# A strategic decision making tool for new product and service design

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## Abstract

**Purpose** – The present study aims to further research the theory of attractive quality for new offers by analyzing the HWWP (Health, Weapon, Wealth, Prospect) model and testing its uniformity. The purpose is to extend and refine the HWWP model based on meridian elasticity curves with the final scope of building a map for better understanding the potential value of the quality attributes in new product or strategic service design.

**Design/methodology/approach** – After a thorough analysis of the HWWP model for prepurchase value judgment, it has been observed that the classical form often presents a concentration of the quality attributes in its graphic representation, which limits managerial decision making. This paper presents a new methodology for testing the uniformity of the current HWWP model and a generalized approach for understanding the potential lifecycle of the new offer's features.

**Findings** – The results of the presented case study validate the novel tool's applicability and can serve as a reference for managers to adequately classify customer requirements as the first step toward strategic design.

**Originality/value** – The author's main contributions are: to have analyzed the current HWWP model and observed the limitations of this approach; to have proposed a statistical simple method used to test the uniformity of the HWWP model; to have developed a generalized new HWWP model that adequately explores each feature value and potential lifecycle base on meridian slices and elasticity orbits.

**Keywords** Kano model, HWWP model, Decision support criteria, Elasticity curves, Theory of attractive quality, Value added, Customer potential requirements, Customer satisfaction

**Paper type** Research paper

## 1. Introduction

In today's business environment, successful companies must differentiate their offer and provide a valuable and desired output. Quality is not enough anymore. According to Munford *et al.* (2012), a valuable, even innovative output starts with information gathering and organization. Frishammar (2003) argues that information is used in strategic decision making to reduce uncertainty. Due to the fact that new product development management issues are related to high uncertainty, high ambiguity, and risky characteristics (Yahaya and Abu-Bakar, 2007), managers need to use strategy tools to overcome these limitations (Hacklin and Wallnöfer, 2012).

The firm can use several methods to handle information and knowledge when proposing a new product or service development. As DeJong and Vermeulen (2003) concluded, new services do not just "happen" and many things can be done to enhance innovation success. A new offer's success is related to performing more product design activities that address critical and key activities (Owens, 2007).

Bilgili *et al.* (2011) argue that the starting point of product design resides in consumer requirements. The corporate offer must delight the customer first, to be successful. Smedlung (2008) also considers that the success of a new service relies heavily on client input, and a high-potential service is "co-produced" in a close relationship with the client. In this way, the

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# USING A REFINED ATTRACTIVE QUALITY MODEL FOR ASSESSING STUDENTS' REQUIREMENTS FOR A NEW UNIVERSITY ONLINE APPLICATION

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## Abstract

Given the increased access to and use of computers, internet, social media and mobile applications, the new generation of students require powerful information sharing tools and ease of collaboration. They socialize and spend a lot of time online, connected to their mobile devices. For delighting these new tech savvy customers, universities must rethink their way of delivering educational experiences. By using adequate technology, university services can become easily accessible and round-the-clock available. In the present study, after a focus group interview with students from different specializations, the requirements for a new university online application have been determined. In the design stage of a new service, we do not have prior performance criteria to rely on, and a thoroughly pre-use value judgement is necessary. Thus, this paper identifies the voice of the student based on the HWWP (Health, Weapon, Wealth and Prospect) model which helps us classify the relevant and valuable attributes we must embed in the new service. This classification represents a first step towards a qualitative (first time right) university-related service which thoroughly addresses the Millennial's needs.

Keywords: quality attributes, focus group, HWWP model, Kano model.

## 1 INTRODUCTION

The competitive environment in which we live in extends to universities and their educational offer. Bilgili and Unal [1] argue that in the light of these new conditions, universities must develop new quality strategies and a student-based service provision approach in which they determine student expectations and meet them adequately.

But what do students need and desire in terms of education? How can university services delight them and help them in their learning process? McMahon and Pospisil [2] describe today's students as digitally literate, always connected and reachable. Khaddage, Lattenman and Bray [3] state that students stay connected through social media and web 2.0 technologies due to the fact that they belong to the digital mobile world. The majority of students work besides university courses, thus Steel [4] considers that these busy students need to find ways to "fit" learning into their lives and mobile devices are obvious tools for this purpose.

The smartphone is one of the most dynamic trends in communication with a wide use in medicine ([5], [6]), business, information, communication and education ([7]). It outnumbers laptops and ownership is exceeding saturation ([8]). The popularity of these devices is on the rise due to the availability of easy-to-use mobile software applications ([9]). Thus, the availability, convenience and low cost of mobile applications (apps) are seen as a great opportunity for students to fit learning into their busy outside class ([4]).

Indeed, mobile apps have raised interests among educators because they facilitate teaching and learning ([10]). Students already use apps during their learning process for several reasons: the convenience of using them to gain time efficiency, accessibility due to the fact that they can be carried all the time, a wide range of learning tools usable on the go and many unique features ([4], [11]).

However, relevant and appropriate apps are not always available ([9]). We can find a multitude of apps for music, business and health but only a few mobile apps in the area of higher education ([12]). In this line of reasoning, Khaddage, Ferial and Lattenman [7] argue that it is crucial to develop unique approaches that can form the base of new apps for learning purposes in higher education. The same authors state that students complain that they can only use apps in an informal way outside their learning context because teachers and administrators are not formally implementing these apps. The reluctance of universities and educators to use these technologies for learning and teaching is due to the preconception that apps are only a distraction for students ([7]).

# The HWWP, a refined IVA-Kano model for designing new delightful products or services

Sabina Alina Potra, Monica Izvercian, Adrian Pavel Pugna and Jens Jörn Dahlgaard

**Journal Article**




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# Using Six Sigma Methodology to Improve the Assembly Process in an Automotive Company

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**Abstract**

The exigencies of the permanently evolving markets require continuous adaptation of company offers. The development and continuous improvement of the quality and environment management systems would be to anticipate these developments and therefore fully satisfy the needs and expectations of each partner (customers, staff and other stakeholders) and also maintain competitive advantage. One of the possibilities of gaining operational excellence is implementing different quality improvement initiatives like Total Quality Management, ISO certification, Agile & Lean manufacturing etc. Real life demonstrated that these initiatives are neither time efficient nor profitable in terms of quality. Therefore introducing and implementing the Six Sigma methodology was proven to provide breakthrough quality improvements in a reasonable short time. This paper presents a creative solution for improving an assembly process in an automotive company in Romania by using Statistical Thinking and DMAIC Six Sigma methodology.


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*Keywords:* Six Sigma; DMAIC; Xbar & R charts; AHP; Poka Yoke

## 1. Introduction

The desire to achieve business excellence in the Automotive Industry assumes the management commitment to develop and deliver perfect solutions, products or services, to promote the "Zero Defects" and first time right production philosophy, the integration of environmental protection in all its activities (design and production), as well as training, motivating and involving all staff in the effort towards excellence.

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# A Refined Quality Attribute Classification Model for New Product and Service Strategic Design

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**Abstract**

The Kano requirement model is based on the need to provide superior quality to clients. Thus, it classifies different product attributes based on their contribution to perceived quality. Nevertheless, in the case of new products or services their value is not perceived, but demanded by consumers. Therefore, literature presents the HWWP (Health, Weapon, Wealth, and Prospect) four quadrant model as an alternative for first time right design. The authors analyse the HWWP's value-added and customer importance principles and provide a refined model with a natural distribution of information and a strategic orientation. This refined perspective of customer needs evaluation is based on mathematical modelling and a thorough delimitation of quality attributes for managerial thinking by using elasticity curves from the economic domain in a previous case study. The present article aims to provide logical classification criteria for customer requirements as a first step towards strategic decision support in new product or service design. The refinement of the HWWP model deepens its position in the theory of attractive quality and transforms it in an innovative strategic tool for new product and service design.


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Keywords: Kano model; HWWP model; customer satisfaction coefficient;strategic decision support criteria; quality attributes.

## 1. Introduction

In the present extremely competitive business environment, successful companies must differentiate their offer and provide a valuable and desired output. Quality is not enough anymore. The starting point of product design resides in consumer requirements [1]. Thus, understanding customer demands determine the need to differentiate and manage them.

Consumers have certain intrinsic or extrinsic requirements but want also to be surprised by an offer. This situation has led to the development of the theory of attractive theory which tries to classify the different roles

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# DFSS in marketing: designing an innovative value co-creation campaign

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**Abstract:** Design for Six Sigma (DFSS) is considered an approach which generates positive quality especially for new products and services. A first time right design is a key success factor for business performance. This paper is an attempt to introduce DFSS efficiency to the marketing domain in a cross-disciplinary approach. Quality attributes influence customer engagement and adequately designed, they sustain value co-creation and innovation for business management sustainability in a global competitive marketplace. The paper discusses the real-life case when DFSS was implemented in designing a successful co-creation marketing campaign.

**Keywords:** Kano model; DFSS; design for Six Sigma; DMEDI methodology; innovation; QFD; quality function deployment; HoQ; house of quality; value co-creation; consumer engagement; crowdsourcing; quality attribute life cycle.

**Reference** to this paper should be made as follows: Potra, S. and Pugna, A. (2015) 'DFSS in marketing: designing an innovative value co-creation campaign', *Int. J. Six Sigma and Competitive Advantage*, Vol. 9, No. 1, pp.21–36.

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# Improving Dimensional Stability of Ag-doped $TiO_2$ Nanoparticles Through Experimental Design

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The efficiency and competitiveness of using nanomaterials can be increased through introducing scientific experimental designs. For obtaining experimental models which can better approximate the real technological systems, a sufficient number of control factors and of necessary experiment units should be taken into account, having in view their economical aspect, too. Considering the importance of Ag-doped $TiO_2$ nanoparticles in such domains as industry, environmental protection, health, etc., it is important for manufacturers to obtain nanoparticles of equal dimensions. The present paper is analyzing the ways of improving dimensional stability of Ag-doped $TiO_2$ nanoparticles produced by the microwave-hydrothermal (M-H) method. In one case, a two-level $L_8$ Taguchi design was used in 8 experiments, with seven control factors. In the other case, the Draper-Lin design of 40 experiments for 7 factors at two levels was utilized. It has been found out that the $L_8$ Taguchi experimental design offers the same results as the Draper-Lin experimental design, but with much fewer experiments.

*Keywords*: *$TiO_2$, Ag, doping, experimental design, Taguchi, draper-lin.*

**УДК** 666.3

## INTRODUCTION

Titanium dioxide ($TiO_2$) has been intensively used as a photocatalyst (see an overview and future prospects of $TiO_2$ photocatalysis in [9]). It also has many applications for environmental protection, such as atmospheric pollution control, sewerage treatment, etc. (See a review in [3]). Nowadays special interest is paid to elaboration of adequate techniques of synthesis, for instance, the microwave-hydrothermal (M-H) and fast hydrothermal [2], methods, to facilitate a strict control of nanoparticles dimensions. Compared with other antimicrobial agents, $TiO_2$ nanoparticles, used in microbiology and medicine, attracted much attention because of their adequate stability but also because they are environmentally benign, safe, cheap, nontoxical, bioactive, etc. Also $TiO_2$ has a great catalytic potential, serving as an active redox agent for water and air purification.

In order to be efficient, it is important that Ag-doped $TiO_2$ nanoparticles have certain features such as high purity and unitary chemical composition; besides, their dimensions must enroll in a uniform, narrow and controllable distribution, form and morphology.

In addition to obtaining nanocrystals by such methods as sol-gel, spray-pyrolysis, precipitation, solvothermal, electrochemical, combustion, etc., there is another method which has many advantages, namely, hydrothermal method. The main advantages of this method are as follows: due to high pressures it allows syntheses at lower temperatures than at room temperature, crystallization duration is relatively low, synthesis conditions can be easily replicated, energy consumption is low, etc. However, it has certain drawbacks, such as low crystallization speed and absence of an effective agitation of the solution to deliver germ of crystallization with fresh nutrient from the solution. Then, thermal inertia is high because heating and cooling processes take place through autoclave steel walls As the heating gradient is low some unwanted tranzitory processes may appear, such as premature crystallizations and dimensional stability of nanoparticles, which cannot be controlled rigorously. Some of those drawbacks can be eliminated by using a microwave field as the heating method. While manufacturing the autoclave permeable to microwaves (usualy electromagnetic radiation with approximately 2.45 GHz) from materials like Pyrex glass or quartz, conductive solvents from solution will absorb energy and therefore will be quickly heated from inside. Moreover, heating becomes more uniform if the autoclave is rotated in the microvawe owen. Thus, stationary processes are completely eliminated due to fast heating and working temperature can be achieved in minutes and maintained constant by controlling the magnetron emision power. Thermal agitation and chemical activation induced by electromagnetic radiation increases the reaction speed, nucleation centers numbers are higher and convection currents efficiently replenishe nuclei with fresh nutrient. In this way, nanoparticles will be produced having low dimensional dispersion due to the high speed of recrystallyzation, a large number of nanoparticles growing simultaneously and very fast.

## METHOD OF OBTAINING AG-DOPED $TIO_2$ NANOPARTICLESSYNTHESIZED THROUGH M-H

Into a Berzelius glass 40 ml of ethyl alcohol were added, on top of which 10 ml of titanium

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# METHOD AND INSTALLATION FOR WEARING TESTING OF SINTERED BASALT

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**Keywords**: sintered basalt, brake disks, brake pads, milling machine, wearing testing

**Abstract**: The paper presents a comparative study of the wearing testing of sintered basalt pellets doped with $TiO_2$ and without doping. Also it presents the method and installation for wearing testing the pellets. For wear testing the brake disk with sintered basalt pellets, it was considered that this is a device used as an arresting gear. For the other break disk, 3 cases were taken into account: the case in which the brake disk with sintered basalt pellets engages a brake disk on which 2 brake pads were fixed; the case in which the brake disk with sintered basalt pellets engages a brake disk on which 4 brake pads were fixed and the case in which the brake disk with sintered basalt pellets engages directly a brake disk. The test were performed on a milling machine, the brake disk with sintered basalt pellets being fixed on the machine compound table and the simple disk brake, the ones with 2 and 4 brake pads respectively, being fixed into the milling head.

## 1. INTRODUCTION

Sintering is a processing technique used to produce density-controlled materials from metal powders and/or ceramic powders by applying thermal energy. Sintering is in fact one of the oldest human technologies, with origins in the prehistoric era, having in view pottery fabrication and the production of tools and weapons from sponge iron. One the most important utilization of sintering in modern era is fabricating sintered components from ceramic materials, inclusive basalt, with appreciable abrasive resistance and high resistance to chemical agents etc.

Sintering is categorized in the synthesis/processing element among the basic four elements of materials sciences and engineering. Unlike other processing technologies, the different stages of processing and corresponding variables, must be considered. For example in shaping stage, one may use a simple compacting die, isostatic pressing, casting, injection molding etc. Depending on shaping technique, the sintering conditions are modified and also the sintering properties may vary considerably. In sintering stage may be used different techniques and different process variables, which may induce variations in microstructure and properties of sintered material.

## 2. INSTALLATION FOR WEARING TESTING

It has been designed a device (figure 1) for supporting the sintered basalt pieces with a special adhesive which gives in at reasonably high temperatures so that the parts are not affected at detachment. With the help of a device using a diamond blade (figure 2), sintered basalt pellets of 4mm thickness were cut.

# APPLYING TAGUCHI METHOD TO $TIO_2$ DOPED SINTERED BASALT

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**Keywords**: sintered basalt, $TiO_2$ doping, Taguchi method, full factorial simulation

**Abstract**: The paper presents a study of the variation of compression resistance of sintered basalt pieces doped with $TiO_2$. For performing the experiments, a $L_8$ Taguchi standard matrix was utilized, for which the controlled factors were assigned. For each experimental condition, 5 basalt sintered pieces were manufactured, which were tested to compression. There were sintered 25 parts (probes), analyzing the improvement in compression resistance by doping the basalt with 2% $TiO_2$. In order to verify the precision of designing the experiments based on a $L_8$ orthogonal matrix, a full factorial simulation was performed.

## 1. BASALT SINTERING

Sintering is a processing technique utilized for manufacturing materials with controlled density from metallic powders and/or ceramic powders (including basalt). One of the most important application of sintering is manufacturing sintered basalt parts with high wearing resistance. Figure 1 presents the general process of manufacturing sintered parts. Unlike other manufacturing technologies, the different stages of processing and the corresponding variables must be considered. Depending on the "forming" technique, sintering conditions may change and also the sintering properties can vary considerably. In sintering stage may be used different techniques and process variables that can induce changes in the microstructure and properties of sintered material.

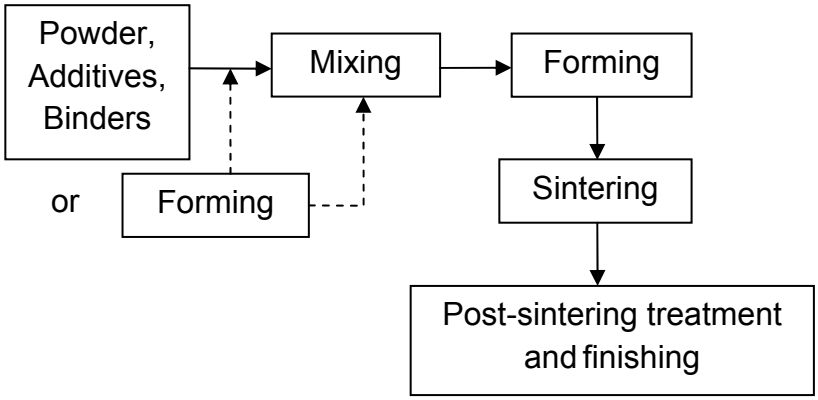


***Fig.1 General process of manufacturing sintered parts***

Sintering processes can be divided into two categories [4]: solid state sintering and liquid state sintering. Solid state sintering (below solidus line) occurs when the compacted powder is fully densified in solid state at sintering temperature, while the liquid phase sintering occurs when liquid state is present in the compacted powder during sintering. Different types of sintering are explained using a schematic phase diagram, although the optimal type of sintering depends on the material and / or to sintering scope. The "Engine" of sintering process is represented by interfacial total energy reduction. Interfacial total energy of compacted powder is expressed as $\lambda A$, where $\lambda$ is the specific interfacial energy and A is total area (interface) of compacted powder. The total energy reduction is expressed in relation (1).

# A greenhouse approach for value cultivation

Jens Jörn Dahlgaard, Adrian Pugna, Sabina Potra, Romeo Negrea and Marian Mocan

**Journal Article**