

Aligning customer requirements and organizational constraints to service processes and strategies

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Purpose: Recognizing the fundamental role of quality as a means to differentiate service organizations, this paper proposes a strategic decision making framework for service organizations, which prioritizes performance improvement strategies that are rooted to customer requirements, organizational goals and constrained by organizational resources.

Design/methodology/approach: The proposed framework is realized through the implementation of two stages and four distinct phases mirroring the combination of enhanced Quality Function Deployment –QFD (first stage), and Zero-One Goal Programming – ZOGP (second stage). It proposes the utilization of a mix of qualitative and quantitative methods, and the collection of data from multiple sources including customers, middle, and top management.

Findings: The application and validation of the proposed framework utilizes information from both customers and employees in the bank services sector. Overall, results from the specific study revealed that a combination of “re-engineering” and “expansion” strategies was more appropriate corresponding to customer priorities, organizational goals, and effective utilization of available resources.

Originality/value: The paper presents a novel two stage strategic framework for service organizations. It utilizes a balanced mixture of qualitative and quantitative methods in an effort to capture and delineate elusive customer requirements and design characteristics of services, allowing the assessment of different combinations of quality improvement strategies in response to management objectives.

Keywords: Quality Function Deployment; Service Strategies; Zero-One Goal Programming; Service Quality; AHP; Banking

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1. Introduction

Service quality excellence is central to global competitiveness. Intensive competition and the continuously increasing consumers' demands have rendered quality orientation vital for business survival (Hwarng and Teo, 2001; Herrmann et al., 2006). It therefore becomes imperative for organizations to continuously predict customers' needs and expectations, adjust services and strategies accordingly. They have to remain alert to constant environmental changes, develop new products/services, and be pioneer with innovative ideas (Kay, 1993; Martensen and Dahlgaard, 1999; Miguel, 2005).

Quality Function Deployment (QFD) is a tool that can be successfully utilized towards this direction, since it provides a structured way for service providers to translate customer requirements into perceptible service features and communicate quality throughout the organization assuring customer satisfaction whilst maintaining a sustainable competitive advantage (Akao, 1990; Chan and Wu, 2002a; 2002b). QFD is a structured approach designed to support the efforts to define customers' needs and translate them in technical characteristics, incorporated into the final product or service, with the overall goal to achieve a higher level of customer satisfaction (Fung et al., 1998, Akao, 1990, Mazur, 1997). The focus in the QFD process is usually the determination of target values for the attributes of a product/service, with a view to achieving a higher level of overall customer satisfaction (Griffin, 1992, Bode and Fung, 1998, Matzler and Hinterhuber, 1998). When an organization applies the QFD process, it is able to link customer requirements, service specifications, target values and competitive performance with a visual planning matrix. The complex relationship between customer requirements and attributes, and the correlation among different attributes, can be illustrated in a typical "House of Quality- HOQ" (Akao, 1990; Hauser and Clausing, 1998). QFD involves the construction of one or more matrices (Houses of Quality), which guide the detailed decisions that must be made throughout the service development process (Cohen, 1995). When appropriately implemented, QFD is likely to be one of the contributing factors to successful product or services (Griffin and Hauser, 1992).

However, the implementation of any strategy to improve quality and performance has to address the problem of resource constraints (e.g. Karsak et al., 2002) since it is limited by the availability of organizational resources, such as financial, human, technological, etc. Thus, it becomes increasingly important for service providers to investigate methods and techniques to improve quality, satisfy customer requirements and improve competitive position, while at the same time addressing multiple and often conflicting organizational goals implied by rigid or soft resource constraints imposed by operational rules. In this respect, Goal programming (GP) is a multiple objective methodology utilized to provide the opportunity to integrate multiple criteria, objectives and constraints in a complex decision making process (Charnes and Cooper, 1961; Ignizio, 1982). Zero One Goal Programming (ZOGP) methodology has been used in combination with AHP (Schniederjans and Wilson, 1991; Schniederjans and Garvin, 1997; Kwak and Lee, 1998; Badri, 1999; Lee and Kwak, 1999 Zhou et al., 2000) and ANP (Lee and Kim, 2000; Wey and Wu, 2007; Tsia and Chou, 2009; Chang et al., 2009). In combining QFD with ZOGP, often, AHP and ANP are used to determine the relationships between the elements comprising the HOQ and thereafter the results feed ZOGP models to reach a final decision taking into account resource constraints and operational rules (e.g. Lee et al., 2010).

The aim of this work is to offer a framework for service organizations to achieve the alignment of key customer wants (requirements) to service improvement strategies, taking into consideration organizational goals and limited resources. The proposed framework is realized by the combination of an enhanced QFD model and Zero-One Goal Programming (ZOGP). QFD offers the framework to prioritize strategies based on specific customer wants and ZOGP allows the selection of a satisfying solution based on the priorities extracted by QFD (the output of QFD is the input to ZOGP), the goals, and the basic resource constraints of a service organization.

The rest of the paper is organized as follows: The next section discusses previous research as the starting point of our proposed work. Section 3 presents the proposed framework, pointing out the specific methodological procedures utilized, and its contribution, while section 4 illustrates the deployment and the results of the framework's application in a specific service organization. The last section

summarizes key findings, presents limitations and offers suggestions for further research.

2. Study Background

QFD has often been used in service contexts in order to develop new or improved services that better satisfy customer requirements. However, only a limited number of previous studies have utilized a joint application of QFD with goal programming in order to manage scarce organizational resources available in product design. Specifically, Karsak et al. (2002) used a two stage approach in their study. First, they used QFD and developed one House of Quality (HOQ), using the ANP approach, in order to translate customer needs into product technical requirements, for a hypothetical writing instrument. Customer needs, their relative importance and the inner-dependencies of the technical requirements were all set based on an illustrative example presented by Shillito (1994). Next, they used Zero-One Goal Programming (ZOGP) in order to take into account the multiple objectives nature for the selection of various product technical requirements, along with cost, extendibility and manufacturability considerations regarding the selection of the appropriate requirements for the design team. Karsak & Ozogul (2009) developed an analogous two stage approach in order to select an ERP system aligned with the needs of the company. First, they developed one HOQ to match ERP system characteristics to company demands, utilizing AHP and Fuzzy Linear Regression. Next, they employed Zero-One Goal Programming (ZOGP) in order to determine the most suitable ERP system alternative. As an intermediate step, Linear Programming was used to determine the target (maximum achievable) values for the ZOGP. Similarly, Lee et al. (2010) developed a product design evaluation framework, using the same two stage approach followed by Karsak et al. (2002). First, they incorporated ANP and Fuzzy theory to QFD in order to calculate the priorities of engineering characteristics for backlight units (flat screens). Next, they employed ZOGP in order to maximize the satisfaction of the new product design, based on the QFD results, cost, manufacturability, time, and technological advances. Finally, Thakkar et al. (2011) proposed a methodology for supply chain planning in SMEs. First, they integrated QFD with interpretive structural modeling and ANP in order to relate business requirements (BRs) and supply chain requirements. Next, ZOGP was used to select

the appropriate BRs incorporating goals such as cost, flexibility, lead times, inventory levels, etc.

Based on the previous analysis, it is clear that all previous research efforts utilized a two stage approach combining QFD with ZOGP, which emphasized the development of product design characteristics in the manufacturing sector, with only the latest work of Thakkar et al. (2011) attempting to address planning efforts in the SMEs context. However, the latter work starts from supply chain practices rather customer needs. Finally, despite any differences all above works have based their analyses on one HOQ only, and data were either from a single source within the organization under study or artificially generated.

3. The Proposed Framework

This paper proposes a strategic decision making framework that extends and adapts the previous works combining QFD with ZOGP in order to deal with the intangibility inherent in the service sector. It helps to capture elusive customer requirements, intangible design characteristics of services, and to delineate operational constraints and organizational goals. Essentially, the framework utilizes a balanced mixture of both qualitative and quantitative methods in an effort to ground analysis and results in the specific context of a service organization.

The proposed framework is deployed following the same two stage approach as the studies presented in the previous section. However, while the second stage, as in the previous works, involves the integration of ZOGP with QFD, the first stage includes three distinct phases corresponding to the development of three Houses of Quality (HOQ). Because the prioritization of customer needs is a critical part of QFD implementation, we utilize the enhanced QFD approach combining Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) in order to overcome inherent methodological shortcomings of the baseline approach mainly related to its subjectivity in reflecting customer needs (Andronikidis et al., 2009; Partovi and Corredoira, 2002; Partovi, 2006).

In the implementation of the first three phases, the interconnected rows and columns corresponding to the three QFD matrices (HOQ) relate market segments, customers' wants, key service attributes and alternative strategies for service performance improvement. The ultimate goal of these interrelated matrices is to assist the service organization in shaping the appropriate customer based strategy for

improving performance and achieving higher levels of service quality. In addition, the AHP is used to determine the intensity of the relationship between the row and column for each house of quality and the Analytic Network Process (ANP) is used to determine the intensity of synergistic effects. Phase 4 incorporates zero-one goal programming (ZOGP) to integrate scarce resources and organizational goals with the results of QFD, and the assessment of the solution by top level managers.

A schematic presentation of the framework is depicted in Figure I, while the related methodological steps for each phase are presented below.

Please insert Figure I near here

Phase 1 involves the development of the first HOQ, which relates key market segments to customer wants. In this phase, the proposed framework suggests customer needs to be identified through a combination of literature review and primary data taken from field survey in the related market. Furthermore, an AHP survey among customers is proposed for the prioritization of these needs. Thus, three key steps are required for the completion of phase 1, namely:

Step 1: Identification of key market segments: Market segments must be identified following the service organization's key markets.

Step 2: Identification of key service selection criteria (wants): Extensive literature review will help design a field survey to detect the underlying factors reflecting customers' service selection criteria.

Step 3: Development of the 1st HOQ: The development of the first HOQ involves the implementation of a second field survey among customers representing all predetermined market segments utilizing a nine-point scale AHP questionnaire.

Phase 2 involves the development of a second HOQ in order to relate the prioritized customer wants to specific service attributes (characteristics) to satisfy them. The identification of these attributes is proposed to be carried out through extensive literature review and in depth interviews with field experts in the specific sector. These attributes should then be prioritized through the utilization of both AHP and Analytical Network Process (ANP), by conducting interviews with middle level managers of the service organization under study. Thus, two key steps are required for the completion of phase 2, namely:

Step 1: Identification of key service attributes: The first step is the identification of all possible attributes that may affect the required service operations and the organization's ability to satisfy customers, namely "key attributes of service performance". These attributes may be identified through extensive literature review in combination with in depth interviews with field experts. More specifically, a comprehensive literature review regarding service performance attributes may reveal a large number of attributes that may affect service performance, which in turn may be consolidated and grouped in broad categories, based on their content and inter-relationships. These categories and attributes will then be discussed with field experts, through in depth interviews, in order to validate their importance, narrow down the list of attributes, and verify and refine the initial categorization.

Step 2: Development of the 2nd HOQ: The development of the second HOQ involves the implementation of the combined AHP, ANP supermatrix approach within QFD, for the prioritization of key service attributes, based on customers' selection criteria. The key performance attributes identified in step 1 are set as the columns of the HOQ, while the columns from the first HOQ along with their respective importance values, become the rows of the second HOQ. To develop the relationship matrix, middle level managers must participate in an AHP questionnaire survey to determine the strength of the relationships between the various attributes of service performance and the customers' selection criteria. The data processing will result in a set of weights for each key service attribute with respect to each selection criterion. The procedure concludes by calculating the limiting supermatrix, which defines the overall importance weights of the service attributes.

Phase 3 involves the development of the last HOQ, which relates the prioritized key service attributes to alternative service improvement strategies. These strategies can be identified through extensive literature review and interviews with top level managers of the service organization. Finally, it is proposed that the identified strategies be prioritized with the use of an AHP survey among top level managers. The ultimate aim is to identify those strategies for service performance improvement that better satisfy customer wants. Thus, two key steps are required for the completion of phase 3, namely:

Step 1: Identification of strategies for service performance improvement: These strategies are identified through extensive literature review and should be discussed and verified by top level managers.

Step 2: Development of the 3rd HOQ: The second step involves the implementation of the combined AHP, ANP supermatrix approach within QFD, for the prioritization of service performance improvement strategies based on the key attributes of service performance. Thus, the key service improvement strategies identified in the previous step are set as the columns of the third HOQ, while the columns from the second HOQ (the key service performance attributes), along with their respective importance values, become the rows of the third HOQ. To develop the relationship matrix, an AHP questionnaire survey should be conducted among top level managers, to determine the strength of the relationships between the various strategies and the key service performance attributes. The data processing will result in the overall importance weights of the service performance improvement strategies.

Phase 4 involves the use of a multi objective decision model in the analysis to select the most satisfactory of the alternative strategies considering their overall importance as detected in Phase 3, along with operational constraints and organizational goals. The multi objective decision model and the proposed solution will be assessed by top level management. The purpose is to improve the decision making process for selecting strategies by including additional soft or rigid constraints related to resources, strategies, key attributes, and goals (such as financial ratios). These constraints represent both qualitative and quantitative objectives. In general, at least four groups of goals can be identified related to (a) minimization of resource consumption, (b) detection of suitable strategies, (c) achievement of key service attributes, and (d) achievement of desired financial goals. Binary decision variables will be used to identify the selection of each strategy.

The contributions and advantages of the proposed framework are multiple. Regarding the context of the study, unlike the majority of previous works, which were implemented in the manufacturing sector, this study fosters the service sector by employing the two stage approach integrating QFD with ZOGP. Unlike previous works, this study develops three consecutive HOQs in order to align business strategies with customer needs in the service sector. None of the previous works,

utilizing a similar two stage approach, started from the voice of the customer to reach tactical and strategic objectives. In addition, the present work suggests the implementation of field research to identify customer requirements, as well as structured methodological approaches to achieve consensus among staff members of different departments and hierarchies, for the determination and prioritization of key business attributes and key business strategic alternatives. The study models interdependencies among specific strategies in HOQ, echoing and aligning alternative hierarchies' views in a service setting.

4. Deployment of the Proposed Framework in the Banking Sector

The applicability of the proposed four-phase framework to service organizations is validated through its deployment in a real case within the banking sector and specifically in a major bank in Greece. The bank was selected after ensuring commitment and support to the research objectives and related procedures from top management.

4.1. Context of the study

Commercial banks squeezed by globalization of markets and the strong growth of competition, seek new ways to add value to their services. Since banking organizations compete in a market of undifferentiated products, the quality of their services constitutes an important means for obtaining competitive advantage (Stafford, 1996). Banking organizations that excel in providing quality services can manage revenue growth, improve the ratio of cross-selling, achieve better levels of customer retention and increase market share (Bowen and Hedges, 1993, Bennett and Higgins, 1993, Gelade and Young, 2005). As a result, banking organizations focus their attention on two important pillars, customer satisfaction and service quality (Lasser et al., 2000, Yavas and Yasin, 2001, Bick et al., 2004, Andreassen and Oslen, 2008). Especially nowadays, the negative fiscal conditions and the debt crisis of Euro zone countries have impacted banks, rendering institutions vulnerable to crash tests and assessments. Within this context, customers have become more insecure and have less trust in financial institutions, increasingly affecting the competition for market share and position. Consequently, banking organizations have intensified their efforts to become more customer oriented by implementing various tools to improve

customer relationships, emphasizing in service quality and satisfaction of customer needs.

Next, the application of the specific methodological steps and procedures, as outlined for each phase of the proposed framework, are presented.

4.2. Implementation of Phase One

The first house of quality relates the retail bank market segments to the bank selection criteria (customer wants).

Step 1. Identification of bank market segments: Market segments were defined using the product categorization of the Central Bank of Greece (Annual Report of Central Bank of Greece, 2007; 2008; 2009), namely, a) house loans, b) consumer loans and loans for very small companies, c) credit cards, d) saving deposits, e) time deposits and f) mutual funds.

Step 2. Identification of bank selection criteria (wants): Extensive literature review provided the basis for designing a field survey, which included a large collection of criteria (customer wants). The survey data (from 549 valid questionnaires - response rate of 31 percent) was used to detect the underlying factors reflecting bank selection criteria for customers. Since the proposed market segments are not mutually exclusive, respondents were clearly instructed to provide feedback based solely on their dominant product relationship with the bank. The analytical description of this phase can be found in Paltayian et al. (2012). The critical factors of bank selection criteria were found to be: “effective services” (quality of services); “innovative products” (the ability of banks to offer); “pricing” (appropriate); “working hours” (operating hours and flexibility); “network” and “location”.

Step 3. Development of the 1st HOQ (Table 1): A second field survey was conducted among customers representing all predetermined market segments utilizing an AHP questionnaire. Customers compared each pair of factors of bank selection criteria, using the nine point AHP scale. Data were processed using the appropriate software (Super Decisions, 2014) resulting in a set of weights for each bank selection criterion with respect to key customer segment.

The relative importances of criteria and the resulting HOQ are provided in Table I.

Please insert Table I near hear

The first column of the HOQ (“Market segment”) represents the market segments based on retail banking products. The second column represents the

corresponding percentages per market segment, in the Greek bank sector. Columns “3”-“8” represent the relative weights of bank selection criteria per market segment, as these were derived from the field survey. Columns “9” and “10” represent the competitive evaluation of the bank under study. More specifically, column “9” (“Current situation”) presents the market share of each market segment for the bank, while column “10” (“Competition”) presents the market share of each market segment for the bank’s main competitor. Column 11 presents the “Target Goal” per segment, given by the bank administration. This goal is set by the top management of the bank and is based on factors like the size of the market segment, the increase of GNP, the positioning of the main competitors, and the forecast of the Bank of Greece regarding the Greek banking sector. The entries in column “12” (“Improvement ratio”) are calculated by dividing the Bank’s “Goal” in column “11” by the Bank’s “Current situation” in column “9”. A ratio higher than 1 denotes the Bank’s intention to improve market share of the related market segment, while a ratio lower than 1 denotes the Bank’s intention to reduce market share in the related segment. The weights in column “13” (“Weight factor”) designate the importance of each particular market segment of the bank and it is calculated by multiplying column “2” (“Market mix”) by column “12” (“Improvement ratio”). Finally, column “14” (“Normalised score”) depicts the normalized weighting factor for each market segment. This normalized score is calculated by dividing the “Weight factor” for each segment by the sum of all weight factors. After calculating the weights of the relationship matrix between market segments and customers’ bank selection criteria, the process moved to the next phase which was the calculation of the last row of the house, which represents the final importance weights of bank selection criteria. Based on these, “pricing” is the most popular criterion for bank selection (weight 35.67%), followed by “effective services” (22.19%), “location” (13.97%), “network” (12.78%), “working hours” (11.52%), and “innovative products” (3.87%).

4.3. Implementation of Phase Two

This phase relates bank selection criteria (customer wants) to key attributes of bank service performance.

Step 1. Identification of key bank attributes: Extensive literature review revealed four broader categories of attributes, namely, “Technology”, “Branch design”, “Human resources”, and “Processes”, which are explicitly presented in Table II.

Please insert Table II near here

The attributes identified from the previous literature review were grouped in four broader categories and they were included in an interview guide that was used as the basis for in depth interviews and discussions with five top level managers of Greek banks. Participants verified the importance of most attributes and the researchers' initial categorization, while splitting the category of "Processes" into two sub-categories, namely "Customer Services" and "Support Services". The complete, consolidated list of attributes and their final categorization after this procedure is presented in Table III.

Please insert Table III near here

Step 2. Development of the 2nd HOQ (Table IV): This step combined AHP, ANP supermatrix approach, and QFD for the identification / prioritization of key bank attributes, based on bank selection criteria (Voice of the Customer). The resulting House of Quality (HOQ) is tabulated in Table IV.

The columns from the first HOQ (representing bank selection criteria) along with their respective importance values have become the rows in this matrix, while the columns in this house represent the key bank attributes (categories), as defined above. In order to calculate the relationship matrix, a survey was conducted among twenty middle level managers (branch managers) of the bank. The AHP approach was used to determine the strength of the relationship between various attributes and customer criteria, asking questions of the following structure: "How much more important is "personnel" when compared to "information systems" in relation to "offering effective services" to customers"?. Data processing revealed the final set of weights for each key bank attribute with respect to each bank selection criterion.

The procedure concluded by obtaining the limiting supermatrix, which actually defined the importance weights of the key bank attributes. Since the initial supermatrix (Appendix A) is stochastic, irreducible and acyclic, its limiting form is stable and provides the result for the introduced QFD model (Saaty, 1996). Accordingly, the questions used to calculate the roof matrix of the house had the following structure: "In satisfying the key bank selection criteria, "Technology" or "Human Resources" contributes more to "Customer Services" bank performance

attribute and by how much?”. The final results are shown in the bottom row of the matrix (Appendix B). Based on these results, “Human Resources” is the most popular attribute (weight 34.60%), followed by “technology” (31.92%), “customer services” (16.89%), “support services” (10.68%) and “branch design” (5.91%).

Please insert Table IV near hear

4.4. Implementation of Phase Three

The third house of quality relates key bank attributes to service improvement strategies. The ultimate aim is to identify those strategies for bank performance improvement that better satisfy customer wants (bank selection criteria).

Step 1. Identification of strategies for bank service improvement: A comprehensive literature review revealed four key performance improvement strategies, which were discussed with the top level managers in order to verify and possibly refine the list. However, no additional strategies were considered essential and the initial list was finalized and presented in Table V. These strategies are: a) Mergers and Acquisitions, which refer to possible agreements between two or more banks to merge their operation or the absorption of one organization from another in order to strengthen market position and increase market share, profits, capital adequacy and liquidity (Altunbas & Marques, 2007; Berger et al. 1999; Radecki et al., 1997), b) Virtual Banking (alternative networks) which refers to the opportunity offered to customers to be served without needing to have personal conduct with bank staff, like ATMs, e-banking, phone banking etc (Liao et al. 1999; Freeman 1996; Crane and Bodie 1996), c) Network Expansion, which refers to the efforts of banks to expand in new markets or abroad with the introduction of new branches (Barros, 1995; Carbal and Majure, 1993; Berger and DeYoung, 2006; Illueca et al., 2009), and finally d) Reengineering, which refers to the radical rethinking and redesign of key bank processes (Shin and Jamella, 2002; Mentzas, 1997; Watkins, 1994; Trkman, 2010; Bortolotti and Romano, 2012).

Please insert Table V near hear

Step 2. Development of the 3rd HOQ (Table VI): This step employs the combined AHP, ANP supermatrix approach and QFD for the identification / prioritization of key bank performance improvement strategies, based on key bank performance attributes, in order to select the best alternative strategy. The resulting House of Quality (HOQ) is tabulated in Table VI. The columns from the second HOQ (representing key bank performance attributes), along with their respective importance values, have become the rows in this matrix, while the columns in this house represent the key bank performance improvement strategies, as defined above. As in the case of the second HOQ, in order to calculate the relationship matrix, five top-level managers (area managers) of the bank were interviewed. The AHP approach was used to determine the strength of the relationship between the various bank strategies and the key performance attributes, asking questions of the following structure: “How much more important is “reengineering” when compared to “virtual banking” in relation to “bank design-equipment”, in satisfying the requirements of bank customers?”. Accordingly, the questions used to calculate the roof matrix of the house had the following structure: “In satisfying the key performance attributes, “virtual banking” or “Mergers and Acquisitions” contributes more to “reengineering” strategy and by how much?”. The data processing produced a final set of weights for each key bank strategy with respect to each bank performance attribute. The procedure concludes by obtaining the limiting supermatrix, which actually defines the importance weights of the key bank strategies. Since the initial supermatrix (Appendix C) is stochastic, irreducible and acyclic, its limiting form, shown in (Appendix D), is stable and provides the result for the introduced QFD model (Saaty, 1996). The final results are shown in the bottom row of the matrix (“Importances”). Based on these results, “Reengineering” was found to be the most important strategy (weight 40.62%), followed by “Alternative Networks” (36.65%), “Mergers and Acquisitions” (15.53%) and “Bank Expansion” (7.20%).

Please insert Table VI near here

4.5. Implementation of Phase Four

Integrating a multi objective decision model in the analysis: This phase comprises the implementation of a ZOGP model and the assessment of the proposed solution by top

level management. More specifically, four groups of goals were identified for the bank under study, related to (a) minimizing resource consumption (m resources, m=2, denoting budget and labour), (b) selection of strategies (n strategies, n=4, denoting reengineering, alternative networks, mergers and acquisitions and expansion), (c) achievement of key bank attributes (s attributes, s=5, denoting branch design, technology, human resources, customer services and support services) and (d) achievement of a desired Liquid To Deposits (LTD) ratio. Binary decision variables X_j were used to denote the selection of a strategy.

A general form of the ZOGP model follows.

$$\text{Min } Z = P_b \sum_{i=1}^m (d_{bi}^+, d_{bi}^-) + P_p \sum_{i=1}^n (w_i d_{pi}^+, w_i d_{pi}^-) + P_k \sum_{i=1}^s (w_i d_{ki}^+, w_i d_{ki}^-) + P_r d_r^- \quad (1)$$

Resources soft constraints:

$$\sum_{i=1}^n a_{ij} x_i - d_{bj}^+ + d_{bj}^- = b_j \quad (j=1,2,\dots,m) \quad (2)$$

Selection of strategies soft constraints:

$$x_j - d_{pj}^+ + d_{pj}^- = 1 \quad (j=1,2,\dots,n) \quad (3)$$

Key bank attributes (importances) soft constraints:

$$\sum_{i=1}^n w_i x_i - d_{kj}^+ + d_{kj}^- = Q_j \quad (j=1, 2, \dots, s) \quad (4)$$

Liquid to Deposits Ratio soft constraint (goal):

$$\sum_{i=1}^n l_i x_i - d_r^+ + d_r^- = LTD \quad (5)$$

$$\text{Where } x_j = \in \{0, 1\} \quad (j=1,2,\dots,n)$$

$$\text{and } d_{\cdot}^+, d_{\cdot}^- \geq 0$$

In structuring the model, we employed deviational variables of the general form d^+ and d^- . Clearly, for each goal only one deviational can be positive, denoting the overachievement or the underachievement of its corresponding aspiration level. These variables participate in the constraints and are used to formulate the lexicographic objective function of the model.

The lexicographic objective function in equation (1) represents an effort to minimize deviations from desired goals (targets) in accordance to soft constraints (2) to (5). The top level managers of the bank organization were asked to define aspiration levels for the right hand side of soft constraints. Using the deviational variables from these soft constraints, priority goals were formulated in the objective function. The particular objective function comprises four distinct parts. As far as the goals are concerned, the symbol P stands only for goal priority and does not indicate any calculation. The first goal, P_b , represents resources. Parameter m denotes the number of different scarce resources that form corresponding goals from equations (2). The technological coefficients a_{ij} of these constraints denote the contribution of each strategy to the achievement of the target b_j ($j=1, 2$) of the right hand side. In the particular context, the first goal attempts to minimize the undesired deviations (variables d_{bi}^+) from aspiration levels set for budget and labour. The second goal P_p , corresponds to the alternative strategies. Parameter n denotes the total number of alternative strategies. As mentioned earlier, the alternative strategies were: reengineering, alternative networks, mergers and acquisitions and expansion ($n=4$). This goal attempts to minimize deviations from the importances obtained by the third HOQ when combined with the soft constraints of equation (3). The undesired deviational variables are denoted by d_{pi}^- while the values for parameters w_i are provided from the third HOQ. The third goal, P_k , represents the key bank attributes, that is, branch design, technology, human resources, customer services and support services (s denotes the total number of attributes and in this case $s=5$). Essentially, the effort is to minimize the undesired deviations d_{ki}^- , from the key attributes importances taking into account the possible strategies as determined by the results of the third HOQ in the QFD model. These deviational variables are found in soft constraints (4) while the entries in the third HOQ are used as technological coefficients in the left hand sides of these constraints. As for the aspiration level (Q_j), the sum of the two largest degrees of significance of each attribute is selected. Of course, the right hand side of these constraints can be set to any desired level. The final goal in the objective function corresponds to the desired improvement of the loans to deposits ratio (LTD). The undesired deviation d_r^- can be found in constraint (5). The technological coefficients l_i correspond to LTD ratios attributed to each different strategy. As a final

comment, the ranking of goals in the objective function is indicative, and is set according to the decision maker's preference.

The model is illustrated using data from the third house of quality (Table VI). The aspiration levels of various constraints set by the top level managers are tabulated in Table VII.

Please insert Table VII near hear

Minimize:

$$\begin{aligned}
 Z = & P_b(d_{b1}^+ + 0,1d_{b2}^+) + \\
 & P_p(0,4062(d_{p1}^- + d_{p1}^+) + 0,1553(d_{p2}^- + d_{p2}^+) + 0,3665(d_{p3}^- + d_{p3}^+) + 0,072(d_{p4}^- + d_{p4}^+) + \\
 & P_k(0,591d_{k1}^- + 0,3192d_{k2}^- + 0,3460d_{k3}^- + 0,1689d_{k4}^- + 0,1068d_{k5}^-) + \\
 & P_r(d_r^-)
 \end{aligned}$$

Where,

P_b : combined deviations for budget and labor hours (d_{b1}^+, d_{b2}^+). Since monetary units and man hours exhibit asymmetry (non-commensurable variables), the coefficient of d_{b2}^+ facilitates commensurability. In particular, as suggested by top managers, an acceptable mean ratio of labor hours to monetary units is 1/10.

P_p : Importances taken from the third house of quality regarding strategies selection are combined with deviational variables d_{pi}^+ and d_{pi}^- to form the appropriate goal. We use both negative and positive deviations to express the desire to reach as much as possible the actual importances values.

P_k : Goal for attributes. We use the negative deviations d_{ki}^- along with results obtained from the third HOQ.

P_r : Goal for LTD ratio (minimize negative deviation d_r^-)

Subject to the following soft constraints

1. $100X_1 + 300X_2 + 75X_3 + 150X_4 + d_{b1}^- - d_{b1}^+ = 500$
2. $1000X_1 + 2000X_2 + 500X_3 + 1500X_4 + d_{b2}^- - d_{b2}^+ = 2500$
3. $X_1 + d_{p1}^- - d_{p1}^+ = 1$
4. $X_2 + d_{p2}^- - d_{p2}^+ = 1$

5. $X_3 + d_{p3}^- - d_{p3}^+ = 1$
 6. $X_4 + d_{p4}^- - d_{p4}^+ = 1$
 7. $X_2 + X_4 \leq 1$
 8. $0,541X_1 + 0,149X_2 + 0,191X_3 + 0,119X_4 + d_{k1}^- - d_{k1}^+ = 0,732$
 9. $0,514X_1 + 0,061X_2 + 0,360X_3 + 0,065X_4 + d_{k2}^- - d_{k2}^+ = 0,874$
 10. $0,456X_1 + 0,217X_2 + 0,224X_3 + 0,103X_4 + d_{k3}^- - d_{k3}^+ = 0,727$
 11. $0,409X_1 + 0,237X_2 + 0,271X_3 + 0,083X_4 + d_{k4}^- - d_{k4}^+ = 0,680$
 12. $0,327X_1 + 0,173X_2 + 0,301X_3 + 0,199X_4 + d_{k5}^- - d_{k5}^+ = 0,630$
 13. $0,2X_1 + 0,8X_2 + 0,1X_3 + 0,4X_4 + d_r^- - d_r^+ = 1,2$
- $X_j = 0$ or 1 ($j= 1,2, \dots, 4$)

Constraints 1 and 2 correspond to the aspiration levels set for the budget and labour hours respectively. Constraints 3 to 6 represent the possible selection of any strategy and form the appropriate goal in the objective function (P_p) using the deviational variables and the Importances from the third house of quality. Rigid constraint 7 assures that, as suggested by top management, “Mergers and Acquisitions” and “Expansion” strategies are mutually exclusive. Constraints 8 to 12 correspond to the goals for the key bank attributes in relation to the specific strategies for performance improvement (data from Table VI). Constraint 13 corresponds to the aspiration level set for the LTD ratio.

LINDO was used to solve the above model. The results are presented in Table VIII.

Please insert Table VIII near hear

According to the results of Table VIII, a combination of strategies “reengineering” and “expansion” is suggested. This, results in lower monetary costs (50% of available resource), total consumption of available man-hours and satisfactory achievement of key bank attributes. The LTD index goal is underachieved by 50%. The solution at hand remains the same within certain ranges of sensitivity which in fact are implied by the values of the deviational variables (see Table VIII). These limits were assessed and finally accepted by the bank’s top management. More specifically, the constraint

related to monetary budget proved to be non-binding ($d_{b1}^- = 250$) and it was not of further concern by the management. The constraint related to labour hours proved to be binding; nevertheless, top management suggested that it was a nonnegotiable upper limit, given the bank's limited human resources. Finally, although the LTD index was underachieved ($d_r^- = 0,6$), it was accepted by the bank's top management, given their unwillingness to change their initial order of priorities and resource constraints.

5. Discussion and Conclusions

Recognizing the fundamental role of service quality as a means to differentiate service organizations, this paper adds to previous works by introducing a generic strategic decision making framework for service organizations. Since customer wants from services are usually vague and difficult to quantify, service organizations need ways to clearly identify and translate them into measurable goals and specifications that can be used in interoperable service designs. The proposed framework utilizes a balanced mixture of both qualitative and quantitative methods in an effort to capture and delineate elusive customer requirements and design characteristics of services. The combined QFD-ZOGP model with the successive implementation of the three HOQs echoes the voice of the customer, enhances effectiveness, and provides additional confidence in selecting strategies for performance improvement in realistic service environments. Furthermore, it allows for sensitivity analysis and assessment of different combinations of quality improvement strategies in response to management objectives.

The applicability of the framework was validated in the bank services context, by prioritizing and selecting strategies for performance improvement that are rooted on customer requirements, organizational goals and resource availability. The first phase revealed customers' prioritization regarding key bank selection criteria, indicating "pricing" as the most popular, followed by "effective services". These selection criteria compare favorably with the results of earlier studies in banking (e.g. Almosawi, 2001; Kaynak and Harcar, 2004; Delvin and Gerrard, 2005). The above prioritized customer wants were then translated, into those key bank attributes towards which banks should focus in order to satisfy customers. Based on these results, the attribute "human resources" prevails, followed by "technology". Thus, it

appears that banks should give priority to staffing their organizations with competent personnel who will embrace and implement strategies for performance improvement. Also, priority should be given to technology, which obviously is an important feature for service improvement. Next, the third phase related the prioritized key bank attributes to alternative strategies for service improvement. Results suggested that “Reengineering” is the most important strategy, followed by “Alternative Networks”. Finally, zero-one goal programming (ZOGP) integrated the results of the QFD model with additional resource constraints and goals. The results suggested that a combination of “reengineering” and “expansion” was most appropriate. This combination seems to result in lower monetary costs (50% of available resource), total consumption of available man-hours and satisfactory achievement of key bank attributes.

Limitations of the framework relate mainly to its implementation efficiency and ease of application. The field survey in phase 1 and the AHP/ANP applications in phases 1, 2, and 3 are often resource consuming, sometimes requiring substantial research effort. The use of extensive literature reviews in phases 1, 2, and 3 along with the conduct of interviews in phases 2 and 3 also add to the overall implementation cost of the framework. However, the tradeoff of this effort is its overall effectiveness in terms of increased accuracy of the related weights and the greater involvement and consensus among members of the decision group. Moreover, the complexity of the related work and the resources required are by all means justified by the high-stakes of strategic decisions which by nature are long-term, risk taking, time and resource consuming. Finally, practitioners are advised to consider context specific issues related to operational resources and goal priorities, since their careful reflection could enhance the effectiveness of the underlying framework. Any combination of drastic changes in parameters’ values and/or management’s priorities might produce alternative scenarios that may in turn provide solutions, which require additional assessment efforts.

Thus, further research could be directed towards validating the applicability of the model in different service contexts such as education, health, and hospitality. Also, additional organizational constraints, like capacity, technological and other financial measures, which are vital to many organizations, might be considered as

constraints in the evaluation of alternative choices in order for top management to come up with more realistic constraints.

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Stages	Phases	Purpose / Step	Methods and Procedures	
1	1	Identification of key market segments	<ul style="list-style-type: none"> As defined by the service organization 	
		Identification of customer wants	<ul style="list-style-type: none"> Literature review Field Survey with customers 	
		Prioritization of customer wants	<ul style="list-style-type: none"> AHP survey with customers 	
	2	Development of the 2 nd HOQ	Identification of key service attributes	<ul style="list-style-type: none"> Literature review In depth interviews with field experts
			Prioritization of key service attributes	<ul style="list-style-type: none"> AHP/ANP surveys with middle level managers
			Identification of service improvement strategies	<ul style="list-style-type: none"> Literature review Interviews with top level managers
3	Development of the 3 rd HOQ	Prioritization of service improvement strategies	<ul style="list-style-type: none"> AHP survey with top level managers 	
		4	Integrating a multi objective decision model	<ul style="list-style-type: none"> ZOGP model Assessment of the final solution by top level managers

Figure 1. The proposed framework

Table I: HOQ for Market segments and Customer Selection Criteria

Customer Selection Criteria														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Market Segment	%Market Mix	Effective Service	Innovative Products	Pricing	Working Hours	Network	Location	Current Situation%	Competition %	Goal %	Improvement Ratio	Weight Factor	Normalized Score %	
1 Mortgage Loans	19,8	0,270	0,036	0,468	0,114	0,066	0,046	21	24	23	1,095	21,68	0,174	
2 Consumer loans	11,8	0,265	0,042	0,441	0,125	0,076	0,051	32	20	35	1,094	12,91	0,104	
3 Credit Cards	21,0	0,251	0,036	0,496	0,096	0,075	0,046	25	20	28	1,12	23,52	0,189	
4 Saving Deposits	30,7	0,123	0,040	0,114	0,107	0,258	0,358	10	40	15	1,5	46,05	0,361	
5 Time Deposits	11,0	0,250	0,037	0,447	0,148	0,071	0,047	15	30	20	1,33	14,63	0,118	
6 Mutual Funds	5,7	0,309	0,048	0,349	0,148	0,089	0,057	23	27	25	1,087	6,196	0,054	
Importances	1,00	0,2219	0,0387	0,3567	0,1152	0,1278	0,1397							

Table II: Literature Review for Key attributes

Authors	Attributes	Category
Batiz-Lazo and Wood (2000)	Telecommunication, Information technology, information processing	Technology
Joseph and Stone (2003)	ATM, information technology, online communication.	
Berger (2003)	Telecommunication, Information technology, information processing, computer equipment and software.	
Pikkarainen et al. (2004)	Online banking, e- banking, technology acceptance model.	
Consoli (2005)	Information technologies, communication technologies, back-office device,	
Consoli (2005)	Microprocessor, switching telecommunication technology, Networking software, microchip used in a plastic card, file transfer protocol, ISDN, ITS, Internet, Mobile phones	
Lin (2007)	Information Technology capability	
Wheelock and Wilson (2009)	Information- processing technology	
Rajput and Gupta (2011)	Information Technology, ATM, e-banking, computerization in bank, real time transactions	
Authors	Attributes	Category
Brill et al. 1984	Furniture, Noise, Flexibility, Comfort, Communication, Lighting, Temperature, air quality	Branch Design - Equipment
Statt (1994)	Technology (computers and machines), furniture, furnishings.	
Uzee 1999	Physical layout of workplace	
Gensler 2006	Workplace design	
Lee (2006)	Lighting, personalize workspace, control temperature, quiet, furniture	
Khanna and New (2008)	Space, Privacy	
Choi et al. (2009)	Air quality, thermal environment, lighting, acoustics and spatial condition	
Hameed and Amjad 2009	Furniture, Noise, Lighting, Temperature, spatial arrangement	
Schakib-Ekbatan et al. (2010)	Temperature, lighting condition, air quality, acoustics, spatial condition, office furniture and office layout	
Bluyssen et al. (2011)	Thermal, acoustic and luminous environment, air quality, control over indoor environment, office	

Leblebici (2012) layout, decoration, and cleanliness
Ventilation, heating, natural lighting, artificial lighting, décor, cleanliness, overall comfort, physical security, quiet areas, privacy, personal storage, work area-desk

Authors	Attributes	Category
Gerhart and Milkovich 1990	Training, profit sharing, opportunities	Human Resources
Terpstra and Rozell 1993	Training, employment security, Results oriented appraisal, internal career opportunities and profit sharing.	
Lado and Wilson 1994	Human asset specificity	
Becker and Gerhart 1996	Employee skills, motivation of staff, participation, job descriptions	
Trethowan and Scullin 1997	Culture, Training, core staff, contractors, part-time staff	
Coff, 1997	Employee skills, experience, knowledge	
Gerhart et al., 2000	Problem solving groups, Group contingent pay, attitude surveys, employment tests used for hiring, hours of training, formal performance appraisal, individual contingent pay	
Zineldin and Bredenaow 2001	Staff cost, counselling staff on the psychology of culture change, training staff, motivation of staff	
Ahmad and Schroeder 2004	Employment insecurity, selecting hiring, use of teams and decentralizations, compensation contingent on performance, extensive training, status difference, sharing information	
Kamg et al. (2007)	Theories of knowledge-based competition emphasize the firm's ability both to explore and to exploit knowledge as the source of value creation.	
Vlachos (2008)	Compensation policy, Decentralization and self-managed teams, Information sharing, Selective hiring, Job security, Training and Development.	
Mendelson et al. (2011)	Compensation contingent, teams, Information sharing, Selective hiring, Employment Security, Training and development, reduced status distinctions, transformational leadership.	
Zhu and Chen (2014)	Employment security, selective hiring of new personnel, self-managed teams and decentralization	
Authors	Attributes	
Roth and Jakson 1995	Personalization, speed to market, distribution channel access.	Processes (Customer services and support services)
Holstius and Kaynak, 1995	Opening Deposit account, Opening Saving account, Opening Checking account, Automatic payment services, availability of night	

Berger and Humphery, 1997 Frei and Harker, 1999	depository, Money orders, issue of credit cards, Offering securities, Loans, Offering savings plans, Financial counseling Deposit, lending business, securitization, derivatives business.
Frei et al., 1999	Opening of accounts, basic transactions, problem resolution within the account
Bortolotti and Romano (2012)	Open checking account, open small business loans account, Open certificate of deposit, Open mutual fund, open home equity loan account, Redeem a premature certificate of deposit, stop payment on a check, replace a lost ATM card cash withdrawal, deposit money and cheques, taxes payment, credit transfers, manual and automated activities, unnecessary movement of workers, wrong office layout design, workers spent much time reworking documents, reported data were incorrect or missing.

Table III: Key Bank Attributes

Key Bank Attributes (Categories)	Specific Items
Human Resources	Unique Knowledge & skills, Experience, Staffing strategy, Compensation strategy, Training & motivation
Branch Design	Equipment, Furniture, Noise, Comfort, Lighting, Temperature, Air quality, Workplace layout & design
Customer Services	Quick Transactions, Distribution channel access, Opening different kind of accounts, Basic transactions
Support Services	Problem resolution within the account, Offering securities, Financial counseling
Technology	Information technology & processing, Networking software, Computer equipment & software, MIS, ATMs, e-banking,

Table IV: The second House of Quality

		Key Bank Attributes						
		Support services	Customer services	Human Resources	Technology	Branch Design-Equipment		
		0,065	0,319	0,458	0,158			
		0,077	0,352	0,501		0,070		
		0,058	0,558		0,251	0,133		
		0,060		0,616	0,182	0,142		
			0,551	0,268	0,119	0,062		
		/	/	/	/	/		
		Key Bank Attributes						
		1	2	3	4	5	6	7
1	Bank Selection Criteria	Importances	Branch Design	Technology	Human Resources	Customer services	Support services	
2	Effective Services	0,2219	0,036	0,198	0,515	0,177	0,074	
3	Innovative Products	0,0387	0,045	0,248	0,452	0,108	0,147	
4	Pricing	0,3567	0,052	0,379	0,333	0,129	0,074	
5	Working Hours	0,1152	0,053	0,435	0,229	0,164	0,119	
6	Network	0,1278	0,096	0,320	0,258	0,171	0,155	
7	Location	0,1397	0,073	0,238	0,283	0,105	0,301	
	Importances	1,0000	0,0591	0,3192	0,3460	0,1689	0,1068	

Table V: Bank performance improvement strategies

Authors	Strategy	Institution(s)
Currie and Willcocks (1996)	Reengineering	Royal Bank of Scotland - UK
G. N. Mentzas (1997)	Reengineering – Information systems	Alpha Bank - Greece
Nweman et al. (1998)	Reengineering – Human Resources	Northbank - UK
Shin and Jemella (2002)	Reengineering	Chase Manhattan Bank -USA
Akamavi (2005)	Reengineering	Lloyds TSB Student Account
Trkman (2010)	Reengineering	Middle- sized Slovenian Bank
Bortolotti and Romano (2012)	Reengineering	Italian Banking sector
Gandy (1995)	Virtual Banking	Security First Network Bank- USA
N. P. Mols (2000)	Virtual Banking	Danish Retail Banking
Bughin (2001)	Virtual Banking	Deutsche Bank (Germany), Barclays Bank (UK)
Guraau (2002)	Virtual Banking	Turkish Romania Bank, Alpha bank Romania, Piraeus bank Romania, Commercial Bank of Greece (Romania).
Sayar and Wolfe (2007)	Virtual Banking	Egg, Smile, Cahoot, Intelligence Finance(UK), Fiba (Turkey)
Flier et al. (2001)	Mergers and Acquisitions	ING (Holland)
Rezitis (2007)	Mergers and Acquisitions	EFG Eurobank -Ergasias, National Bank of Greece, Piraeus Bank, Alpha Bank.
Matthews et al. (2008)	Mergers and Acquisitions	TSB and Lloyds (TSB Group), Barclays and Woolwich, Bank of Scotland and Halifax (HBOS)
DeYoung et al. (2009)	Mergers and Acquisitions	literature review based
Boufounou (1992)	Expansion	Commercial Bank of Greece
Barros (1995)	Expansion	Portuguese Banking Sector
Berger and DeYoung (2006)	Expansion	U.S multibank holding companies
Illueca et al. (2009)	Expansion	Spanish savings banks

Table VI: The third House of Quality

		Bank performance strategies					
		Reengineering	Mergers and Acquisitions	Alternative Networks	Expansion		
		0,000	0,123	0,800	0,077		
		0,685	0,000	0,211	0,104		
		0,783	0,150	0,000	0,067		
		0,179	0,700	0,121	0,000		
		Bank Performance Strategies					
		1	2	3	4	5	6
1	Key Bank Attributes	Importances	Reengineering	Mergers and Acquisitions	Alternative Networks	Expansion	
2	Branch Design	0,0591	0,541	0,149	0,191	0,119	
3	Technology	0,3192	0,409	0,237	0,271	0,083	
4	Human Resources	0,3460	0,456	0,217	0,224	0,103	
5	Customer services	0,1689	0,514	0,061	0,360	0,065	
6	Support services	0,1068	0,327	0,173	0,301	0,199	
7	Importances	1,0000	0,4062	0,1553	0,3665	0,072	

Table VII. Data obtained from top level managers

Constraint	Technological coefficients				Aspiration level
	X_1	X_2	X_3	X_4	
Budget	100	300	75	150	500
Labor hours	1000	2000	500	1500	2500
Improving liquidity ratio	0,2	0,8	0,1	0,4	1,2

Table VIII. Model Results

Decision Parameters	Interpretation
$X_2=0, X_3=0, X_1=1, X_4=1$	Select strategies 1 and 4 together
Deviation Variables	Interpretation
$d_{b1}^+ = 0, d_{b1}^- = 250$	250 monetary units below maximum level
$d_{b2}^+ = 0, d_{b2}^- = 0$	2500 human resources hours (binding constraint).
$d_{p1}^+ = 0, d_{p1}^- = 0$	Strategy 1 is selected
$d_{p2}^+ = 0, d_{p2}^- = 1$	Strategy 2 is rejected
$d_{p3}^+ = 0, d_{p3}^- = 1$	Strategy 3 as above
$d_{p4}^+ = 0, d_{p4}^- = 0$	Strategy 4 is selected
$d_{k1}^- = 0,07, d_{k2}^- = 0,30, d_{k3}^- = 0,17$ $d_{k4}^- = 0,19, d_{k5}^- = 0,10$	Deviations of key bank attributes in relation to strategies (underachievement)
$d_r^- = 0,60$	The index “loans to deposits” deviates from the desired target value by 0,60 (underachievement).