



## Linking Social Media with E-Government Services (Saudi Arabia case study)

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### ABSTRACT

Governments around the world are adapting the e-government initiative to provide new ways of delivering their services. The e-government initiative aims to increase government performance efficiency; however, there are a number of limitations facing the success of the e-government initiative. One of the key limitations is the citizens' lack of knowledge about the e-government services which, in turn, requires an in-depth understanding of the citizens' needs in order to provide them with the right service, at the right time. One way to accomplish this is by using the life-event approach, which is considered to be a citizen-centric approach that matches the citizen's life-events with the needed e-government services. Moreover, with the increasing population using or organising their lives on social media, some services are turning to organising and recording a person's life. One such example is the 'timeline' on Facebook, in which the events in a person's life are being recorded, and considered to be a source for capturing citizen's life-events and needs.

This research aims to develop a mechanism to advertise e-government services to citizens by using social media based on the life-event approach. Accordingly, the Social Media - Norm-Based Life-Event (SM-NoBLE) system is implemented with a mechanism for extracting citizen's life-events from citizen interactions with social media. Then, it matches life-events with relevant e-services using the Norm-Based Life-Event (NoBLE) framework and the concept of norms borrowed from organisational semiotics for the matching mechanism. This research creates a case study of Saudi Arabia to apply the SM-NoBLE system to evaluate accuracy and functionality.

### Keywords

Social media, e-government, life-event, twitter.

## 1. INTRODUCTION

### 1.1 Research Background

The term electronic government or e-government has been of global interest, and has become one of the main topics on the international agenda. The e-government project was launched in the late 1990s by governments at all levels, to provide governmental information and services to citizens and businesses (Gronlund and Horan, 2004). Governments are increasingly developing their own services using the Internet to improve this provision, and at the same time, e-government adoption has increased rapidly around the world.

There are a number of challenges facing e-government adoption and limiting the expected benefits. According to Ebrahim and Irani (2005), the main challenges that emerge from analysing different literature are categorised into: IT infrastructure, security and privacy, IT skills, organisational issues and operational costs. These challenges could vary from one country to another depending on the nature of the government. Another challenge that has emerged from reviewing the literature, in identifying factors affecting the citizen's intention to adopt e-government, is that citizen awareness is one of the barriers that affects the adoption of e-government services (AlAwadhi and Morris, 2009; AlShihi, 2005; Alateyah et al., 2012; Alshehri et al., 2012). This issue occurs when citizens have certain needs and governments provide them with the wrong services, due to a lack of knowledge on both sides, and the citizens do not have the knowledge of which services could be found in an e-government portal.

Many governments have started looking for new approaches to address their e-service provision, based on their citizens' needs. Basically, the citizen is one of the key stakeholders in the e-government system, and it has become one of the main objectives for e-government to provide high quality services for citizens that improve citizen awareness and the usage of these services. Lately, the life-event approach has been developed to match the services with citizens' needs (Alsoud, 2012). Life-event approaches provide e-government services and information to citizens based on the most important events of a citizen's life. Many governments around the world are now using the life-events approach in their governmental portals as a main channel for presenting and providing their e-government services, such as in the United Kingdom, Jordan and the Maldives (Alsoud and Nakata, 2012). As mentioned earlier, the life-event approach is a way of providing e-government services and information to citizens based on the most important events in their lives.

In addition, the number of people using the social media has increased (Hampton et al., 2011), people start to organise their lives on social media and reveal their personal information and day-to-day activities and life-events, and it is all recorded in the social media sites. In another way, if this interaction with the social media combined to push e-government information and services. In particular, using the social media as a source of citizen's life-events to enable e-government service based on social media.

### 1.2 Literature Review

#### 1.2.1 Life-Event Approach



The life-event approach is a new and emergent technique that is useful in the provision of information and services from the e-government to the citizens. The distribution of the information and the various important services is via government portals (Vintar et al., 2002), and this approach uses the technique of grouping the information and services, which are essential for providing a solution to a particular problem. Citizens are able to find solutions easily, because this approach carries out the integration of all relevant services that are necessary to solve their problem. The access to information and services is fast, since all of the information is in one area on the web. The government portals have different models that assist in a quick response to all of the various life issues and events that trouble citizens (Leben et al., 2004), and the models are based on the characteristics of the citizens, such as birth, education, marriage, death, retirement and family. Any information relating to the mentioned characteristics is from the corresponding portals that contain similar information. According to Leben et al. (2004), this approach has been acting as a metaphor for citizens to retrieve and administer various activities in a user-friendly environment. The various portals used include life-event photos (Vintar and Leben, 2002), and they are very effective in the provision of government related information.

The proposal is built on models that will act as a framework for the life-event approach, and are able to provide the user services as suggested by Todorovski et al. (2006). The proposed model was to be used to provide detailed information for these portals at different levels, and to be suitable for different classes of citizens. These include the identification level, specification level, interactive level and transaction level. The identification level consists of the descriptions of the life-event approach, and the specification level contains the descriptions of public services. The interactive level contains the documents and processes that can be used to describe life-event interests. Finally, the transaction level contains employee information, and the backup for the different public services.

We reviewed a number of research papers (Vintar et al., 2002; Vintar and Leben, 2002; Bercic and Vintar, 2003; Leben and Bohanec, 2004; Todorovski et al., 2006; Trochidis et al., 2006; Momotko et al., 2007; Tambouris and Tarabanis, 2008; AISoud and Nakata, 2012) conducted on the use of the life-event approach for presenting, designing and building e-government portals. Up to this point, the use of the life-event approach has only touched on areas like design, presentation and building of the portals for the e-government public service, with the exception of AISoud and Nakata (2012). They used the Norm-Based Life-Event framework known as NoBLE, which uses the same life-event approach but designs and builds the whole e-government portal based on it. NoBLE develops a systematic framework to design a life-event oriented G2C e-service provision system by adopting the life-event approach. The framework is founded on norms perception, which is used to direct the behaviour of the framework and to capture the social and government norms.

### 1.2.2 Norm-Based Life-Event (NoBLE) Framework

The NoBLE framework uses the life-event approach for designing active e- government portals. The designed portals are also based on the life-event approach, and this framework is known as the Norm-Based Life-Event, with a mechanism similar to other life-events. The services found here include the registration of e- services, specification of life events, and the creation of the profiles for the citizens. Organisational semiotics (OS) acts as the basis upon which the concepts of this framework are built, and this framework is vital for the provision of the identification of services. It also provides conditions, actions and responsible agents to be followed in cases of information retrieval.

The conceptual framework has the capability of capturing the various needs of citizens using their profiles. This new approach, in terms of the conceptual framework, incorporates three basic components: non-anticipatory life events, anticipatory life events and recurring services. It allows the government to provide personalised services to the citizens using citizen profiles and norms. The NoBLE framework is preferred to the basic life-event approach because it has a more integrated and active portal for life-events. The integrated and active portals are essential for the provisions of G2C services, because they have provisions for the creation of a Lifecycle for the citizens.

### 1.3 Research Problem

There are a number of limitations in the current provision of e-government services, which in turn constrain the use of e-government services. For example, the IT infrastructural weakness of the e-government public sectors includes its lack of technical experience, personnel and financial capacities. Another key limitation is that the citizens lack knowledge about the e-government services, and the time to find a service on the e-government websites is slow and complicated (Sabucedo et al., 2010). These limitations are key concerns for governments who are trying to improve the e- government adeptness. As a result, if we could find a mechanism to bring the e- government services closer to the citizen, then we will increase the citizen awareness and adeptness of the e-government services. Moreover, the last few years have seen rapid growth in the use of social media by users revealing their information and day- to-day life events. For this reason, there is the motivation to link social media with e- government services in order to bring the e-government services closer to the citizens. However, this creates the questions of how to link them, what approach should be used, and whether linking social media users to e-government services is effective.

### 1.4 Aim

The aim of this research is to investigate a mechanism to push information about e-government services to citizens by using social media based on the life-event approach. In this research, the target country is Saudi Arabia.

## 2. RESEARCH METHODOLOGY

In general, there are two main research approaches: quantitative and qualitative. Quantitative methods are used to gather quantitative data, or information dealing with numbers and anything that is measurable, which is widely used in both the

International Journal of Management and Information Technology natural sciences and social sciences. On the other hand, qualitative methods aim to gather an in-depth understanding of human behaviour and the reasons that govern various aspects of human behaviour, while focusing on small samples rather than large random samples. Hevner et al. (2004) stated that in order to evaluate the developed artefact, it requires the definition of appropriate metrics and possibly the gathering and analysis of appropriate data. IT artefacts can be evaluated in terms of functionality, completeness, consistency, accuracy, performance, reliability, usability, fit with the organization and other relevant quality attributes (Hevner et al., 2004).

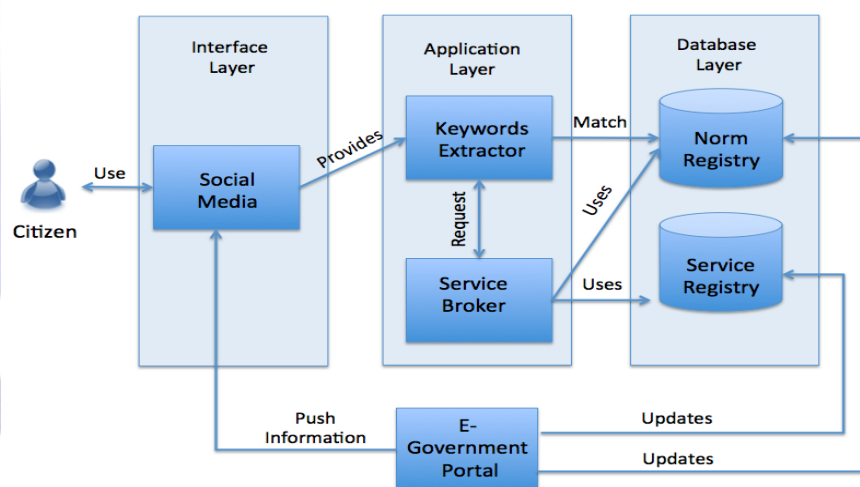
In this research, we adopt this design for research to develop an IT artefact; and to evaluate this artefact, a quantitative case study approach was chosen in order to achieve the research aim and objectives. Case study research is one of the most common methods in IS research since it can follow a design science paradigm to study an artefact in depth in a business environment (Hevner et al., 2004). The research case study of Saudi Arabia (KSA) consisted of three stages. The first stage was basically evaluating the Saudi Arabian e-government portal, especially in terms of e-service, to discover what it offers and what challenges they face. The second stage was applying the developed artefact to the Saudi Arabian e-government and social media users. The last stage consisted of evaluating the developed artefact in terms of functionality and accuracy using a quantitative approach.

## 2.1 Active Push of E-Government Information to Social Media Users Based on NoBLE Framework

For the Social Media - Norm-Based Life-Event (SM-NoBLE) system, the waterfall model phases are followed in order, beginning with the requirements definition, resulting in the requirements specification. In the second phase, the system design results in the software architecture. Third is the implementation phase, resulting in the actual system. Finally, the system testing phase tests the implemented system.

### 2.1.1 Architectural Design

This architectural design aims to describe the structure of the active push e- government information to social media users, based on the NoBLE framework system, and to show the role of the architectural components by explaining the relationships and the dependency between these components. Additionally it shows how they work together in order to achieve the main objective of the architecture, which is providing the needed e-government services to social media users. In Figure 2.1, we propose the system's architectural design. The relationships between the interface layer, application layer and database layer will be described below.



**Fig 2.1: System's Architectural Design**

The above architectural design of SM-NoBLE illustrates the entire process. Initially, the citizen should be interacting with the interface layer by using the social media to write posts. These interactions provide numerous keywords from these posts, which will be extracted by the keyword extractor using a specific algorithm. The service broker in the application layer then plays the role of analysing these keywords and matching them with a related e-government service that is registered, using the service register in the database layer.

The matching process is based on the NoBLE framework matching mechanism, which consists of two stages. The first stage, norm match, matches keywords from social media using the keyword extractor, which will be used as input to the second stage. In the second stage, keywords of service needs are matched with keywords of relevant e-service, again through the service broker. Finally, the norms and services are defined and registered in the database layer in the norms and services registries.



### 2.1.2 Architectural Design Component

- **Keyword Extractor:** The use of the keyword extractor is mainly aimed at specifying life-events from the citizen posts in the social media, using a text analysing process, where we match each word from each post by using a set of keywords from the norm registry. Then, match it using the service broker with the needed e- government services.
- **Service Broker:** The service broker will adapt the NoBLE framework matching mechanism that follows the concept of norms from the organisational semiotics discipline. A norm subscribes to the following construct: Whenever <condition> if <state> then <agent> is <permitted/prohibited/obliged> to <action>. This norm format captures the necessary elements of the norm specification. The aim of this service discovery process is to find relevant e-services that match the citizen's service needs. This process can be obtained by matching the service keywords identified in the NoBLE e-service registration schema, with the norm keywords identified as part of the Norm Analysis Method (NAM) (AlSoud, 2012). The NoBLE framework implements this mechanism using the keywords in each norm analysis and e-service registry. These keywords can be derived from the service name, description and attributes. After the identification of related keywords for norms and e-services, the keywords of the norms should be checked against the keywords of the e-services. This matching will involve the norms registry and the e-service registry, and when keyword matching occurs, the services with the matched keywords will be selected and retrieved from the registry. In order to determine how the relevance of services can be selected, services with more matched keywords should be more relevant and, therefore, should be listed before those with less matched keywords.
- **NoBLE E-Service Registry:** The e-service schema is a key component of the NoBLE framework. Basically, it stores the e-government services from different government agencies to one centralized and unified schema. This schema aims to standardize and keep all government services from different ministries and departments consistent by developing a schema for registering e-government services to suit the NoBLE framework.
- **NoBLE Norms Registry:** Based on NoBLE, most G2C government relationship rules follow people's behaviours, which can be described as behavioural norms. NoBLE developed a norm-based life-event approach for designing e-government portals to improve the efficiency and effectiveness of the matching processes in such portals. The use of norms in NoBLE is based on the theory of organisational semiotics, to provide a normative and systematic management of the architecture, where norms act as basic rules and guidelines for interactions between the framework components.

For the NoBLE matching mechanism, which was described earlier, each norm has keyword identification to its NAM. These keywords can be derived from the norm description and specification. A norm can be controlled by another norm, for instance, a life-event norm will detect relevant services and detect the agent's eligibility or actions to be taken based on the execution of related norms.

### 2.1.3 Choose Social Media Interface

Social media providers, like Twitter, Facebook and Google have been main leaders for building social diagrams, advertising the imparting of data, and encouraging enhancement. While these providers have created some great tools, their most fantastic innovation might actually be opening up their database to outside developers through the utilization of the programming interface, which is known as API.

Recently, an enormous increase in the number of Arab users in social media has been observed, and Twitter is one of the most popular social networking sites in the Arab world. According to the latest research done by AFP (2012), the Arabic language ranked sixth among the most common languages used on Twitter. This raises an opportunity to choose Twitter as a representative for the social media in our research, especially the content found on Twitter, due to the enormous amount of opinions that are public and up-to-date in a timeline.

### 2.1.4 Coding

Twitter has a public search API service, which provides the ability to obtain relevant tweets matching a specified query in real time. Consequently, in this research we have implemented a program that connects to the Twitter API using a Python wrapper, python-twitter. The program was designed to request tweets every time we run the system, which can easily be converted to run every fixed period of time. The system filters out irrelevant tweets by applying the Search API request parameters which will be explained in detail below. The collected data is then stored in a local database according to category, based on the norm schema.

The Twitter Search API allows us to filter the Twitter message by applying parameters in the request. We first selected the language to restrict the Twitter messages to those that are written in this language. In addition, we used other search parameters to automatically label the twitter message from targeted places, since the norm is different from country to country and from language to language. However, the collected data will not be 100% accurate, as some people in the targeted location might not use the location language, or could have different nationalities but exist in this location. We have implemented the program to first use the geographic Search API, which returns the place identification (ID) of the giving country name, such as Saudi Arabia or the United Kingdom. Then, this retrieved ID was used as a parameter in



International Journal of Management and Information Technology searching for Twitter messages, which returns tweets written near the place's ID. Moreover, we send the norm keywords with the search API, so each returned tweet would contain one or more of these keywords, depending on each norm and its related keywords. Then, all the retrieved tweets go to the cleaning step, in which the retweeted messages are removed.

Afterwards, the matching algorithm matches the service to tweet. For each tweet we extracted and stored, we will look for the most matched service using the NoBLE matching mechanism that we described earlier.

### 3. CASE STUDY: APPLYING THE SM-NOBLE SYSTEM IN THE SAUDI ARABIAN E-GOVERNMENT PORTAL

This case study aimed to evaluate the SM-NoBLE system accuracy, functionality, and to examine the operational part of the NoBLE framework. It began by using the NoBLE lifecycle to cover three lifecycles: School, higher education and work. Next was the structuring of the Saudi Arabian E-Government Portal mentioned earlier to match the NoBLE framework in terms of NoBLE norms and e-government service registry. In the end, we extracted real-time data from Twitter over one week and linked it with the needed e-government services.

#### 3.1 Citizen Lifecycle For Saudi Citizens

As mentioned earlier, the NoBLE framework has a generic lifecycle that contains seven life-event categories: birth, school, higher education, work, marriage and family, retirement and pension, and death. However, this lifecycle can be customized to suit different countries based on culture and other factors (Al-Soud, 2012). In this case study, we focused on three categories that occur in almost any citizen's lifecycle. Moreover, after evaluating the Saudi Arabian e-government, we noticed the existence of these categories: school, higher education and work.

#### 3.2 Specifying Life-Events

In each lifecycle there are common life-events for Saudi citizens that have been identified by evaluating the Saudi e-government services. These life-events suggest some service needs for Saudi citizens; for instance, in the school lifecycle category there is a 'going to school' life-event and 'change of school' life-event, and each one of these life-events infer needs for services related to it. Each life-event could have one or more norms, depending on the conditions, agents and service needs (Al-Soud, 2012). The NoBLE matching mechanism aims to link the specified life-event with its related e-government services by identifying the service needs. First, by identifying service needs, using norms, and linking them with life-events; and second, by matching the service needs to relevant e-services. In Table 3.1, some samples of how we have used the norms to match the life-events with service needs.

**Table 3.1: Specifying norms for the identified life-events**

Norm	Whenever	If	Then	Is	To
Life-event					
Going to School	A citizen wants to apply for school	Citizen is older than 6 years of age	Parents	Permitted	Register for 1st grade elementary school
			Parents	Permitted	Apply for admission in public school
		No conditions	Parents	Permitted	Search for school in Riyadh
Finding a job	A citizen looks for a job	Citizen is not a public sector employee	Citizen	Permitted	Apply for e-employment (Jadara), and register an account for employment

The specifications of the norms have resulted in identifying a set of service needs for each life-event. The identified service needs, which will be discussed later, must be matched with actual e-government services, after the norms related to the life-events are specified, in order to identify the service needs. However, norm specification is one step of the NAM, illustrated in the next section, which must be conducted for each life-event in order to register each of them in the norm registry. As mentioned earlier, the number of norms related to each life-event could vary depending on the involved conditions, agents and service needs.

#### 3.3 NoBLE Norm Registry

In this section we use the NoBLE norm registry schema.

**Table 3.2: Norm analysis for finding a job life-event**

Norm ID: N. 2	Finding a job	Related Keywords
Responsibility analysis	Citizen	Find job
Proto-norm analysis	Completed application	Search job
Trigger analysis	Pre-condition: Registration form is submitted	Look job Jadara
	Post-condition: Citizen is not public sector employee	Employment
Detailed norm specification	Whenever a citizen looks for a job, if citizen is not a public sector employee, then citizen is permitted to apply for e-employment (Jadara), and register an account for employment.	

### 3.4 NoBLE E-Service Registry

To find the needed service, it must be registered using the NoBLE service registry schema as shown in Table 3.3. The schema attributes information were found in the published e-services in the Saudi portal.

**Table 3.3: NoBLE e-service registration schema**

Service		Description
ID		S3
Name		E-Employment (Jadara)
Description		A recruitment program for male and female citizens in the public sector by e-registering their own data in The Civil Service Ministry website
Keywords		Jadara, Recruitment, Employment, Job.
Service attributes	Availability	24/7
	Eligibility	Citizenship
	Type	Transactional
	Display name	E-Employment (Jadara)
	Description	A recruitment program for male and female citizens in the public sector.
	URL	<a href="http://eservices.mcs.gov.sa/website/(S(gda3xwrszvfhczurk2kbhcv0))/users/index.aspx">http://eservices.mcs.gov.sa/website/(S(gda3xwrszvfhczurk2kbhcv0))/users/index.aspx</a>
	Prerequisites	None
	Version	Date of publication
	Transaction fee	None
	Provider	Ministry of Civil Service

### 3.5 Test

The SM-NoBLE system has stored all of the norms and services, and the next step is extracting tweets from Twitter that indicate a life-event using the key extractor in order to match it with the norms' keywords and remove the retweeted ones. Then, the linkage of citizen needs (tweets) with the relevant e-government service can be done by matching the norms' keywords with the e-services' keywords. First, we collected tweets over one week, between 17-11-2013 and 25-11-2013, with a total of 962 tweets, divided as:

- 742 tweets in jobless life-event represented in norm 1.



- 60 tweets in finding a job life-event, represented in norm 2.
- 37 tweets in going to school life-event, represented in norm 3 that all tweets come from, and no tweets found in norm 4 even when we searched in the English tweets.
- 8 tweets in changing school life-event, represented in norm 5, and because we found only 2 tweets in Arabic we tried English and found 6 more.
- 3 tweets in graduating from school life-event, represented in norm 6.
- 112 tweets in getting scholarship life-event represented in 35 tweets in norm 7 and 77 tweets in norm 8.

We then took a random sample of one-hundred tweets from different life- events to evaluate the system's accuracy for each life-event, and the overall accuracy. We tried to balance the sample, but due to the small number of tweets retrieved from some life-events it was difficult. The method of analyzing the accuracy will be described in the next section.

### 3.6 Method of Analysing

First, from the selected sample for each tweet we manually specified what kind of life-event it indicated and what services matched it. After this, we ran the system to observe if it indicated the same services. The aim for doing this was to check the accuracy of the system for each life-event and for the overall accuracy. Moreover, since we are applying this in Saudi Arabia, most of the tweets retrieved were in Arabic. An example of this analysis is illustrated in table 3.4.

Table 3.4: Analysis Method

Tweet ID 2-2:	قاعد الدور لى وظيفه ب جريدة خخخ
Translated Tweet	I am looking for a job in a newspaper hhhh.
Manually matched service:	S1: Register an Account for Employment.
SM-NoBLE system matched service:	S1: Register an Account for Employment.
Result:	Match (True)

Then we applied this to the rest of the sample to calculate the accuracy. The result of the data analysis and the accuracy for each life-event, as well as the overall accuracy will be discussed in the next section.

### 3.7 Result Analysis

The test outcomes showed a 59% overall accuracy level from the sample. However, it also showed different levels of accuracy among the life-events as:

- 67% accuracy level in jobless life-event.
- 89% accuracy level in finding a job life-event.
- 17% accuracy level in going to school life-event.
- 75% accuracy level in changing school life-event.
- 67% tweet in graduating from school life-event.
- 57% accuracy level in getting scholarship life-event.

The results show that the best accuracy was achieved in the 'finding a job' life-event (89%), and the lowest accuracy in the 'going to school' life-event (17%). In some cases, the system couldn't match a service to the tweet or provide more than one service with the same match percentage. However, one of the notable limitations of these results is the variation between the number of tweets retrieved in each norm. For example, the total number of tweets retrieved for norm 1 is 742, but none in norm 4 and only 8 in norm 5. This can be justified mainly by two reasons, first the time; it is now the middle of the term in Saudi Arabia, so it is very rare to find someone talking about going to school or changing schools. However, for finding a job, the percentage of unemployment in Saudi Arabia is now increasing, which is why we found a lot of tweets from people searching for a job or jobless. The second reason for this variation is the employment age, and as we mentioned in the literature review, the user demographics for Twitter users are those aged between 23 and 35.

## CHAPTER 5: RESEARCH EVALUATION

### 5.1 Findings

The development of the SM-NoBLE system presented in chapter four began with the designed architecture, and has demonstrated the ability to provide G2C e- services based on the life-event approach to social media users. This was proven by implementing the system and applying it in the real world. For example, the evaluation of the SM-NoBLE system in chapter five demonstrated the accuracy of the system (59%), and checked the functionality and accuracy of the system in using social media to capture citizen needs and life-events. However, this percentage relied mostly on the



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NoBLE matching mechanism that was implemented in the system, which shows that NoBLE, as a conceptual framework, is useful when operating in such systems.

We noticed there were two reasons for unmatched scenarios. First, the Arabic language has different dialects, such as Egyptian, Gulf, Levantine, Moroccan and Iraqi. We found some tweets coming from Saudi Arabia, but they were written in the Egyptian dialect, and in this case, we considered it to be unmatched, especially if the services for Saudi citizens only. These can be avoided in the future by adding a dialect detection function to eliminate any non-Gulf posts. Another reason for the unmatched result is that for some tweets of people being ridiculous and silly about a topic, this makes the judgment about whether they really need the service or not difficult. This may be because we used Twitter; based on the literature review we did previously, Facebook users seem to be more serious about their status and posts.

## 5.2 Recommendations And Limitations

Based on the findings of this research, there are a number of recommendations, including:

- The government should pay more attention to citizens needs, especially in terms of e-services.
- The Saudi Arabia e-government portal is facing many challenges, and the government should pay more attention to the public awareness and IT infrastructure.
- The government could use social media to capture the citizens' needs and concerns.

However, this research study has number of limitations. One of the limitations was that it was not possible to investigate the usefulness of the SM-NoBLE system, which could be checked by counting the number of clicks to the e-service links from social media, and if other social media users are interested in viewing these services. Another source of limitation is the evaluation of the system using only Twitter, without exploring another social media providers, such as Facebook, in which there are users that are more trusting. Moreover, using only the document archaeology technique to collect stakeholder's requirement may cause some misunderstandings or shortage in the requirements and it would be better if it were combined with other techniques, such as interviewing, brainstorming and questioner. Additionally, as far as school and grades and early employment go, Twitter is probably a good choice for linking life-events from this group to the e-government services. However, it may be more challenging to find linking sources for older people's life events, as they have a limited usage of social media.

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