

KADİR HAS UNIVERSITY



AHP/ANP APPLICATIONS TO CONCEPT EVALUATION IN A NEW PRODUCT DEVELOPMENT

PRE-PRINTS: THE FIRST EDITION

Edited by
Zeki Ayağ

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by

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Dedicated to my family for their never ending support

Preface

Today's world is characterized by major changes in market and economic conditions, coupled with rapid advances in technology. Consequently, companies are forced to develop new products for current markets, especially in technology-driven or high-tech markets. The changing economic conditions and technologies, combined with increased domestic and global competition, changing customer needs, rapid product obsolescence and the emergence of new markets, necessitate a very fast innovation process. The innovation process can be divided into three main areas: the fuzzy front end (FFE) or project planning, the new product development (NPD) process, and commercialization.

A NPD process is the sequence of steps or activities that an enterprise employs to conceive design and commercialize a product. Many of these steps and activities are intellectual and organizational rather than physical. One way to think about the development process is to view it as the initial creation of a wide set of alternative product concepts followed by the subsequent narrowing of alternatives and increasing specification of a product until the product can be reliably and repeatably produced by the production system. The concept development process includes the following activities: identifying customer needs, establishing target specifications, concept generation, concept selection, concept testing, setting final specifications, project planning, economic analysis, benchmarking of competitive products, modeling and prototyping.

Concept design, the next stage in the design process, involves establishing a conforming set of sub-systems. Each sub-system performs a sub-set of the functions given in the specifications and, when taken as a whole, the entire set can perform all the required functions. During concept design, different sub-systems are generated to perform each sub-set of the specified functions. After various concepts have been outlined, the best combination of harmoniously conforming sub-systems is selected in terms of highest performance and lowest cost. This process is called concept selection.

Concept selection is often the Rubicon in the design process. It is often said in the literature that nearly 80% of the product cost is committed at this stage. After this stage has been passed, the design process will diverge towards a detailed solution. Concept selection is therefore a vital part in the design process. It is recognized that the ability to rapidly evaluate design ideas, throughout their development within the design process, is an essential element in the goal to increase design productivity. Given the need for companies to produce more and more innovative products in an increasingly competitive market place, it follows that designers have to consider an increased number of design options. The activity of judging between and selecting from a range of competing design options is referred to as evaluation. As the number of options to evaluate increases and the time available decreases, it is evident that human evaluators will require increasing assistance in maintaining objective evaluation throughout the development process. Of the multiple-criteria decision making methods in current literature, the AHP/ANP, invented by Thomas L. Saaty has been commonly used in industry to aid in concept selection.

This book is the collection of the selected journal and conference papers that were published in outstanding journal and conferences, indexed by Science Citation Index (SCI), and includes the works on concept selection of the author and the contributing authors.

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Zeki Ayağ
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Biography



Zeki AYAG is currently working as an Associate Professor at Industrial Engineering Department of KADIR HAS UNIVERSITY. He is also Department Chair of Industrial Engineering Department, and Director of Graduate School of Science and Engineering after have been serving as an Assistant Professor between 2005 and 2008 at the same university. He holds an undergraduate degree in Industrial Engineering Department of Faculty of Business Administration, a Master's in Engineering Management Program of Industrial Engineering, and a Ph.D. degree in Industrial Engineering Program of Industrial Engineering at ISTANBUL TECHNICAL UNIVERSITY (I.T.U). Before joining to KADIR HAS UNIVERSITY, he worked as an Assistant Professor in ISTANBUL KULTUR UNIVERSITY for almost 2 years. In addition to his academic experience, he has national and international industrial experience such as; CAD Engineer in MAGNA INTERNATIONAL, INC., Cam-Slide Mfg. (CANADA), Engineering Designer in MOLD-MASTERS LTD. (CANADA), Construction Department Chief in MAKINA TAKIM ENDUSTRISI A.S., and Quality Assurance Engineer in PIMAS A.S. He also worked as a full-time Research and Teaching Assistant in the IE Department at I.T.U. for 4 years. He taught many courses, such as Operations Research I and II, Systems Simulation, Multiple-Criteria Decision Making, Facility Design and Plant Layout, Integrated Enterprise Systems, Computer Integrated Manufacturing (CIM) and so on. His research interests include Multiple-Criteria Decision Making (MCDM), Analytic Hierarchy/Network Process (AHP/ANP), Fuzzy Logic, Simulation of Manufacturing Systems, New Product Development (NPD). He has published many articles in leading periodical journals indexed by SCI® and SCI-Expanded®, such as International Journal of Production Research, Journal of Intelligent Manufacturing, IIE Transactions, Journal of Engineering Design and Journal of Intelligent and Fuzzy Systems and so on. He is also an active referee for the leading journals such as International Journal of Production Research and Computer and Industrial Engineering, International Journal of Approximate Reasoning, Information Sciences, Journal of Engineering Design and so on, and for conferences such as International Conference on Information Systems (ICIS 2005). He has also given many seminars on his interest fields with numerous publications in conference and congress proceedings. He is a licensed Professional Engineer (P. Eng.) from both Society of Professional Engineers in Ontario (PEO) in CANADA, and Chamber of Mechanical Engineers of Turkey (TMMOB). He is Senior Member of Institute of Industrial Engineers (IIE). He has also various memberships such as Operational Research Society, TURKEY (YAD), Turkish Industrial Engineers Group (TURK IE), Society of Fuzzy Systems, TURKEY (BUSIDE), International Society on Multiple Criteria Decision Making (MCDM), International Association of Engineers (IAENG), IAENG Society of Industrial Engineering, IAENG Society of Operations Research, IAENG Society of Artificial Intelligence, IAENG Society of Information System Engineering and so on. He is also listed in various editions of Who is Who in Engineering in the World, and Leading Engineers of the World. He is also Associate Editor in Advances in Fuzzy Systems, Editorial Board Member of International Journal of Production Research, Associate Editor of Journal of Intelligent Manufacturing, and in different capacities for other journals.