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Research Article

EVALUATION PRODUCT DEVELOPMENT, PRODUCT DESIGN FOR THE FURNITURE-WOOD INDUSTRY VIA QUALITY FUNCTION DEPLOYMENT AND PARETO ANALYSIS

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ABSTRACT

Product design and development are often discussed by industry experts from a strategic perspective. A common view among these experts is that product development is necessary, and companies are advised to focus their efforts on this process. In this study, product development processes of companies in the furniture industry were examined. The literature and concepts of product development, user friendly design, the state of innovation research in the furniture-wood industry, implementation of these concepts in the system, and marketing strategy for the industry are presented in order to support the objectives of this study. One purpose of this research is also to define the fundamental concepts and properties of the range of activities leading to products that are new to the firm. These activities include the product development process and its key success factors, which are not necessarily new to the market perception, to present the literature of the resource-based view of the firm and the organizational capabilities approach and to discover the principles toward the framework for the furniture wood industry. This study shares common ground with several of the above-described perspectives. This study aims to further the knowledge about product development in the furniture wood industry and to provide insight that can help management make their product development process more effective. According to this objective, the research aimed to demonstrate a general overview and assessment of product design development in terms of quality management and furniture products via Quality Function Deployment (QFD) and Pareto Analysis (PA) respectively.
Keywords: Wood-furniture industry, Pareto Analysis (PA), product development, product design, Quality Function Deployment (QFD).

1. INTRODUCTION

Resource limitations, production process uncertainty, the vulnerabilities of the wood material, and systemic limitations of supply chains to certain market segments are identified by product Development managers in the qualitative study as obstacles to product development. In the qualitative study, resource limitations, production process uncertainty, vulnerabilities of the wood material, and systemic limitations of supply chains to certain market segments were identified by product development managers as obstacles to product development. Research on forest product development were classified according to the specific fields of interest: (1) organizational

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innovation (what are the determinants of organizational innovation?), (2) development of innovative goods (how can a good new product be made better?), (3) and innovation structures (what is the right way to promote innovation in the composition and engagement of actors and institutions?). The numerous product, process and business processes advancement categories have been recognized by previous studies on advancement in the forest products industry. Researchers have given the highest importance to process creativity of these styles. For instance, the outsourcing techniques of the joinery and furniture sector have caused a demand for personalized blanks. Sector and consumer trends have contributed to process technology requirements [1], [2].

Initial public offering increases productivity by increasing the shelf life of a company and enabling cost savings for production and manufacture. Faster product production contributes to better efficiency according with the cite models built by consultant firms and other recent scientific studies [3], [4].

The increasing intensity encountered in the forest industry is rising as the availability of timber tightens and the global market sharps. However, a 'fresh' trend in innovative and environmentally sustainable building and refurbishment practices carries with it a tremendous possibility for the sector to expand its market shares by increasing value [5]. Throughout the value chain of the building industry, the players have traditionally tried to optimize their own profit, without recognizing the impact of the value chain as a whole on the productivity [6]. Previously, however, the emphasis on teamwork and the maximization of overall interest has been expanded. The concept is that new building practices and lean development strategies (e.g., modular architecture, off-site system manufacturing, and just-in-time delivery) would improve the productivity of all the value chain actors. Wood-based building technologies have numerous benefits in the manufacturing of off-site parts (e.g., light weight, which enables the transport of prefabricated modules) and are energy-efficient in both development and service [7], [8].

The latest developments in the retail market have included a broad variety of goods, dynamic pricing, product quality and user-friendliness. As a result, manufacturers of wood components are confronted with requests for vast quantities and a broad variety of ready-to-use items in packaging options tailored for the market. We are also expected to comply specifically with just-in-time delivery to retailers and fulfilment centers [9]. Industries also shifted downstream in the furniture and joinery industry, contracting their wood processing operations and focussing on manufacturing, developing and selling device solutions. The resultant demands on the manufacturers of wood goods provide just-in-time production of specific blanks and parts, as well as technological and marketing assistance [10]. Ultimately, cost limitations, manufacturing method complexities, wood content vulnerabilities, and supply chains logistical deficiencies to certain consumer segments were described as obstacles to product growth by research and development representatives in the qualitative report.

2. DEVELOPMENTS IN THE FOREST PRODUCTS INDUSTRY - MARKETING STRATEGY

Marketing has highlighted the value of customers' position as collaborators in manufacturing processes. Customers are not a silent group and operating together more effectively in building meaning and meeting their specific desires is a ladder which often increases mutual happiness [11], [12]. The opinions of management on product creation, as stated in the literature, revealed that product production in their businesses are carried out intentionally in a more unstructured, trial-and-error manner than suggested in the literature [13]. Managers' views often offer proof of a personal association between creativity in the company, method and business model. This is compatible with some research [14] but in contrast with an earlier forest industry innovation analysis (Hovgaard and Hansen, 2004) [1], which defines such kinds of innovation as more or less distinct methods. Great consumer products do not market directly, so they do not release classify

themselves like an afterthought to be dealt with late in the process. A well organized human and correctly guided deployment is a finely balanced product marketing strategy, conducted with excellence. The delivery needs to be right resourced both in terms of individuals and funds [15], [16], [17]. Market costs of forest goods indicate a declining pattern, as demonstrated, for instance, by the actual value of sawn wood shipped from Finland, which plummeted 15 per cent from 1997 to 2004 [18]. Although, the belief in forest as an environmentally friendly resource has never been higher [19], [20]. According to Hansen et al. (2014) [2], forest strategic marketing work can be classified according to the key fields of interest: corporate creativity (what are the characteristics of innovation capability throughout companies?); new product creation (how could a competitive new product be better formed?); and process innovations (what is the structure of, and connection with, a new design?). Original forest product market innovation work has identified the different commodity, method and company advancement types of structures [1]. Scientists have paid the most systems to perform creativity of such styles [2]. Sirmon et al. (2007) [21] offer a paradigm explaining the mechanism through which organizations successfully build and optimize their capital and capacity resources by resources development. The model of this study demonstrates the mechanism by which resources are pooled and incorporated into capacity development, and explains how additional capabilities and capacities are created or gained, partially as a function of business sector impact.

Garcia and Calantone (2002) [22] define the scale of creativity as the degree of product innovativeness for product inventions. They say that product innovation is a measurement of the possible misalignment that a product (method or service) in the marketing and/or technical cycle may produce. From a macro viewpoint, innovativeness is the potential of a technological product to establish a paradigm change within an industry's science and technology and/or business structure. Innovativeness is the potential of a new product to impact the current marketing strategies, technical capital, expertise, experience, strengths, or policy of the business from a micro viewpoint. Another (common and commonly agreed definition of product innovation according to Trott, 2005 [23]) is that proposed by Booz and Hamilton (1982) [24]: 'New-to-the-world goods' establish a different demand and typically require a major technical change. The classification 'New Product Lines to the Business' encompasses goods new to the Business that enable the Company to join for the first time in existing markets. Additions to current product lines involve items of the same sort as established goods of the business but with one or more substantial variations. The changes and modifications of current products segment involve improvements in the efficiency or functionality of established products, which comprise the bulk of all new product development. Drucker (2002) [25] argued that innovation factors are contained in operational demands, business and consumer developments, emerging technology, unintended progress or loss, incongruities, population trends and paradigm adjustments. Throughout the Scandinavian forest industry several of those drivers are noticeable. Improvements in technology and business have contributed to new procedure demands, e.g. the restructuring practices of the joinery and furniture sector have created demand for design blanks. Changes in legislation and attitudes surrounding forest in multi-storey structures have contributed to growing interest in forest as a material for construction, therefore generating a need for wood-based device solutions for the construction sector [6].

Manufacturing process is also restricted, although in developed economies, trading is confined to manufacturers and customers. There are few vendors and the segment’s main performance drivers are product growth, and building a reputable reputation of a trustworthy solution. Inventory control (e.g., at builders merchants) is an example of a complementary business on the path to maturity during the late growth process. Incrementally, a phase of supply problem is substituted by consumer expansion. The consistency of the company model increases and standardizes around those mainstream consumer structures have come a long way. Pressing costs is essential to product growth.

Industry analysts also address product creation from a technical viewpoint. A popular opinion is that new creation is required, so it is prudent that businesses concentrate their energies on it. There is also often guidance about what kinds of goods can be produced. Nevertheless, no matter what kind of growth initiative, conventional approaches, hierarchical processes and systems are obstacles to such progress in the forest industry [6]. Studies on creativity in the forest industry based largely on process improvement [2], and academics provided minimal guidance about how to successfully handle product production and resolve certain obstacles.

The key research issue is: What is the structure and engagement of actors and organizations that best promotes innovation? Studies into innovation processes are also the result of guidance about how to implement sectoral, national or global (innovation) policies. The Forest Development studies, a joint attempt to identify and incorporate the R&D (Research and Development) strategy for the forest business focused on by European forest owners' organizations (CEPF), the forest industry (CEIBois), and the paper industry (CEPI), are modern illustration of industrial collaboration that departs from the viewpoint of sectoral production schemes [26].

3. THE WOOD-FURNITURE OF TURKEY

In Turkey, furniture is manufactured both in factories and in industrial-scale production units. Furniture production among a large number of small workshops is extremely decentralized. In manufacturing hand crafted and handmade furniture, these tiny workshops play a significant role. Workshops are versatile institutions in design that have ample resources that labor force to extend their manufacturing line and produce massive orders. By using advanced mass-production processes, large-scale wood furniture companies manufacture regular versions. Furniture-wood production in Turkey is concentrated primarily in Istanbul, Ankara, Bursa, Kayseri, Izmir and Adana. The most significant furniture production divisions are the center of Istanbul and Bolu-Düzce area, which is popular for its production of wood products. The wood industry is expanding rapidly in Bursa-İnegöl region, the third most important region of furniture production, which is accompanied by forest areas. The wood furniture industry in İnegöl region is limited but has tremendous potential to develop itself. Another significant furniture sector is Kayseri, which has a large manufacturing capacity for sofa beds, sofa beds and seven of Turkey's twenty-two largest producers' products [27], [28].

The wood industry is expanding rapidly in the Bursa-İnegöl zone, the third most important area of furniture production, which is surrounded by forest areas. The furniture industry in İnegöl area is limited but has tremendous potential to develop itself. Another significant furniture sector is Kayseri, which has a large manufacturing capacity for sofa beds, sofa beds and seven of Turkey's twenty-two largest producers. It also has furniture production districts named "Karabağlar and Kısıkköy" which supply furniture to the Aegean Region. As with so many consumer goods, furniture production is susceptible to change in design. Since the production of wood furniture is an important aspect of marketing, Turkish manufacturers are actively pursuing customer trends in international markets and are developing new designs and creating model modifications and enhancements. Turkish furniture makers and exporters are mindful that industry dynamics and customer behaviour play an important role in the production and design of new products [27], [28].

4. MATERIALS AND METHODS

4.1. Quality Function Deployment

Quality Function Deployment (QFD) is a recognized strategy that works successfully in the manufacture and operation of high quality [29], [30].

Lam and Dai (2015) [31] also claimed that QFD is well recognized for being a system that offers customers' expression in a comfortable way. QFD is regarded as an influencing device for companies to identify their customer requests, expand market share and enhance customer satisfaction strategies [32]. According to Khorshidi et al. (2016) [33], QFD will help the creation of an important factor for the performance of product or service.

QFD is a methodology used in more effective product creation and Consistency Feature delivery improving consistency in many ways [34]. The QFD approach identifies customer requirements in detailed, complex companies and helps them to resolve severe market strategies. QFD is a tailored quality control system which aimed at increasing consumer loyalty [35]. Vinodh and Chintha (2011) [36] stressed the point that QFD is not used to fix the issues, but is rather helpful in determining what needs to be done to improve consumer penetration. The QFD aims at helping the company to identify the customer; to meet with and prioritize client needs; to integrate demand for quality maximization; to prepare a holistic management system for user satisfaction; and to develop products/services approaches and practices that offer the greatest strategic advantage [37]. A variety of QFD productive ventures in the private corporations, including the business system such as instruction [38], [39], difficult archives and database systems [40] , public sector [41], e-banking [42]. QFD is a frequently used, cross - organizational group systemic construction analyzed to determine and analyze significant issues related to customer satisfaction delivery, operational activities, policy and procedures [42]. QFD is a foundational solution to the development or enhancement of good quality and durable goods and facilities, property, qualities and accountability.

Deployment method for consistency feature: Quality Function Deployment (QFD) is a visual connective process that provides communities with the complete development programme focused on requirements of customers. It offers the means to provide consumers with realistic technological specifications at any step of a development cycle of customer/operation development. The usage of QFD can be checked well to minimize the development period by 50% and development costs by 30% [43], [44].

Four steps of the activity of the QFD:

(i) The planning of products: quality house.
(ii) Product architecture and construction: emerging materials.
(iii) Preparing of the procedure.
(iv) Operating monitoring (illustrations of quality management).

A graph-matrix displays every phase of the QFD system cycle. QFD map is a graph that determines the "whats", the "hows", the interactions between "whats (consumer requirements)" and the parameters to determine which of the "HOWs (technical characteristics)" would reach the highest and most significant customer loyalty [44], [45], [46].

As can be shown in figure 1, the house of quality (HoQ) comprises six steps:

1- Identify consumer specifications (WHATs) and decide certain weights for the left-hand wall of the house;

2- Link the quality of the company or the delivery of service to the right-hand wall;

3- Convert the client requirements into features and service design criteria (HOWs) just below the roof;

4- Decide the relation-core between WHATs and HOWs in the simple deployment matrix or in the modelling process decided to name;

5- Determine the relationship between the various attributes of the material and service architecture for the roof matrix and

6- Plan and develop the target utility conditions for the house's bottom floor, which are of utmost significance to each product / service design's structures and specifications.

The QFD illustrations supply the community of goals on topics that are of utmost interest to the customer and how they should be theoretically achieved.

To sum up, through benchmarking of technological, conceptual and consumer, the rating of the opponent's products and services may be performed. The QFD model is a multi - function system that can be extended throughout the whole partnership. This is an approach for engineering to restart clear, fundamental data in a functional form-document. This defines the customer's personality and general major shareholders for the context of selling and utilizes it to recognize and exploit potential possibilities [40], [43].

4.2. Data and Methodology

In this part of the study, Quality Function Deployment (QFD) was implemented in this component of the analysis to obtain assessment of product design in terms of management, creativity, product-making quality control with the consumer and market-business expectation for the furniture industry. QFD was evaluated in the wood- furniture industry of Turkey. In this application, customer requirements, customer significance level and technical characteristics were determined and scored with the experts and employee of all production industrial sectors (TUSIAD-Turkish Industrialists and Business People Association). Besides, a questionnaire was prepared for learning the opinions, perspectives of customers about the sustainability of the lifecycle (design) of wood-furniture products. This step of the study was very important to gather data and also to assist in the implementation of the research.

The research was focused on a quantitative perception by means of a questionnaire-based survey determining the evaluation of the sustainability of the lifecycle (design) of or the furniture industry with companies-firms in Turkey currently enrolled in the program. This survey was e-mailed to approximately a total of 76 companies of Furniture production Industry in Turkey with the help of the Turkish Industrialists' and Businessmen's Association (TUSIAD) and Turkey Exporters Assembly (TIM). The results of this questionnaire were assessed on the framework of environment-oriented production such as green production. The sample size was 55, returning the survey from the textile companies in Turkey, with a 72% rate of response.

4.3. Quality Function Deployment Application

Customer requirements in the term of the lifecycle –furniture design of furniture products include some criteria. These are environmentally Eco-Friendly Design/Production-multi-storey construction (Green Production), Timely Delivery/Providing Service, Economic-User Friendly, fashion-Modular Design, Quality Production/drivers of product development, Long Life Production/Service (Customer Oriented).

The Technical characteristics include groupings identified according to the questionnaire on the environment which is focused on quality of product and sustainability of lifecycle of the textile product. These characteristics which were determined according to the survey questions and answers are shown in Table 1.

Some standards provide consumer expectations for quality-based products and customer loyalty, depending on the company's distribution structure. The technical features include quality control questionnaire defined, user-friendly interface based on product quality, efficiency, safety, reality and sustainability of incorporation of the enterprise’s development network. These features are seen in Table 1 and Table 2 and were calculated due to the questionnaire and responses to questions.

Table 1. Technical Characteristics-Requirements (TCs-TRs)

Criteria			
s1	Regular machine checks-wide range of ready-to-use products	s10	Onsite Quality Studies-Green Manufacturing (Zero Error, Seeing the poor quality)
s2	Control plan at specific frequency	s11	Identify important points competitive pricing, Durable products
s3	Solving Technical Problems Presentation of the product / service to the customer	s12	Machines, Hand Tools and Auxiliary Apparatus innovation over improvements of thread
s4	Workers should work carefully	s13	Cutting Workshop Standing Work hidden engine of economy
s5	Machine-Equipments Maintenance systematics	s14	Psychosocial Factors-consumer-adapted packaging solutions
s6	Production Performance Evaluation wide product range	s15	Ergonomics & Manual handling & Handling of loads the more advertisement-Modular Design, Unique Design
s7	Technical Competences, Product Satisfaction	s16	Measures for chemicals-weaknesses of the wood material
s8	Brand, Fashion Trends	s17	Emergency Procedures-elimination structural shortcomings of supply chains
s9	Kaizen work (Improvements, Teamwork)	s18	Providing the necessary training and information

Table 2. Quality Function Deployment Table –Matrix for Furniture Industry

Customer Requirements (What)	Importance of customer**/ Technical characteristics (How)	Technical Criteria of Wood-Furniture Production																		General Total
		s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16	s17	s18	
Eco-Friendly Design / Production-multi-storey construction , Green production	4	3	9	3	9	9	3	9	0	0	9	3	9	9	3	9	3	3	3	
Timely Delivery / Providing Service	4	3	9	9	9	9	1	9	3	3	0	9	9	9	9	9	9	9	9	
Economic-User Friendly, Modular Design,Fashion Design	4	3	3	3	3	9	3	3	1	1	1	9	9	9	9	9	3	9	9	
Quality Production / drivers of product development	5	1	0	3	9	9	3	0	0	0	1	1	9	9	9	3	3	9	9	
Long Life Production / Service (Customer Oriented)	5	3	0	3	9	9	9	9	9	9	3	3	9	9	9	9	9	9	9	
Absolute Net Weight (AW)		56	84	90	174	198	88	129	61	61	60	104	198	198	174	168	120	174	174	2311
Customer Requirement Net Weight (CNW)		2,42	3,63	3,89	7,53	8,57	3,81	5,58	2,64	2,64	2,60	4,50	8,57	8,57	7,53	7,27	5,19	7,53	7,53	100,00
Rank		18	14	12	4	1	13	9	15	15	17	11	1	1	4	8	10	4	4	18

Note : Strenght of relationships (Yılmaz, 2009): Importance of customer **1-5 (1-Not important;2-Less important;3-not decide;4- important;5-Very important), Technical characteristics* (0-Not correlated;9-Very strong correlate;3-Middle correlate;1-Weak correlate)

For evaluated product categories from the furniture-wood industry, the QFD team focuses on the relationship (improvement ratio) between customer needs compares favourably to technical product specifications. The aim of this study is to decide how values variations of some quality characteristics influence the values of the other parameters for sustainability (Hows). Such research has a significant impact on the consistency and environmentally sustainable qualities of car components in the creation of the latest equipment, since the influence of intervention

feedback on all business is shown. The outcome of this evaluation is reported in the matrix of correlations. The effects of the appraisal are reported in the framework of associations the make up the standard house without the roof. The QFD implementation analyzes the degree of satisfaction of customers with the quality attributes of customer demands (whats), associated with customer specifications, for analysed furniture sectors ' products with technical specifications of all furniture products. Importance weights (IW) – consumer requires degrees vary from 1 to 5 (5 – very important, 1 – not important), and the degree of connection intensity between consumer demands and technological demands of the applications are vary from 0 to 9 (9 – really strong correlation, 0 – not correlated).

For the first column, the metric and calculation knowledge are only clarified in respect to the requirement for consistency functions in the automotive industry, as seen below. Equations (1) and (2), similar to the similarity values of the QFD Framework Table (Table 2), are used for the scoring and comparisons of the other columns.

The numerical values in relationship matrix structures are an essential and simple technique for the measurement of weights. Equation (1) is the absolute weight (AW) of the j th functional criterion.

Absolute weight (AW): the calculation of IW weight and IR ratios brings one total weight of the consumer wants. The easiest way to measure the weight of the functional criterion is to assign symbol numbers in the reference matrix (Equation 1).

The following equation (1) shows the total weight of the functional specifications characteristic:

In the following Equation (1) and (2) (47-Yılmaz, 2009; 48-Talebi, 2014; 44-Mukherjee, 2014) we can show the level of importance of the corresponding features:

$$AW_j = \sum_{i=1}^{n} IR_{ij} x\ IW_i \tag{1}$$

AW: Row absolute weight vector for degree of technical complexity of specific criteria-Absolute weight

Wherever;

IW: Importance Weight - importance weight of customer's requirement in respect with IRij
IR : Improvement Ratio - weight appointed to the relationship matrix, weight dedicated to the relationship matrix by row i and column j (i = 1,.2…,m m = 18 ; j = 1, 2, …..,n n = 5)
m = number of technical requirements
n = number of customer requirements.

Absolute importance weight (AW) is reported in the results matrix for each one of the specified quality features-criteria and higher absolute weight values represent the greater importance of the technical descriptor to represent VoC (Voice of Customer).

Consumer Need Weight (CNW-the relative importance): The AW value for each functional condition splits the total AW and then measures the percentage ratio to produce a weighted consumer required weight (Formula 2).

$$CNW_j = \frac{AW_j}{\sum AW_j} \text{ x } 100 \tag{2}$$

CNW in the first column = (The first total absolute weight in the first column/General Total of the Absolute weight) x 100

In addition, for each standard characteristic-criterion the relative weight (CNW) is determined in part as a share of the overall relative value of all property-criteria. From this knowledge, the QFD committee must decide which of the product characteristics-specifications would lead to greater consumer service in compliance with the requirements presented, and which will therefore

need growth. For the measurement of CNW, the scoring-weighting and estimates in the other columns have been carried out, continue only as above formula (2).

Table 3. The groups of the priority order for the Technical Requirements (Depending on the sorting (Rank) CNW -percentage value)

The priority number-importance (Rank)	CNW-percentage value	Technical Requirements
1 (1)	8,57	s5; s12; s13
2 (4)	7,53	s4; s14; s17;s18
3 (8)	7,27	s15
4 (9)	5,58	s7
5 (10)	5,19	s16
6 (11)	4,5	s11
7 (12)	3,89	s3
8 (13)	3,81	s6
9 (14)	3,63	s2
10 (16)	2,64	s8;s9
11 (17)	2,6	s10
12 (18)	2,42	s1

The CNW-percentage values (Table 3) are the values found by calculating in Table 2. These values (CNW) are listed in Table 3 from high to low value in the application of quality function distribution in terms of meeting the occupational health and work safety and customer needs of the firm operating in the textile industry. With this ranking, suggestions were made for the technical characteristic results of high value. First, three (s5; s12; s13) technical characteristics, which gave the weight of customer needs with a percentage of 8.57%, secondly, four (s4; s14; s17; s18) technical characteristics, which gave the weight of customer needs, third suggestions were made for the development and improvement of one (s15) technical characteristics (CNW-technical characteristics which are listed in Table 3), which give the customer requirement weight (CNW) with a percentage of 7.27% in the priority ranking. It continues as shown in the Table 3.

5. PARETO ANALYSIS APPLICATION

The Pareto analysis (PA) is adopted in a simple method to identify the root cause and/or problem solving; therefore the first component addresses the largest amount of issues. This is focused on the premise that as little as 20 percent of the problems will affect 80 percent of the issues.

Additionally, literature work shows that there is no doubt that the Technical Requirements (TCs-TRs) are the real modification of consumer needs and requests, however the actual TCs-TRs priority level. TRs are not appropriate, and can be further managed to improve. Regardless of the general trigger one TR may have precedence over the other TR. It can also be calculated that higher statistical importance of some TRs will do a stronger role than all the other TRs that might architect an implementation of the 80/20 theory of Pareto [49].

Absolute weight (AW) values may be grouped into a Pareto diagram from the quality function deployment matrix (Table 1) to demonstrate the functional aspects are most critical in the fulfilment of consumer requirements.

A major risk threshold metric has been defined as a Pareto (PA) measurement of 80%, with an emphasis upon risk factors that may arise in the development and adjustment of quality-oriented engineering work and which has the gradation due to the magnitude of the quality parameters and the estimation of the related relative metric percent [49].

It is one of these types of studies which involve team preparation and analysis. Of the value of activity research to a related commitment that encourages assessments against possible errors to achieve a high-risk standard measured at the middle of the Average Weight (AW) table.

A similar chart may be developed by categorizing the data range into categories (also known as categories, bins or classifications). The Pareto chart's left-hand vertical axis is labelled 'absolute weight' (AW-the number of numbers for

Every classification), the correct vertical axis of the pareto chart is the total AW number, and the horizontal axis of the pareto chart is labelled with the specific criteria section names. Data points are numbered. Evaluation by residing within each group and constructing a Pareto diagram but unlike a bar diagram, the Pareto diagram is arranged in descending frequency severity and customers describe the groups [50], [see Figure 1].

Table 4. The Cumulative Values of CNW of the Technical Requirements for Pareto Analysis

Technical Requirements	AW	Percent (%)	Cumulative percent
s13	198	8,57	8,57
s12	198	8,57	17,14
s5	198	8,57	25,70
s18	174	7,53	33,23
s17	174	7,53	40,76
s14	174	7,53	48,29
s4	174	7,53	55,82
s15	168	7,27	63,09
s7	129	5,58	68,67
s16	120	5,19	73,86
s11	104	4,50	78,36
s3	90	3,89	82,26
s6	88	3,81	86,07
s2	84	3,63	89,70
s10	61	2,64	92,34
s9	61	2,64	94,98
s8	60	2,60	97,58
s1	56	2,42	100,00

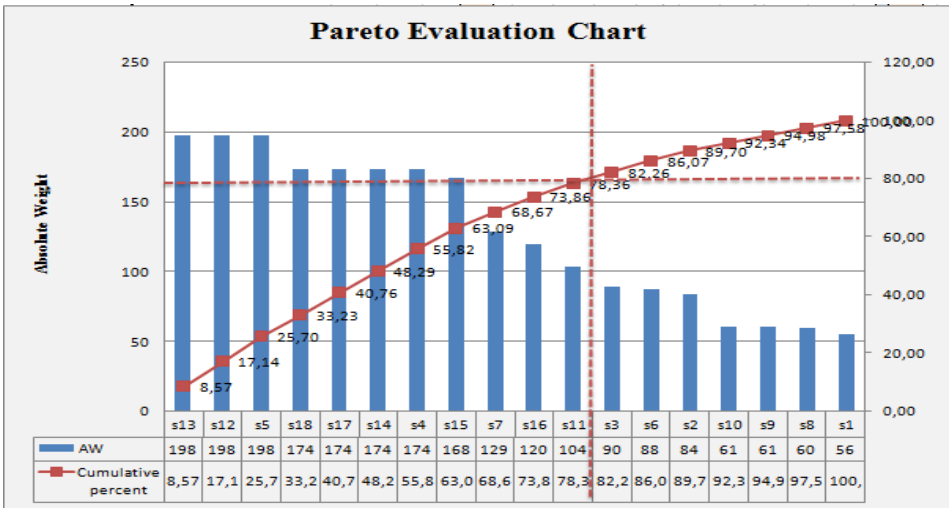

Figure 1. Pareto Analysis for the Prioritization of Technical Requirements

It is focused on the Pareto theory (also known as the 80/20 rule), which suggests that only a limited number of factors decide the bulk of the issues or outcomes of each case. The table 4 helps classify the vitally few participants who are accountable for most consistency problems. The chart is a kind of histogram that orders any data obtained by frequency of occurrence, and displays, for example, how many quality defects a specific category of defined cause has produced. A Pareto chart is used to display failures in the processing of beneficiary data for the initiative. The study defined eighteen items-categories of problems and calculated the amount of occurrence among the overall number of errors for each group. Figure 1 displays the corresponding map, where the bars reflect every failure type. The chart shows how 80% of errors could be reduced by improving data collection in 11 items-categories.

Correspondingly, in order to assess the value of technologies while developing, producing and refining the furniture products of the world furniture-wood industry in Turkey based on the significance of quality-oriented engineering studies, the TR for the longevity of the lifecycle of products following organized specifications is defined as an initial destination. PA findings lead to specific recommendations-solutions for systems and criteria that give rise to problems or issues with the proportion 80/20.

6. DISCUSSION AND CONCLUSIONS

According to the QFD, the resulting Pareto analysis (PA) review led to process guidelines, which identified difficulties or concerns with the 80/20 ratio. Pareto analysis theory advocates the determination of the top 20 percent of the causes that the needs to be addressed to resolve 80 percent of the challenges [49]; these methods are utilized with the most important forms of loss, in addition to address the original demand and customer service conditions. This challenge can be found in both industrial and utility industries. Failure Modes and Effect Analysis and Multi-Criteria Decision Making approaches can use together for this topic with every area of analysis that can be combined into the criteria of technology and the user.

It builds on the Pareto principle, which implies that only a small range of variables influence the majority of the problems or results of each event. Pareto chart is a form of histogram that points out any data collected by frequency of occurrence and shows, for example, how many quality defects a certain category of specified cause has produced. The Pareto diagram is used to

demonstrate deficiencies in the collection of the beneficiary data for the project. The research established 18 issues-categories of problems and estimated the amount of instances between the total numbers of defects within each category. Figure 1 shows the related map, where the bars represent each type of failure. The graph illustrates how 80 percent of errors could be minimized by optimizing the processing of data in 11 categories.

Accordingly the TR for the durability of the product lifecycle following structured requirements is identified as its initial objective to assess the value of innovations during the growth, production and refining of furniture products in the global furniture-wood industry in Turkey based on the importance of quality-oriented technology studies. The results of the PA lead to clear recommendations-solutions for processes and requirements that give rise to challenges or concerns with an 80/20 ratio.

7. CONCLUSIONS

Pareto Analysis (PA) and Quality Function Deployment (QFD) classification have been widely employed in the literature and such approaches are also used to identify the most significant-threatening faults, remove or mitigate the most important forms of failures. Those are control analytical methods that can be used to assess which form of truth required to be assisted for improved improvement according to the measured and defined attributes. It can be known as the House of Quality had the opportunity to demonstrate durability of the technical facets of furniture product lifecycle by customer service demands, quality assurance and setting the stage for further real-life changes. A working group of leaders would develop a business plan to improve and raise efficiency by focusing on the benefits and disadvantages demonstrated by the equation of contact between the services of the customer and the associated property.

In this situation, these two methods were merged and employed together to test different requirements, boost quality of customer service and voice of customer (Customer loyalty with VoC-Voice of Customer). QFD is a systematic method for creating a new commodity or promoting sustainability, allowing the company to assess whether client preferences are adequately converted into their needs. Accordingly, achieving or beating consumer standards means more than maintaining or increasing service performance. Producers that do this, that rely on creativity and imagination to stay competitive, and who fulfill the expectations of their customers, will be able to compete in the global business climate. The software helps with identifying and categorizing the requirements for quality assessments to determine the lifecycle and longevity of furniture items.

The findings of the PA and QFD lead to simple recommendations-solutions for procedures and criteria that give rise to 80/20 problems or concerns. In the event of consideration of some recommendations to strengthen these criteria for the outcomes of applicable methodologies, a part of the important recommendations in this scope of study is explained as below;

-All specifications for the various stages of the life cycle should be determined in the design process. Maintenance and cleaning are the most important things which can be subject to particular criteria.

-The company helps a product to gain notice, among other items, by advertising it as a distinct furniture product. This is the fundamental aspect that shows the consistency and longevity of a furniture piece.

If the buyers are pleased with the advertised product, these consumers are converted into loyal consumers of the brand. Depending on the marketing strategy, the company allows the customer to buy new goods. The life-cycle of the product increases as the quality-durability of the product increases.

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