Applying Quality Function Deployment to Social Housing?

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Abstract

Purpose of this paper	*This paper focuses on the application of Quality Function Deployment (QFD) in a Housing Association located in the UK. Facing the problem of improving a company's performance, practitioners and academics have fashioned and applied a variety of models, theories and techniques.*
Design / methodology / approach	*The research questions were developed from a review of the quality and process improvement literature and tested using evidence from field-based, action research within a UK Housing Association company. The case study provides insight to the benefits and challenges arising from the application of QFD.*
Findings	*The results provided insight to the benefits and challenges arising from the application of a specific tool, QFD. The primary findings were: i) QFD can be successfully adapted, applied and utilised within the challenging environment of social housing and other sectors, such as professional services; ii) the model can be modified to use most processes/sub-processes; it must include both external and internal requirements and, to be useful, use more detailed process parameters appropriately.*
Practical implications	*The conclusions drawn add to on-going commentaries on aspects of quality improvement, especially the application of QFD within the service sector. The authors develop questions for future research regarding improvement projects.*
Originality/ Value	*The conclusion proposes that the implementation of QFD should have a positive impact upon a company; if approached in the right manner. It provides a useful mechanism for developing evidence based strategy of operational change, control and improvement. The research proposes questions for future research into aspects of operational quality and efficiency.*

Key Words: Quality function deployment, services, housing sector

Article Classification: Case Study

Introduction

Within highly competitive environments, manufacturing firms and service organisations focus on optimising their production processes in order to satisfy the market demand and gain a competitive advantage (Lam and Dai, 2015; Mohanraj *et al.*, 2015). Approaches such as Value Stream Mapping and Process Management in conjunction with the use of techniques, such as the Quality Function Deployment (QFD), have proven to be successful and have measurable results in terms of improving a company's performance and reducing operating costs (Kuhlang *at al.*, 2013). The challenge of implementing a Process Management based approach lies in creating an effective Process Management System (PMS). Such a system is often based on the Plan-Do-Check-Act philosophy (Deming, 1982) and typically consists of processes, sub-processes and procedures linked together. Performance measurement and preventive mechanisms must also be an integral part of the system. However, a question that often arises when coming to design an effective PMS is 'what are the standards according to which one has to design and manage a Process Management System?' Eliciting, understanding and utilising the Customer Requirements that can inform a successful PMS is the key to Business Excellence (Soosay *et al.*, 2012; Walker and Jones, 2012).

This paper, therefore, investigates whether the application of QFD within a Housing Association can assist the company to translate the 'voice' of customers into performance improvement. It also attempts to contribute to the relevant literature regarding the implementation of QFD in the service sector. The PMS used by the company was not fit for purpose as was not performing to the maximum of its ability. The company required a method to identify areas for improvement to enable it to introduce improvement projects and increase customer satisfaction. The rationale was that QFD would enable the company to correlate process functions to customer requirements and identify critical success factors.

The paper is structured as follows. The literature review presents various applications of QFD and communicates the benefits and drawbacks. A number of examples of QFD application in non-

manufacturing industries are presented, mainly to understand the reasons and need to adapt the product-oriented QFD process. The research methodology is then presented and the use of a case study approach briefly justified. Subsequent sections introduce the analysed scenario - the analysis of the processes and the customer requirements; all incorporated within three House of Qualities. The final section discusses conclusions and possible further research.

The Literature review

QFD definitions and aim

Many authors have dwelled over which is the best approach of achieving high levels of quality (Esteban-Ferrer and Trics, 2012). Chen *et al.* (2015) propose that many companies are engaged in assessing ways in which their productivity, product quality, and operations can be improved. Although Business Process Re-engineering (BPR) and Value Stream Mapping (VSM) used to attract the most attention in the 'process arena' (Motwani *et al.*, 1998), Quality Function Deployment (QFD), one of TQM's primary activities, has been considered as a systematic methodology for quality management and product development (Vinodh and Chintha, 2011; Sousa and Voss, 2012).

Several authors have defined QFD, either based on its process and contribution/results or according to its components. Lam and Dai (2015, p.316) stated that "*QFD is well known as a system for translating the "voice" of customers into appropriate company requirement*". QFD is considered as an effective tool for businesses to identify customer desires, expand market share, and develop strategies to achieve customer satisfaction (Yeh *et al.*, 2013). Khorshidi *et al.* (2016) explained that QFD can be a contributing factor to a product's or service's success. Vinodh and Chintha (2011) stressed the fact that QFD is not a problem-solving tool, but it is very useful in identifying *what* has to be done to increase market share. The QFD's aim is to allow the organisation to identify the customers; understand and prioritise the customers' requirements; add value through quality maximisation; design a comprehensive quality system for customer

satisfaction; and develop strategies and optimise those product/service aspects that brings the greatest competitive advantage (Garver, 2012). This is achieved by translating the customers' needs and expectations into items that are measurable, actionable and potentially capable of improvement, through the planning and design stages (Dror and Sukenik, 2011; Camgöz-Akdag *et al.*, 2013).

Benefits and difficulties of applying QFD

Many authors attempted to categorise the benefits of the QFD tool; the literature is rich with empirical and conceptual research of QFD's contribution (Mohanraj *et al.,* 2015). Andronikidis *et al.* (2009) pointed out that this technique facilitates the organisation's growth, quick respond to the market's needs and, as a consequence, prosperity because it assists in developing a series of products, which are attractive to existing and new customers. Products designed according to QFD may benefit from superior product design - the potential for breakthrough innovation, lower project and product costs, and as a result satisfied customers (Esteban-Ferrer and Trics, 2012). Vinodh and Chintha, (2011) stated that companies using QFD would observe a reduction in warranty claims, improved internal communications, increased sales, and reduction in the number of design changes. Clausing and Pugh (1991) documented that the use of QFD can reduce the development time by 50% and start up and engineering costs by 30%. Zare Mehrjerdi, (2011) concluded that QFD not only enhances the design process and competiveness, but the underlying organisation itself.

The main advantage of QFD is its structural deployment. QFD is based on Total Quality Management philosophy, it embraces towards improving quality, but unlike most theories around quality management, QFD uses tools, graphs and statistics to quantify quality (Ikiz & Masoudi, 2008). The main feature of the QFD approach to improving quality is the 'House of Quality' (HOQ) (Khorshidi *et al.,* 2016). It is the foundation of all QFD processes and incorporates a large amount of data from various sources, such as surveys, interviews, listening to salespeople, trade shows and customer complaints (Esteban-Ferrer and Trics, 2012). It is a matrix that identifies the 'whats', the

'hows', the relationships between them, and criteria for deciding which of the 'hows' will provide the greatest customer satisfaction (Chahal and Thareja, 2012; Zare Mehrjerdi, 2011).

Besides the fact that organisation could benefit by applying QFD, Carnevalli and Miguel (2008) highlighted that several difficulties can also occur: difficulties in defining the correlations between the quality demanded and quality characteristics (Chan and Wu, 2002); interpreting the customer voice; working in teams; and dealing with the lack of knowledge (Martins and Aspinwall, 2001). As Carnevalli and Miguel (2008) explained these issues have discouraged the QFD application and as a result, there is the need for understanding the purpose of using it, the benefits and difficulties derived from its application in order to facilitate it in the future.

The implementation and success of QFD depends on many prerequisites, the first of which is support for QFD from top management. To be competitive in this global market, top management of an organization should demonstrate support for this new approach (Das *et al.,* 2011). It requires extensive education and training because those directly involved with the implementation need to be able to construct, interpret, and apply the QFD philosophy (Chan *et al.,* 2009). Furthermore, policy management techniques rather than objective management (management by results) should be emphasised and practised.

Alternative QFD Applications

Although QFD was traditionally developed to assist product design, with some modifications the QFD technique could be applied in service industries; the key differences are customer identification, procedures for the establishment of expectations, inseparability of the service offering and the service delivery and the definition of the quality elements (Andronikidis *et al.,* 2009). The main reason for QFD to have been gradually introduced into the service sector is the design and development of quality services (Chan and Wu, 2002). The application of QFD in a non-manufacturing environment revealed the following three main benefits (Lim *et al.*, 1999): i) QFD translates customers' expectations into appropriate service quality specifications; ii) QFD clarifies

customer priorities for competitive advantage; iii) QFD gives directions for the improvement of service quality and helps organisations to think in terms of the entire system and not just isolated service elements or isolated customer expectations.

There have been several studies describing QFD application in the service industry (Esteban-Ferrer and Trics, 2012; Sivasamy *et al.,* 2015). A representative example is that of the use of QFD in conjunction with a logical framework approach (LFA) in the healthcare industry to develop a conceptual model that could enhance the quality of care in accident and emergency (A&E) units (Buttigieg *et al.,* 2016). In addition, the QFD approach has been adapted to design environmental friendly process and sustain logistics services (Lam and Dai, 2015). Other attempts of using QFD in a service environment were made in the educational setting; QFD has been used to improve teaching effectiveness and customer satisfaction (Lam and Zhao, 1998). The use of QFD has also been studied for improving the decision making process (Ho *et al.,* 2010)). Partovi (2001) proposed an analytic model, which adds quantitative precision and fine-tuning to an otherwise qualitative decision-making process.

Literature indicates that there is little evidence regarding the QFD application within the real estate sector. Hamilton and Selen, (2004) developed a framework to create a personalised customer experience in a real estate service. Similarly, Llinares and Page, (2011) focused on the use of QFD in order to identify relationships between customers' needs and design characteristics; the relationship between customers' emotional impressions and the purchase decision. However, there is a need for further research to be undertaken in determining the QFD and its application in software development within the real estate sector. Consequently, the objectives of this research are to gain a deeper understanding of this phenomenon and to assess the way QFD has been implemented within the study area. For this to be achieved, the following research question has been developed (RQ1) = 'Can Quality Function Deployment be used for reviewing processes utilising customer requirements as the benchmark?'

Methodology

The incentive for this research came from a company keen on quality and business improvement, a Housing Association (HA). As part of this project and in alignment with the strategic direction, the company decided to undergo a process review to determine in detail the level of customer satisfaction specific processes achieved. The scope of the project, which took place over a 6 month period, was restricted to three processes: i) Tenancy Management; ii) Meeting Customer Choice; iii) Asset Management. The core objectives were identified and expressed: i) to utilise QFD in order to categorise and prioritise customer requirements; ii) to map the customer requirements against the company's core processes and derive the level of interdependence and correlation; iii) to use the QFD matrix produced to identify the focal points within those processes that affected customer requirements.

Research methods

To achieve the objectives, this study adopted a case study approach (Yin, 2008). The research was facilitated by adopting action research where customer feedback was the main source of primary data. Collecting that information is an important step in any QFD application, as clearly stated by the literature (Azam Haron *et al.,* 2014). In this project customer feedback was obtained through a series of surveys. The "WHAT" section of the QFD matrix was completed using the following surveys: i) Tenant Survey Year 1 and Year 2; ii) Tenant's Panel (TP); iii) Complaints Monitoring Log and interviews with key HA staff.

The first source of information was the Tenant Survey HA performing every year. A list of customer requirements was created based on the analysis of the survey's results conducted over a two year period. Another source of information was the Complaints Monitoring Log. Interviewing and discussing with members of staff was a way of getting experienced and valid opinions about customer requirements. Finally, after a list of requirements was compiled, feedback from the tenants as to whether or not the list was valid and truthful was received. The next step was to list these

requirements and group them to the same company function: Repairs Reporting; Regular Contact with Tenants; Better Gardens; being more informed about HA; Better House Maintenance; Better House Design / Layout; Better Security.

Project Methodology

Since there was no recorded case study of QFD implementation for process reviews, it was essential to design an original model. It was decided to construct one House of Quality (HOQ) for each core process. The core processes and the associated sub-processes are illustrated in the company's PMS map (Figure 1), below. The purpose of each of the HOQs was to identify Areas for Improvement to satisfy customer requirements (Khorshidi *et al.*, 2016). The HOQ design consisted of two levels: the 'Primary' matrix correlated customer requirements with sub-processes. For the grading it was decided to utilise the typical 9-3-1 scale for strong-moderate-weak correlation respectively. By adopting this approach, the level of interdependencies between sub-processes was assessed. The analysis that follows will consider only the top three Customer Requirements with the largest 'weighting' scores. This prioritisation is necessary so as to focus in identifying Improvement Areas for the most distinguishable customer requirements. The 'Secondary' matrix attempts to correlate the sub-processes or functions with a set of 'process parameters'. By correlating the above process parameters with the sub-processes of the three core processes the authors and the company would be able to identify weaknesses and areas for improvement.

The final phase of the project included the analysis of the processes and the customer requirements were incorporated into the design of the three HOQs. For the design of the HOQs the commercial computer programme 'QFD Capture' was used. The calculation of the 'average' figures was programmed by the authors and it was decided that the Interdependencies correlation made in the roof of the HOQ would not be considered, because they were deemed insignificant for the identification of areas for improvement.

Findings and Analysis - QFD Applied

The host company is a Housing Association (HA) based in Greater Manchester. It aims to provide its customers with quality homes and a lifestyle that suits their individual needs. The company is a non-profit making organisation regulated by the UK Government Housing Corporation. The HA had approximately 2,500 homes for rent and sale throughout the North West of England. The homes they build and modernise are financed through public and private institutions. Their everyday running costs are funded through the rents paid by their customers. The Chief Executive stated that it is the HA's aim to become a world class organisation by: '*Investing in our greatest strength, our talented staff, to ensure that, through their development, training and empowerment, they have the knowledge and skills required to meet our challenging goals and the ability to deliver a service that enhances customer satisfaction*'.

Housing Association: Process Management System (PMS)

The company had undergone many changes, aimed at achieving World Class performance by creating an effective PMS. The business improvement at HA resulted in the company having a documented, functioning PMS, which regulated, manages and controls 12 key business functions of the company. These processes, apart from describing the basic functions of a HA, have been designed according to Business Improvement and Quality Management principles, using the Plan-Do-Check-Act philosophy (Deming, 1982). In order to achieve maximum integration of processes and maximise the effectiveness of the PMS, the company decided to map the PMS in a circular arrangement, concentrating the three core processes of the business in the centre; the processes that support and maximise the effectiveness of the core processes in the second level; and in the third level were the peripheral processes that offer input and infrastructure in the entire PMS. Figure 1 illustrates the PMS's map.

HA's three core processes are consisted of many sub-processes and procedures. Having a better understanding of the interdependencies between processes and sub-processes in order to evaluate them based on customer requirements, the following parameters have been considered:

- Inputs and Outputs: To design the House of Quality, it needs to be judged how a sub-process affects or is being affected by another.
- Performance Determinants: In each sub-process, there are functions and variables that determine the effectiveness and affect the overall performance of the process. In most cases the functions have been procedures that can affect variables such as:
  - Time the process takes to be completed
  - Quality of deliverables
  - Level of customer satisfaction

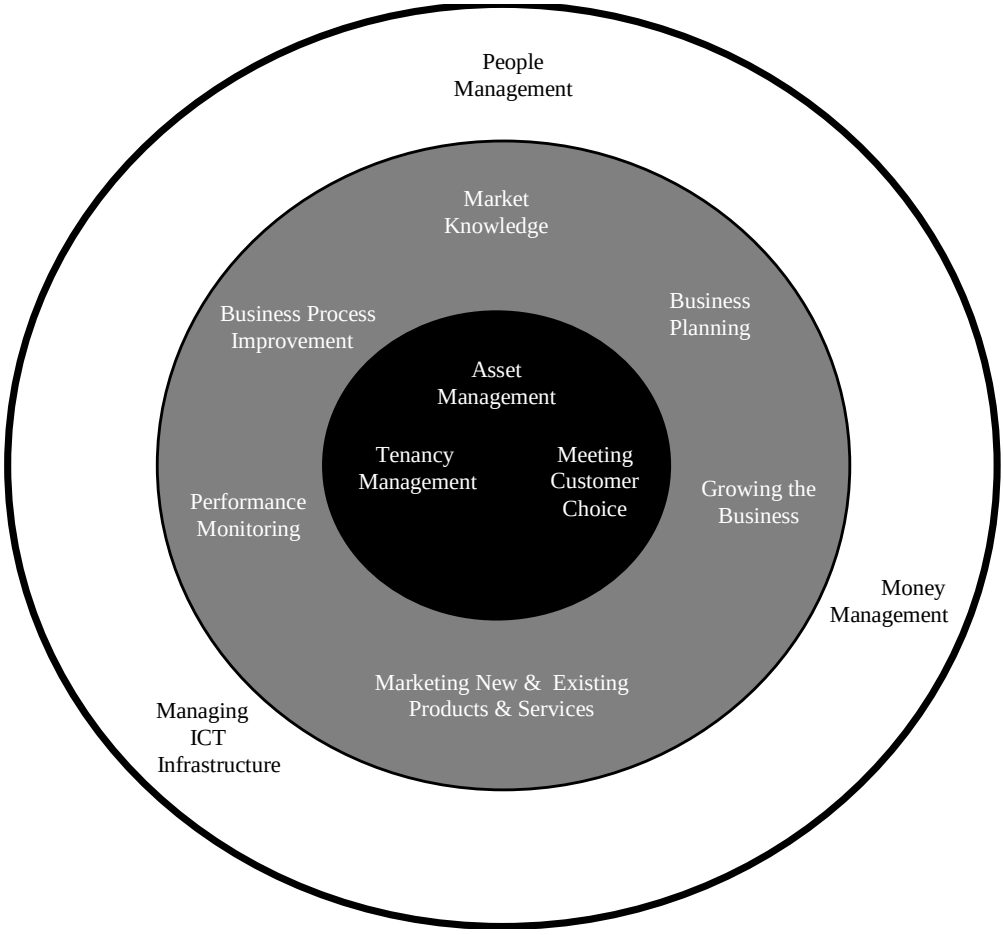

Figure 1: The PMS's map

To analyse the transformation process within each sub-process is essential to understand the various procedures and decisions and how they can affect the overall performance of the process. The various Performance Determinants that have been identified and the reasons why these can affect the overall performance of the process are following.

The Core Processes

Asset Management Process

Asset Management is the core process that deals with the assets of the company. According to the company's PMS, the purpose of Asset Management is: "*to protect our investment by maintaining and improving the properties*" (source: HA PMS/Policy and Strategy). The objectives of the process are: "*the company to improve the organisation's stock to an agreed standard and maintain it at or above this standard into the future; to develop and implement a five-year asset management plan; to identify and plan alternative proposals for stock; to investigate the opportunities afforded by stock rationalisation, transfer and so on, in areas where its properties are isolated*" (source: HA PMS).

The Scope of the process relates to the functional areas or sub-processes it entails. These areas are: Planned & Cyclical Day-to-Day Repairs; Health & Safety; Decants; Invoice Processing. . In attempting to create an effective Process Management System, these processes, sub-processes and procedures are linked through their inputs and outputs. Table 1 summarises them.

Sub-processes	Inputs	Outputs
Planned & Cyclical Day-to-Day Repairs	- Information provided to create Maintenance Strategy. - Notifications of vacant property and advices maintenance are received.	- If no maintenance work is required, then the output is a link to the 'Voids' sub-process. - If maintenance work is required, then a Schedule of Works is prepared. - Feedback slips to the 'Invoice Processing' procedure.
Health & Safety	- H&S related maintenance is required and to what extent.	- The Asset Management process
Decants	- The functions required for moving a tenant out of his/her home after maintenance inspection is carried out.	- The decision point of whether a Decant is required
Invoice Processing	- The decision steamed from the Monitoring Procedure.	- The Money Management process.

Table 1: Planned & Cyclical Day-to-Day Repairs: Inputs - Outputs

House of Quality (HOQ) Design

There are two levels within each HOQ. The 'primary' matrix considers the correlation between 'customer requirements' and sub-processes. Shahin and Nikneshan (2008) explained that this reflects how important each process is in the eyes of customers. Similarly, Esteban-Ferrer and Tricas (2012) stated that customer expectations can be presented through measuring the perceived quality based on the customer satisfaction regarding the services providing. The secondary matrix evaluates the sub-processes based on certain 'process characteristics'. As Chen et al. (2015) highlighted it is critical to identify the process characteristics in order to accumulate and enhance the resources and thus satisfying the customers. Combining the two levels will provide insight as to possible improvement areas.

The Asset Management House of Quality was the first matrix constructed (see Figure 2). The top three Customer Requirements are:

- ‘Better House Maintenance’: House Maintenance is an activity very strongly correlated with the ‘Planned & Cyclical day to day Repairs’. Especially the ‘Abandonment Procedure’ and the Inspection Procedure’ are the starting point for possible house maintenance. The quicker those two procedures are performed the quicker the maintenance activity will take place. The ‘Repairs Handling Procedure’ is responsible for issuing repairs and maintenance and the ‘Monitoring Procedure’ is responsible for monitoring and evaluating the quality of repairs & maintenance. Finally, Better House Maintenance is also heavily depended on the ‘voids’ sub-process. This is due to the fact that the faster a void is identified the faster the maintenance related procedures, mentioned before, will begin.
- ‘Planned & Cyclical Day to Day Repairs’: The ‘Repairs Reporting’ customer requirement has very strong correlation with the ‘Planned & Cyclical Day to Day’ sub-process. This is because of the ‘Repairs, Environmental Works, Aids & Adaptation Procedure’, which is the entry point for any repairs request into the PMS. Even though the ‘Repairs Reporting’ requirement has Weak correlation with the other sub-processes, its overall ‘weighting’ into the Asset Management’s process performance is 14, which is the second largest score.
- ‘Regular Contact with Tenants’: Even though this customer requirements relates with the level of contact HA has with its customers, in evaluating the correlation with the Asset Management sub-processes an attempt was made to identify and grade all the possible and probable points of contact. Consequently, when a strong or medium (as the case is) correlation is identified it does not necessarily mean that there is a problem. It could mean that there is simply room for improvement.

It becomes apparent from the Primary Matrix analysis (see Figure 2) that the sub-processes whose performance affects the most the customer requirements are ‘Planned & Cyclical Day to Day Repairs’, (with an average score of 7.5) and ‘Voids’ (with an average of 4). Areas for improvement that satisfy stated customer requirements are:

- Planned & Cyclical day to day Repairs: As it can be seen from the secondary matrix, the particular sub-process has a very strong 'Functional Complexity' parameter. That means that the 'Planned & Cyclical day to day Repairs' sub-process is either very complex or that its functional requirements are very high. This complexity might be the cause for customer dissatisfaction.
- Voids: Even though the 'Voids' sub-process has been analysed as a part of 'Planned and Cyclical day to day Repairs', the 'Void Property Inspection Procedure', which is referenced behind a 'voids' function box, has a strong correlation with the 'Better House Maintenance' customer requirement. This is reason enough to analyse the process parameters that influence the performance of the sub-process.

The first observation one can make is that the 'Voids' sub-process has a strong 'Frequency / Repetition' parameter. As with the 'Planned & Cyclical day to day repairs' sub-process, that would mean that the 'Voids' sub-process is 'Elastic'. The fact that the 'Voids' sub-process has a moderate 'Lack of Manageability' parameter means that it is not managed effectively.

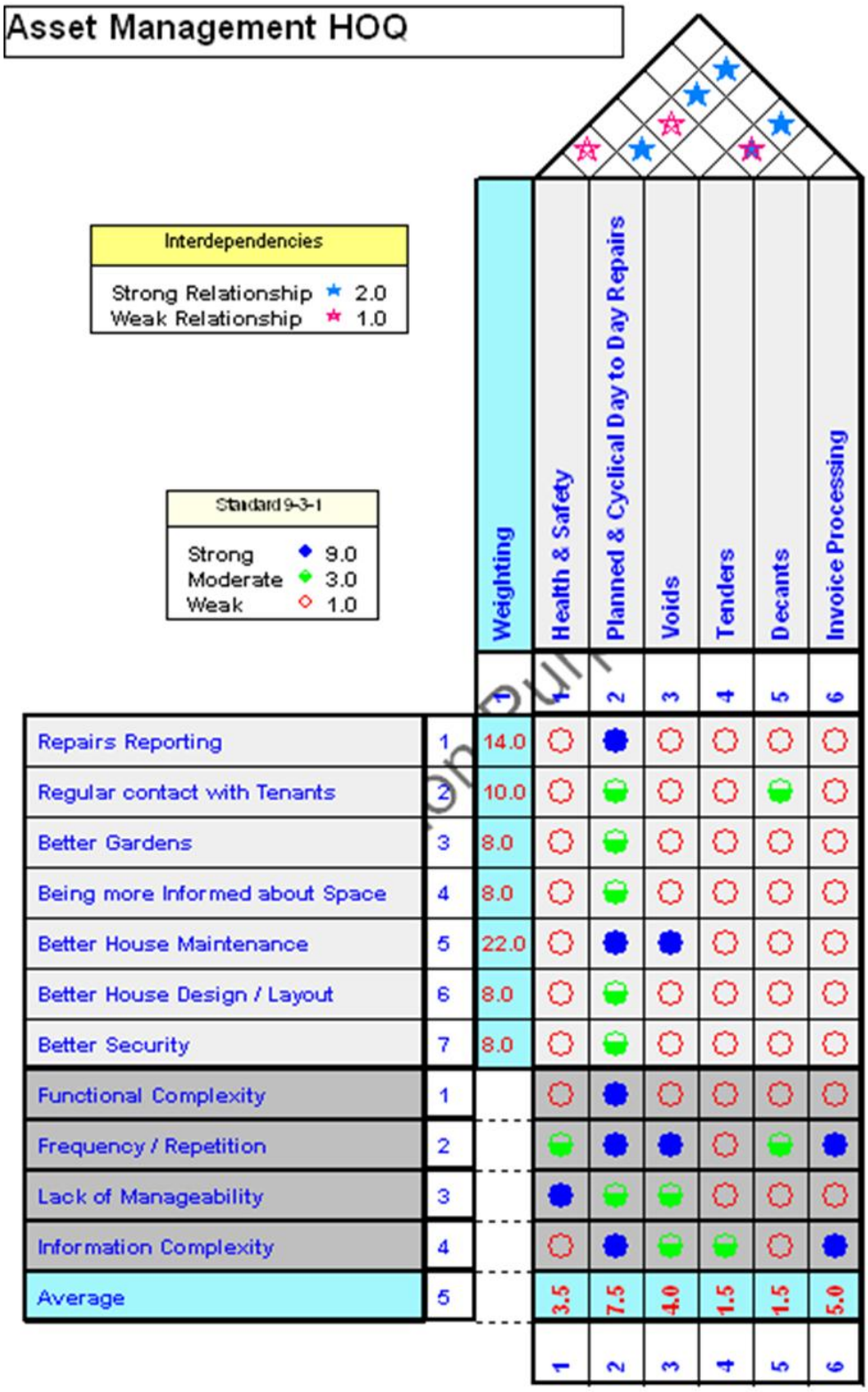

Figure 2: Asset Management HoQ

Meeting Customer Choice (MCC) HOQ

According to the company's policy, "*meeting Customer Choice process is set up in order to 'to balance the need to let and sell properties with customer choice*". To analyse this process, four basic sub-processes were identified, which are presented in Table 2.

Sub-processes	Inputs	Outputs
Mutual Exchange	- The 'request for mutual exchange' received by the tenant.	- Paperwork related to payments
Potential or Existing Customer Management	- A request for accommodation from an existing or new customer.	- The 'Potential or Existing Customers Management' and 'Tenancy Management' processes
Shared Ownership	- A request in the form of an application.	- After the completion of the 'Shared Ownership' sub-process, the Housing Officer has to 'Pass copy of Completion Statement to Corporate Services'. This statement is the final output of the sub-process and a link to 'Money Management' process.
Local Authority (L.A.) Nominations	- Nominations provided by the Local Authorities every year.	- A link is created with the 'Potential or Existing Customer' sub-process with output the waiting list.

Table 2: Meeting Customer Choice: Inputs – Outputs

Having analysed the 'Meeting Customer Choice' process it became apparent that it does not have negative effects on the identified customer requirements. However, the process review attempted in this project aims not only in identifying problems but also, identifying critical success factors and areas for improvement. According to Martins and Aspinwall (2001) QFD is considering as a design tool aiming at attaining better quality products and services.

- Primary matrix: As can be seen from the MCC-HOQ (see Figure 3), the two customer requirements that have strong correlation with the sub-processes of 'Meeting Customer Choice' are 'Regular Contact with tenants' and 'Being more informed about the HA. Both

customer requirements express the need to have better quality and flow of information between the company and the tenants.

- Secondary Matrix: This sub-process received the greatest grading when evaluated against the process parameters. The fact that it has a strong grading in the 'Frequency / Repetition' parameter means that its performance is Elastic.

The 'Functional Parameter' of the 'Potential or Existing customer Management' sub-process received a strong grade because the sub-process is complex and at the same time crucial for the overall MCC process performance. In the 'Application' procedure the 'priority assessment' function has caused customer dissatisfaction because it is not being utilised effectively. The same applies for the 'Selecting a Customer' procedure, where the function of actually selecting a customer has caused dissatisfaction and complaints. Finally, the 'Potential or Existing Customer Management' sub-process received a high 'Information Complexity' grading, because procedures like 'Signing up a Tenant' involve the exchange of a large amount of information.

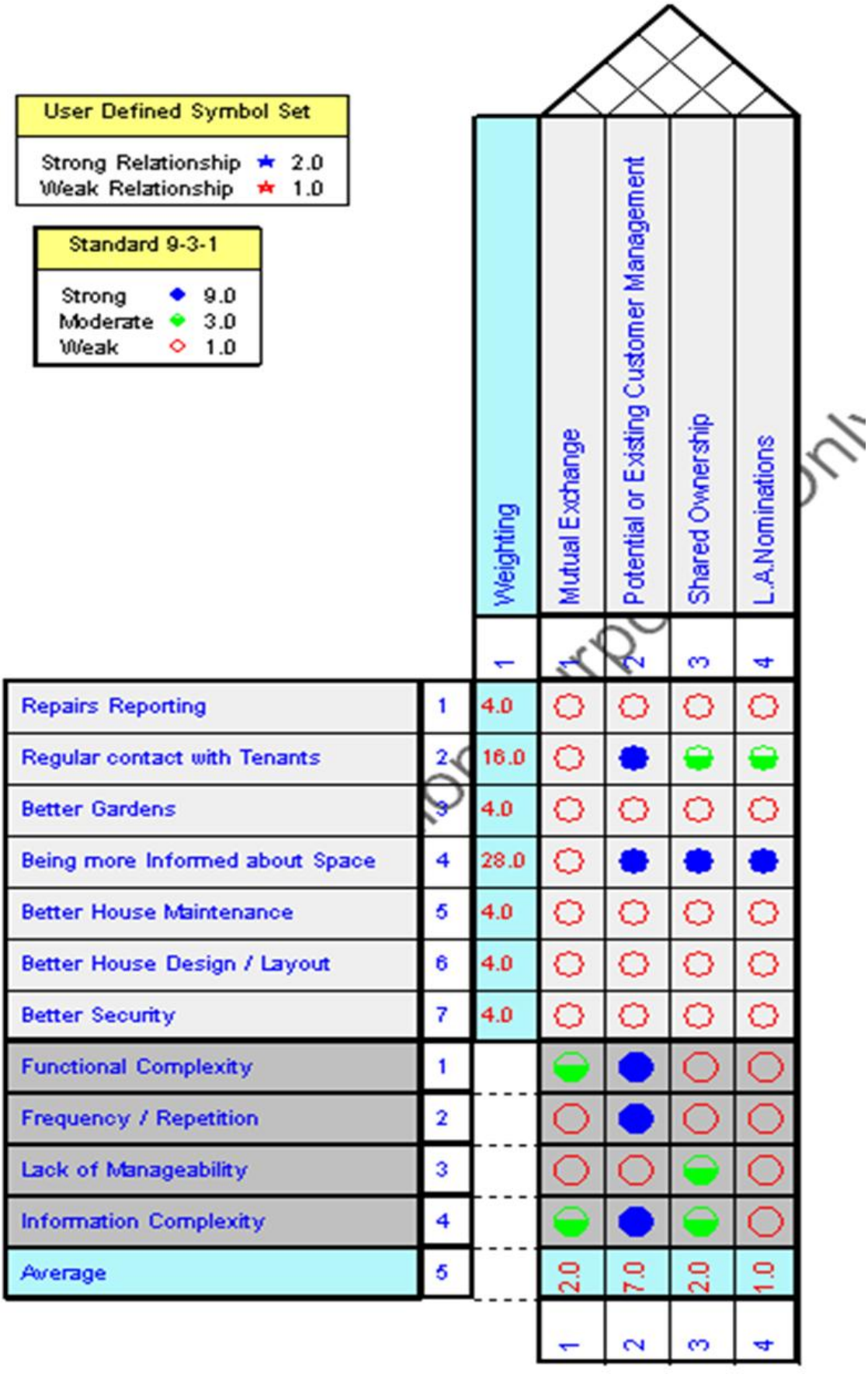

Figure 3: Meeting Customer Choice HoQ

Tenancy Management HOQ

The purpose of 'Tenancy Management' is "*to provide a range of tenancy services that support the needs of both our customers and our business*". This process includes all sub-processes and procedures required to manage the company's customers, offering them services of high quality and aiming at achieving their satisfaction. Six major sub-processes are involved in this process, which are summarised in Table 3.

Sub-processes	Inputs	Outputs
General Tenancy Management Services & Management Agreements	- The tenant files from the 'Meeting Customer Choice' process.	- The decision related to whether the company can provide the particular service the customer wants.
Rent Collection	- The starting point for the Rent Collection functions	- Responsibility for the monitoring function.
Dealing with Anti-social behaviour	- The input is related to the decision point of 'whether the breach is a rent arrear'.	
Tenant Participation	- The decision point of 'Whether the service can be provided by Space'.	
Estate Management Services	- Any request or complaint becomes an input	- The request for invoicing the contractor responsible for the estate service.

Table 3: Tenancy Management: Inputs – Outputs

The 'Tenancy Management' process is rather large and complex because it includes all the tenancy related services the HA offers to its customers. In the Tenancy Management HOQ, presented below (Figure 4), the three sub-processes, which constitute the Rent Collection function, are considered concurrently.

- Primary Matrix: although the Pareto Rule would be applied in the analysis of the matrixes, the 'Tenancy Management' process is big and complex that problem and probable

improvement areas are more frequently identified; consequently, all the customer requirements will be analysed.

- Repairs Reporting: The 'Repairs Reporting' Customer Requirement has received an average grade of 11 because two sub-processes: 'General Tenancy Management Services and Management Agreements' and 'Tenant Participation' involve close contact between the tenants and the company.
- Regular Contact with Tenants: Concerning the 'General Tenancy Management Services & Management Agreements' and 'Dealing with Anti-social Behaviour' sub-processes and the 'Rent Collection' function, the particular customer requirement has a moderate correlation grading. This is because the regular contact and information exchange demanded by the sub-processes involved offers the capability and potential of improving contact with the tenants.
- Better Gardens: This particular requirement has strong correlation with only one sub-process in all three processes. The 'Estate Management Services' sub-process is solely responsible for gardening, according to the 'Estate Management Services Policy'.
- Being More Informed about HA: For this customer requirement the only sub-process that has a strong correlation grade is 'Tenant Participation'.
- Better House Maintenance & Better House Design/Layout: Both the above customer requirements have a moderate correlation with the 'General Tenancy Management Services and Management Agreements' and the 'Estate Management Services' sub-processes.

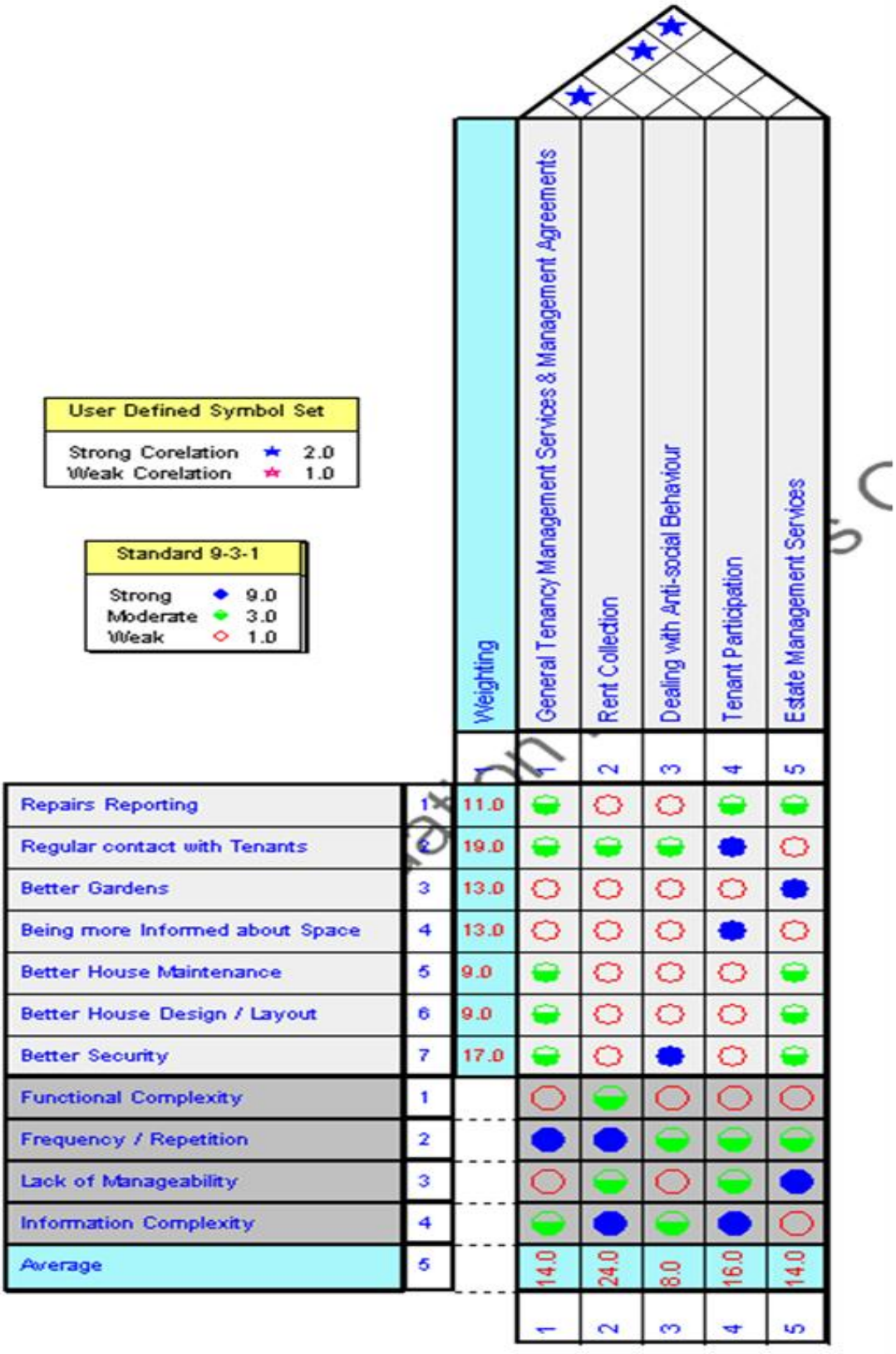

Figure 4: The Tenancy Management HOQ

- Secondary Matrix: it becomes evident that all the sub-processes and functions of the 'Tenancy Management' process can and should be improved. This statement is further supported by the fact that the 'average' parameter grading ranged from 8 up to 24, which is the highest grading from all the three processes.
  - General Tenancy Management Services and Management Agreements: This sub-process is the portal into all 'Tenancy Management' functions and sub-processes. Consequently it is expected to have a very strong correlation with the Frequency / Repetition parameter making it a highly Elastic sub-process. This fact alone means that the 'General Tenancy Management Services and Management Agreements' sub-process must be closely monitored and evaluated.
  - Rent Collection: The 'Rent Collection' function has the greatest average grading form all functions and sub-processes. The three sub-processes that constitute the 'Rent Collection' function are responsible for generating profit for the company. Even though this function is not strongly related to any of the stated customer requirements, it could be useful to make some observations for the benefit of the company.
  - Dealing with Anti-social Behaviour: The only observation that can be made for this sub-process is that it is repeated quite frequently and that it involves managing a fair amount of information.
  - Tenant Participation: This particular sub-process has a moderate correlation with the 'Frequency / Repetition' parameter, which means its performance is somewhat Elastic. Strong correlation grade exists between the sub-process and the 'Information Complexity' parameter. This is because there is a multitude of ways of gathering information related to customers.
  - Estate Management Services: This final 'Tenancy Management' sub-process has very strong correlation grade with the 'Lack of Manageability' parameter. As it can be seen in

the ‘Monitoring’ procedure analysis, contractors must be managed more effectively in order to maintain higher performance levels.

Key learning from the research

The primary deductions that were reached for the project were:

- Even though QFD is a Quality Tool introduced by and for manufacturing industry, and used for product design and development, it can be transformed to fit other, service based applications.
- The QFD model designed can compare customer requirements with processes/sub-processes and determine the level of correlation.
- The model can be modified to use any process/sub-process, include both external and internal customer requirements or use more detailed process parameters.
- Compared to other process reviewing and problem identification techniques, such as Failure Mode and Effect Analysis, Process Audits etc, the QFD model is more effective due to its highly visual, graphical nature and the fact that it is perceived to be easier to manage and control.
- The company has benefited from the use of the QFD model, because, areas for improvements were identified that had remained hidden even after a full year of desktop process reviews and two external consultants auditing the company.

Summary and conclusions

In attempting to address the research question, a detailed literature review was conducted to fully understand the complexities and particularities of QFD. Then a QFD model was designed correlating the customer requirements with processes/sub-processes; and the processes/sub-processes with specific parameters that determine their performance. Finally, the model was tested using the company’s three core processes, as they were designed in the Process Management

System, and the stated external customer requirements. The recommendations for the company were structured according to the requirements of the customers. Areas for improvement were identified, as follow:

- Repairs Reporting: make the 'Repairs, Environmental Works, Aids & Adaptation Procedure' simpler and more manageable. Reduce the complexity, assign responsibility to specific persons/job roles and introduce better information management techniques (computer system, logging system etc).
- Regular Contact with Tenants: can be improved by increasing the frequency of tenant participation venues and my assigning specific responsibility to a number of employees, such as Housing Officers, in engaging into more contact with the tenants.
- Better Gardens: introduce partnering management techniques. HA can introduce auditing and consulting activities to its partners in order to help them raise their standard and improve customer satisfaction.
- Being More Informed About the HA: sub processes can be modified to improve the flow of information between tenants and the company. E.g. the 'Signing up a Tenant' procedure can become simpler and more focused in offering the tenant the most important information about HA (i.e. Customer Charter, Complaints Procedure etc.).
- Better House Maintenance: these procedures must be made simpler and better monitored. The 'Void Property Inspection Procedure' must become more manageable. Accountability must be sought as to who is responsible for handing in the keys. Warning mechanisms must be sought after in order to identify Voids faster.
- Better Security: If the particular sub-process can be expanded to take care of security issues, perhaps through closer cooperation with the police, then one could expect an increase in Customer Satisfaction.

This paper potentially contributes to both the academic literature and practice. Although the QFD application was at a pilot stage, it demonstrated that QFD can be used as a systematic method to direct the company on how best the performance and customers' satisfaction can be enhanced. In addition, the paper has made a contribution to literature related to improved service process. It has

shown that tools and techniques utilised in manufacturing can be applied to facilitate the management of service production, to potentially gain a competitive advantage.

After completing the project it became apparent that there are some areas of ambiguity that demand further research. In particular, the development of a QFD model being used for process reviews it was necessary to identify certain parameters or process characteristics that would enable the researcher and the company to evaluate the three core processes. The four parameters used were adequate in identifying generalist areas for improvement. However, it would be beneficial for any company to establish a set of more detailed process characteristics that can be used to evaluate processes and sub-processes in more detail. Although in the QFD model developed only the external customer requirements were taken into account, it is believed that the 'voice of the user' must be considered in order for the processes of a Process Management System to be improved.

Further research is required to involve and identify both internal and external customer requirements for developing the model; the results would probably be more impressive. The QFD methodology suggests the use of four levels of matrixes, from product realisation to process control. This QFD application has only utilised one level to identify Improvement Areas. Further research could be made to determine how QFD could be used to translate and manage these improvement areas into improvement projects and then into individual targets. Finally, the scope of the project involved only the three core processes of the HA. A full scale QFD implementation could be more useful in defining interrelations between processes and procedures and how they affect customer requirements.

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