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Soft Set Theory Based Decision Support System for Mining Electronic Government Dataset

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ABSTRACT

Electronic government (e-gov) is applied to support performance and create more efficient and effective public services. Grouping data in soft-set theory can be considered as a decision-making technique for determining the maturity level of e-government use. So far, the uncertainty of the data obtained through the questionnaire has not been maximally used as an appropriate reference for the government in determining the direction of future e-gov development policy. This study presents the maximum attribute relative (MAR) based on soft set theory to classify attribute options. The results show that facilitation conditions (FC) are the highest variable in influencing people to use e-government, followed by performance expectancy (PE) and system quality (SQ). The results provide useful information for decision makers to make policies about their citizens and potentially provide recommendations on how to design and develop e-government systems in improving public services.

KEYWORDS

Decision-Making, E-Government, Facilitation Conditions, Maximum Attribute Relative, Performance Expectancy, Soft-Set Theory, System Quality

INTRODUCTION

Electronic government (e-government) is the use of information and communication technology as a process of interaction between government and citizens to increase the service to citizen, for example, e-government application in the legislative and judicative area can improve internal efficiency of democratic governance (Jacob et al., 2017a). However, technological, governing and social issues have to tread carefully in order to adopt these phenomena. Carter and Weerakkody (2008) stated that one important factor for the success of e-government services is the acceptance and willingness of people to use e-government. Meanwhile, the other scholars Al-hujran et al. (2015) and Lian (2015) stated that e-government leads to better transparency, accountability and public services.

E-government initiatives are still in the early stages in most developing countries (Alomari et al., 2014; Chartier et al., 2015; Chen et al., 2015), and face many issues regarding the adoption and implementation (Rana et al., 2013). Adoption and implementation are fundamental stages in terms of measuring the success in using of e-government systems. While governments develop e-government

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systems to provide e-services to citizens, the adoption and usage level is still low especially in developing countries (Kim & Grant, 2010; Stier, 2015; Sharma, 2015). Successful implementation of electronic government processes and satisfactory usage level by all government stakeholders are the main goals, thus, analyzing the significant factors that influence the adoption and utilization of e-government becoming a necessity. The traditional main objectives of analyzing significant factors of e-government service are to deal with the uncertainty due to designing the e-government adoption model in order to improve public service. To achieve this objective, certain clustering techniques are also being applied. Clustering a set of objects into homogeneous classes is an important data mining operation. Furthermore, clustering is a process for grouping data into multiple clusters or groups so that data in one cluster has a maximum degree of similarity and the data between clusters has a minimum similarity (Qin et al., 2012; Herawan et al., 2010; Yanto et al., 2012). However, certain set theory is not well suited for analyzing uncertainty information systems, as demonstrated in the previous work on constructing student models through mining student's classification (Wang et al., 2001). Meanwhile, the other work studied about mining significant association rules and rough set theory for clustering the e-government data set in Indonesia (Jacob et al., 2017b; Jacob et al., 2017c). Their results showed that attention should be given to handle the uncertainty information in order to reach a satisfactory prediction accuracy.

This work applied maximum attribute relative as the clustering technique for grouping e-government data set. It is based on a concept of attribute relative where the comparison of attributes is made by taking into account the relative of the attribute at the category level (Mamat et al., 2013). The data were taken from a survey aimed to identify the citizen behavior in using e-government. Furthermore, descriptive statistics is used to find out the Mean (M) and Standard Deviation (SD). Therefore, the nine variables, namely: (1) Performance Expectancy (PE), (2) Effort Expectancy(EE), (3) Social Influence (SI), (4) Facilitating Condition (FC), (5) Behavior Intention (B), (6) User Behavior, (7) Trust (TR), (8) System Quality (SQ), and (9) Information Quality (IQ) are examined to identify the variables to select the best clustering attribute.

The remainder of this paper is organized as follows. Section 2 presents proposed method. Section 3 describes the study's performance expectancy of e-government data set. Section 4 describes experiment result. Finally, the conclusions of this work are reported in section 5.

PROPOSED METHOD

The earlier idea of soft-set is presented in the work of Pawlak (1982), where the Pawlak's concept of the soft-set theory is a unified view of the classical set, rough set, and fuzzy set. However, today's soft-set theory is a result of Molodtsov's work (1999) where the notion of soft-set theory has been defined. Molodtsov's notion of soft-set theory is a general method for dealing with uncertain that is free from the inadequacy of the parameterization tools. Next subsections describe how soft-set theory was implemented in a group of data set.

Soft Set Theory

Throughout this section, a set U refers to a non-empty initial universe, E is a set of parameters describing objects in U, $P(U)$ is the power set of U and $A \subseteq E$.

Definition 1: A pair (F, A) is called a soft set over U, where F is a mapping given by $F : A \to P(U)$. In other words, a soft set (F, A) over U is a parameterized family (subset) of the universe U. For $\alpha \in A$, $F(\alpha)$ may be considered as the set of α -elements of the soft set $F(A)$ or the set α -approximate elements of the soft set $F(A)$. Clearly, a soft set is not a (crisp) set.