



The Value of Mobility for e-Government

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Abstract: Mobility is the future trend of e-government development. Yet we don't know much about what leads to user adoption of mobile government applications and services. In this paper, based on our analysis of extensive number of mGov applications, we propose a 3P Model of mobile government value model which can be used as a tool to evaluate applications in three dimensions: prime value, pleasure value and post value. This tool may be of interest to governments and mobile solution developers.

Keywords: Mobile Government, mGovernment applications, application evaluation

1. Introduction

With the developments in mobile and wireless technologies, some applications and services of e-government are being provided through mobile devices, and yet these technologies are also opening ways to some unique and new applications and services. We term this move of e-government implementation on the mobile platforms as Mobile Government (Kushchu, 2003).

Since the emergence of e-government there has been various approaches to analysis and classifications of applications and services. Following from e-commerce traditions, these approaches are often very broad such as Government to Government (G2G), Government to Citizens G2C etc. Some other broad views look at these applications and services in terms of functions they perform including information models, communication or transaction models.

These approaches often undervalue critical details that actually determine the real value of particular applications or services. In order to avoid such pitfalls we propose a closer look at the details and form an analysis of these applications based on value that a particular application or service may offer. In this paper we focus on mobile government and propose a 3P Value Model of mGovernment applications (3P Model) which uses three perspectives in explaining the value of mobile government applications and services. An analysis and understanding of mobile applications and services based on 3P model is important at least for two reasons:

1. The governments and public sector policy makers can better understand the real value applications and level of possible adoptions by the users in order to plan and prioritise the resources and make informed commitments to particular applications and services.
2. IT practitioners developing mobile government applications can better refine the design of your tools for successful marketing and user adoption.

In this paper, we first present a conceptual framework of mobility for e-government. Next, after presenting the 3P Model, we analyse various mGovernment applications and services within the model proposed. The paper concludes with limitations of the model and future plans.

2. Mobility of e-Government

With an increasingly mobilized workforce, people realized the importance of quick and readily available information. This set the basis for developing mobile government applications.

2.1 Driving Forces for Mobility

In many developed countries, a significant amount of services are being delivered online in parallel to the developments in e-government. The service quality will follow the technological evolution of the Internet, and the future development of e-government applications will be evaluated based on mobility, interactivity and intelligence. Among these three dimensions, mobility is expected to gain more attention than the other two. The reasons are (Kushchu, 2003):

- *Increased expectations towards government services:* Often, people having more money than time, and they want services to be more readily available with a high standard. When people are aware that some new service is available in the commercial sector, they will expect for more in governmental services. This in turn requires more efficient civil servants who need more accurate and timely information readily available regardless of where they

are working. This contributes to the forces driving mobile government applications.

- *Emergence of mobile internet:* With the development of 3G mobile network services, the capability of providing services through mobile devices are greatly improved. This development makes the provision of mobile government applications possible and more accessible than using the wired Internet.
- *Further improvement on e-government effort:* Mobile government is not a replacement to e-government but complementary to it. People can access the applications from a new platform in case they do not have access to the wired internet.

2.2 Mobile government applications

To facilitate the discussion ahead, let's provide a brief definition of mobile government: *a strategy and implementation of governmental services through a mobile platform to provide its users, both citizens and civil servants, the benefit of getting services and information from anywhere at anytime.* (Arazyan, 2002; Kushchu, 2003)

Extending from this definition, mobile government applications may be considered as different from e-government applications in terms of the followings:

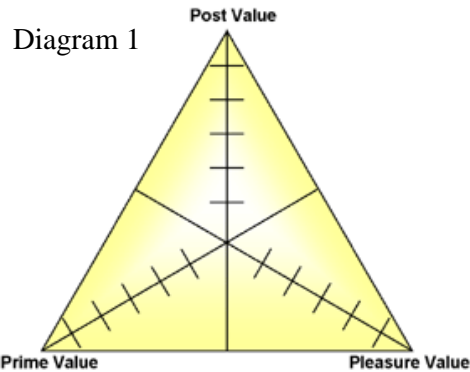
- *Personalized information:* Computer can be shared among different users, but mobile devices are designed to be used by a single user. This means that personalized information can reach the same user at any time through that one specific device.
- *Always on:* Different from personal computers, most mobile devices are always switched on. Usually, these devices stay at an inactive state, but applications can "wake up" the device. This is very different from e-government applications.
- *Mobile devices are designed to be carried around:* As mobile devices are always carried around by the user, applications can be designed to provide instant information to the users. An example is to send out warnings during emergencies.

The development of mobile government applications can simply be migrating e-government applications to a new platform, or to develop new applications according to the characteristics of mobile devices. There is no definite answer to which approach is better, and that depends wholly on the provisions of particular applications.

In terms of technology involved, currently many mobile government applications make use of SMS (short messaging service). Other technology includes WAP, MMS and mobile internet. It is expected that mobile internet will play a much more significant role in near future due to the development of 3G technologies and the capabilities to process more information faster.

3. Value of mobile government applications

After visiting the importance of mobility in government services, the next issue is concerned with the evaluation of value for mobile government applications. We have reviewed many secondary



resources, such as report and news on applications from different countries. According to our observation, we have identified three major areas which contribute to the overall value of an application. Therefore, we have come up with a 3P Value Model for mGovernment application (3P Model). 3P Model has three dimensions of evaluations: *prime value, pleasure value and post value.*¹

In the following discussion, we will use 3P Model to identify the key elements of what is valuable in some current mobile government applications.

This analysis aims to help improving our understanding of mGovernment applications and services and to help application developers and government officials to identify applications that are worthwhile to invest in.

3.1 Prime Value

Prime value means satisfying a real need for the users. Satisfying the real need does not simply imply providing users with what they want, but to solve a particular problem they are facing. For mobile government applications, prime value is concerned with providing a solution to problems that could not be solved easily by the wired technologies.

Every application has its own functionalities and serves a different need to the users. We will demonstrate how prime value is created in each of the following examples.

3.1.1 Instant information release

Mobile devices are often carried by users and are always turned on. This characteristic enables mobile devices to serve as a warning or reminder to users with quick and specific information release. The tables below each having three columns provide information on where the application is developed, a brief description and its relevance to the dimensions of 3P model. *As these models are foundations of our model we invite readers to go through the tables carefully.*

Table 1: Instant information release

| Where | Description | Relevance |
|---|--|---|
| <i>SMS for people with hearing disabilities</i> | | |
| Great Britain | <ul style="list-style-type: none"> citizens with hearing problems can be contacted by the police with SMS. (Zalesak, 2003b) | <ul style="list-style-type: none"> may not be replaced by the wired Internet |

¹ The earlier version of 3P Model is originated from the service model of Hong Kong Correctional Services Department (Hong Kong Correctional Services Department, 2002) and is fine-tuned to fit the discussion in mobile government applications based on our analysis of the experiments.

| | | |
|-----------------------------------|---|---|
| Amsterdam | <ul style="list-style-type: none"> • SMS message are sent to citizens with hearing problem in emergencies • includes instruction such as "go home" or "leave the place", so they understand how to react. (Zalesak, 2003b) | <ul style="list-style-type: none"> • people with hearing problems cannot listen to warning bells and the only way to warn them of danger is by the use of mobile devices which can vibrate to notify the users • satisfies the need to warn citizens with hearing problems about potential danger |
| <i>Special notification cases</i> | | |
| California, USA | <ul style="list-style-type: none"> • SMS are sent to citizens in case of energy black-outs. (Zalesak, 2003b) | <ul style="list-style-type: none"> • governments try every communication channel to notify citizens during emergencies |
| London | <ul style="list-style-type: none"> • Police may send notifications to citizens about potential terrorist threats or attacks. (Zalesak, 2003b) | <ul style="list-style-type: none"> • yet working people are too concentrated on work and may not receive the warnings • notice danger when friends or families call • more effective to spread the message directly |
| <i>SMS floods warning systems</i> | | |
| Malaysia | <ul style="list-style-type: none"> • automatic measuring devices are installed to monitor water level. • when it rises to certain level, the control centre sends a message to all the affecting citizens. (Zalesak, 2003b) | <ul style="list-style-type: none"> • citizens may aware of danger in day time even without warnings from government • in night time, mobile device which are often with the user serve as a very good way to warn the users of potential danger. |
| United Kingdom | <ul style="list-style-type: none"> • In case of emerging floods, information are sent via SMS, emails, fax and television. (Zalesak, 2003b) | |

3.1.2 Mobile warning

In the above examples, the messages are sent as mass mailing to people who are in danger. Another way of using messaging service is to target at particular persons and give them specific warnings. Please refer to table 2 for some examples.

Table 2: Mobile warning

| Place | Description | Relevance |
|---|--|---|
| <i>Fight against mobile phone theft</i> | | |
| Amsterdam | <ul style="list-style-type: none"> • SMS messages are sent to the mobile number of stolen phone every 3 minutes • make use of IMEI code which is unique for each phone • application can still work even when original SIM card is removed (Zalesak, 2003b) | <ul style="list-style-type: none"> • application is nominated to special prize of the Ministry of Justice • this application creates burrier to thieves on handling stolen mobile phones and prevents them from re-selling. • create the prime value of preventing mobile phone thefts |

| <i>Prevention of bogus phone calls on emergency lines</i> | | |
|---|---|---|
| Dutch crisis centre in Driebergen | <ul style="list-style-type: none"> When bogus calls are initiated through mobile phones, SMS messages will be sent to that mobile number to "bomb" the phone. (Zalesak, 2003b) | <ul style="list-style-type: none"> only one fifth of the calls are genuine the centre need to reduce these bogus calls to better allocate resources to serve those who are really in need. application stops people from making repeated bogus calls |

3.1.3 Quick information collection

The possibility of retrieving information while on the move is one of the major characteristics of mobile government applications. This allows civil servants to collect necessary information to provide more efficient and effective service to the public. Examples are shown in table 3.

Table 3: Quick information collection

| Place | Description | Relevance |
|---|---|--|
| <i>Fire fighting</i> | | |
| | <ul style="list-style-type: none"> firemen receive critical information on their way to the site using mobile devices get information such as structure of building, presence of toxic materials, surrounding environment and number of people trapped. can connect mobile devices to camera in the buildings on fire and observe the interior environment (Kushchu, 2003) | <ul style="list-style-type: none"> in the short time between receiving fire alarm and arriving at the site, fire fighters may have only a few minutes to form a strategy based on limited information. fire fighters can receive more information and forms better strategy. impossible to use wired internet |
| <i>Search for missing children / citizens and criminals</i> | | |
| Germany | <ul style="list-style-type: none"> when police are searching for missing person or criminals, SMS message will be sent to registered bus and taxi drivers. includes relevant information such as description of the person and possible location to be aware. (Zalesak, 2003b) | <ul style="list-style-type: none"> increase the chance of finding missing person by extending the search from police to drivers minimize the searching time for missing people minimize the potential danger of criminals posed on the public |

3.2 Pleasure Value

The *pleasure* dimension of 3P model represents provision of better services to make citizen-government interaction more enjoyable. This dimension may come about in different forms, such as ease of getting service, or clarity of information. The possibility of receiving service through mobile phone is an improvement in experience already.

Different from applications which contribute to prime value, applications classified as this dimension do not address new ways of satisfying users. Instead, applications are designed to

improve the overall experience of service recipients from governmental organizations. The following examples can demonstrate how pleasure value is created by mobile government applications.

3.2.1 Mobile transactions

Transaction is a very important part in doing business and how to improve that experience for customers can be an interesting issue. Currently, many companies are exploring the possibility of mobile commerce and some governmental organizations have already taken the initiative to utilize this opportunity.

Table 4: Mobile transaction

| Place | Description | Relevance |
|----------------------------------|--|--|
| <i>Mobile automobile parking</i> | | |
| Sweden | <ul style="list-style-type: none"> registered driver can log in and log out a parking space using a mobile phone. fee is automatically charged to the driver's account receipt is sent via SMS (Olov, 2003) | <ul style="list-style-type: none"> drivers can skip the painful process of carrying loose changes and searching around for the nearest parking machines the convenience and time saving create a better experience |
| <i>Tax declaration</i> | | |
| Norway | <ul style="list-style-type: none"> pre-filled tax declaration form is mailed to the citizen in advance if the person has nothing to change in the form, he can send a SMS message with specific code and complete the entire tax declaration procedure. (Zalesak, 2003b) | <ul style="list-style-type: none"> simplify the tax declaration is feasible in e-government context, but mobile technology improves users' experience because they can complete the whole process even during his way to office. |

3.2.2 Faster information exchange

In case the speed of information exchange is important but not critical, applications are defined as enhancing the pleasure value for users.

Table 5: Faster information exchange

| Place | Description | Relevance |
|------------------------------------|--|---|
| <i>Mobile hospital staff</i> | | |
| Sweden | <ul style="list-style-type: none"> doctors and nurses can catch, deliver and receive care data at the point of care equipped with pocket PCs which are connected through wireless LAN to the central database (Olov, 2003) | <ul style="list-style-type: none"> mobile technology enables hospital staff to have faster information flow decrease in time for transferring data results in better decision in shorter time |
| <i>Mobile elderly care workers</i> | | |
| Sweden | <ul style="list-style-type: none"> field workers are equipped with mobile devices provide updated information on elderly, ailing or handicapped people in | <ul style="list-style-type: none"> ability to access data from service site allows care workers to spend more time on their job rather than travelling around for information |

| | | |
|---|--|--|
| | need of home care | |
| <i>SMS for fighting against higher rate of employment</i> | | |
| Australia | <ul style="list-style-type: none"> target: citizens, mainly teenagers on potential offers or updates (Zalesak, 2003b). | <ul style="list-style-type: none"> allows job seekers to reach information in a timely manner improves users' experience in accessing the information. |
| Sweden | <ul style="list-style-type: none"> SMS were sent to a pool of registered workers who are willing to work as temporary (Olov, 2003). | |
| <i>More efficient garbage collection via SMS</i> | | |
| Quezon, Philippines | <ul style="list-style-type: none"> reports need for cleaning services in given areas. (Zalesak, 2003b) | <ul style="list-style-type: none"> allows citizens to communicate with dustmen service, so the environment can be improved. |

3.2.3 Fighting against crime

To fight against crime, law enforces need citizens' corporation to provide information. The reports from citizens can increase the chance for police to arrest suspects, find missing people and better investigate the cases. Table 6 shows some examples.

Table 6: Fighting against crime

| Place | Description | Relevance |
|------------------------|---|--|
| <i>Reporting crime</i> | | |
| Manila, Philippines | <ul style="list-style-type: none"> can report suspicious activities via SMS receive SMS messages on the increase in crime rate in particular region | <ul style="list-style-type: none"> encourage people to report criminal activities by simplified procedures, easier channel and faster response from the improved the participation in crime prevention from citizens |
| Italy | <ul style="list-style-type: none"> a couple of thieves are caught after photos of criminal act were taken by others and sent as MMS to the police. | |

3.3 Post Value

Value is a comparative relationship between benefits and costs; clearly the issue of costs can have a significant impact on the users' perception of value. Besides the cost in terms of money, other costs may include potential privacy issues and possible danger in security. Post value, the third dimension deals with these issues. This value is the perception of users towards government services and how users feel after they use the services. This serves as a foundation to the 3P model and differentiates applications that are welcomed and easily adopted by citizens. Applications that provide this value should make users feel that their privacy or security issues are handled properly.

To demonstrate how post value is created, we will look at several example pairs. In each pair, the applications have similar functionality but the users' response is greatly different. We will look at the nature of applications and identify the elements that differentiate the two.

3.3.1 Location identification: privacy of users

GPS can be a very powerful tool to identify users' location. The proper use of it can allow users to be located and shortens the time to find services at a particular location. However, users are

worried about misuse of such tool to interfere with their privacy. In the following tables, the left column will provide descriptions on 2 similar applications and the right column will discuss the relevance to the post value dimension.

Table 7: Location Identification

| Application Pair | Relevance |
|--|--|
| <ul style="list-style-type: none"> all police are equipped with GPS enabled mobile devices by tracking the location of each police on the road, control centre can better allocate resources. | <ul style="list-style-type: none"> both applications make use of GPS system to track the location and have potential benefits to the users. but users' reaction can be very different policemen are required to report their location and GPS system automates the process, results in better allocation of resources drivers do not want to be tracked every moment because it is invasion into their privacy difference in users' situations leads to differentiation in the value of two applications by providing different post value policemen feels good because it reduce their work, but the privacy issues of drivers overrule the potential benefits of the application |
| <ul style="list-style-type: none"> every car is equipped with a device similar to black box of airplanes in car accident, message will be sent to police and hospital. different emergency units can react quicker to accidents | |

3.3.2 m-Voting: security of data transfer

Mobile voting via SMS has been used in some local government elections, but is especially popular for private commercial use in conducting polls and receiving customer comments, often for entertainment events. Table 8 shows the differences of m-Voting in commercial service and governmental sector.

Table 8: m-Voting

| Application Pair | Relevance |
|---|---|
| <ul style="list-style-type: none"> countries such as United Kingdom and Czech Republic have tried voting via mobile phones the response is not very positive. (Kushchu, 2003) | <ul style="list-style-type: none"> In commercial m-Voting, there are not much privacy issues because people are not worried if the message content is known by others voting in government applications may be different in terms of the sensitivity of subject matter. It involves personal data as well as the political believe. when people cast their vote via SMS, the opposite side may know their mobile number and track back to the person lack of confidence in mobile technology has greatly affected the post value, thus results in negative comments |
| <ul style="list-style-type: none"> in commercial sector, voting is usually for the use of entertainment e.g. casting votes for the favourite singer or movie | |

4. Integrated evaluation of 3P Model

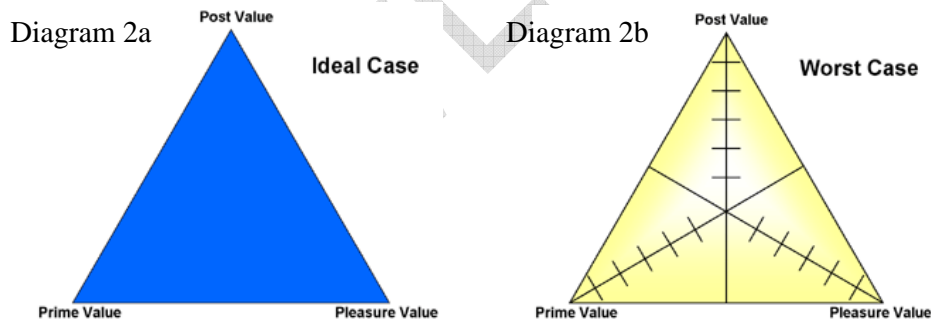
After reviewing the dimensions individually, we will talk about how the three components contribute to the overall value of an application.

To visualize the overall value and facilitate the comparison of different applications, we use a diagram to show the level of different values of an application. The values are positioned at the corners of a triangle and the distance from centre to the corner is proportional to the level of value provided. After plotting the value in each dimension, a triangle is drawn and the size of the triangle shows the overall value of the application.

We will first present the method to quantify the value level for each dimension and the extreme cases, that is ideal application that provides best value in all the dimensions and worst application that does not provide any value. Then out of the many examples we have analysed, we will present a few of the typical applications that are actually in use.

4.1 Extreme Cases

An ideal application should serve its purpose through the use of mobility in providing enjoyable experience during and after the use of that particular application. Putting this ideal application in the 3P model, it means that it should fill the triangular model as shown in diagram 2a. In contrary, the worst case is shown in diagram 2b. The application cannot provide any value in the three dimensions.



4.2 Example Applications

In reality, there is no such extreme case. No application is perfectly good or bad and we will look at a few of the examples mentioned in this paper from all three dimensions. (The value evaluation of all the applications can be found in the appendix.)

- SMS for people with hearing disabilities:* As mentioned in 3.1.1, this application provides a good prime value for people with hearing disabilities. At the same time, this application provides fair value in both pleasure and post-feel. While using the application, users can communicate better with policemen and this improves their experience in receiving governmental

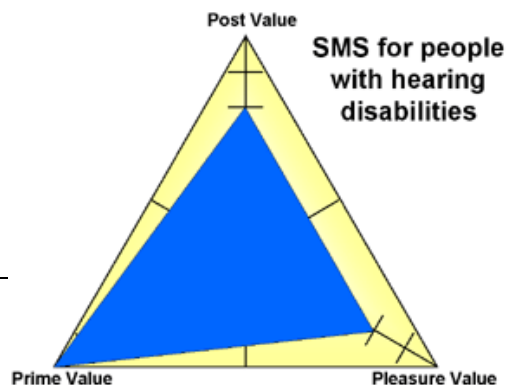


Diagram 3

service. For the post value aspect, users have to register for the applications before they can use it. This is a voluntary registration and users give consent to police for using this information to help them to solve problems. Users are aware of private data collected, though users may still have some worry on privacy issues. Overall, this application is excellent in terms of the purpose it served and provides fairly good pleasure value and post value.

- Mobile automobile parking:* The major function of this application is to improve the experience when drivers pay for the parking fee. This provides excellent pleasure value, but provides little prime value. The transaction of parking bill can be settled in person at the gate and there are not much extra value provided through paying the bill with mobile phone. For the post value, this is a voluntary registration and drivers are aware of data provided. However, there is still some privacy issue, because the application will record the time when drivers use that car park. Also, there may be security issues in the transaction. This provides some negative impact on the post value.

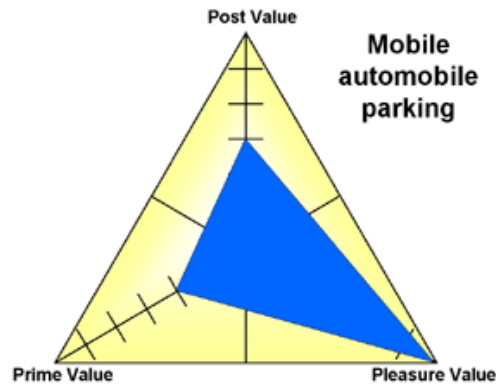


Diagram 4

- M-Voting:* The value provided by m-Voting system in governmental service is shown in diagram 5. The application provides fair prime value as it allows users to cast a vote even they are on the move. From the aspect of pleasure value, users enjoy the use of mobile device to do voting because it simplifies the voting process and users can do the voting easily without the trouble of going to vote centres. However, in terms of post value, the application does quite a bad job. Users are concerned with whether their political stand is known and tracked and the possibility of missing the vote. These negative feelings contribute to the low post value of the application.

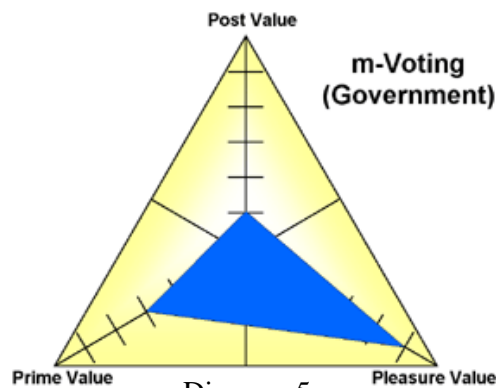


Diagram 5

We have analyzed all the applications (18 in total) mentioned in this paper with the 3P model, but only three are presented as examples. Currently, there is no standardized way in quantifying the value level for each dimension. However, we are working on the selection of features/descriptions that determine the value level of each dimension. This will come as part of our plan in finding experiential evidence that serve as solid backing to this model.

In the mean time, we suggest that the value level can be determined by examining current mGovernment applications. For example, we observed that the pleasure value can be a combination of easiness to use, accessibility, quick response, time and money saving. These

features contribute equally to the level of pleasure value and an application that has all five features will have the highest pleasure value.

Other ways to describe value level can be a linear scale with descriptions for each value level. Take the prime value as an example. An application that has the highest value may fit into the description "Mobility is critical in the application and satisfies unique need which cannot be accomplished by other communication channel." Another application with minimum prime value may fit into "application that fulfils its designed purpose but this purpose can be fulfilled by more than one other delivery channel".

In our planned experiments, we aim to discover the best ways to determine and quantify the value level for each of the three dimensions.

4.3 Application development

Although the size of triangle in the 3P Value Model describes the overall value of an application, there is one important factor that weighs more than the size. The post value should be given priority when an application is developed. Even if an application achieves very high value in prime and pleasure value, the application cannot be fully utilized if it provides little post value. When an application is under the planning stage, the ideal way of design should go from the post value, then to prime value and lastly to the pleasure value. This will ensure that issues like privacy, security and validity are well considered and planned in the application. Prime value should go before the pleasure value to ensure that users' need is properly addressed and the application serve its original purpose.

However, in reality applications are mostly designed the sequence of prime value, pleasure value and post value is considered at last. This is mainly because post value is difficult to achieve in the mobile environment. There may be technical solution to security and other issues, yet people still have doubts towards these solutions due to lack of understanding in such technologies. For privacy issues, there are currently no solutions and this is a very difficult question for system developers.

5. Conclusion

This paper aimed to provide a framework for analysing and classifying mGovernment applications which goes beyond the traditional G2C, G2B classification. With the 3P model, the characteristics of mobile applications are highlighted and differentiated accordingly. We believe that this model can be useful to IT solution providers and government officials when they plan for the development of mGovernment applications.

The 3P model is designed based on evidence from our analysis of extensive number of current applications of mobile government and services. This study helped us to identify the dimensions of the model and also how to evaluate each application on the triangular map of these dimensions. The 3P model serves its purpose of providing an analytical method, yet it lacks experimental evidence to show the analytical result of the model to usability of applications. Another weakness of the current model is the lack of systematic approach to quantifying the level of values provided by each application. To overcome these weaknesses, we plan to conduct surveys or other forms of experiment to provide a stronger foundation to this model.

In applying the model, dimensions may be changed more dynamically, but essentially we believe the dimensions we proposed are representative. As a summary of this paper, we have presented various mobile government applications and analysed the value associated with it. Also, we have proposed foundations of a model that may be used in evaluating the value of mobile government applications and serves as a tool for policy makers and IT solution providers.



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