User Preferences Towards M-Government Services: In Search of Assessment Methodology

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1 Introduction

Today, many countries are actively engaged in various e-Government projects to effectively enhance the provision of government services. Although e-Government encompasses the usage of all forms of information and communications technologies to deliver governmental services to citizens and improve the quality of governmental activities, the governments have been primarily focused on the Internet as the means of public service provision. That made e-Government be often thought of as "online government" or "Internet-based government." M-Government, being an extension of e-Government, refers to the strategic utilization of all kinds of mobile technology, services, applications, and devices for improving benefits to the parties involved in e-Government. (Kushchu & Kuscu, 2003) And though the utilization of mobile technologies by governmental servants has been practiced for quite a long time (communications and data capturing for emergency services, postal delivery services, and utility services in various sectors such as housing, civil engineering, and drainage), the advent of the term "m-Government" is related with public services provided via mobile technologies to citizens and business. Such services may include security alerts, emergency announcements, notification to citizens of not paying their fines and rents, confirmation of the accuracy of tax returns, reminders and notifications of licenses renewal, receiving results of medical examinations, bus schedules, ticket purchasing, and others.

The use of mobile technologies and applications differentiates m-Government from any other developments in the public sector, including e-Government. (Kushchu & Borucki, 2004) Provision of public services through mobile platforms is considered to be more user-centric, allowing better personalization and accessibility of the services due to specific features of mobile technology. Unlike computers, most mobile devices are always on and are carried around, granting users ubiquitous access to government services. This means that citizens do not have to go and search for Internet cafés or kiosks when they need to access necessary information while on the move. People now carry m-Government access terminals with them wherever they go. (Zálešák, 2003) Governments can take advantage of these features, primarily to provide users with vital information during emergencies. M-Government services also allow improved precision and personalization in targeting users, as mobile devices are themselves personal, i.e. designed to be used by a single user. (Ghyasi & Kushchu, 2004) As there are more people using mobile phones than computers, citizens can be reached with the channel that is perceived as more familiar and user-friendly.

Widespread acceptance of mobile phones is often seen as a key factor for reaching citizens and providing services in the last mile that, in many cases, e-Government has failed to accomplish. At the same time, most of the researchers agree that m-Government is not meant to be a replacement for e-Government; stressing on the technological limitations of a mobile phone as a terminal for information access. These constraints concern both network and devices and include low bandwidth, unreliable connectivity, limited processing power, high latency, small size of information window, limited ability to transfer large volume of information, complexity of setting up access sessions, slow information flow, the miniaturized numerical keyboard, small storage memory, and electric power consumption. (Abramowicz et al., 2005; Germanakos et al., 2005; Ghyasi & Kushchu, 2004; Östberg, 2003; Sotelo & Lopez, 2007) In addition, there are serious concerns about security and privacy of data and interactions, which can significantly limit the amount of government services to be provided to mobile users. There is no doubt that technological enhancement can open new horizons for provision of government services. Nevertheless, such statements can lead to the presumptuous conclusion that technological advances making possible migration of e-Government applications to a mobile platform, will assure high levels of adoption inherent to current usage of mobile services in the world. The risks of ignoring adoption mechanisms and undervaluing preferences of potential users include a failure of achieving acceptance and widespread use of these services. (Caroll, 2005)

In spite of growing recognition of user needs having a determinative power in m-Government success, only a small portion of research to date has been concentrated on the user. Much of the user research on m-Government has

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been dealing with user profiling and service quality requirements (visual and interaction quality requirements, reliability, responsiveness, accuracy, user interface, trust, and customization). (Carroll, 2005, 2006; El-Kiki & Lawrence, 2006, 2008; Germanakos et al., 2005) Yet, not much attention has been given to the evaluation of potential demand for service content. The importance of exploring this dimension of user needs is recognized and supported by empirical research. A number of studies on current use of mobile services indicated a strong will from the side of users to control the traffic on their devices and limit incoming information to meet their local, real-time needs. (Carroll, 2005, 2006) The spectrum of possible methods of demand evaluation is wide; however, absence of previous experience with m-Government services limits the use of statistical methods for the investigation of user preferences for new, yet-to-be-implemented services.

This paper aims to address these shortcomings. It contributes to the research on user-centric m-Government by providing a methodological framework for assessing user preferences for services that users have not yet experienced. The paper begins with an overview of m-Government services to clarify the phenomenon. Next, the problem of studying user preferences is set out and grounded in relation to practical needs and resulting research problems. Chapter 3 presents available theoretical and methodological background on methods for deriving user preferences. Literature research was done to build forward on existing knowledge, with the aim to develop a solution for assessment of user preferences for m-Government services that users have not yet experienced. Therefore, different assessment techniques used to derive users' valuations on new products (services or technologies) that are not yet on the market are presented and examined in respect to their ability to overcome the identified challenges. The paper concludes with a methodological framework for a constructive case study.

2 Key challenges in studying user preferences for m-Government content

M-Government services represent a package[1] of services offered in different fields such as healthcare, education, tourism, transport, logistics, etc. and to a specific community, e.g., municipality, university campus, tourists. They may include different types of applications, serving as a support for activities of the communities. In order to be adopted, these packages should reflect the services that citizens and other users are more likely to prefer. (Carroll, 2005) Identification and evaluation of the most desired services address a number of important issues. Obtained information on service (content) preference can be further used for 1) designing a package of m-Government services that would reflect the most demanded services, 2) increasing efficiency of financial resource allocation by setting priorities in service design and implementation in accordance with the interests of the stakeholders, 3) defining the types of services in which the users are interested the most and to concentrate efforts on development of similar services, 4) elaborating of proper technological solutions for service delivery.

One of the main challenges of studying user needs is entailed to the fact that users have difficulty in articulating their preferences. (Carroll, 2005; van Kleef et al., 2005)

Preference assumes a real or imagined "choice" between alternatives and the possibility of rank ordering of these alternatives based on the value they provide. In the case of m-Government, people are often dealing with unfamiliar services, as many countries just started incorporating mobile dimension into their e-Government frameworks. From a user's perspective, it is difficult to reveal "true" preference for a service prior to service consumption. Both absence of previous experience with m-Government services and lack of knowledge regarding the possibilities and restrictions of the mobile technology create a difficulty for potential users to describe the desired service and provide exact numerical values of service importance. As a rule, people have only non-numeric information on service preference, being represented by comparative propositions of the type: "a certain service attribute is more important than another" or "a certain service attribute is more important that all the rest of the attributes taken together." (Hovanov, 1997) Such propositions represent non-numeric, e.g., ordinal or ranking information on user preferences. The main problem of ranking information is that it is on an ordinal scale only and it is difficult to know how far apart the attributes are from each other.

Directly asking about preference strength implies assuming that users are able to fully understand their own needs and know their preferences. Before giving a preference judgment, users have to imagine the benefits a product will deliver for them. The absence of previous experience with m-Government services results in difficulties faced by users when understanding needs these services could actually satisfy. And although people are familiar with using mobile services, the current usage is mostly focused on leisure communication and entertainment purposes. Therefore, users may be unaware of the value that the usage of mobile technology can bring in other areas.

1 The term "service package" refers to the organization of services into interrelated groups or bundles.

This shortage of information implies “the problem of weight-coefficients estimation on the base of uncertain information” (Hovanov, 2008, p.13). Since users are not able to provide exact numerical values of a service importance, there is a need for an approach which would allow deriving user preferences towards m-Government services and their attributes in an indirect way.

3 Assessment methods

The starting point in this study has been marketing techniques used to derive users’ valuations on new products that are not yet on the market. The most popular method for measuring customers’ preference structures is the conjoint measurement. (Sattler & Hensel-Boerner, 2000) Current approaches for implementing a conjoint analysis project differ in terms of stimulus representation, formats of data collection, nature of data collection, and estimation methods. The approaches that are more commonly used are full-profile conjoint analysis, choice-based conjoint analysis, adaptive conjoint analysis, and self-explicated analysis. (Rao, 2007)

Conjoint analysis is derived from Lancaster’s theory of demand, which posits that goods are consumed for the characteristics they possess and they are the objects of consumer preference or utility. (Lancaster, 1971) It is assumed that characteristics possessed by a good are in principle objective and the same for all consumers. The utility derived by a consumer, on the other hand, is subjective and depends on his preference function. (Hendler, 1975)

Thus, the methods make one fundamental assumption: the value of a product is an aggregation of the values of its characteristics. (Marder, 1999) The methods proceed from the concept of determinant attributes which states “that only a limited set of attributes, the ‘determining attributes,’ play a critical role in determining choice” (Mayers &Alpert, 1968). Determinant attributes are those that are important to consumers and are variable among the alternatives. Hence, the objective is to determine which attribute and attribute levels consumers prefer and how much they value the attributes. (Van Kleef et al., 2005) Products or product concepts are represented by their attributes, where each attribute can have two or more alternative levels. Using the conjoint technique, levels of attributes or features describing a product (good, service, or policy) are combined to build descriptions of hypothetical bundles. (Kim, 2005)

In the full-profile method, the respondents are asked to rate every possible profile, while in choice-based conjoint analysis, the respondents might be presented with many groups of attribute bundles and are asked to select one of each group, or they might be given pairs of concepts and are asked to select between the concepts. (Dahan &Hauser, 2002)

Adaptive methods involve developing questions in a sequential manner depending upon the responses from a respondent to previous questions; these methods are essentially a subset of either ratings or choice-based methods. (Rao, 2007)

Conjoint measurements rely on a decomposition approach, based on the assumption that the preferences people have and the choices they make are an overall single response to the product as a whole. In a conjoint task, respondents are asked to express their preference towards hypothetical bundles. Each of the constructed bundles represents one possible combination of characteristics, and the respondents are asked to evaluate these bundles in their entirety. Conjoint methods are intended to “uncover” the underlying preference function of a product in terms of its attributes.

Assume that individual i faces a choice among j alternatives and the individual is asked to rank the alternatives in order of preference. The preference function can be written as

$$U_{ij} = \beta_i x_{ij} + \varepsilon_{ij}$$

where x_{ij} is the vector of attributes associated with alternative j, β_{ij} is a vector of unknown parameters (the coefficients of attribute vector x_{ij}), and ε_{ij} is a random error of the model.

The three methods mentioned above are called decompositional because preference parameters are estimated from data on customers’ overall evaluations of a set of alternatives that are pre-specified in terms of levels of different attributes. (Green & Srinivasan, 1990)

Self-explicated methods are based on the assumption that choices people make are made up of separate pieces, i.e., people assess the various characteristics of a product approximately one at a time. (Marder, 1999) Self-explicated approaches are called compositional because the importance of a given attribute and the desirability of levels within each attribute are directly obtained from the respondents. The utility value is composed from these data expressed as the weighted sum of importance and desirability values.

The choice of method for the measurement of consumer preferences should adequately reflect how users make decisions and the way in which products are described and considered. (Orme, 1996) In our case, the product (m-Government service pack) consists of a set of characteristics (information or functional components) with only two levels: the availability or absence of these characteristics. Since the choice is made on the basis of the presence of characteristics (services) that have value to the customer, (Van Kleef et al., 2005) we argue that the assessment process of an m-Government service pack corresponds more closely to the direct measurement used in self-explicated approaches.

There are three methods commonly used to estimate attribute importance values in self-explicated studies: 1) ratings, 2) ranking, and 3) constant-sum allocation. In ranking tasks, respondents are asked to rank options in terms of desirability. In rating tasks, respondents are asked to rate the importance of services (attributes) on discrete rating scale (for example, 1 = not that important, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important). Rating tasks can also be represented by continuous scales where the respondents rate the objects by placing a mark at the appropriate position on a line that runs from one extreme of the criterion variable to the other. The rating scale approach is very popular as the rating tasks are relatively easy for respondents to complete. In the constant-sum method, respondents are asked to allocate a number of points across the different product attributes to reflect the relative importance of each attribute.

As commonly admitted, the main problem with the ratings approach is that it does not explicitly capture the trade-off between attributes. Thus, it is easy for respondents to say that every attribute is important. This often leads to a relatively narrow distribution of attribute importance. (Netzer & Srinivasan, 2007) In addition, respondents tend to use the scale in different ways, such as mainly using the top or bottom of the scale or tending to use more or fewer available scale points. (Sawtooth Software, 2006)

The constant-sum and ranking approaches overcome this limitation but introduce a new problem. To give an answer to the question of "how much more important one attribute is to another?" is a very difficult task. In addition, it is difficult for the respondent to divide a constant sum among all the attributes or to allocate unrestricted sum, especially with a large number of product attributes.

As has been often argued, even with a manageable number of items, the consumers find it really hard to complete that task. Some respondents have difficulty distributing values that sum up to a particular value, even when restriction is built in computer-interactive program. Respondents get irritated very quickly and start to reduce points for attributes at random. The mechanical task of making the allocated points sum up to a particular amount may interfere with respondents revealing their true preferences. (Steenkamp et al., 2001; Sawtooth Software, 2006)

It has been suggested that resource allocation is not appropriate 1) as a measure of preference strength, 2) as a measure of choice uncertainty, 3) as a summary across different usage contexts. (Huber& Bradlow, 2001)

Theoretical and practical considerations indicate that the most stable and easily perceived by the decision-makers (users) are ranking tasks and ordinary information. Ranking data is considerably more efficient compared to other data collection tasks. Previous research found ranking data to have superior reliability and validity over rating data. In addition, as indicated by the researchers, rank order data collection is considerably more efficient than the paired comparison tasks; in the same amount of respondent time, many more equivalently paired comparisons can be inferred from a ranking task than from direct paired comparison judgments. (Green, Srinivasan, 1990) The main problems of ranking tasks are the following: 1) they become difficult to manage when there are more than about seven items and 2) the resulting data are on an ordinal scale only and it is difficult to know how far apart are the attributes from each other. (Sawtooth Software, 2006)

Several approaches have been proposed to address these problems and improve the estimation of the attribute importance values. One is the MaxDiff technique, invented by Jordan Louviere. (1993) With MaxDiff, respondents are shown a set or subset of the possible items and are asked to indicate the most and least important items. The subset consists of a minimum of three items. The importance values are estimated by a hierarchical Bayes logit procedure. The metric information about how much more important one attribute is to another is derived by pooling data across respondents and by utilizing the inconsistencies (if any) in the individual's data. Thus, MaxDiff technique overcomes the limitations of traditional methods but does not provide metric information on importance levels from the individual's data.

Another is the adaptive self-explicated approach, which uses an individual's own data for deriving metric information from ordinal information on attribute importance levels. (Netzer & Srinivasan, 2007) In the first step, the respondent is asked to rank all the product attributes. Based on the ranking data, the respondent is then asked three constant-sum paired comparison questions where respondents are asked to allocate points between two product attributes at a time, to reflect the relative importance of each attribute. The three questions compare the attribute ranked first with the attribute ranked last, the attribute ranked first with the attribute ranked middle, and the attribute ranked middle with the attribute ranked last. The relative importance of the attributes ranked first, middle, and last are estimated using the log-linear multiple regression. The importance levels of each attribute, not included in the paired comparisons, are linearly interpolated based on the ranks using the attributes at the top and bottom of the corresponding interval. An indubitable advantage of this approach is that it provides (approximate) standard errors for each attribute importance. However, the proposed approach of deriving metrical information from ranking data is based on a constant-sum allocation task, the adequacy and feasibility of which is questioned by many researchers. (Huber & Bradlow, 2001; Steenkamp et al., 2001)

Metric information may also be derived with technique based on so-called ASPID- (Analysis and Synthesis of Parameters under Information Deficiency) methodology. The method is broadly applied for value estimation of consumer goods based on a hierarchical attribute system; an expert committee's collective opinion synthesis under uncertainty; multicriteria estimation of probabilities by information obtained from different sources, etc. (Afgan et al., 2000; Hovanov et al., 1995, 1997)

The main advantage of ASPID-methodology is being enclosed in its ability to work accurately with non-numerical, inexact, and incomplete information on weight-coefficients. The method is based on the well-known Bayesian model of uncertainty randomization. (Hovanov et al., 1997)

Non-numeric information can be represented by a system $w_i = w_j > w_s$, $i, j, r, s, \in \{1,..., m\}$, for weight-coefficients $w_1,..., w_m$.

Inexact interval information is represented by the system $a_i \leq w_i \leq b_i$, $i = 1,..., m$, where $0 \leq a_i \leq b_i \leq 1$. Thus, inexact information indicates the intervals $[a_i, b_i]$ for admissible values of weight-coefficients.

Interval information may reflect the judgments about all system of weight-coefficients. For example, given a statement that "a certain attribute *i* is more important than all the rest of the attributes taken together" can be represented by the following interval information $w_i \geq 0.5$. If the importance of another attribute *j* does not exceed the importance of attribute *i* and the importance of all the rest of the attributes taken together does not exceed the importance of attribute *j*, then the interval information can be represented by the system $0.50 \leq w_i \leq 1.0$, $0.25 \leq w_j \leq 0.50$. In a similar way, it is possible to set interval information on any chain of descending weight-coefficients, when each of them exceeds the total importance of all the following attributes.

It is also possible that some weight-coefficients don't enter in these systems of equalities and inequalities. For example, the respondent may not be able to rank all the attributes, but will provide information regarding the relative preference of, say, only two of them. In such case, information is considered to be incomplete.

Let the measurement of weight-coefficients be accurate within the step $h = 1/n$, where n is a positive integer. In this case, the infinite set W of all possible weight-vectors may be approximated by a finite set of all possible weight-vectors with discrete components:

$$W_{(m,\,n)} = \{w^{(t)} + (w_1^{(t)},\ldots, w_m^{(t)}): w_i^{(t)}\{0, 1/n, 2/n,\ldots, n\text{-}1/n, 1\},$$

$$w_1^{(t)} + \ldots + w_m^{(t)} = 1$$

The number of elements of the set $W(m, n)$ may be counted by the formula

$$N(m, n) = \binom{n+m-1}{n}\binom{n-m-1}{m-1} = \frac{(n+m-1)!}{n!(m-1)!}.$$

A non-numeric ordinal, an inexact interval, and incomplete information (I) is then used for reducing the set $W(m, n)$ of all possible weight-vectors with discrete components to a set $W(I; m, n) = \{w^{(s)}, s = 1,..., N(I; m, n) \leq N(m, n)\} \subseteq W(m, n)$ of all admissible weight-vectors, i.e., weight-vectors that meet the requirements implied by the non-numeric, inexact, and incomplete information I.

Uncertain choice of a weight-vector $w = (w_1,..., w_m)$ from the set $W(I; m, n)$ may be modeled by a random choice, which is determined by uniform distribution on the set. Such randomization of uncertainty gives us random weight-coefficients $\tilde{w}_1(I),..., \tilde{w}_m(I)$. Mathematical expectation $\bar{w}_i(I) = M\tilde{w}_i(I)$ of ith random weight-coefficient $\tilde{w}_i(I)$ may be used as a numerical estimation of i – th particular criterion significance and exactness of this estimation may be measured by standard deviation $s_i(I) = \sqrt{D\tilde{w}_i(I)}$ of the random variable $\tilde{w}_i(I)$. As a vector $\bar{w}(I) = (\bar{w}_1(I),..., \bar{w}_m(I))$ $\bar{w}_i(I) \geq 0$, $\bar{w}_1(I) + \bar{w}_m(I) = 1$ of numerical estimations of weight-coefficients is determined on the base of information I, this vector may be treated as a result of arithmetization of non-numerical information I and may be marked by symbol $NINI(I)$ (Numerical Image of Non-numerical Information) or by symbol $QIQI(I)$ (Quantitative Image of Qualitative Information). (Hovanov et al., 1997)

Application of ASPID-methodology allows avoiding the use of constant-sum allocation task for deriving numerical information for service importance. Individual-level attribute importance is derived from ordinal and/or interval information, which also can be incomplete. Moreover, the method also provides mathematical expectation and standard deviation of weight-coefficients which reflect the significance and exactness of the estimations.

The problem of ranking a large number of attributes and services is suggested to be solved by application of hierarchical structuring. Hierarchical structure in elicitation tasks is considered to be natural and easy to understand for respondents. (Oppewal & Klabbers, 2003) The hierarchical structure maps the large number of attributes (content features and services) onto a smaller number of groups. Each group summarizes a particular subset of attributes (services). There can be several levels of hierarchy. In the case of m-Government services, the lowest level is the content of the services reflecting functionality and the degree of detail the content should possess to suit the needs of the users on the move. Next, the content is allocated to the subset of service bundle, and then different service bundles are grouped into more generalized subsets.

4 Methodological framework

The conducted examination of assessment techniques allows proposing the methodological framework for assessment of user needs for m-Government services. The proposed solution assumes the following steps:

1. Elaboration of potential services to be included in a survey.

First, a group of the potential services should be elaborated for users to rank in expressing their preferences. The list of potential services should be detailed very carefully. These should also consider requirements imposed by mobile environment and correspond to three contexts in which users might adopt mobile services (Decker, 2006; Kar, 2004):

- mobile situations where services are of value only through a mobile device, as one's need for these services predominantly arise when away from home,
- time-critical situations and situations in which spontaneous decisions and needs play a role. These situations require immediate response to triggers in their physical or virtual environment. Mobility enables immediate access to static information and to information that is continuously updated,
- situations where people have time to increase efficiency or to kill time using entertainment .

In addition, potential content and services should be relevant to the region, culture, and language in order to initiate and create belongingness to the mobile user. (El-Kiki & Lawrence, 2006) Moreover, since demand for services is non-uniform, it is impossible to satisfy the interests of everyone and accomplish all users' needs. Therefore, it is suggested that the preference should be given in areas where the level of interest among the target group of the services is the biggest. (Rannu & Semevsky, 2005) Therefore, the segmentation of the users is required to optimize the service offer for a particular segment, e.g., in case of mobile municipal services, the segments can be represented by individuals, households, communities, organizations, and businesses. Individuals and households, in turn, might be represented by students, retired individuals, parents, young adults without children, tourists, etc. However, inside the segment, users are not homogeneous either, and their demand for services has a complicated structure. They may belong to various customer groups and have interests on specific topics that may align to one or more specific services. Given this, identification of a small set of high-value services for a particular segment seems to be more appropriate.

2. Hierarchical structuring of potential services

Including an extensive list of potential m-Government services in ranking tasks might lead respondents to confusion when analyzing a substantial number of services and content attributes simultaneously. In order to avoid placing information overload on the respondents, the services have to be grouped in a hierarchical structure. The hierarchical structure is researcher-defined. It has to be made based on theoretical considerations, empirical findings, or the ad hoc needs of a research project. (Oppewal & Klabbers, 2003) Therefore, it is necessary to consider grouping applied to m-Government services in both research literature and practice. There are many categorizations of mobile municipal services suggested by researchers. The most extensive are offered by Zálešák (2003) and Sotelo and Lopez (2007). Zálešák classifies m-Government services in eight categories: (1) m-Communication (both not binding and legally binding communication and information, provided by businesses or individuals to government and vice versa), (2) m-Payment for information and services, (3) m-Voting, (4) internal m-Government operations, (5) location-based services; (6) m-Government for transportation, (7) m-Government for education, (8) m-Health.

Sotelo and Lopez classify services into six types: (1) information retrieval (criminal investigation, weather information, car traffic, etc.), (2) public online service (process of request, retrieval of certificate, issue from citizen, notice of result), (3) data gathering (environment/pollution, census poll), (4) disaster alert (message services such as hurricane warnings, earthquake warnings, etc.), (5) G2B service (government procurement and payment), (6) e-Tax (payment of national tax, local tax, car tax, etc.).

Since the needs of every community are different and the idea of the hierarchical structuring is "to group the attributes into logical or at least useful subgroups which are either meaningful to the individual or actionable by management or both" (Louviere, 1984), it is necessary to examine the living environment of a respective municipality in order to come up with appropriate groupings.

In addition, defined groupings have to be tested to reveal whether they seem natural for the users since hierarchical structures that are more intuitive and natural for respondents will better support the decision-making process than structures that are less natural. (Oppewal & Klabbers, 2003)

3. Offering to the users a number of potential services for ranking the options in terms of desirability.

Next, the questionnaire survey has to be designed. The questionnaire should contain the description of the m-Government service package describing the basic concept, and it should comprise three tasks.

In the first task, potential users will be asked to rank the importance of presence of different attributes in each service bundle. The second task records the subject's perception of different services inside each service group. The ordinal information on each service's importance is to be obtained in a similar way as it is done in the first task. The third task of the questionnaire records the subject's perception of relative importance of pre-defined groups of services.

Many studies can be criticized because of inadequate effort spent on designing and testing the questionnaire. (Pearce et al., 2002) It is therefore necessary that the draft questionnaire is tested by focus groups comprising of six to twelve people to reveal whether the issues are understood, wording is clear, and questions are sensible. After the focus group sessions, the questionnaire design has to be revised in light of the responses, so as to eliminate any problems that had arisen and maximize the amount of information that can be gathered.

4. Applying fuzzy sets synthesis technique based on ASPID-methodology to derive user preferences towards services and their attributes.

Obtained ordinal information reflecting relative importance of different service attributes and services is then to be evaluated using ASPID-methodology. The evaluation is to be conducted using a decision support systems shell named "ASPID-3W." The output information for the attributes within a service bundle, for service bundles within a service group and for pre-defined groups within a service package include:

(1) mathematical expectations of weight-coefficients which are used as a numerical estimation of attribute (service) criterion significance,

(2) standard deviations which reflect the accuracy of this estimation,

(3) probabilities of dominance in pairs which are used as reliability estimation of the revealed ranking values.

5 Conclusion and future directions

Investigation of the user preferences is among the crucial factors required in order for m-Government initiatives to succeed. Reported investigation is, therefore, a contribution to the research on user-centric m-Government. This paper has presented a methodological framework that allows revealing numerical information on users' preferences towards potential m-Government services and content features. The problem of uncertainty entailed in the inability of the users to provide exact numerical values of the services' importance was addressed by the adoption of the ASPID-methodology. Application of the ASPID-methodology allowed taking advantage of using ranking data, which has proven to have superior reliability and validity for deriving numeric values of services and service attributes' importance. The developed framework will be further applied to study user preferences for m-Government services in one municipality in Japan.

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