

Analytic hierarchy process essay



**ASSIGN
BUSTER**

1. 0 Introduction

1. 1 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) is a decision-aiding tool for dealing with complex, unstructured and multiple-attribute decisions (Islam, 2003; Partovi & Burton, 1993; Uzoka, 2005/2006). It is a multi-criteria decision analysis (MCDA) method developed by Thomas L. Saaty during 1970s.

As stated by Uzoka (2005/06), the AHP is preferred to most of the MCDA methods for the following reasons: (i) AHP is structured to document and replicate for situations involving subjective judgments and (ii) considers both quantitative and qualitative data. It is also able to measure the consistency of preferences and is suitable for group decision making (Partovi, 1993).

In higher education, AHP was used to evaluate the academic research paper at Villanova University (Liberatore and Nydick, 1997) multidisciplinary research of the University of Groningen, Netherlands (Hummel and al, 1998), helps to plan the national forest at University of Arizona (Crimmins et al, 2005) and to select the best candidates of graduate student (Bahurmoz, 2003).

1. 2 Quality Function Deployment (QFD)

Motwani and Kathawala (1994) have described an application of QFD that helped American businesses to compete successfully in the global marketplace. The findings also suggest that QFD is not an easy tool to implement especially when the company is not oriented towards focusing on customer needs. Therefore, top management must be fully committed in

order to apply QFD and the organization must overcome the obstacles in applying QFD.

Pitman et al. (1996) showed how the QFD can measure customer satisfaction in educational institutions and briefly summarized the application of TQM concepts at several institutions. They reviewed the MBA program at Grand Valley State University by utilizing QFD principles. In general, QFD as a process is highly successful in satisfying customer requirements. Evidence has shown that a complex process can be managed by using the QFD method as a model and it is a very useful tool in ascertaining customer needs, prioritizing them, and directing organizational resources toward fulfilling those needs.

Ginn and Zairi (2005) present the concepts and principles of QFD as they are implemented by Ford Motor Company. The paper also illustrates the essential linkages between external and internal customers to suppliers (i. e. "Voice-Quality-Satisfaction" chain). It discusses the various arguments and proposals that link together the end user or customers' voice.

There are various implications for QFD and its role within a company-wide quality control (CWQC) process to support customer-supplier chain. It is clear that key elements of TQM such as product and service quality, customer satisfaction, benchmarking, internal customer-supplier chain, cross-functional teamwork, multi-disciplinary use of quality tools are all fundamental building blocks to both QFD at a product attribute level, and TQM at a corporate cultural level. According to the authors, senior and

middle management support including the release of resources remains a critical component of successful QFD implementation.

Zhao and Lam (1998) proposed and tested a methodology for identifying different teaching techniques and their effectiveness in achieving educational objectives from students' perspective. This paper demonstrates how QFD and AHP are used in identifying teaching methods and in evaluating their effectiveness in achieving educational objectives. This study also shows the application of AHP and the QFD in evaluating the effectiveness of teaching in achieving educational objectives at the Department of Applied Statistics and Operational Research of the City University of Hong Kong. With the help of the AHP software Expert Choice, a hierarchy was constructed for the purpose of selecting alternative teaching techniques to achieve teaching excellence. Using pair-wise comparisons of subjective judgments from teaching staff, the software package calculated the effectiveness ratings for each of the seven teaching techniques.

2. 0 Review of the Papers

2. 1 Choosing a Hospital: Analysis of Consumer Tradeoffs by Raishekhar G. Javalgi, S. R. Rao and Edward G. Thomas

According to the authors, as today's health care industry is very competitive, hospital administrators and marketers must determine how important various products and services which attributes to potential consumers and how those attributes influence consumer choice decisions. The authors outline an approach (the analytic hierarchy process) that can be used to assess or predict health care choice decisions by consumers. The further

<https://assignbuster.com/analytic-hierarchy-process-essay/>

explained that the analytic hierarchy process is a method for analyzing consumer choice behavior whereby a hierarchical structure is used to determine the relative preferences of consumers for health care alternatives. Various marketing strategies based on the study findings are also suggested.

In this article, the authors found out that, developing market-driven strategic approaches and technical decision-making skills are needed for the health care professionals to solve the complex problems they face. A successful marketing approach to those problems requires knowledge of how consumers make their choices of physicians, health insurance plans, and hospitals. It is essential for managers to understand the underlying decision processes of consumers, who have become more knowledgeable and sophisticated in health care matters in recent years.

The authors used the analytic hierarchy process (AHP) for illustration to describe consumer preferences in hospital selection decisions. According to the authors, consumers make preference judgments about the relative importance of various attributes embodied in the decision alternatives (hospitals). The criteria consumers use in evaluating different hospitals and how they combine their preference judgments about various criteria to arrive at a final choice are important to health care marketers. The consumer's knowledge of the hospitals provides some reasonable basis for rating or evaluating the decision alternatives on a given criterion.

The consumer's knowledge about the decision alternatives depends on previous personal experience, the experiences of associates and friends, and perceptions of the hospitals formed through exposure to advertising by the

hospitals. Because consumers conjure up perceptions of institutions and their product/service offerings, the health care marketer's task, as part of a sound marketing strategy, is to create positive images in the minds of consumers to enhance those perceptions.

The objectives for this study were the potential application of the AHP in hospital selection decisions are stated below:

1. What product or service attributes (choice criteria) do consumers deem to be important in selecting a hospital? What is the relative importance (weight) of these criteria?
2. What are the relative preferences of consumers for the decision alternatives (hospitals) in terms of each of the attributes considered in the decision process?
3. How do consumers integrate the relative importance of the attributes?

The following figure drawn by the authors illustrates one possible hierarchy for the hospital choice problem. The top level of the hierarchy shows that the overall objective is to select the best alternative (hospital). The middle level of the hierarchy contains criteria (attributes). The selection of relevant criteria is of paramount importance in constructing the hierarchy. As we discuss subsequently, in the hospital selection problem, nine criteria were selected for inclusion on the basis of a literature review and focus group interviews with randomly selected customers, physicians, and hospital administrators. The third and final level in the hierarchy represents the decision alternatives, here the choice of one of three hospitals. Obviously, as

the number of levels of analysis, the number of attributes identified, and the number of decision alternatives increase, the more complex the AHP model becomes.

The AHP approach provides interesting insights into the nature of the consumer selection process as it might apply to three hospitals in one particular community. Gaining an understanding of what product/service attributes consumers deem to be important in any health care context-in this case, selecting a hospital-and how those attributes are prioritized according to their relative importance will enable health care professionals and marketers to devise appropriate marketing strategies. To illustrate how this understanding might benefit health care marketers, the following discussion suggests how the AHP results obtained in our study could be used to formulate such strategies.

The modeling of consumer preferences by the analytic hierarchy process could have an important role in health care marketing. The ability of the AHP to synthesize multiattribute preferences and provide diagnostic information, thereby enabling decision makers to understand better the behavioral process underlying choices, makes it an attractive tool for health care marketers. The AHP also can be used to study the consumer decision process related to the choice of, for example, physicians, health care insurance plans, dentists, midwives, pharmacists, and optometrists, as these and similar choice problems can be structured in a hierarchical form. Development of such a hierarchy provides information that is essential to the identification of managerial implications for strategic planning of the marketing mix.

The AHP offers potential not only in analyzing consumer choice decisions, but also in redesigning specific products/ services, introducing new service concepts, and determining the direction for new product development. Hospital managers and marketing executives could benefit greatly from using the AHP. It would enable them to accomplish such tasks as product development while at the same time assuring them that their strategies are driven by critical marketing considerations, because market-driven business plans require the choice and evaluation of interrelated components.

The findings demonstrate the suitability of using the AHP for which easy-to-use software is now available to perform all the calculations needed-in evaluating the hospital selection process. Marketers in the health care industry should be encouraged to consider using this versatile approach in their planning and decision making.

2. 2 Quality Function Deployment and Decision Analysis: A R&D Case Study by Gwen Delano, Gregory S. Parnell, Charles Smith and Matt Vance

In this article, the authors presented and compared two techniques for making multi-objective product design decisions: quality function deployment (QFD) and decision analysis (DA). They did a case study which describes the application of these techniques to the selection of the design for a new cargo/passenger aircraft. According to the authors, QFD provides a process for maintaining the voice of the customer, structuring the information in a concise format, developing teamwork, and improving communication. On the other hand, DA improves the quality of decisions by providing the decision maker with a better understanding of his values,

insights into value trade-offs an understanding of major uncertainties, and the value of additional information. In this study, authors found many similarities between the two techniques; however, for multi-objective decisions, decision analysis provides some significant advantages for generating alternatives and performing analysis. At the end, the authors recommend combining the best features of QFD and DA for R&D decision making.

The purpose of this study was to illustrate and compare two techniques for making multi-objective decisions: quality function deployment (QFD) and decision analysis. The decision investigated was a study performed by a major aerospace company to determine the most promising aircraft to replace an existing cargo/passenger aircraft. The company originally performed this analysis with a QFD process to identify the customer values, and make a selection between potential replacement aircraft (Kirkwood, 1997). The authors reexamined the study using decision analysis techniques, evaluated how well both QFD and DA support the decision making process, and compared the advantages and disadvantages of QFD and DA. The main data sources for this analysis were an internal company document and the company QFD study director.

The authors begin with an overview of quality function deployment and a description of the QFD analysis performed by the aircraft company, followed by an evaluation of each technique with respect to the different stages of the decision making process, and conclude with both a comparison of QFD and DA and a recommendation for combining the best features of QFD and DA for R&D decision making.

According to the authors, the particular decision analyzed was a study performed to determine the most promising aircraft to replace the existing cargo/passenger aircraft of the customer. The company originally used the QFD analysis tool to identify the customer values and make a selection between potential replacement aircraft (Vance et al., 1996). The authors included the following description of the QFD analysis performed so that they can make a comparison to the analysis performed with decision analysis techniques. The information was obtained from discussions with two QFD experts of the aircraft company and an internal company document. The first step in the analysis was to define the QFD architecture that would specify the houses of quality. The first HOQ indicated the types of flights the replacement aircraft would be required to complete and the air vehicle requirements that were necessary to satisfy those missions. The second HOQ indicated what design characteristics supported the vehicle requirements from HOQ 1 and those characteristics the customer would be willing to finance.

The authors' goal of this matrix was to select the design characteristics for a new concept aircraft that would be added to the list of existing aircraft alternatives. The third HOQ indicated the criteria that were used to select the replacement aircraft. The process of defining the QFD architecture and filling in the matrices would typically be completed through interaction with the customer. However, the intent of this R; D project was to prove to internal decision makers of the aircraft company that use of a process like QFD would improve the quality of the aircraft they would present as an alternative to the customer. Based on this intent, the aircraft company selected a group of

company employees to form a surrogate customer team to complete these matrices as is described below. After this process was internally accepted at the aircraft company, the customer was contacted and did agree that the QFD matrices accurately reflected customer needs.

For the first matrix in the above Figure, the customer attributes section listed the “ required flights” that the customer planned to support with the replacement aircraft (customer values) and contained a weight for each type of flight indicating its importance to the customer (relative importance). The Engineering characteristics section contained a list of air vehicle requirements that would improve the aircraft’s ability to perform these flights, and the center of the house contained the correlation matrix that indicated which air vehicle requirements would support each type of flight. The air vehicle requirements were selected by answering the question “ what replacement aircraft air vehicle requirements would improve the customer’s ability to complete its flights?”

The correlation matrix was determined by measuring how well each criterion supported each type of flight. Each entry in the matrix was given a value based on the following judgments:

- * Strong positive relationship (9 points)
- * Medium positive relationship (3 points)
- * Weak positive relationship (1 point)
- * No relationship (0 points)

Then a relative importance score was given to each requirement by multiplying each correlation value by the importance weight of the respective. The QFD scores for each criterion were determined by comparing each alternative to the baseline aircraft and selecting one of the following judgments: strongly, moderately, or weakly superior to the baseline, equivalent to the baseline, or strongly, moderately, or weakly inferior to the baseline. Then the authors converted this scoring function to a single dimensional value function using relative value increments.

Finally, the authors compare the two methods indicating the similarities and differences. They recommend combining the best of the two techniques in an R&D environment and discuss areas for future research. QFD and DA (house of quality perspective) has three main parts:

1. Customer attributes section
2. Engineering characteristics section
3. Center of the house

According to the authors' findings, in the customer attributes section, QFD and DA are very similar. Both methods provide techniques for eliciting a set of customer objectives including weights for each objective. DA arranges these objectives in a value hierarchy and QFD stores these objectives in the HOQ. The major differences are the methods for determining weights and for evaluating alternatives and the QFD's ability to communicate objectives and priorities to later stages of development.

The authors further explained that, when evaluating alternatives, QFD uses a scale to rate the alternatives and DA uses value or utility functions. The value functions explicitly state the values of the decision maker and provide for a more objective and traceable decision. Again the two methods have similar capabilities; however, the figure below clearly shows that DA has a significant advantage in its ability to incorporate probabilistic analysis, including uncertainty analysis and value of information

The authors find out that, decision making requires the ability to gather and communicate information and to perform different types of analysis. Both QFD and DA provide tools to support the R&D environment, and combining the best features of both techniques would improve any R&D study. QFD provides a process for maintaining the voice of the customer, structuring the information in a concise format, developing teamwork, and improving communication. DA improves the quality of decisions by providing the decision maker with a better understanding of his values, insights into value trade-offs an understanding of major uncertainties, and the value of additional information.

Finally, the authors recommendation that, combining QFD and DA in an R&D study will define common terminology and capture customer requirements and engineering characteristics in the HOQ. DA should be used to extend the customer attributes to a value hierarchy and to develop value models in order to evaluate alternatives. A combination of QFD and DA (e. g. the mixed integer program) can be used to generate alternatives. The HOQ can then be used to flow down requirements for developing parts, defining manufacturing processes, and defining production processes. Combining the two techniques

<https://assignbuster.com/analytic-hierarchy-process-essay/>

will create a decision making tool which crosses functional barriers. It will improve communication between all members of the team while at the same time improve the quality of the resulting analysis.

According to the authors, more research is needed to determine the best way to combine QFD and DA in the area of defining objectives. Research which focuses on comparing the processes of creating the customer attributes section of the HOQ and of eliciting a value hierarchy in DA and identifies a combined process would benefit future R&D studies. Also more research is needed in the area of generating new alternatives. We presented a mixed integer program for alternative generation, but more research is needed to determine the best way to implement the constraints of the model, especially the engineering characteristics trade-offs constraints. Also research should be performed to compare this mixed integer program with other optimization techniques.

3. 0 Using AHP & QFD in “ Strengthening Medical Tourism in Malaysia; A Tourist’s Perception”.

The AHP, developed by Saaty (1977, 1980), is a multi-objective, multiattribute decision-making tool whereby a Pairwise comparison procedure is used to arrive at a scale of preference among the elements (attributes). The AHP is particularly suitable when subjective criteria (e. g., hospital reputation and quality of service) are involved and when the attributes and or alternatives are considered intangible. The AHP provides a mechanism for synthesizing consumer decision processes underlying the

selection of decision alternatives (in this case, hospitals and treatments in Malaysia).

A tourism product, characterised by its non-amenability to uniform product specifications, is considered to be a mixture of different tangible and intangible elements. Keeping in view the heterogeneity, perishability and the uniqueness involved in a tourism product, the present study attempts to develop an AHP-QFD framework for designing a tourism product, which takes care of the touristic needs of tourists. Having identified the needs of the medical tourists with reference to a tourist destination, the needs will be prioritised with the help of the Analytic Hierarchy Process (AHP).

Subsequently, the concept of Quality Function Deployment (QFD) will be employed to formulate operating strategies by eliciting opinions from tourism professionals. Pairwise relationships among the operating strategies will be investigated to find out whether the strategies support each other or are in conflict with each other. Finally the strategies will be prioritised and evaluated, which will enable the design of a tourism product (medical tourism) incorporating the diverse needs of tourists.

The Analytic Hierarchy Process (AHP) will be used to prioritize the service requirements. An AHP questionnaire will be developed to collect data for prioritization. Data will be collected in four phases. In the first phase, clients' requirements will be obtained and in second phase, the achievement level of customer satisfaction through service quality will be found.

Then in the third phase, the requirements are to be prioritized using Analytic Hierarchy Process (AHP). In the final phase, again by contacting the

respondents, technical requirements are to be prioritized using Quality Function Deployment (QFD).

4. 0 Conclusion

Both AHP ; QFD techniques for decision making are discussed in this paper. The author found that each technique offers unique features and benefits that can be combined to create a decision analysis. This combined approach will provide a new method for improving decision analysis techniques in the better decision making.