# Chapter 52
# Applying the Fuzzy Analytical Network Process in Digital Marketing

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## ABSTRACT

*The fuzzy analytical network process (FANP) is introduced as a potential multi-criteria-decision-making (MCDM) method to improve digital marketing management endeavors. Today's information overload makes digital marketing optimization, which is needed to continuously improve one's business, increasingly difficult. The proposed FANP framework is a method for enhancing the interaction between customers and marketers (i.e., involved stakeholders) and thus for reducing the challenges of big data. The presented implementation takes realities' fuzziness into account to manage the constant interaction and continuous development of communication between marketers and customers on the Web. Using this FANP framework, the marketers are able to increasingly meet the varying requirements of their customers. To improve the understanding of the implementation, advanced visualization methods (e.g., wireframes) are used.*

## INTRODUCTION

The soaring technology level enhances communication between marketers and customers in digital marketing and alters its methods and goals to improve the interaction between them. The ability of marketers to understand the requirements of their customers increases, which is necessary to be economically competitive. Today, the challenge is that information gains ever more value and multiplies

itself continuously. All marketers are confronted with big data and possible information overload. It has become more difficult to analyze the huge amounts of data and to filter out the relevant ones to accurately understand the requirements of their customers.

Since it is necessary to continuously adjust one's own business to meet varying customers' requirements and to make the best offer for a specific group of customers, it is important to select the right kind of information from the growing data pool. Additionally, personalization plays a crucial role in marketing as customers currently get spammed with unwanted or uninteresting advertisements. It is crucial to understand and meet stakeholders' requirements, because only information matched to their requirements is valuable. Since the marketer has to understand his customers, stakeholder management is needed to specify the relevant requirements.

Zadeh (1979)'s information granulation theory proposes a way to deal with big data naturally. It clusters data and represents it in a structured way (Yao, 2005; Zadeh, 1998) to easily see which information is relevant which is important for increasing one's competitiveness. The analytical network process (ANP) enables information granulation (Saaty, 2006) by representing the organization of given information in a networking structure (i.e., networking granulation). This networking structure corresponds to clustering (Punj & Stewart, 1983), a widely used method in marketing.

Since the interaction between multiple stakeholders cannot be captured exactly, fuzzy logic (Zadeh, 1988) is applied as a way to address vagueness. Instead of searching for the best solution, it is often better to search for good enough (i.e., approximate) solutions that fit the requirements of the stakeholders (i.e., customers) (Yao, 2000) and, thus, to make enhanced personalized offers. Fuzzy logic is added to conventional ANP to create the fuzzy analytical network process (FANP). FANP makes it possible to work with uncertain information (e.g., see Ahmadi, Yeh, Martin, & Papageorgiou, 2014) and to structure the information in a networking form. Thus, the presented implementation enables improved digital marketing through FANP.

The intention is to create a cooperative decision support system (DSS) (Haettenschwiler, 2001) to improve data acquisition and decision making that is focused on digital marketing measures. The authors combine ANP as a multi-criteria-decision-making (MCDM) method with fuzzy research on the soft handling of big data. Existing knowledge (i.e., a conceptual framework) can be applied and enhanced, as the implementation is based on previous research (Portmann & Kaltenrieder, 2015).

First, the theoretical background of all used concepts for this chapter will be provided. The concepts of digital marketing, stakeholder management, requirements engineering, big data, granular computing (GrC), fuzzy logic and fuzzy sets, fuzzy cognitive maps (FCMs), ANP and FANP will be explained in this part. Afterwards, the implementation and its process steps will be presented, accompanied by elicited requirements of involved stakeholders for a digital marketing use case. Thereafter, several visualization methods will be considered to find the most suitable one that fits the requirements.

## BACKGROUND

The evolution of marketing is closely associated with developments in technology. Towards the end of the 20th century, the Web became a widely used business and communication tool, which indicated the beginning of the era of digital marketing. According to Ryan and Jones (2009), the potential audience grows, because the market penetration of digital channels is growing rapidly and so does the attraction of digital marketing. An increasing growth in digital marketing is expected. The interaction between

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