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RQFD -An Effective Tool for Responsive Investigation on Ergonomic and Functionality Aspects in Product Development

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Abstract Product development is a crucial activity for a company's profitability, competitiveness, and prosperity. But Product development is a risky activity as very high percentage of new products fail to accomplish their objective economically. In contemporary industrial society, where distance between producers and users are burgeoning, a tool is imperative to evaluate the requirements of the customer. This work aims in accomplishing a model to determine the importance of product development process and their relationship with Ergonomic factors at the design stage and also to help organizations to evaluate their ergonomics at the workplace. Quality Function Deployment integration in Ergonomic is done in engineering workshop/mechanical labs. As an attempt, a new model Responsive Quality Function Deployment-RQFD for addressing immediate response for customer requirements is proposed. Responsive Quality Function Deployment is an effective design method to integrate ergonomics and functionality into workshop design as it explicitly focused towards increasing the effective product design, anthropometry, occupational health and safety awkward posture environment. RQFD examines the posture and muscles including the ergonomics aspects of the students in the mechanical/production labs in the engineering college.

***Index Terms*— Product development, Ergonomics evaluation, Responsive Quality Function Deployment, Voice of customer, College workshops.**

I. INTRODUCTION

Product development (PD) is a creative and multidisciplinary activity which transforms a market convenience and technological modernization into successful products. A PD process is the complete set of processes to bring a new perception to a state of market preparedness. It is a complicated business process of converting new ideas into bankable new products, processes or services. Its activities and steps involve more than engineering. It is charged with uncertainty and favorable circumstances, and it requires competent perception over applied science, time, and the market. Many of these steps and activities are creative and organizational than physical.

Quality Function Deployment (QFD) is a systematic method for defining customer needs or requirements and translating them to certain plans to produce products to satisfy those needs. This paper proposes a new QFD Model, *Responsive Quality Function Deployment-RQFD* for addressing immediate response for customer requirements. RQFD is responsive QFD which is proposed as a powerful quality improved design method to integrate ergonomics and functionality into workshop design as it decidedly abode the translation of customer requirements into engineering characteristics.

II. QUALITY FUNCTION DEPLOYMENT

Quality Function Deployment (QFD) was matured to bring the intimate blend to leading-edge manufacturing and business. QFD connects the needs of the customer (end user) with engineering, manufacturing, growth, service functions and design.

QFD is an inclusive quality system that orderly connects the needs of the customer with different business operations and organizational methods, like quality, manufacturing, production, design, sales, marketing, etc., lining up the complete company for accomplishing a desired common ambition.

There are fundamentally 7 steps for QFD. They are:

1. Record customer requirements (WHATs)
2. Record technical descriptors (HOWs)
3. Originate an association Matrix between WHATs and HOWs
4. Originate the interdependence matrix between HOWs
5. Competitive judgment
6. Originate preference customer requirements
7. Originate preference technical descriptors

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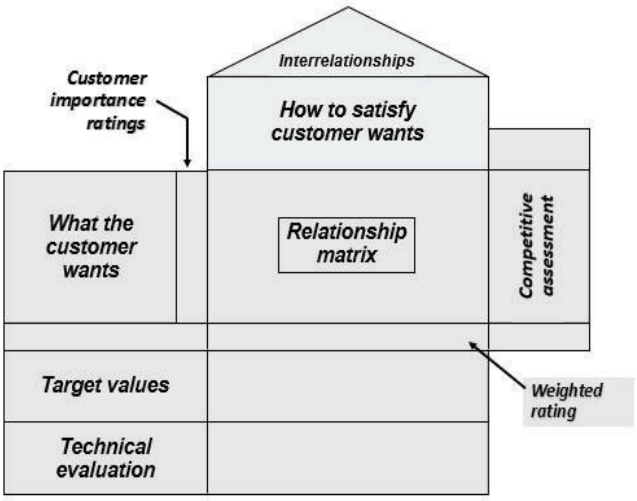

Fig. 1 House of Quality (HOQ)

III. RQFD MODEL

Two phases of activities were carried out before designing the RQFD model. First, literature reviewed and found that no activities had so far been reported on integrating QFD with Ergonomics and Functionality and vice versa. And during the second phase survey was conducted over 250 students in engineering colleges that had ergonomics issues in the lab. The survey results also indicated that ergonomics and functionality integration with QFD has to be done to practice. Thus RQFD model was designed. The conceptual features on RQFD is show in the figure 6. As shown, the performance of a student can be heard through the voice of customers. These Customer feedbacks are used to establish the house of quality. This process has to be accomplished by the RQFD team. The outputs from the house of quality, which are in the fashion of technical terminologies, are presented to the administration for the final strategic decisions. This step is considered vital as the researchers have entrenched the demand for implement a critical approach in both QFD and ergonomics projects key to their victory. Here, their application is concentrated against expanding the intuition product design, anthropometry, occupational health and safety, awkward posture, environment. The yields are obligatory to be echoed in the mode of quality improved conclusion, especially improved design, increased productivity, increased morale and enhanced goodwill. All the expressed merits of turnouts are used for establishing another HOQ and also correlating with determined purposes. At this mark, the adjacent cycle starts. The RQFD model carried out will be an incessant sustained development process. An idiosyncratic attribute of the RQFD model is not imperative to alter or disassemble the process of thriving the house of quality, ergonomics and functionality which may be hitherto in practice in the lab concerned.

RQFD model is for inscribing post-haste response of customer requirements. RQFD is a potent design method to integrate ergonomics and functionality. RQFD examines the posture and muscles including the ergonomics aspects of the students in the mechanical/production labs in the engineering college. Demanded Quality and Quality characteristics are obtained by personal interviews and questionnaire from 300 students of an engineering college. Relation matrix between demanded quality vs quality characteristics are shown in figures below: Fig. 2, 3, 4, 5, 7.

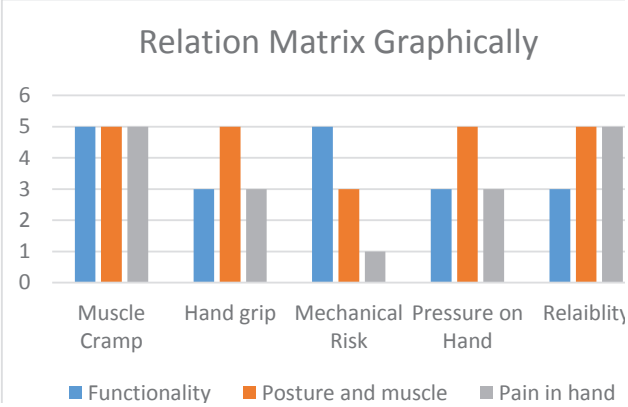

Fig. 2 Relation Matrix Graphically 1

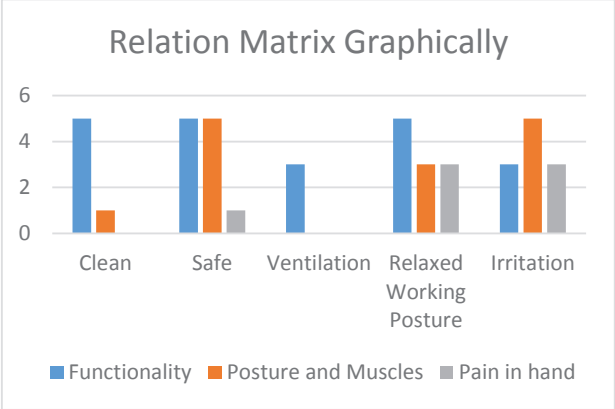

Fig. 3 Relation Matrix Graphically 2

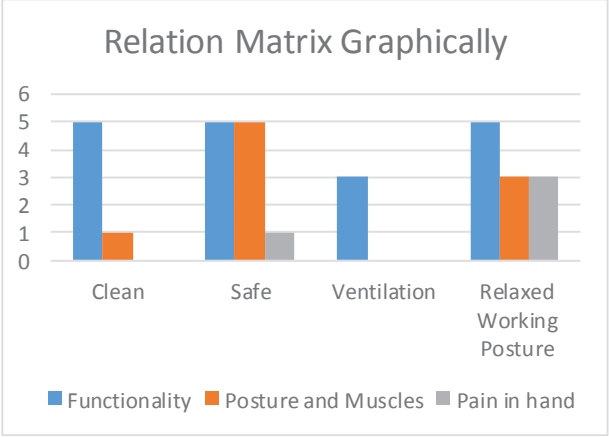

Fig. 4 Relation Matrix Graphically 3

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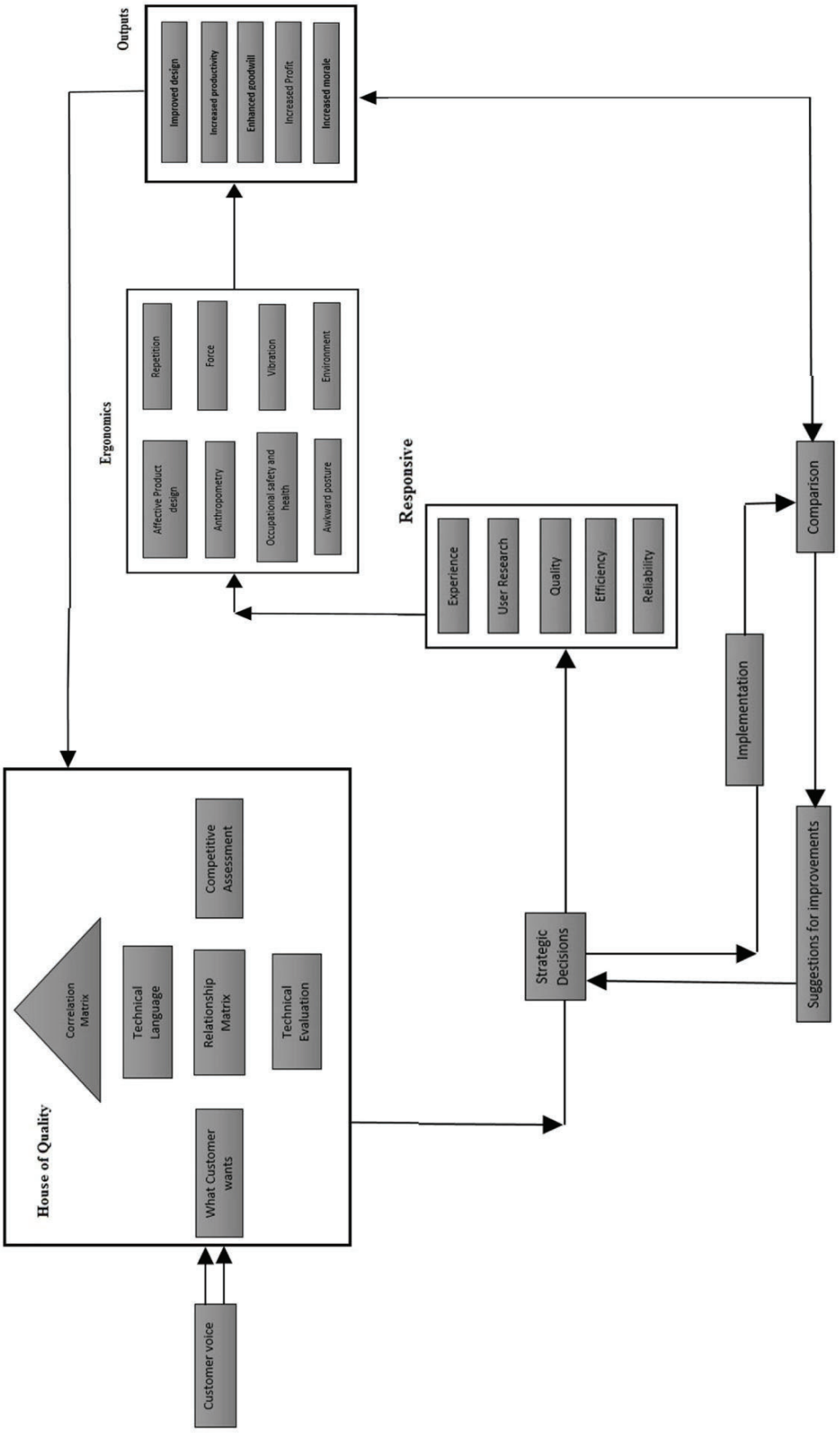

Fig 6 RQFD Model

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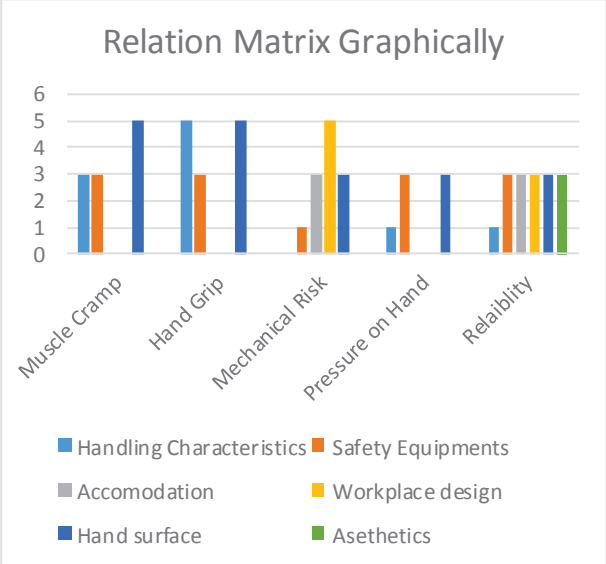

Fig. 5 Relation Matrix Graphically 4

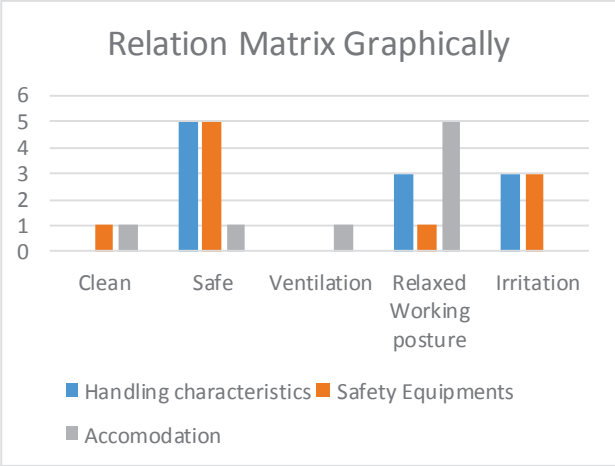

Fig. 7 Relation Matrix Graphically 5

IV. CONCLUSION AND SCOPE FOR FUTURE RESEARCH

According to the contemporaneous literature, QFD is used to feed customer assessment. Nevertheless, the condition is divergent in the ergonomics design field, where the customer opinion assumption is absent. Consequently a masterplan has to be embraced to get compensation across the integration of QFD and ergonomic design. Heretofore, no research has been consummated in this orientation. As an attempt to overthrow this glitch, this paper contributes an RQFD model. This model has been proposed by associating QFD's house of quality with ergonomic principles. To construct this model for pragmatic condition, we have integrated ergonomics with the functionality performance framework, namely productivity, sustainability, accuracy, security, compliance, within the RQFD model. In order to head-on the RQFD schedule in consonance with directorate objective and strategy, the allocation for creating the strategic decisions has been incorporated. While RQFD's practical credibility has further to be scrutinized, we have proposed a hypothetical case study, which adorn its enactment steps. We trust this model will be a functional vehicle for the organizations to attain successful product development by sustained quality improvement. The curb of this study is the nonappearance of an enactment study of RQFD in a real-time condition. Thus, we wish to implement RQFD in a number of companies and study its practical validity. Actual case studies on enactment RQFD in manufacturing fields with new product development will further offer extremely useful contributions. The authors believe the RQFD model impart a satisfactory reference model for succeeding researchers looking strategies for ameliorating ergonomics and functionality on an unending manner.

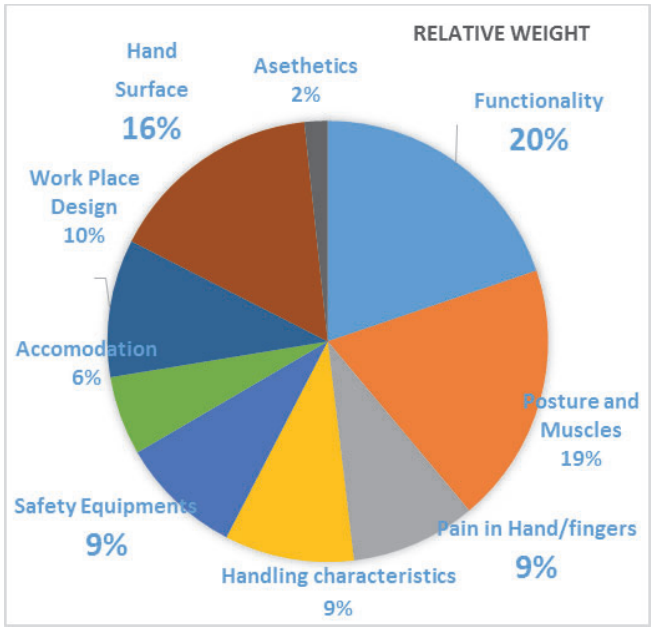

Fig. 8 Pie chart representation

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