is Co-Designer

There are numerous service providers who are known to be developing their service with reference to the level 3 of the customer involvement maturity grid, in order to lessen the prospects of risks. At this stage the risks are avoided so that the customer requirements are not misunderstood and are clear for the manufacturers to know what they have to do. In this stage, the customer has a lot to do in the integrated service design of the product.

#### Level 4: Customer Is a Partner

The fourth level indicated in the CIMG is inclusive of extensive planning and the development for a long term. In this stage the customer and the service providers become a team.

#### E. Hierarchy Structure of Assessment Criteria

A further consideration when designing CIMG is how the criteria of customer involvement can be represented. Representation as a series of one-dimensional linear stages is widely accepted and has formed the basis for assessment in many existing tools; however, this form of assessment:

- Does not adequately represent maturity within complex domains such as customer involvement in SD within result oriented PSS
- Provides a simple means of comparing maturity stages
- Provides little guidance to a service provider wishing to improve the 'as-is' position.

Through the review of the factors influencing customer involvement from the literature and the thematic analysis abstraction process in current practice, the researcher defined and refined the themes to five main criteria and 15 sub-criteria. However, the assessment of each main criterion is based on the results of the three sub-criteria. Although there are dependencies between these five criteria, they are treated separately. The hierarchy tiers can be represented by the main domain (customer involvement in service design), domain components (main influencing criteria) tier 1 and sub-components (sub-criteria) and tier 2, as shown in Fig. 7.

## VI. DISCUSSION

It is advocated in the study findings that the maturity grid is an eminently useful and productive form of assessment tool that could be utilized by the service providers. It is ascertained that the maturity grid is imperative for assessment for the reasons that it is relatively easy to understand and comprehend. The main reason of its effectiveness is the self assessing nature of it, and not requiring the any external assistance for its conduction. This developed framework is also important because it easily defines the customer involvement and its relationship with the development of the maturity grid. The research imperatively looked into the process of designing a grid that assessed the balance between the process of complexity and simplicity. The Customer Involvement Maturity Grid (CIMG) was developed by integrating the industry analysis with the research data .The



CIMG is comprised of the five major criteria which are further divided into 15 sub criteria that reflect four levels of maturity.

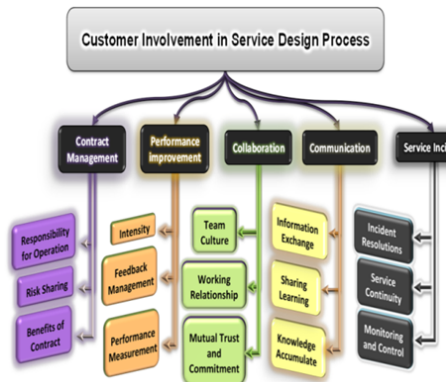


Fig. 7 Hierarchy Structure of Assessment Criteria

By the process of conducting this research through the industry and literature analysis, the objectives that were set out for the study were achieved with significance. Key factors regarding the influence of customer involvement in the process of service design were deduced from the literature review and the drafting of the framework.

## VII. CONCLUSION

This research fundamentally worked towards the development of a framework that assessed the involvement of the customers in the service designing process within result oriented PSS and also attempted to develop the maturity grid that enhanced the understanding of the levels of maturity of the customers that are involved in the SDP. The framework had been developed with the help of analysis of literature and the qualitative methods of research employed in the study. The study provided important implications for the identification of the involvement of customers with the help of relevant literature and the industry analysis. Moreover, the study pertinently developed a framework for the assessment of how service providers and manufacturers can significantly gauge the level of maturity of their customer involvement and make significant changes.

The contribution that this paper has made in adding to the existing knowledge regarding the involvement of customers in the SDP is incontestable, as this study has helped in establishment of the framework for self assessment. This aspect of self assessment is considered to be the most beneficial implication drawn from the study. The due process identifying and analyzing the pertinent factors of customer involvement was obtained through this study in the field of designing of the result oriented PSS. However, this research was not exclusive of the limitations that were identified. The research methodology adopted in studying the SDP framework might have been limited due to the researcher biasness in the interpretation of the qualitative data; which in turn impacted the reliability and generalizability factors of the study. Also, this research study is limited to the type of service industry

that was studied and analyzed, as the implications for customer involvement can greatly be influenced by the type of service that is offered.

In conclusion, it is ascertained that for the B2B communication and interaction, customer involvement holds a significant position for influencing the industry and the success of the services it provides. The significance of the customer involvement becomes more important in the planning and designing of the result oriented PSS. Also, it was revealed that the deficiency of support received by the issue of customer involvement has significantly had an impact on the productivity of the service and in turn increased costs invested by the firms. Fundamentally, the study significantly pointed out the importance of the relentless struggle that firms have to go through, when transitioning from the product oriented to service oriented.

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