Measuring User Satisfaction with e-Government Systems:
An Empirical Study to Evaluate IS Effectiveness

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Declaration of Authorship

I, Alanawd Alshehri, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Alanawd Alshehri

July, 2016

Acknowledgment

By the grace and mercy of God, I dedicate this thesis to my lovely parents, my mother Salwa and my father Amer, for all their genuine love and care no matter what. It is they who guided me to where I am today. And also to my sisters and brother, for all their support and prayers for me.

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Abstract- Governments around the world have continuously embraced e-government development in an endeavour to achieve social, economic and environmental goals (United Nation E-Government Survey, 2012). In this research, e-government is considered from an information systems (IS) perspective underpinned by the aims of achieving efficiency and effectiveness in public sector organisations. Evaluating the effectiveness of adopted e-government IS is a critical process, as it provides necessary data for cost-benefit analysis of governmental investment in technology and the value it creates, allowing decision makers to judge whether required and specified needs have been met successfully.

IS end-user satisfaction is identified in the literature as a surrogate measure for IS effectiveness. The construct of IS End-User Computing Satisfaction (EUCS) was conceptualised and developed in the late 1980's in the context of work-setting mandatory use of systems by organisations, but it still is being used today as a valid and reliable instrument to measure IS end-user satisfaction. With technology becoming advanced and ubiquitous, end-users are now empowered to use e-government through multi-channel access. End-users are also empowered to become active content-generators through the use of social media in cyberspace, rather than passive consumers of static information.

By adopting a quasi-experimental design, the researcher will challenge the standard measure of IS satisfaction, the construct of EUCS, by conducting a behavioural experiment in real-world settings by comparing and contrasting two methods to evaluate IS end-user satisfaction. These two methods utilise social media data of Twitter and the EUCS instrument adopted from Doll & Torkzadeh (1988). Such findings will contribute to improving understanding of the nature of IS end-users, and help determine if the current conception of EUCS is still valid, or whether the ubiquitous nature of IS and expanding role of IS end-users requires the formulation of a new conceptualisation.

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List of Acronyms

Amos	Analysis of Moment Structures
ANT	Actor-Network Theory
AVE	Average Variance Extracted
C.R	Critical Ratio
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Construct Reliability
EDT	Expectation Disconfirmation Theory
EFA	Exploratory Factor Analysis
e-Government	Electronic Government
EUCS	End-User Computing Satisfaction
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
KMO	Kaiser-Meyer-Olkin Measure
P	Probability Value (Significant Level)
PCA	Principal Component Analysis
RMSEA	Root Mean Square Error of Approximation
S.E	Standard Error
SET	Social Exchange Theory
SPSS	Statistical Package for Social Sciences
TLI	Tucker Lewis Index
TRA	Theory of Reasoned Action
VE	Variance Extracted

Chapter 1: Introduction

E-Government is defined as 'the use of IT by public sector organisations' (Heeks, 2006b). In recent years many governments around the world have continually and increasingly adopted e-government projects to take advantage of opportunities made possible by rapid improvements in technology (United Nation E-Government Survey, 2012). E-government is moving beyond the traditional model of utilising information technology (IT) for automated processing of governmental data to a new model that utilises information and communication technology (ICT) for processing and communicating governmental data (Heeks, 2002). Like other investments in the area of information management, e-government projects go through a cycle, characteristic of information systems (IS) management development (Avison & Fitzgerald, 2006), that usually ends with measuring the effectiveness of the developed system in order to ensure it meets specified criteria and objectives and delivers expected value, thus determining the level of success of e-government investment (Kaisara & Pather, 2011). There are many successful e-government projects that deliver real value to citizen end users, and show a positive correlation with citizens' use of them and satisfaction and trust in government (Welch, Hinnant & Moon, 2005). Such projects also deliver value to the organisation. Before defining e-government, with all it promising benefits, it is important to first explain the motives and reasons governments have for shifting from traditional government to e-government.

In the mid-1990s, many governments in the West recognised the potential advancements that new technology held for governments, including improvements in performance, efficiency and transforming the way in which government services are provided (Bellamy & Taylor, 1998). Public sector organisations have recognised the need to increase efficiency and effectiveness, as evidenced by the United Nation's E-Government Survey (2012), and many governments have started to utilise advancements in technology and information communication technology (ICT).

Governments have seen the need for such technologies to improve their performance and operations (Heeks, 2002; 2003).

There has been criticism of poor performance and inefficiencies in public sector organisations. Public sector organisations are often not very efficient in providing maximum information and services vis-à-vis public expenditures (Heeks, 1998; Parent, Vandebeek & Gemino, 2005), resulting in declining levels of public trust (Grimmelikhuijsen, 2012; Parent, Vandebeek & Gemino, 2005) and highlighting ineffectiveness in public processes and services (Nolan, 2001). Many governments have continuously embraced e-government development, as they have seen them as solutions to improve public sector organisations. Advances in technology, including IS and ICT, have facilitated information sharing of governmental information and services that can create both economic and social value, helping to build trust and satisfaction among citizens (DeContil, 1998). It is important to note that the value of e-government investment will be gained only if e-government projects are a success when implemented. In other words, for governments to adopt and implement successful technologies that meet the specified criteria, objectives and outcomes, it is always best to deliver and then get them accepted and used by the users. Failure to do so can result in partial or total failure (Heeks, 2003). To avoid such mistakes, the emergence of techniques to measure effectiveness of governmental investment in meeting objectives and delivering expected value was needed in the information systems field (Bach et al., 2011). Failure with e-government projects can result in six identified costs as defined by Heeks (2003), which are direct financial costs, indirect financial costs, opportunity costs, political costs, beneficiary costs, and future costs. Thus, measuring the effectiveness of e-government projects is a crucial step to evaluate the success of e-government investments and ensure that value is delivered from such investments across the globe (Heeks, 2006a).

The early adoption of technology and IS was motivated by efficiencies, such as cost savings that can be measured by financial indicators, for instance savings realised by utilising automating data processing (Avison & Fitzgerald, 2006). Effectiveness, on the other hand, was more about how to improve performance and to see the

outcomes (Avison & Fitzgerald, 2006). Comparing gains in effectiveness and efficiency, it was found that gains in effectiveness went beyond the desired improvements and objectives. The positive influence of the adoption of technology can change the behaviour and attitude of users, and have a positive impact on the environment (Avison & Fitzgerald, 2006), which makes the measurement of effectiveness an important goal. Thus, positive impacts on the environment and behavioural change can be achieved by users, as a result of increases in effectiveness.

Looking at the benefits of the realisation process of effective projects (Avison & Fitzgerald, 2006) it was found that the benefits of effectiveness are achieved in two stages. The first stage will appear in the internal environment of an organisation through successful adoption and implementation of the system. The second stage includes the impact of the implemented system on the external environment and the effect it has on users' behaviour and attitudes, which indicate a higher recognition of the value and acceptance of the provided services.

When applied to the context of e-government, measuring the effectiveness of projects ensures that they are implemented successfully and are able to meet user expectations, as this will be critical in influencing user behaviour. Users will be encouraged to use the systems, as they will be an improvement on the facilities that the government is offering via its e-governance. One of the benefits of the effectiveness projects, as mentioned by Avison and Fitzgerald (2006), is to view improvement as a tool to increase revenues, and not just a way of providing an improved interface. Examining traditional ways to measure the effectiveness of e-government projects reveals that various costly approaches were used to gather data in order to evaluate the effectiveness of e-government projects (Heeks, 2006a), including statistics, web assessment, internal self-assessment and surveys. Three indicators to measure the effectiveness of e-government are based on user values: administration burden, user value/satisfaction, and inclusivity of service (Heeks, 2006a).

Heeks (2001) was able to classify the benefits that are associated with successful e-government adoption as cheaper, quicker, better and newer.

Improvements in increased output and improved quality were observed in quantifiable measurement parameters that were identified earlier (Heeks, 2001). Since the inception of social media, successful technologies have followed which have attracted many governments to adopt them to serve different governmental purposes (Bertot, Jaeger & Hansen, 2012). The inception of the Internet reinvented the way governments work (DeConti, 1998).

So what is new today? The answer is advancement of technologies, such as Web 2.0, that facilitate user-content generation, and defined by Chun et al. (2010) as 'a collection of social media through which individuals are active participants in creating, organising, editing, combining, sharing, commenting and rating Web content, as well as forming a social network through interacting and linking to each other'. Web 2.0 is the technological platform on which social media applications are based on. Web 2.0 has empowered Internet users to participate and create content, which is very different to Web 1.0, which only facilitated public organisations to create content and make users a passive consumer of information rather than a participating user (Chun et al., 2010). The introduction of ICT has changed and at the same time impacted the interaction and communication between government and citizens (Chun et al., 2010)

Social media has been utilised from different perspectives by both the private and public sectors (Picazo-Vela, Gutiérrez-Martínez & Luna-Reyes, 2012). Looking at the current adoption and use of social media it was found that social media has been utilised, and at times misused, to promote transparency and anti-corruption, to share and disseminate governmental information (Bertot, Jaeger & Grimes, 2010), to connect with citizens and their expectations and services they need (Bertot et al., 2010), to reduce governmental costs associated with information and services (Snead, 2012), to assist in crisis management (Kavanaugh et al., 2012), and to extend governmental services and promote openness towards government that reinforces trust and belief in good government. Such efforts do not deliver value unless they create public value (Luna-Reyes & Chun, 2012). One might ask what is new about social media in this research. The answer is, to observe the use of social media in the context of e-government, and use it in an innovative way.

As governments have recognised the importance of employing and exploiting advancements in technology (IT/IS) and information communication technology (ICT), it has become possible to use them to harness their power to serve governments better. At the same time, these technologies help achieve government objectives and increase the effectiveness of services and processes (Bovaird & Löffler, 2009). The time has come to employ and exploit social media to do the same, but in a different manner. This research will contribute to harnessing the increased attraction and popularity of social media and in particular the efforts to expand social media usage and exploitation by government. Bovaird and Löffler (2009) conclude that ICT should aid in strategy formulation and not only be used as a tool for implementation: this was the basis for establishing the relationship between strategy and technology. Thus, this research aims to use social media not as a tool to measure the effectiveness of e-government projects, but rather to use it in forming strategies seeking to measure the effectiveness of e-government projects by governments. In other words, to find ways in which effectiveness of e-government can be linked to measurements using social media.

1.1 Effectiveness

Before measuring the effectiveness of e-government, it is necessary to understand what effectiveness means, in order to clarify and understand what we are going to measure. The Oxford Dictionary defines effectiveness as 'the degree to which something is successful in producing a desired result; success'. Hamilton and Chervany (1981a) define effectiveness as 'the accomplishment of objectives'. Thus effectiveness means success in producing desired values and results, and in meeting the objectives identified for a particular e-government project. In the literature, there is no single measure used to observe a system's effectiveness and there is no acceptable IS model that shows effectiveness (Thong & Yap, 1996). Information systems effectiveness is in general a multidimensional concept (Scott, 1995) that can be measured in various ways depending on various views, perceptions and objectives (Malik & Goyal, 2001; Hamilton & Chervany, 1981b). Measuring the effectiveness of e-government projects is a challenging task (Kaisara & Pather, 2011), and at the same time it is an integral part

of every project in order to improve IS management, since it is used at different levels (Hamilton & Chervany, 1981a).

There are two perspectives used to look at system effectiveness; one is the goal-centred view and the other is the systems-resource view (Hamilton & Chervany, 1981a). The former focuses on the objectives being met and the latter focuses on resource viability showing how well the service will be used overall. User satisfaction (Melone, 1990) is one of the main aspects of measuring the effectiveness of IS projects, and it is considered as an important aspect, as it helps to specify the level of how users perceive the usability and usefulness of the systems. At the same time, users are also able to indicate their level of satisfaction with its usability, and their interaction with it. It is important to note that user satisfaction is considered to be one of the many identified measures of effectiveness, and it should be combined with other measurements (Melone, 1990), which help to account for the effectiveness of e-government. In this research, however, the main focus is limited to providing innovative ways to measure user satisfaction with e-government.

The most important element for assessing e-government is to first gain a good understanding of the concept of effectiveness and the various ways in which it might be measured (Janssen, Rotthier & Snijkers, 2004). Effectiveness can be measured in different ways from various points of view (Ramezan, 2009), such as using questionnaires (Ramezan, 2009; Wolstenholme, 1988; Kaisara & Pather, 2011), to yield different outcomes and values. Different effectiveness measures might be applied to measure effectiveness that depends on stakeholders' views and interests, and on the nature of the system itself (Seddon et al., 1998). Thus, it is important to identify the interests of stakeholders and measures they are interested in (Seddon et al., 1998), as the nature of any information system is to involve different stakeholders with different views and interests (Pitt, Watson & Kavan, 1995).

Looking at measuring effectiveness in general in the field of information systems (IS), it is found to be a challenging activity (Miller & Doyle, 1987), which is subjective in nature, and occurs after the implementation process (Wolstenholme, 1988). Stakeholders (Pitt, Watson & Kavan, 1995) found that that there is no single

definition for information systems effectiveness (Wierenga et al., 1999 in Ramezan, 2009), as the effectiveness will be different depending on the expected outcomes and the value that the information systems are supposed to deliver to various stakeholders with various interests and perspectives on what would be effective to each one of them (Ramezan, 2009). Some adopted user satisfaction as a measure for IS effectiveness, and others adopted financial indicators, such as return on investment (ROI) or usability measurements (Miller & Doyle, 1987; Ramezan, 2009; Palmius, 2007). One of the most citied IS effectiveness measures (Palmius, 2007), defined by DeLone and McLean, depends on the multi-dimensional model for measurement of success in information systems. Their schema includes six measures that are system quality, information quality, service quality, use, user satisfaction and net benefit (Bach et al., 2011).

When measuring the effectiveness of a system it would be helpful to be able to compare the findings with previous measures (Palmius, 2007). This comparison will help to identify the level of improvement and effectiveness achieved and how this can be improved use in the future.

1.2 Satisfaction

This research contributes to measuring the effectiveness of e-government by utilising user satisfaction as a measure for systems effectiveness. Although various measures exist in the literature (Thong & Yap, 1996), user satisfaction is a widely accepted measurement for IS effectiveness (Ramezan, 2009).

There are many reasons for choosing user satisfaction as a measure for e-government IS effectiveness. The first is the popularity of social media and its promising potential for government use. The power of social media and exchange between its users can facilitate and elicit increased levels of user satisfaction with e-government. User satisfaction is a better measure in the context of social media, with its nature of socialising and connecting people. Second, user satisfaction is one of the objectives that governments aim to achieve by adopting and implementing e-government: thus measuring user satisfaction reflects the aim of e-government

projects. It is emphasised in the literature that selected ways used to measure a given system effectiveness should be in alignment with the system's objectives (Green, 2001). Third, IS in general are not considered to be successful unless they are well utilised by system users. User satisfaction thus reflects the positive experience of users when interacting with the system, which implies using and accepting the system. Fourth, e-government reduces costs and increases government effectiveness, thus ensuring that user satisfaction and use of e-government is associated with reducing the cost of governmental processes and operations. Fifth, a means of measurement of IS effectiveness is the level of satisfaction of the user (Thong & Yap, 1996) and the way that they have associated with the systems. Such an assessment will reflect a full effective assessment of the project (Hamilton & Chervany, 1981b).

This research is made possible by the use of the massive amounts of data generated and shared through social media, and by the power of connectivity across diverse groups of people that it provides. We endeavour to utilise and exploit the use of social media by government in a new and innovative way. This research recognises the powerful use of social media, which is based on the exchange seen in social life as proposed by Blau (1986). Our focus is on e-government and its link to IS and how IS contributes to measure the effectiveness of e-government.

1.3   Research Aim and Objectives

The aim of this research is to contribute to determining the effectiveness of e-government IS by investigating how to measure end-user satisfaction with e-government IS and using it as a surrogate for system success. Based on all aforementioned considerations, the following research questions are posed, which are motivated by the attempt to understand using social media in the context of IS, by asking this research question:

> 'Can social media be used as an evaluative measurement of end-user satisfaction with e-government systems?'

Then, another question was added to challenge the existing assumptions of knowledge, before starting this investigation into the promising venue of using social

media to investigate the adequacy of identified measures of conventional IS, towards their use in the context of ubiquitous IS. This led to the second question:

> 'Can End-User Computing Satisfaction (EUCS) be used as an evaluative measurement of end-user satisfaction with e-government systems?'

Despite the fact that this research is motivated by the first research question, the research started with the second research question to challenge the assumptions of existing knowledge of the hypothesised theoretical measurement model of EUCS, as challenging existing knowledge may result in producing interesting research (Davis, 1971; Alvesson & Sandberg, 2011) that challenges rather than reinforces, and confirms the assumptions of existing knowledge. Then, the use of social media data from Twitter was examined to enhance understanding about evaluating e-government IS.

The research objectives are as follows:

1. Test current EUCS constructs as applied to e-government.

2. Use social media to measure user satisfaction.

3. Revise the theoretical underpinnings of satisfaction formation of the construct of IS end-user satisfaction.

This thesis is organised into eight chapters. The outline of the chapters for this thesis is as follows:

Chapter One introduces the research context and area of contribution, and focuses on evaluating and measuring user satisfaction of e-government as an information system. It introduces the concepts of e-government, social media and the meaning of user satisfaction in the context of information systems, which is used and applied in the context of e-government. Research aims and objectives are identified and presented in this chapter.

Chapter Two reviews the literature in order to understand the research issues under investigation better, and to place this research in context and shed light on research contributions. This chapter presents a comprehensive review of previous studies, with

the focus on the nature of public sector organisations and the adoption of e-government, social media use by governments, and effectiveness in the information systems field, along with approaches to evaluation and measurements, but with a focus on the construct of IS user satisfaction.

Chapter Three introduces the theoretical background adopted to explain IS end-user satisfaction formation in the context of IS, and presents the theoretical framework of Social Exchange Theory (SET) that is applied in this research, and its use in and beyond the context of IS.

Chapter Four clarifies the philosophical position, and identifies and justifies the research approach, methodology and methods. The chapter also presents and discusses the pilot study with its data, findings and lessons learned, before proceeding to the main studies of this research. The chapter then introduces the major studies employed in this research, and discusses ethical issues that arise from utilising social media data from Twitter. Finally, the researcher identifies and establishes the methodological rigour and relevance for this research.

Chapter Five introduces the first study, the context of the Ambassador system and the nature of its IS end-users, and presents and discuses data collection and analysis used in the Ambassador study. The Ambassador system was developed and operated by the Ministry of Higher Education (MOHE) in Saudi Arabia, and aims to support Saudi students studying abroad by providing electronic services. The electronic services provided by the Ambassador system are not automated services, as Ambassador allows students to place various types of requests, such as financial and educational requests, electronically, to be processed later by the Ministry and related bureaux where students are based.

Chapter Six introduces the second study, the context of the Oyster system and the nature of its IS end-users, and presents and discuses data collection and analysis used in the Oyster study. The Oyster system was developed by Transport for London (TFL) in the UK, and is operated by TFL and its public transportation partners. The Oyster system is a ticketing payment system for public transportation. The Oyster system

provides fully-automated services to its end-users, who use the system to pay travel fares and maintain their accounts.

Chapter Seven discusses our findings in term of empirical and theoretical insights in relation to extant literature and to the theoretical measurement model of End-User Computing Satisfaction (EUCS).

Chapter Eight summarises the research contribution in terms of its theoretical, methodological and practical contributions. Also, future research and research limitations are discussed.

1.4   Summary

This introductory chapter has shed light on the context of e-government and the motives underpinning its adoption and implementation. This research seeks to contribute to measuring the effectiveness of e-government by utilising user satisfaction as a measure for systems effectiveness. The motivation was to utilise the promising venue of social media data for research investigations. That led us to starting the research by challenging existing assumptions of knowledge by investigating the adequacy of identified measures of conventional IS when used in the context of ubiquitous IS, as a prelude to investigations involving the promising venue of using social media data. This chapter has laid the foundations and motives for this research, as well as describing the context in which it is presented. The research aims and objectives are identified, as well as an outline of the structure of this thesis.

Chapter 2: Literature Review

It is important to place this research in context to understand the research contribution better and the challenges involved in measuring user satisfaction of e-government information systems (IS), why it is important to do make such measurements, and how this research could contribute to evaluating user satisfaction by utilising social media. The complicated nature of the public sector is reviewed, which imposes additional challenges to IS evaluation, and which e-government IS operate and are continually and heavily adopted. Three other areas are also reviewed: the importance of e-government IS, current social media use by government and how this research might expand such usage, and exploiting social media to evaluate IS end-user perception as a surrogate for IS success. Lastly, this chapter discusses how measuring user satisfaction is applied, and the ways this research could contribute to the evaluation process in terms of IS end-user satisfaction.

2.1 The Nature of the Public Sector

Starting by reviewing the nature of the public sector should help to understand better why the evaluation process of e-government IS is a challenging process. The process of adoption and evaluation of information system (IS) in general is a challenging process by itself, and when it is placed within the public sector environment, it becomes more challenging and complicated.

The public sector environment adds a further burden to evaluate e-government IS, and by comparing the public sector to the private sector helps to understand the complications inherited in the nature and operations of the public sector.

The focus in the private sector is on maximising profits. One way to achieve this is to develop a marketing strategy aimed at attracting and retaining customers. Another way is to develop a strategy on segmentation marketing aimed to design and deliver different levels of services and products to different levels of people (Bose, 2002). In contrast to the private sector's focus on profitability, the public sector's primary focus is on equity and creating public value by providing public services that meet different

needs (Flynn, 2012). In the public sector, segmentation is adopted to fulfil all different individual needs by providing various levels of services and information that meet different needs (Lee, Gim & Yoo, 2009). The public sector aims to create public value, better government, better society and better life standards (Moore, 1995).

The differences in objectives between private sector and public sector organisations mentioned in the previous paragraph lead to differences in approach, and in level of difficulty in evaluating and measuring performance. Lamb (1987) differentiates between the private and public sectors.   The private sector has the clear and quantifiable objective of maximising profits. Financial metrics facilitate these measurements and can be used to compare results across organisations and across time. The main objectives of public sector organisations, on the other hand, are largely qualitative in nature and are normally measured by determining effectiveness, efficiency and equity (Lamb, 1987)

Public sector organisations have been criticised for lack of quality and performance (Heeks, 1998a; Parent, Vandebeek & Gemino, 2005) and for ineffectiveness in public processes and services (Nolan, 2001). This has resulted in a decline in the level of public trust (Grimmelikhuijsen, 2012). Responses to criticisms of the public sector include the reforms introduced in the late 1980s and early 1990s (Heeks, 2001a; Nolan, 2001). These reforms sought to respond to the demand to improve public sector operations and performance. They also sought to reduce public sector expenditure. In other words, they sought to improve the economics, effectiveness and efficiency of the public sector (Pollitt & Bouckaert, 2000). The promising potential of advancements in technology was recognised in the mid 1990s (Bellamy & Taylor, 1998). In particular, these advances had an impact on e-government in the late 1990s (Grönlund & Horan, 2005), and led to public sector organisations of developed countries playing a more influential role in public sector reform.

Furthermore, the differences between public and private sectors have implications for influencing technologies and information systems adoption, development and design processes. IS in the public sector are different than those in the private sector, which encompasses and serves political, social and public value purposes with significant

diversity in stakeholders ranging from governmental officials, citizens and the public, and private organisations with diversity in information use objectives (Grimsley & Meehan, 2007). This results in complication in making IS evaluation processes more complex and challenging, where the evaluator needs to ensure that various needs are addressed and captured in design and implementation processes (Newcomer & Caudle, 1991).

Adopting and managing information technologies (IT) with a focus on IS in the public sector is a complicated and challenging process that is characterised as large-scale IT investment and development with inter-organisational interdependency (Ctas-Baril & Thompson, 1995). On the other hand, adoption of advancement of technologies allows for integration within the public sector, and enables flow of data across organisations that results in efficiency in reducing costs and time, and effectiveness in processes and operations performance (Bellamy & Taylor, 1998). Also, it enables effective information management and utilisation (Caudle, 1990) and assists in better governance, policy formulation and better services development.

The advancement in technologies in the public sector and the promising benefits that could be realised with successful IS adoption are important. This research focuses on IS effectiveness in public sector organisations that have adopted electronic government (e-government), and the contributions of measuring the effectiveness of e-government IS in terms of IS end user satisfaction as a surrogate measure for IS success.

2.2 Creating Public Value through e-Government

The importance of e-government is manifested by understanding the concept and the motives that underpin this. Adopting and implementing e-government is more than a socio-technical solution adopted by public sector organisations where technologies are adopted in the working place for improvement. It is about creating public value and public sector effectiveness by improving services delivery to public, improving organisational effectiveness and improving productivity. Thus, evaluating the success of e-government is a crucial process to create and deliver value to the public. E-government is underpinned by the concept of the creation of public value for the

public and organisational effectiveness, so evaluating the success of e-government is the focus of this research, and the success of e-government is evaluated based on IS end-users (citizens) and how they perceive and are satisfied with their e-government system.

Public value can be derived from investing in e-government IS development and adoption. Investment in e-government adoption and development assists governments with their endeavour and aim of creating public value. Karunasena, Deng and Singh (2011) propose an extended framework in which public value can be created by adopting e-government through the delivery of public service, the achievement of outcomes, the development of trust, and the effectiveness of public organisations.

E-government endeavours to create public value, as creating public value is the aim of government (Moore & Khagram, 2004). It is important to note that for the purposes of this research, the terms government and public sector organisations will be used interchangeably, and no distinctions are made between these in this study (Heeks, 2006b).

The public sector has been continually challenged to create public value for the public, and challenged to legitimate their decisions and investment. In order to understand what forms public value better and how to achieve it, a 'strategic triangle' was developed by Moore and Khagram (2004) that constitutes public value with legitimacy and support, and operational capabilities. This construct can be used to guide public sector managers to successfully create public value by ensuring that this is clearly identified and that the resources needed to create public value and the capabilities needed to deliver public value are available. It is also noted that there are perceptions that public value is created for the public, but there is no clearly agreed definition of public value (O'Flynn, 2007). One definition suggests that 'public value is the product of governmentally-produced benefits, which are undertaken when market mechanisms are unable to guarantee their equitable production' (Harrison et al., 2011). Another public value definition is 'an appraisal of what is created by government on behalf of the public' (Nabatchi, 2012). It is important to recognise that

creating public value is not the monopoly of the public sector: public value can also be created by the private sector and any kind of organisation (Alford & O'Flynn, 2008).

Public participation plays an important role in helping to understanding the public's point of view of what constitutes public value from their perspective. Public participation does not, however, create public value in and of itself - it merely facilitates it (Hui & Hayllar, 2010). It also helps to solve the issue of policy conflict (Nabatchi, 2012) and to promote more engagement in government-private partnerships (Hui & Hayllar, 2010). Different segments of society may hold different views as to what is perceived as public value (Nabatchi, 2012), but public value should be perceived as a social value that contributes to society as a whole, which successfully creates positive benefits to society in general (Hui & Hayllar, 2010). Understanding the meaning of public value and how it is perceived has implications for designing and developing e-government IS that meet such expectations and delivers identified objectives and social value.

Alford (2002) differentiates the relationship between government and citizens and between private sector organisations and customers, and develops a typology of organisation-public relationships to help governments gain a better understanding of each group and to help create value to meet the needs of each group.

Hui and Hayllar (2010) note that improvement of public service goes beyond enhancing quality and efficiency, but is also about the social and economic improvement created for society. One difficulty in assessing the degree of such improvements is that value created by government is difficult to measure because of its soft (qualitative) nature (Alford & O'Flynn, 2008). Williams and Shearer (2011) also discuss the fact that public value is largely qualitative in nature, as it lacks the support of empirical research.

Zu, Zhang and Pardo (2008) developed a Public Value Framework that adopts public points of view to assess public value. This approach to assessing public value offers a systematic framework for a new approach to goal setting and measurement (Coats & Passmore, 2008). The Public Value Framework differentiates between public and

private services, and puts public value in the context of public management, in that it guides public managers in decision-making processes (Coats & Passmore, 2008).

Moore (2006) points out that 'performance measurement is fundamental to the ability to manage organisation'. In the private sector financial metrics, such as revenue, are sufficient to measure customer satisfaction, in that customers willing to pay money for products and services must value them, and the value they perceive is related to the price they are willing to pay for those products and services (Moore, 2006). In the public sector, surveys are typically used to evaluate the outcomes and check the physical characteristics of the products (Moore, 2006). Such methods seek direct measurement of the public value that this research is trying to produce, but these methods are expensive (Moore, 2006). In light of the high cost, it is important to be clear about the goals of measuring public value. Moore (2006) lists some of these goals: to meet demands for external accountability, to establish a clear, significant mission and goal for the organisation, and to foster a strong sense of internal accountability.

Public management is primarily concerned with the creation and realisation of collective value. The public manager responds to need, not consumer demand; citizen voice is a condition of public management, whereas consumer action (spending) is a feature of the private market (McKevitt & Lawton, 1994). Thus, it is challenging to create public value and evaluate such effort that is characterised by its qualitative nature, and social and economic value.

This consideration of the value and underpinning perspective of adopting e-government by the public sector aims to create and derive public value from such investment. The following section considers the concept of e-government itself, as information systems (IS) adopted by government and enabled by the advancement of technologies.

2.3   e-Government Information Systems (IS)

There are various definitions for e-government (Alshehri et al., 2012), but using information technology (IT) is at the core of these definitions. Thus, e-government can be defined as 'the use of IT by public sector organisations' (Heeks, 2006b).

It is important to highlight that e-government is moving beyond the traditional model of information technology (IT) of automated processing of governmental data to a new model of information and communication technology (ICT) processing and communicating governmental data (Heeks, 2002). This new model is facilitated by the development of computer networks and Web 2.0 technology that facilitate collaboration and social networking (Lytras, Damiani & Pablos, 2008) and it promises to help achieve good governance by integrating people, processes, information and technology (Heeks, 2001b). Such advancements in technology have a strong influence on e-government and on public sector organisations and have changed the way governments disseminate information and communicate with citizens. At the same time, it empowers end-users to turn from passive consumers of governmental information to active participants in content-generation (Bertot, Jaeger & Grimes, 2010).

Looking at the current practices of e-government, there are three main areas adopted by public sector organisations: improving government processes (e-administration), connecting citizens to government services (e-services), and developing external interactions (e-society) (Heeks, 2001b). More specifically, e-administration could include managing process performance, forming strategic connections within government, and transferring authority and resources from centralised to more localised locations. E-services could include informing citizens of government programmes and activities, making public servants more accountable, gathering citizen input regarding public sector decisions, and improving services. Finally, e-society could include forging ties and improving cooperation between government and business, and aiding in building local communities (Heeks, 2001b).

The new model of e-government is made possible and desirable due to the intersection of advances in technology and secular global trends. In the old model,

internal government processes were improved through data processing using information technology (IT). In the new model, ICT is utilised to transform the external function of governance. Concurrently with this development is a revolution in governance: there is an urgent need for government that costs less, delivers more and is more accountable (Heeks, 2001b).

These needs are especially acute in the developing world, where public agencies are tasked with improving quality, response times, access to services and transparency, while facing resource constraints (Kumar & Best, 2006). These improvements can produce real improvements in the lives of citizens; for example, they empower citizens with information about public services that they formerly had no access to, or had to bribe unscrupulous intermediaries for (Kumar & Best, 2006).

Initiating successful e-government in developing countries can be quite different than in developed countries. Since inexpensive labour can negate any cost savings due to automation, ICT in developing countries requires a broader vision for e-governance that must go beyond simple automation. Effective e-governance in developing countries requires a shift in focus from automation to informatisation and transformation, and from processing to communication (Heeks, 2001a).

In summary, the tremendous potential and need for e-government has resulted in significant investments by many governments worldwide (Hunter & Tan, 2006). There have been beneficial results. E-government has been associated with building citizens' trust in government through providing transparency and interactivity (Welch, Hinnant & Moon, 2005; Grimmelikhuijsen, 2012). Also, e-government is credited with building and managing relationships with citizens, the public and private sectors, and more, which could create many business opportunities (Layne & Lee, 2001). It is a challenging process, however, to measure the effectiveness of e-government (Kaisara & Pather, 2011; Scott, 1995). E-government investments need to be evaluated and measured to ensure their effectiveness and their ability to deliver value and successfully meet specified objectives, as most initiatives have met with critical difficulties that so far have limited successful implementation (Heeks, 2003). Defining and understanding how we can evaluate and measure the effectiveness of e-government in terms of

employing the construct of end-user satisfaction with e-government IS is the focus of this research, as end user perceptions will be captured and analysed by utilising and exploiting the Web 2.0 technology, and in particular social media, to evaluate and measure the effectiveness of e-government IS, and compare and contrast these findings with the end-user computing satisfaction (EUCS) instrument that is a widely accepted measure (Doll & Torkzadeh, 1988).

E-government IS acceptance and usage by citizens is a critical factor for successful e-government investment (Gauld, Goldfinch & Horsburgh, 2010; Hamner & Al-Qahtani, 2009). Thus, some researchers have focused on investigating the factors that influence citizens' perceptions and acceptance of using services provided by e-government IS (Alshehri et al., 2012), and identify four factors that are influential, and are website quality that meets end-user needs, end-user expectation about system performance and required effort to use the system, and system support. Carter (2008) found other factors including past experience with using the systems, ease of use and trust in using the Internet. He found that perceived usefulness is a strongly influential factor for e-government acceptance, and this is also supported by Chu et al. (2004), who also suggest the factor of quality of information provided by the system. Furthermore, trust in e-government is found to be an influential factor on system usage and satisfaction (Khayun, Ractham & Firpo, 2012) and associated to IS success (Teo, Srivastava & Jiang, 2009). The ultimate aim of such effort is to predict the acceptance and usage of e-government IS by understanding the most influential factors that influence citizens' perceptions and intentions to use the system.

End users' perceptions and subjective evaluation with regard to IS, is critical for the success of IS. Thus, many studies focus on understanding the factors that influence end users' perceptions and acceptance to use and accept the system as an antecedent for the system's success. In addition to influential factors mentioned earlier, needs fulfilment and segmented services that suit different individual needs are found to be a direct influential factor for end user satisfaction (Lee, Gim & Yoo, 2009).

E-government has been criticised as being insufficiently developed, when compared to the quality of services provided by e-business and adopted by the private sector

(Morgeson & Mithas, 2009). Thus, as a result, e-government effort need to emphasise the importance of e-government evaluation processes, as these should contribute to improvements in current and future systems, and enhance end users' experiences and fulfilment of their needs. IS evaluation process is important and should be the basis for any planned improvement. This research contributes to these evaluation efforts by focusing on IS end users' satisfaction and evaluating their level of satisfaction with the system.

2.4   Social Media Use by Government

Reviewing current practices of using social media by government should help to understand to what extent social media is exploited and used by government and how they utilise it as part of e-government. This research attempts to encourage social media use by governments in order to exploit this technology further, as it has strong potential to be utilised to measure the effectiveness of e-government IS in terms of measuring IS end users' satisfaction as a surrogate of IS success.

Social media, as its name implies, refers to the exploitation of the advancement of information and communication technology (ICT) by facilitating social interaction and communication within cyberspace and empowering people to be active participants by creating and sharing content instead of being consumers of information. One such advancement is the creation of social channels by which people can communicate together through the Web, providing a platform to create online communities (Chun & Luna-Reyes, 2012). Examples of social media include Facebook, Twitter, LinkedIn, You Tube and Flicker (Chun & Luna-Reyes, 2012)**. These social media facilitate content generation by users, and shift the ownership of experience, economic value and authority from institutions to communities (Wang et al., 2007). The key feature associated with social media is the user-generated content. Social media users have freedom of expression, as they can express their thoughts and ideas by participating in social media channels available free online.

Governments utilise web 2.0 applications including social media to support four areas that are identified by Chua, Goh and Ang (2012) as information acquisition,

dissemination, organisation and sharing. They also suggest there is a positive relationship between adopted Web 2.0 applications within governmental websites and perceived overall website quality.

The Open Government Directive of the U.S. Government focuses on transparent government, and participatory and collaborative government (Chun & Luna-Reyes, 2012). The popularity of social media can enable promising benefits if adopted successfully by governments, and governments can reach more people effectively and efficiently. Governments already recognise that social media is a promising channel to communicate with citizens and improve services (Kavanaugh et al., 2012).

 In the United States, social media is deployed as a cost-effective and efficient channel to disseminate information and encourage public participation in government and to communicate with citizens (Snead, 2013; Jaeger & Bertot, 2010) in order to achieve the objectives of the Open Government Initiative launched by the Obama Administration in 2009. This Initiative focuses on improved transparency, openness and public participation. In response to the U.S. Open Government Plan, agencies are initiating and expanding their presence on social media (Bertot et al., 2010).

 In 2011, the Open Government Partnership was initiated by the Obama Administration to promote openness and participatory government with other countries around the world (Lee & Kwak, 2012). It points out that more disclosure of information makes government more accountable - but that does not necessarily mean government exhibits better behaviour (Park & Blenkinsopp, 2011). Can governments disclose information and behave better at the same time? Do governments need to consider citizens' feedback and reactions and act upon them in order to improve and behave better? Or would simply informing citizens with updated information be enough? E-government has not been designed with the needs of users in mind. In particular, members of the public seeking information or engagement have not been well served (Jaeger & Bertot, 2010).

Bertot, Jaeger and Grimes (2010) identify four areas with strong potential for social media use: collaboration, participation, empowerment and time. Users can participate

and interact collaboratively, and are empowered with the ability to express themselves freely in real time. Another important area with potential is the capability social media has to influence. Social media users are most likely to affect each other when communicating through different social media channels, where they may exchange ideas, opinions and facts with those of different backgrounds and/or cultures. This identifies that the potential strength of social media can be harnessed and used by government in order to help them achieve their objectives and strategies and contribute to achieving better government.

The Open Government Maturity Model (OGMM), proposed by Lee and Kwak (2012), consists of five levels to aid and guide government in their endeavours to achieve more open government. Each federal agency is tasked with developing its own plan on achieving greater openness and public engagement, in response to the Open Government Directive (Lee & Kwak, 2012). This implies that differences exist in the situation of each agency and that customised plans may be more effective than a unified plan that is imposed. Involving individual agencies in developing their own plans may serve to encourage innovation.

Park and Blenkinsopp (2011) investigated the role of transparency and how it could be used as a deterrent to corruption through increasing the level of citizens' awareness and vigilance, leading government to take corrective action and develop a higher level of trust in government. This research suggests a possible link between government transparency and reduced levels of corruption and increased citizens' satisfaction. The corrective actions stemming from transparency should eventually lead to improving performance. Thus, transparency could be adopted by governments, as one strategy to improve performance.

Social media could be exploited by governments as a tool to increase transparency and to disseminate governmental information and connect to citizens, but whether social media could contribute to improving performance remains an open question. How can a connection be made between transparency and better performance; in other words, can transparency be used to improve governmental performance? How can

transparency be used as a motive and catalyst to achieve better government? Could social media help in making that connection?

With continuous monitoring of social media, public organisations could benefit from showing that they are knowledgeable with regard to citizens' views, issues, opinions and levels of satisfaction. The information content of social media is considered to be a rich environment for government to exploit. The immense volume of information available on social media should be utilised by the public sector to create public value and contribute to better government. This is the main focus of this research in which social media data will be captured and analysed in order to evaluate the effectiveness of e-government IS in terms of IS end users' satisfaction. In particular, social media data in the form of tweets will be exploited and analysed to gauge how end users' perceive the system and measure their satisfaction with IS. Value and meaning will be extracted from social media data in order to have a positive influence on adopted e-government IS and assist decision makers.

The rich amount of data contained within social media facilitates studying and observing social interaction, and it has attracted many researchers seeking to understand and forecast user behaviour in order to allow decision makers to assess and evaluate potential policy impacts better (Sobkowicz, Kaschesky & Bouchard, 2012). However, social data also contains a substantial level of noise, and methods need to be devised to filter this noise, so that underlying trends and patterns could be discerned (Kavanaugh et al., 2012). Social network systems that are facilitated by social media allow for large-scale collaboration, information sharing and creation of collective intelligence at all levels of government, from local to federal (Chun et al., 2010).

The information available on social media can be used as a measure of how well the public sector performs, and to detect any issues raised by citizens in order to address these at an early stage, and to avoid possible negative sequences that might stem from public dissatisfaction. Social media can be utilised as a platform for government to detect and sense what is going on, in order to act on it properly and in a proactive manner. Many private organisations recognise the importance of managing proactively (Overby, Bharadwaj & Sambamurthy, 2006) and this approach has proven to be

successful in the private sector. A proactive approach could be adopted and implemented by governments for their advantage.

Governments have adopted and implemented advanced information systems to achieve increased effectiveness and efficiency, which are the two important aims that have been achieved by utilising information systems (Avison & Fitzgerald, 2006). They are the motivation for governments to move from paper-based processes to electronic processes. Now, with the prevalence of social media, governments can move to more proactive management of the public sector and utilise social media to influence decisions and performance of the public sector.

Although there is potential in utilising social media by governments, there are many challenges associated with the nature of data of social media, such as challenges that stem from the volume, velocity and variety associated with social media data (Chun & Luna-Reyes, 2012). Emphasis is placed on the importance of efficient storage, processing and analysis of social media data in order to extract value and meaning, and identify key events and sentiments that can positively affect the strategies and decisions of government.

Social media data may also be utilised as input for decision making, in order to improve decision-making capabilities. The argument has been made that democratic governments have adopted transparency as a key aim, and are likely to disseminate more information than authoritarian governments (Jaeger & Bertot, 2010). This is not necessarily relevant to this study, as the focus is not related to the volume of information disseminated by either democratic or authoritarian governments. Rather, it is about exploring social media data and how to use this to enhance governmental performance.

Bertot, Jaeger and Grimes (2010) reviewed the approaches to achieving government transparency and battling corruption, and highlight some instances in which social media have been applied to battle corruption successfully. They emphasise the importance of disseminating information to citizens and allowing citizens to monitor government activities to achieve the aim of transparency and to battle corruption. In

the light of this, social media could be of use as a channel to facilitate honesty in government.

Effectively involving the public and enabling them to participate and communicate with the public sector should increase the level of public self-responsibility and the sense of belonging and awareness. Citizens can be a key factor in improving governmental performance by participating with their feedback and moving away from being passive consumers of government information and towards active participation with government interaction. On the other hand, this type of communication should keep governments continuously aware of public issues, trends and concerns, and enable government to manage these proactively; for example, a UK-based service that allows citizens to report issues that need to be repaired or attended to regarding local roads (Bertot et al., 2010).

Local government departments that are not present in these social platforms are not hearing citizens' opinions about them, and are missing an important grass-roots source of information regarding local policy, public services and daily life in their jurisdiction (Bonson et al., 2012).

Other significant research includes the study by Picazo-Vela, Gutierrez-Martinez and Luna-Reyes (2012), who describe the continuously increasing number of social media users, and the study by Hsu and Park (2012) who investigated the use and influence of social media by political parties, and the findings of Jaeger et al. (2007), who investigated the viability of social media in emergency management.

Social media may be useful in measuring the effectiveness of information control and propaganda in a study of social media by government (Kavanaugh et al., 2012). The researchers report that local government often uses social media without knowing its costs and benefits or the target audience. In addition, often there is no designated person in the organisation that monitors communication, or how and when responses are needed. The effects that social media communications have on the public are also reported to be neglected, and this study highlights the concerns of the US Government

regarding organisation, information exchanged between the organisation and community, and technology.

Welch, Hinnant and Moon (2005) investigated the relationship between citizens' experience with e-government, satisfaction with e-government, and trust in government. Citizens' satisfaction with e-government is reported to be associated with trust in government, and trust in government is reported to be associated with trust in e-government (Teo, Srivastava & Jiang, 2009). Another observation is the decrease of public trust in government that implies loss of public confidence and dissatisfaction. The adoption of information technologies by more people in society and increasing the availability of governmental information to the public may help correct biased public perceptions and negative expectations by narrowing the information gap between the public and governments (Welch, Hinnant & Moon, 2005). Providing more information about government performance outcomes may turn out to be an important method of increasing citizens' trust in governments (Grimmelikhuijsen, 2012).

This review of the literature of social media use by governments, and this current research should contribute to expanding the usage and exploitation of social media data. In particular, end user perception of e-government IS, can be captured and analysed to evaluate and improve e-government systems. The success of e-government IS can be evaluated in terms of end user satisfaction with the system. Social media facilitates the capture of such perceptions and should enable better understanding of end users' points of views with regard to e-government IS.

2.5   Measuring the Effectiveness of e-Government IS

The aim of this research is to contribute to determining the effectiveness of e-government IS by investigating how to measure end user satisfaction with e-government IS and use this as a surrogate for system success. The focus is on end-users of IS as 'e-citizens': people who access government information, communicate with government agencies, and engage in using on-line government services in cyberspace. This process begins with the importance and meaning of 'effectiveness',

then moves to explore how this is identified, conceptualised and measured in the literature, and then an evaluation of IS user satisfaction.

2.5.1 Information Systems (IS) Effectiveness

Organisations invest in IS development and implementation in order to enhance organisational effectiveness or organisational success in general. This is a dynamic process. Organisations typically engage in continuous revisions of their strategic plans, objectives and strategies in order to achieve their targets better (Iivari & Ervasti, 1994). One reason for this is the need to adopt and respond to changes, such as political, economical and technological changes, imposed on organisations by the external environment. Another reason is the influence of other organisations: organisations do not operate in isolation, and often respond to each other as if they were connected by an umbilical cord (Day, Reibstein & Gunther, 2004). Failure to respond could result in a loss in competitive advantage. The ultimate aim of the organisation in all this is to realise increased efficiency, effectiveness and competitive advantage, so that the aim is to reduce costs, improve the way work is done, and to successfully compete against other organisations. Successfully achieving these aims is one of the benefits and desired outcomes of investment in technology and IS. The above considerations apply to both private and public sector organisations.

IS effectiveness is defined as 'the contribution of IS to organisational effectiveness' (Iivari & Ervasti, 1994), and system effectiveness is defined as 'the degree to which the system operates in a way that is efficient, productive and useful' (Whyte & Bytheway, 1996). Measuring IS effectiveness is a critical process and it is considered to be an integral and crucial part of any information systems adoption and implementation process to evaluate system success (Hamilton & Chervany, 1981a), partly due to its strong influence on and relation to organisational effectiveness.

Hamilton and Chervany (1981b) discussed and compared the points of view of various stakeholders including users, development and internal audit team members, and top management. They developed different evaluation measures for each group and suggest using results from multiple viewpoints in the evaluation of systems

effectiveness. Li (1997) found that IS personnel and IS end users within the same organisation evaluate the effectiveness and success factors of IS differently. This presents considerable complications to top management, who are tasked with considering and meeting the needs of these disparate groups in an equitable manner. Seddon et al. (1998) also conclude that measuring IS effectiveness needs to incorporate different stakeholders with their needs and interests carefully identified and considered along with the system under evaluation. Difficulties also arise from trying to trace and measure the effects of Management Information System (MIS) due to the presence of an array of intermediate factors. Researchers have attempted to address these difficulties through the use of surrogate measures for MIS effectiveness (Kim, 1989).

Hamilton and Chervany (1981a) summarise the challenges involved in evaluating systems effectiveness. They include poorly defined objectives and measures along with poor alignment between them, and a focus on the quantitative measures of efficiency, while neglecting more qualitative measures of effectiveness due to their complexity. Leclercq (2007) finds that there is a strong and complicated interdependence between IS, the organisation, individuals and management, and concludes that this precludes successfully evaluating IS using a single variable approach.

Many perspectives on effectiveness are present in the literature. One of these perspectives is that IS effectiveness needs to be considered using both macro and micro perspectives in order to gain a more comprehensive view (Grover, Jeong & Segars, 1996). At the macro level, IS effectiveness contributes to organisational effectiveness by achieving organisational objectives and helping to form better and more competitive strategies. At the micro level, IS effectiveness contributes to organisational processes and operations by assisting employees in performing work tasks and in improving their performance and productivity.

Hamilton and Chervany (1981a) identify two perspectives on systems effectiveness. The first of these is goal centred and focuses on achieving the identified objectives and creating measures to ensure that objectives are successfully achieved. The second perspective is system resources centred and focuses on resource viability, which

considers how well the service will be used overall. They conclude that both need to be combined to evaluate systems effectiveness. Hamilton and Chervany (1981a) also find that systems effectiveness is determined ideally by its success in utilising information systems to contribute to the accomplishment of organisational objectives: increasing organisational performance is key; for example, organisational performance might be expressed by the degree of customer satisfaction.

Whyte and Bytheway (1996) identify three perspectives on system effectiveness that are product, process and service. Product is related to the outcomes of the development process including the delivered system and the factors related to it. Process includes areas such as the systems development process. Service includes support provided to the users of IS.

Malik and Goyal (2001) developed an integrated view for systems effectiveness in order to provide a holistic view of effectiveness that includes product view, process view and environment view.

Grover, Jeong and Segars (1996) combined IS effectiveness with organisational effectiveness to identify three evaluation perspectives: comparative, normative and improvement. Comparative evaluation compares the effectiveness of a system with another comparable system. Normative evaluation evaluates the effectiveness of the system to theoretical and best practices identified in the literature. Improvement evaluation focuses on improvement and evolution and the contribution to improved organisational effectiveness. This study incorporates the multidimensionality of IS effectiveness by developing a construct space including various evaluation criteria (comparative, normative and improvement), analysis type (organisational or individual), and evaluation type (process, response and impact).

In the context of organisational effectiveness, the choice of effectiveness criteria may vary from one organisation to another, as it is based on organisational objectives. Therefore, the meaning of effectiveness is outlined and defined by the context of the organisation being considered (Cameron, 1980). Measuring and evaluating IS effectiveness may contribute to organisational effectiveness, as it ensures that value is

derived from investment in IS and that objectives are met. With the continued and increasing investment in IS, the evaluation process is important in order to evaluate the benefits from IS investments (Leclercq, 2007). The benefits of IS investment will not be realised unless it influences users' behaviours and perceptions.

As mentioned above, measuring the effectiveness of IS is a complex and challenging activity, because effectiveness is a multidimensional concept (Hamilton & Chervany, 1981a; Petter, DeLone & McLean, 2008; Miller & Doyle, 1987) that varies from one organisation to another (Thong & Yap, 1996), has multiple and diverse objectives (Pitt, Watson & Kavan, 1995) and has multiple points of view (Ramezan, 2009).

Subjective measures, such as the construct of end-user satisfaction, are utilised as a surrogate for IS effectiveness, because of the difficulty of obtaining and quantifying objective measures of IS (Saarinen, 1996). This is conceptually defined and operationalised by developing a single or set of items/scales (instruments) in order to capture the meaning of the concept in a measurable way, because of the subjective nature of end-user satisfaction.

User satisfaction is used as a surrogate for information systems effectiveness, and the practice of employing user satisfaction in order to evaluate information systems effectiveness is well established in the literature (Melone, 1990; Zviran & Erlich, 2003) and is reviewed and discussed in the following section.

2.5.2   The Construct of IS End-User Satisfaction

Many previous studies consider the use of end-user satisfaction as a surrogate measure for IS effectiveness, and have devoted effort to develop and validate instruments to measure such a construct (Bailey & Pearson, 1983; Baroudi & Orlikowski, 1988; Ives, Olson & Baroudi, 1983; Doll & Torkzadeh, 1988), which may then be used to investigate users' perceptions of information systems as an indicator for system success. End user perceptions are also important in that they may reflect the quality of other variables inherited from systems design and development (Au, Ngai & Cheng, 2002), and may contribute to clarify the issue of acceptance-discontinuance anomaly, in which users discontinue use of IS after initial acceptance

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(Bhattacherjee, 2001). User satisfaction is a popular measure for system effectiveness due to its relative ease of measurement and the fact that user-perception data is very useful and considered to be very important in its own right (Galletta & Lederer, 1989).

End-user attitudes and end-user beliefs are other measurement concepts that are related to the end user. Melone (1990) defines end user attitudes towards IS as 'a predisposition to response favourably or unfavourably to a computer system, application, system staff member, or a process related to the use of that system or application.' Bhattacherjee and Premkumar (2004) define belief in the context of IS as 'initial pre-usage expectations'. Goodhue (1986) concludes that end user satisfaction is an appropriate measure related to attitudes that have value in predicting end user behaviour.

The influence of end user attitudes on behaviour is supported by psychological expectancy theory; for example, end user satisfaction influencing the end user behaviour of IS use. This link between satisfaction and behaviour, along with the difficulty of obtaining objective measures of IS impact, are two reasons to shift to a strategy of utilising measured user satisfaction as a surrogate for IS effectiveness (Gatian, 1994). User satisfaction has a strong influence on user behaviour, and user satisfaction encourages IS use leading to the realisation of benefits and organisational objectives (Petter, DeLone & McLean, 2008). Gatian (1994) investigated the influence of user satisfaction on user behaviour - in particular focusing on user performance - and reports that there is a measurable influence. Petter, DeLone and McLean (2013) reviewed the literature and identified the antecedents of user satisfaction that can be used as a predictor of satisfaction with IS.

Satisfaction is one of the most employed subjective constructs for measuring IS effectiveness (Thong & Yap, 1996) and one of the most critical and accepted measures to determine the success or failure of IS (Powers & Dickson, 1973; Thong & Yap, 1996; Zviran & Erlich, 2003). Kim (1989) differentiates between user satisfaction measures based on the adopted perspective and underlying definition of the concept, and points out that user satisfaction is studied using three different perspectives: user satisfaction

in terms of attitudes toward MIS, user satisfaction in terms of information quality obtained, and user satisfaction in terms of MIS effectiveness.

User satisfaction has been employed in many areas including measuring user satisfaction with e-commerce (Pather, Erwin & Remenyi, 2003), where measurements have implications for user satisfaction with products and services that are provided. They also considered the emergence of a new type of end-user of IS, who communicates and interacts remotely through cyberspace, in contrast to the traditional end user of IS that generally was in an organisational environment, located at the physical site of the organisation, and involved in performing a known and understood role for the organisation. This traditional view had a strong influence on the traditional way of measuring user satisfaction of IS. Chin, Diehl and Norman (1988) developed a Questionnaire for User Interface Satisfaction (QUIS) that focuses on measuring satisfaction with the system interface.

The construct of user satisfaction as a measure of IS effectiveness has been studied from various perspectives. Melone (1990) evaluated user satisfaction as a theoretical and conceptual construct for IS effectiveness. Galletta and Lederer (1989) identify three areas that UIS has influence upon, including contributions to achievement of organisational objectives, the quality of the work environment, and the level of encouragement of voluntary system usage. Goodhue (1992) distinguished between the underlying constructs for evaluating users' points of view as a basis for choosing an appropriate measure, and proposed that the task-system fit is an important possibility that might be used as an underlying construct of user satisfaction.

To investigate the measurement of end users' perceptions and evaluation of IS, scales have been developed and used in the IS literature that use questionnaires that include different points of view towards IS. Since various users are involved with and affected by information systems, including data from various groups having different points of view, should contribute to a more inclusive measure of IS effectiveness (Hamilton & Chervany, 1981a).

User Information Satisfaction (UIS) (Bailey & Pearson, 1983; Ives, Olson & Baroudi, 1983) is one measurement of system effectiveness, and is a perceptual and/or subjective measure of information system success that may serve as a substitute for objective measures of information system effectiveness. This is useful, because objective measures are often not available (Ives, Olson & Baroudi, 1983).

Various instruments have been developed to measure and evaluate users' perceptions of IS using developed scales in the form of questionnaires as tools to gather data. Bailey and Pearson (1983) developed a valid measure using a semantic differential technique that uses adjectives to measure users' perceptions for measuring system user satisfaction by identifying and using 39 factors that influence users' satisfaction. In a study by Olson and Baroudi (1983), the researchers developed and validated a short form in order to develop a standard short form that may be used to measure overall satisfaction with IS in less time. These short form instruments were validated using different samples and could be used as diagnostic tools to detect user dissatisfaction in organisations, and to identify and suggest areas for further investigation (Baroudi & Orlikowski, 1988). These are considered to be important contributions to measuring and analysing user satisfaction, and still serve as the basic source for constructing new information systems user-satisfaction questionnaires (Zviran & Erlich, 2003). However, they have been criticised by Doll and Torkzadeh (1988) for their focus on measuring satisfaction with traditional data processing systems in which users interact indirectly with IS through an analyst or operations, thus being inappropriate for use in end-user computing (EUC) systems in which users interact directly in an interactive manner with the IS. Li (1997) extended the work of Bailey and Pearson (1983) by adding seven more factors of IS success, obtaining a total of 46 factors that influence IS success. UIS has also been extended by adding two dimensions: development process and IS impact, in order to measure IS success more directly by including objective measures and measures of IS impact (Saarinen, 1996).

2.5.3 End-User Computing Satisfaction (EUCS)

Doll and Torkzadeh (1988) developed End-User Computing Satisfaction (EUCS) instruments that take into consideration the important aspect of interactivity and

direct interaction between end-users and IS, as these factors were not considered in the User Information Satisfaction (UIS) Instrument (Bailey & Pearson, 1983; Ives, Olson & Baroudi, 1983). They developed 12 items to measure end users' computing satisfaction that focused on information product and integrated ease of use. The EUCS was developed in order to evaluate applications with the aim of improving further efforts at application development, resulting in increased social and economic benefit from investments in information technology (Doll & Torkzadeh, 1991).

The validity of the End-User Computing Satisfaction (EUCS) instrument has been confirmed by multiple studies and it is used as a standardised measure for end-user satisfaction.   Doll, Xia and Torkzadeh (1994) conducted a cross-validity study using confirming factors, McHaney, Hightower and White (1999) verified test-retest reliability, and both McHaney, Hightower and Pearson (2002) and Somers, Nelson and Karimi (2003) verified that the EUCS maintained its psychometric stability. The EUCS instrument validity and reliability are also supported by many other studies that indicate it could be used as a general measure across organisational department and applications (Harrison & Rainer, 1996; Seddon & Yip, 1992). Having a standard and robust measure that can be applied in different contexts and cultures plays an important role in assisting decision makers when making decisions regarding IS strategy and improvement, as it allows for comparison by providing equivalent measurements across diverse samples, enabling the inclusion of a variety of conditions and/or population subgroups present in the organisation (Doll et al., 2004). It also allows measurements to be made across different cultures (Deng et al., 2008). The EUCS instrument is probably one of the best known and is frequently employed in the literature (Chin & Lee, 2000).

EUCS is shown to be a robust instrument and is employed by many researchers as a valid and reliable measure of end user satisfaction in a variety of contexts (Helm, Chaparro & Farmer, 2005; Hou, 2012; Larsen, 2009; Downing, 1999; Al-Gahtani & King, 1999, Aggelidis & Chatzoglou, 2012; Chen et al., 2000; Gelderman, 1998; Hussein, Abdul Karim & Selamat, 2007; Ilias & Razak, 2011; Kanellou & Spathis, 2013). It has also been applied in a cross-culture study and proved its applicability and suitability (Deng

et al., 2008). It has also been translated into other languages and its validity tested and supported (Heilman & Brusa, 2009). Therefore, EUCS is an appropriate instrument to be utilised in this research, which involves two different cultural contexts (UK & Saudi Arabia). EUCS allows cross-culture comparisons, and to compare and contrast satisfaction measures. Based on its validity, reliability and stability being confirmed by previous studies in the literature (see Table 2.1), EUCS is an effective choice for this research study.

Table 2.1: The Construct of End-User Computing Satisfaction (EUCS) Employed in this Research

Operationalisation of EUCS Construct		
Construct	**Operational Definition**	**How Measured**
End-User Computing Satisfaction (EUCS)	*'The affective attitude towards a specific computer application by someone who interacts with the application directly'* (Doll & Torkzadeh, 1988).	The EUCS instrument (Doll & Torkzadeh, 1988) that covers five IS dimensions: content, accuracy, format, ease of use, & timeliness.

Baroudi and Orlikowski (1988) validated the short form of the user information satisfaction instrument (UIS) developed by Ives, Olson and Baroudi (1983) and illustrates how it could be used as a diagnostic tool for measuring general user satisfaction and also to detect specific problems and factors having a negative effect on users' satisfaction. They also suggest that the instrument needs to be used in conjunction with deeper analysis, including end user interviews and consultations to identify the source of dissatisfaction.

The User Information Satisfaction (UIS) Instrument (Bailey & Pearson, 1983; Ives, Olson & Baroudi, 1983) remains an important instrument since its development in 1983, and is been widely used as a valid and reliable measure (Whitten, 2004; 2005; Wan & Wah, 1990). UIS and EUCS are shown to be the two most widely used and accepted measures for end user satisfaction with IS (see Figure 2.1, see Table 2.2).

Figure 2.1: End-User Computing Satisfaction (EUCS) Instrument, Adopted from Doll & Torkzadeh (1988)

CONTENT
C1: Does the system provide the precise information you need?
C2: Does the information content meet your needs?
C3: Does the system provide reports that seem to be just about exactly what you need?
C4: Does the system provide sufficient information?

ACCURACY
A1: Is the system accurate?
A2: Are you satisified with the accuracy of the system?

FORMAT
F1: Do you think the output is presented in a useful format?
F2: Is the information clear?

EASE OF USE
E1: Is the system user friendly?
E2: Is the system easy to use?

TIMELINESS
T1: Do you get the information you need in time?
T2: Does the system provide up-to-date information?

Table 2.2: The Construct of User Information Satisfaction (UIS) & End-User Computing Satisfaction (EUCS)

Operationalisation of Construct of End-User Satisfaction of IS			
Construct	**Operational Definition**	**How Measured**	**Instrument Focus**
User Information Satisfaction (UIS)	*'The weighted sum of a user's positive or negative reaction to a set of 39 factors' (Bailey & Pearson,1983)*	UIS instrument comprised of 39 scales with four items per scale using differential semantic technique & cover IS product & services attribute (*Bailey & Pearson, 1983*)	Focus on measuring end-user satisfaction with IS products & services in traditional data processing systems.
	'The extent to which users believe the information system available to them meets their information requirements' (Ives, Olson & Baroudi, 1983).	UIS instrument (short form) comprised of 13 scales with two items per scale (Ives, Olson & Baroudi, 1983).	Focus on measuring overall end-user satisfaction with focus on electronic data processing (EDP) staff & services, information product, & knowledge/ involvement in traditional data processing systems.
End-User Computing Satisfaction (EUCS)	*'The affective attitude towards a specific computer application by someone who interacts with the application directly'* (Doll & Torkzadeh, 1988).	EUCS instrument comprised of a 12 item-scale using five-point Likert-type scale, covering five IS dimensions: content, accuracy, format, ease of use, & timeliness (Doll & Torkzadeh, 1988).	Focus on measuring end-user computing satisfaction with information product of a particular application.

Instead of using developed and validated instruments for measuring end users' satisfaction with IS based on a questionnaire, Downing (1999) employed behavioural observations to measure end users' satisfaction in the form of quantitative data on system use, as an efficient alternative to measuring IS satisfaction that was captured by using meta-monitoring of IS. These results are similar to those found using traditional instruments.

2.5.4 Supporting Studies

IS effectiveness/success is best characterised as a process, rather than a single discrete measurement or event, and by the interdependent nature of its success factors (DeLone & McLean, 1992; 2003). User satisfaction as a success measure can influence and be influenced by other factors. As a result, and to contribute to the end-user satisfaction with IS, some studies have focused on investigating the relationship between end users' satisfaction and other related IS variables, but other studies have focused on investigating the antecedents of end users' satisfaction in an effort to predict system success and anticipate users' perceptions of IS.

Studies that support the influence of user satisfaction on user behaviour towards IS include those of Baroudi, Olson and Ives (1986), Gatian (1994), Goodhue (1986) and Iivari (2005). Other studies have focused on studying the relationship between end users' satisfaction and other IS variables in order to discover and understand the existence of relationships and their extent better. Baroudi, Olson and Ives (1986) investigated the influence of user involvement on user information satisfaction and the use of the system. They found that users' involvement in the process of developing IS has a positive influence on users' information satisfaction with the system and on use of the system. They also found that user information satisfaction is positively influenced by system usage. The measurement used for user satisfaction in these studies was based on Bailey and Pearson (1983). Goodhue (1986) investigated the relationship between the fit of the required task and IS, based on users' objective beliefs, in contrast to users' attitudes that focus on subjective users' feelings towards IS. Whyte and Bytheway (1996) identified 21 service attributes that have a strong influence on users' perceptions of whether IS is viewed as successful, and the importance of these attributes vary depending on the organisational context.

The positive relationship between user satisfaction and system usage is also supported by Hou (2012). System usage consequently results in improvement in the individual's performance. The instrument used in this research was the EUCS developed by Doll and Torkzadeh (1988). Mahmood et al. (2000) investigated the relationship between end users' satisfaction with other variables by conducting a meta-analysis of empirical studies in the literature. The most influential factors related to end users' satisfaction were found to be user involvement in system development, perceived usefulness, user experience, organisational support and users' attitudes toward IS.

The relationship between end users' expectations as an influential factor of end user satisfaction is supported by Staples, Wong and Seddon (2002). This relationship was also investigated by Ryker, Nath and Henson (1997), who found that end users whose expectations are formed by sources inside the organisation are more satisfied than those whose expectations are formed by sources outside the organisation. They identify three circumstances: expectations formed through past experiences,

expectation formed based on sources inside the organisation, and expectation formed based on sources outside the organisation. These findings introduce complications regarding managing end users' expectations, and they recommend that expectations formed inside the organisation need to be maintained at realistic levels to serve as antecedents of end users' satisfaction.

Woodroof and Burg (2003) found that measurements of user satisfaction with IS is affected by users' predispositions. They propose that users' predispositions should be identified and isolated when measuring IS satisfaction in order remove the effects of predisposition from the data. Another important consideration is users' perceptions of equity of IS resources allocation, which is found to be an important influential factor on user satisfaction (Joshi, 1992).

Other studies have focused on investigating the antecedents of end users' satisfaction of IS in an attempt to predict end users' satisfaction of IS, and to contribute to IS effectiveness. Leclercq (2007) concluded that end-user satisfaction is based on the fit between end users' needs and the functionality of IS. This study also suggests that organisational and individual contingency variables influence end users' perceptions, and that effective communication is important. Organisational contingency variables include organisational size and structure, organisation culture, and whether IS function governance is centralised or decentralised, as this influences organisational responses and support for end users' needs. Iivari (2005) reports two factors that strongly influence end users' perceptions of satisfaction: perceived system quality and perceived information quality, and that end users' satisfaction results in individual impact.

End users' points of view are very important as they influence the level of satisfaction. Doll and Ahmed (1985) emphasise the importance of users of IS, and the increasing interest in user related concepts. One of many user related concepts of IS is user documentation that contributes to higher levels of user satisfaction and organisational and system effectiveness (Gemoets & Mahmood, 1990; Doll & Ahmed, 1985). User involvement is another concept, and the relationship between user involvement and the development of successful IS is investigated by Ives and Olson (1984). The positive

relationship between these factors and the importance of user involvement to system success is also supported by Harris and Weistroffer (2009). Amoako-Gyampah and White (1993) investigated the relationship between end users' perception of their level of involvement and user satisfaction. They also correlated the quality of communication and interaction between the development team and end users to study how to positively and directly influence user satisfaction through the process of user involvement. Igbaria and Nachman (1990) show that managerial and communications skills of IS mangers can positively influence user satisfaction. Other studies focus on investigating the relationship between user information satisfaction and job satisfaction (Ang & Koh, 1997; Ang & Soh, 1997) as an effort to contribute to measured system effectiveness in terms of technological and human resources.

Allingham and O'Connor (1992) indicate that user information satisfaction varies among organisational functions within the same organisation and for a particular IS. They introduced the variation of information satisfaction to the different levels of user involvement among organisational functions during the process of IS development, which influences the level of fit between the end user task requirements and IS functionality in order to capture and meet end-user requirements at different organisational levels. This variation of organisational and individual contingency variables is discussed by Leclercq (2007), who found this to be an influential factor of user perception of IS.

To summarise the antecedents of end-user satisfaction of IS, there are various kinds of end user satisfaction antecedents. Some antecedents are related to IS concepts (see Table 2.3). Others are related to end user concepts (see Table 2.4), organisational factors (see Table 2.5), and control and communication skills (see Table 2.6).

Table 2.3: Antecedents of End-User Satisfaction of IS (System Related Concepts)

Antecedents of IS End-User Satisfaction		Source
System Related Concepts	**System Usage**	Hou (2012), DeLone & McLean (2003)
	Systems Usefulness	Staples, Wong & Seddon (2002), Mahmood et al. (2000), Leclercq (2007)
	Ease of Use	Staples, Wong & Seddon (2002)
	Information Quality	Staples, Wong & Seddon (2002), Iivari (2005), DeLone & McLean (2003)
	System Quality	Iivari (2005), DeLone & McLean (2003)
	Fit of the IS to the End-User Needs (Tasks)	Leclercq (2007), Petter, DeLone & McLean (2013), Leclercq (2007)
	Task Difficulty (Inverse Relationship with End-User Satisfaction)	Petter, DeLone & McLean (2013)
	Segmented Services	Lee, Gim & Yoo (2009)

Table 2.4: Antecedents of End-User Satisfaction of IS (End-User Related Concepts)

Antecedents of IS End-User Satisfaction		Source
End-User Related Concepts	**User Documentation**	Gemoets & Mahmood (1990), Doll & Ahmed (1985)
	Prior-Use Expectation	Staples, Wong & Seddon (2002), Petter, DeLone & McLean (2013), Ryker, Nath & Henson (1997)
	User's Predisposition	Woodroof & Burg (2003), Petter, DeLone & McLean (2013)
	User Involvement	Harris & Weistroffer (2009), Ives & Olson (1984), Petter, DeLone & McLean (2013), Baroudi, Olson & Ives (1986), Mahmood et al. (2000)
	End-User's Attitudes toward Technology/IS	Petter, DeLone & McLean (2013), Mahmood et al. (2000)
	End-User Training, Education & Experience	Petter, DeLone & McLean (2013), Mahmood et al. (2000)
	End-User Understanding of the IS	Leclercq (2007)
	End-User Participation	Leclercq (2007)
	End-User Enjoyment	Petter, DeLone & McLean (2013)
	End-User Perception of Equity of IS Resources	Joshi (1992)
	Need Fulfilment	Lee, Gim & Yoo (2009)

Table 2.5: Antecedents of End-User Satisfaction of IS (Organisation Related Factors)

Antecedents of IS End-User Satisfaction		Source
Organisational Related Factors	**Organisational Contingency Factors** (Organisational size, structure, culture, IS function, centralized/decentralized IS governance mode)	Leclercq (2007), Petter, DeLone & McLean (2013)
	Individual Contingency Variables (Variation of IS end-user role and function performed)	Leclercq (2007)

Table 2.6: Antecedents of End-User Satisfaction of IS (Communication & Control Skills)

	Antecedents of IS End-User Satisfaction	Source
Control & Communication Skills	Organisational/Management Support of IS	Petter, DeLone & McLean (2013), Mahmood et al. (2000)
	Communication & Interaction between the Development Team & End-User.	Amoako-Gyampah & White (1993), Petter, DeLone & McLean (2013)
	Managerial & Communications Skills of IS Mangers/Function, Quality of Relationship	Igbaria & Nachman (1990), Petter, DeLone & McLean (2013), Leclercq (2007)
	Competencies of IS Function	Leclercq (2007)

There are various reasons for employing user satisfaction as a surrogate measure of IS effectiveness and individual impact (Iivari & Ervasti, 1994; Iivari, 2005). Quantifiable objective measures associated with IS have been criticised as being unable to clarify the relationship between benefits achieved and adopted IS, and unable to capture the soft benefits of adopted IS and the positive influence on decision makers at an individual level (Leclercq, 2007; Au, Ngai & Cheng, 2002). Measurements of user satisfaction can be interpreted as both perceived system quality and system acceptance (Ives & Olson, 1984). There are intangible benefits derived by IS, such as the influence on the process of decision making, which cannot be quantified and measured using financial cost (DeLone & McLean, 1992; Ives, Olson & Baroudi, 1983). In other situations, there are objective measures which can be quantified and compared, but for some reasons are not available. User satisfaction can capture these intangibles, and is an appropriate surrogate measure when objective measures are not possible. For these and other reasons, there has been a shift in focus towards using user perception and evaluation (Ives, Olson & Baroudi, 1983). Although it may appear much easier to measure than user satisfaction, impact of MIS on profitability runs into the difficulty of precisely measuring the impact of MIS on company or organisation profits, due to the effect of other variables such as production factors, management styles and sales levels: distortions due to these factors make it very difficult to accurately determine the affect of MIS on profits (Galletta & Lederer, 1989).

It is also difficult to find objective measures of enhanced organisational performance due to IS, again due to other variables likely to interact with such measures, and the difficulty of singling out the effect of IS. User satisfaction is easier to measure than

impact of IS on organisational performance and profit (Leclercq, 2007). User satisfaction seems intuitively very reliable in the sense that it would be difficult to deny the performance of an IS in the case where the user appreciates it (Leclercq, 2007).

DeLone and McLean (1992) found that user satisfaction is the most widely used single measure of IS success for many reasons. First, user satisfaction has a high degree of face validity: it is hard to deny the success of a system that its users say that they like. Second, the development of tools by Bailey and Pearson (1983) and its derivatives has provided a reliable tool for measuring satisfaction and for making comparison among studies. Third, user satisfaction has relative appeal as a success measure because most other measures are so poor: they are either conceptually weak or empirically difficult to obtain.

2.5.5 Theoretical Underpinnings

In order to better understand end-user satisfaction of IS as a construct, it is important to understand the process of satisfaction formation in the context of IS. End user satisfaction has been criticised as lacking a theoretical foundation (Melone, 1990). As a result, many studies focus on this issue in an effort to investigate and understand satisfaction formation in order to provide a more solid grounding in theory. Au, Ngai and Cheng (2002) reviewed the literature of end user information systems satisfaction (EUISS) and found that many previous studies based on Expectation Disconfirmation Theory (EDT) (Oliver, 1980) that focused on understanding user satisfaction by depicting behaviour as a natural process that starts with initial belief (prior use), then actual use, and then perception can be formed as a result of contrasting user expectation to resulting disconfirmation, which results in satisfaction or dissatisfaction. Expectation Disconfirmation Theory is employed to understand the process of satisfaction formation by IS end-users in which satisfaction is determined by initial expectation that end users formed before using the system, and confirmation of these expectation after using the system (Bhattacherjee, 2001; Ryker, Nath & Henson, 1997). Also, expectation disconfirmation theory has been employed to understand factors that influence IS continuance use: satisfaction and disconfirmation are found to be two

important factors that influence users' attitudes and the behaviour of continued use of IS (Bahattacherjee & Premkumar, 2004; Bhattacherjee, 2001).

Expectation disconfirmation theory has been criticised by Au, Ngai and Cheng (2002), who found that meeting end users' expectations does not necessarily lead to end users' satisfaction in the context of IS. Also, initial expectations (prior use) of end users of IS may not exist in some cases, because there was no initial expectation formed or it is challenging to predict how the system might be supportive (Au, Ngai & Cheng, 2008). Au, Ngai and Cheng (2002, 2008) proposed an equitable needs fulfilment model: a conceptual model of end user IS satisfaction that incorporates equity and needs theory in addition to the expectancy disconfirmation theory, and places a focus on understanding IS user satisfaction by understanding end users' perceptions of equity of their 'input' to the 'outcomes' or 'benefit' gained by using the system, plus perceived equity from other variables that influence end users' satisfaction and contributes to fulfil individual needs. They identified three needs of IS end users that should be equally fulfilled, based on the work of Alderfer (1969). These needs are work performance fulfilment, relatedness fulfilment and self-development fulfilment.

The equitable needs fulfilment model of Au, Ngai and Cheng (2008) is based on the assumption that IS end users have various needs, and fulfilling these needs leads to satisfaction. In the context of e-government IS, segmented services provided by e-government to fulfil users needs have been found have a direct influence on end users' satisfaction (Lee, Gim & Yoo, 2009).

Satisfaction as a result of discrepancy of expectations that leads to disconfirmation, as mentioned earlier, is extended by Chin and Lee (2000) to include end users' desire. They differentiate between end users' expectations and desire, so that overall satisfaction is a combination of expectation-based satisfaction and desire-based satisfaction. As a result, they propose a model of end users' satisfaction that depicts satisfaction as being formed by contrasting prior users' expectations and desire to post hoc perceptions formed as a result of using the system.

Utility theory has been adopted from economic theory to understand satisfaction formation with IS better (Sun, Fang & Hsieh, 2014). Their applied utility theory, in which end users' satisfaction is perceived as a utility, states that satisfaction can be formed as a result of benefits end users gain by consuming IS information and services.

End users' satisfaction is identified as an attitude in the literature (Doll & Torkzadeh, 1988). Based on this, Thong and Yap (1996) adopted the Theory of Reasoned Action (TRA) in order to understand attitudes and how these influence behaviour, in order to improve understanding of users' satisfaction that is rooted and underpinned by attitudes. The Theory of Reasoned Action (TRA) (Fishbien & Ajzen, 1975) is a conceptual framework compromised of four distinct and interrelated variables, which are beliefs, attitudes, intentions and behaviours, and depicts the relationship between them as following 'a causal chain of linking beliefs, formed on the basis of available information, to the person's attitudes, beliefs, and attitudes to intentions, and intentions to behaviour' (Fishbien & Ajzen, 1975). This framework was adopted to explain the behaviour of end users of IS and how this is influenced by users' intentions, attitudes and beliefs.

For a summary of the contribution of satisfaction formation and adopted theories within an IS context, see Table 2.7. These theories are covered in greater detail in chapter three.

Table 2.7: Theories Used to Explain End-User Satisfaction Formation with IS

End-User Satisfaction Formation Theories with IS			
Theory	**Adopted by**	**Origin of Theory**	**Adopted Perspective**
Expectation Disconfirmation Theory (EDT)	Bhattacherjee, (2001), Ryker, Nath & Henson (1997).	Oliver (1980).	Satisfaction of end users of IS is determined by initial expectations (prior user) & confirmation of these expectations (post hoc use) of the system.
Equity & Needs Theory	Au, Ngai & Cheng (2002, 2008).	Equity Theory (Adams, 1965). Needs Theory (Alderfer, 1969).	Equity theory: end users will evaluate their input to the benefits gained. Thus, satisfaction will be determined based on that as perceived equity on their input to the benefits gained. Needs theory: satisfaction will be formed as a result of meeting end users needs. By equity & needs theory in addition to expectancy disconfirmation theory, Au, Ngai & Cheng (2002; 2008) propose 'an equitable needs fulfilment model'.
Utility Theory	Sun, Fang & Hsieh (2014).	Bentham (1781).	'The utility approach views users' satisfaction as a utility gained by consuming IS' (Sun, Fang & Hsieh, 2014)
Theory of Reasoned Action (TRA)	Thong & Yap (1996).	Fishbien & Ajzen (1975).	Attitude is the underpinning and the root of users' satisfaction. Thus, understanding attitudes & how these influence behaviour will help to understand users' satisfaction (Thong & Yap, 1996).

Overall, this research contributes to understanding the success of a system, and how it is perceived by end users. It contributes to efforts to develop better systems in the future, acts as a guide for updating existing systems, and identifies improvement areas in order to encourage system use and acceptance by end users. This research also contributes to measuring end users' satisfaction with e-government IS as a surrogate of IS success and IS effectiveness. Research shows that end users' perceptions and evaluation of IS are an important measure for system success (Goodhue, 1992). Satisfaction is chosen as a measure, because it is very appropriate for successful use in the context of social media that is characterised by connectivity, exchanges and sharing. When choosing an effectiveness measure, there is no one measure that is so superior that it is preferred over all other measures: rather it is about selecting the most appropriate measure for the focus and purpose of the study being conducted (DeLone & McLean, 1992). Based on these considerations and the aim of this research, end users' satisfaction is considered to be the most appropriate measure for evaluating e-government IS utilising data captured from social media. This research

investigates the utilisation of social media to evaluate the dimension of users' satisfaction as a measurement for e-government effectiveness. The focus of this research is not to contribute to the development or improvement of existing IS success models, but rather to focus on contributing to the use of end users' satisfaction as a useful construct, and to contribute to improving current practices used in measuring end users' satisfaction.

The value of IS considered from an e-citizen perspective, as this is very important and fruitful perspective (Petter, DeLone & McLean, 2012). Social media is utilised to gauge users' perceptions and their evaluations of the system they have used. Then outcomes are compared with the one of the well known, robust and classical end users' satisfaction instruments, EUCS (Doll & Torkzadeh, 1988), to investigate whether such a measure is still valid for use, or if there are new variables that emerge inductively from social media data that need to be incorporated. The findings of both the EUCS instrument and social media are then compared and contrasted. Measuring satisfaction directly is shown to be preferable to indirect and objectives measures of systems (Conrath & Mignen, 1990).

End users' satisfaction is one of the success measures of IS (DeLone & McLean 1992, 2003) and it is the focus of this research. The following section reviews IS effectiveness and success models that include users' satisfaction as one of its dimensions. Reviewing IS success models should help to present a broader insight of IS effectiveness and its dimensions, and how end users' satisfaction is incorporated into these models.

2.5.6   Models of IS Effectiveness/Success

There are many models of IS effectiveness identified in the literature (DeLone & McLean, 1992; Seddon et al., 1998). There are also effectiveness models developed in the particular context of e-government. Therefore, as e-government systems are IS, success measures and evaluation of IS can generally be applied to measure and evaluate e-government IS.

Gupta and Jana (2003) propose a framework that incorporates both soft measures (related to qualitative benefits) and hard measures (related to quantitative benefits) of

e-government IS. Galletta and Lederer (1989) classify the success measures of IS to be either economic or personal. Economic measures relate to the financial expenditure or profits of implemented IS, and personal measures relate to satisfaction and usage measures.

One of the most well-known and cited information systems evaluation measures (Petter, DeLone & McLean, 2008) is the DeLone and McLean IS success model (DeLone & McLean 1992; 2003). This model classifies IS success measures into six interrelated and interdependent measures of IS success/effectiveness: system quality, information quality, service quality, use, user satisfaction and net benefit. DeLone and McLean IS success model and the relationship between its success factors was validated by Petter and McLean (2009). Furthermore, the DeLone and McLean IS success model is applied in the context of e-government to measure the effectiveness of government-to-citizen (G2C) systems (Wang & Liao, 2008).

Petter, DeLone and McLean (2013) reviewed the literature and investigated the factors influencing the independent variables of the DeLone and McLean IS success model (the six dimensions of IS success). Fifteen antecedents were identified that have influence on these factors in order to contribute to and to predict IS success. By focusing on the technical aspects of IS, Hussein, Abdul Karim and Selamat (2007) emphasise the importance of technical aspects of IS to IS success and identify five influential technological factors, including IS competency, IS facilities, IS integration, IS structure, and user support.

The DeLone and McLean IS success model (DeLone & McLean, 1992; 2003) proved its applicability in the context of e-commerce (DeLone & McLean, 2004) despite the differences between the context of e-commerce and the traditional context of IS in which organisations employ IS internally to support organisational operations and processes. The context of e-commerce includes using on-line services and complicated interconnectivity facilitated by employing technology, and this is associated with voluntary use of systems. Contrast that to the traditional IS context in which employees are the users of IS with mandatory IS use. Evaluating and measuring the system becomes more critical as customers can now be users outside the boundary of

the organisation who connect with the system remotely and voluntarily to access information and conduct transactions. Thus, there is a need to differentiate between IS end users as e-customers and as employees. Similar considerations can be applied to the context of e-government IS with its more challenging and complicated nature and environment.

Other efforts have focused on identifying effectiveness measures and models in the context of e-government. Horan and Abhichandani (2006) developed an e-government satisfaction (EGOVSA) model comprised of performance constructs (utility, efficiency, and customisation) and emotional factors (confidence, pleasantness, frustration and satisfaction) to evaluate citizens' satisfaction with e-government. They report that performance constructs are important factors that have considerable influence on emotional satisfaction. Maheshwari et al. (2007) developed a framework for e-government portal effectiveness that focuses on a management point of view to evaluate e-government portals and assist in the design and development process for effective e-government portals. Another model is E-GovQual developed by Papadomichelaki and Mentzas (2012), which focuses on measuring end users' perceptions of quality of services provided by e-government. The model is comprised of efficiency, trust, reliability and citizen support to contribute to improving services provided by e-government.

Alawneh, Al-refai and Batiha (2013) employed the construct of e-satisfaction to measure end users' satisfaction with e-government services, which use five factors derived from the literature identified as strongly influential factors when using e-government services: security and privacy, trust, accessibility, quality of public services, and awareness of public services. One of their findings is that awareness of products and services provided by e-government is one of the factors that strongly influences e-satisfaction. This supports the utility of using social media to contribute to end users' satisfaction by increasing awareness of provided e-government services and information. Social media can play an important role in this regard with its power of social interaction and ability to increase levels of awareness. Carter (2008) argues that perceived usefulness is one of the most influential factors related to the use of e-

government services, and suggests applying this as a predictor for e-government use. Therefore, communicating benefits and services facilitated by using e-government through social media can make an important contribution to successful e-government adoption.

Other e-government evaluation models were developed based on a user-centric approach. Zhang et al. (2009) developed an evaluation model that incorporate measures called perceived fit, perceived ease of use and usefulness. Another user-centric model was developed by Verdegem and Verleye (2009), which is a comprehensive model for evaluating e-government satisfaction that focuses on the needs and expectations of end users.

There are several models that aim to measure IS success by incorporating measures of end users' perceptions. Therefore, end users' perceptions of IS as conceptualised as end users' satisfaction of IS forms a key element that has the potential to provide robust and useful measurements of the success of IS programs. It is proposed that end users' satisfaction could serve as a surrogate for general IS success. The focus of this research is on measuring and utilising end users' satisfaction with IS as a surrogate for IS success, but this is only one element of such a measurement.

The link between end users' satisfaction and general IS success is supported by previous studies. End users' satisfaction of IS that is based on individual perceptions has been regarded as a substitutive measure indicating the degree of success of IS (Leclercq, 2007). The focus here is on users' experiences when using the system, how end users of IS perceive their interactions with the system, and the actual information and services provided by the system (Ramezan, 2009). Although useful, end users' satisfaction might not capture all the elements needed to obtain an accurate measurement of IS effectiveness. Melone (1990) found that end users satisfaction alone is not sufficient to capture a full measure of effectiveness, and that it needs to be combined with other measures to obtain a more holistic view of a system's effectiveness.

2.5.7 What is Different about e-Government?

The above considerations apply to both private and public sector organisations. The focus for this study is e-government IS and the public sector. Applying changes in public sector organisations, as opposed to private sector organisations, can be more difficult and pose additional challenges to the processes of IS evaluation. However, it is also true that the public sector has a greater potential for improvement in terms of organisational performance (Robertson & Seneviratne, 1995). The influence of other organisations is especially evident in the case of e-government: in order to work effectively, government agencies and departments must work together to some extent. Yet those same agencies and departments compete with each other for government funding and influence. These political considerations impose considerable challenges to successfully implementing e-government IS (Bellamy & Taylor, 1996; Bacon, 1999). However, the benefits of meeting these challenges and successfully achieving IS integration and interdependency across agencies and departments include facilitating inter-organisational work flow in a more efficient and effective manner and increased transparency: these are important goals.

It is worth emphasising the considerable differences between the challenges faced by public and private sector implementation of IS. In particular, public sector organisations are compromised of various diverse processes within a legal and political context. The fluctuating nature of these legal and political contexts necessitates regular review and implementation of adjustments and changes in order to stay in compliance (Peters, Janssen & Engers, 2004). This tends to make the IS development and evaluation process more challenging than in the private sector (Newcomer & Caudle, 1991). Along these lines, Robertson and Seneviratne (1995) differentiate between the nature of public and private sector organisations and how those differences influence the assessment of organisational effectiveness and the need and ability to adapt to change. They compared and evaluated public and private sectors in terms of seven organisational variables: organising arrangements, social factors, technology, physical setting, individual behaviour, individual development and organisational performance. Alshawaf and Khalil (2008) studied the differences

between how public and private sector organisations perceive IS success factors and the impact of IS on the organisation. These results and their vital importance to e-government IS are summarised by Gupta and Jana (2003), who state that 'People and policies play the primary role in making e-government a success. Technology plays a supportive, but important, role. However, it cannot work in isolation. ... what comes to the fore is not how to quantify the contributions of e-government, but to consider how useful the information and services are in the context of its use'.

Janssen, Rotthier and Snijkers (2004) analysed 18 international e-government evaluation studies on e-government policy and found that different indicators are used depending on the aim of the evaluation process. They categorised these indicators as input, output, usage, impact and readiness. Each one of these measures is comprised of various indicators. Measuring satisfaction is one of these impact indicators.

Heeks (2006b) suggests that e-government IS 'consists of technology plus information plus people who give the system purpose and meaning plus work processes that are undertaken'. Therefore, these systems are multidimensional and need to be evaluated in more than one way. One of these is the evaluation of e-government investment in order to determine its success and influence on public sector organisations' strategies, and to help decision makers make better decisions (Janssen, Rotthier & Snijkers, 2004).

There are various reliable and valid measures of end users satisfaction in IS literature, as discussed earlier. Researchers have borrowed and employed satisfaction measures from consumer literature and validated these for use within an IS context (Bhattacherjee, 2001; Bhattacherjee & Premkumar, 2004). Identified user satisfaction instruments in the literature include questionnaires that compromise items that cover areas that affect the levels of users' satisfaction of IS in order to investigate users' perceptions and evaluation. These satisfaction instruments have been continuously improved by adding and deleting items either to increase the reliability and validity of the instrument, or to keep in step with the continuous advancement in technology and IS, which influences and expands the role of the end users of IS. The role of end users of IS has continuously evolved as a result of evolving technologies and IS (Pather, Erwin & Remenyi, 2003). The role of end users of IS has also changed from indirect users to

direct users of IS within and outside the context of an organisation. End users of IS are moving beyond the organisational environment to include providing information and services to those outside the organisational boundaries (e-customers). E-customers are end users of IS and access information and services provided by either public or private organisations through cyberspace. However, there is debate about using the term of 'e-customer' in the context of e-government IS, and criticised by Schachter (1995) as an inappropriate metaphor that has applied in the context of government services. He argued that citizens are not customers, as 'customer' implies the consumption nature of products and services, while citizen play a more important role by participating with their input to elect governmental representatives and participate in forming agendas. This debate is beyond the focus of this research, but the term 'e-citizen' is chosen and used in this research to represent citizens using e-government IS over cyberspace to access governmental information and conduct online services.

The role of end users of IS has evolved as a result of the evolution and advancement of technology, as systems that can be accessed and used by end users from anywhere and anytime are becoming ubiquitous. This evolving environment needs to be managed by a robust end user computing (EUC) strategy that extracts value from organisational investment in technologies and fulfils end users' needs and expectations. Moore, Jackson and Wilkes (2007) report that having an end user computing (EUC) strategy positively influences end users' satisfaction and behaviour. The value and benefits gained by investment in technology would not have been achieved without the combined contributions of information management and effective strategy (Merchand, Kettinger & Rollins, 2000).

Advancement in technologies and IS, including Information Communication Technology (ICT) and Web 2.0, facilitate many of the promising features and benefits that were not available before social media was characterised by reach and user-generated content in real-time. Evolving technology has resulted in evolving and expanding the role of end users of IS, which has impacted methods of measuring users' satisfaction in the literature. There are many end users' satisfaction instruments developed for an IS context, but the seminal work on end users' satisfaction

instruments that have been identified in the literature as valid and reliable measurements and currently used are developed based on literature reviews of previous studies, interviews with professionals and managers (Bailey & Pearson, 1983), employee surveys with managers (Ives, Olson & Baroudi, 1983), and surveys of end users (Doll & Torkzadeh, 1988). All these development efforts employ data collection methods to develop satisfaction instruments focused on a targeted sample. End users of IS are generally considered to be placed inside the organisation boundaries, familiar with the organisation context, use IS to perform organisational tasks and contribute to organisational effectiveness. Therefore, this research contributes to measuring end users' satisfaction with e-government IS, takes into consideration citizens as IS stakeholders, end users of IS who are placed outside the organisation context and connect to IS through cyberspace in order to access governmental information and conduct governmental services (transactions). This kind of communication and interaction between citizens and e-government IS to serve citizens' needs is different than that used by e-government IS to support organisation processes and operations to serve employees' needs. However, this research also contributes to utilising social media to collect data and capture citizens' perceptions of IS as end users, instead of using targeted samples and employing traditional data collection methods. The continuous evolution in technology has consciously resulted in changes in the way communication and interaction takes place. Web 2.0 is a technological platform that social media builds upon to empower end users to be active participants in creating content and participating with their input in cyberspace, rather than being consumers of governmental information. It has also empowered researchers with the ability to capture end users' perceptions of satisfaction with IS by methods other than the utilisation of questionnaires and surveys. Social media generates huge and massive volumes of generated and exchanged information that can be utilised, captured, analysed and employed to evaluate the effectiveness of IS in terms of end users' satisfaction. Social media is an example of how advancement in technology can influence ways of measuring users' satisfaction by exploiting generated and exchanged data, which eliminates bias inherent in representative samples.

IS has continually evolved and expanded from the early adoption of IS by Data Processing Systems (DPS) in the 1950s and 1960s to the current customer-focused era in which customers are the most important users (Petter, DeLone & McLean, 2012). The customer-focused perspective has been adapted by both private and public sector organisations, but to serve different objectives in each case. In the private sector, the aim is to create customised products and services in order to increase sales and profits, but in the public sector, segmented services are utilised to fulfil individual needs better (Venkatesh, Chan & Thong, 2012). The customer-focused era discussed by Petter, DeLone and McLean, (2012) has influenced the way end users' satisfaction is measured, because the role of end users has evolved and expanded to include those placed outside the organisation boundaries who utilise organisational information and services, and are empowered by voluntary use of the system. This has implications and consequences in the way that new variables might emerge that could influence measurement of IS effectiveness, and the need to incorporate these external IS success measures by considering the evolved and new role of IS end users as a customer in which value is created for both the organisation and its users over cyberspace (Petter, DeLone & McLean, 2012). Currently global systems support end users to perform tasks in a work setting, but also serve the convenience of individuals.

IS have evolved from workplace tools used by a few employees to systems that have become embedded in our everyday lives. Evaluating IS success originally focused on speed and accuracy, which is a quantitative and objective evaluation, to a more qualitative and subjective approach that considers strategic and social impacts of the system (Petter, DeLone & McLean, 2012).

Having a valid and reliable measure is crucial in order to evaluate IS, and to assist management to make decisions, allocate resources and identify areas for improvement. The evaluation process of IS contributes positively to influence IS adoption and development (Mathieson, 1993). With continuing increased investment in e-government IS, there is a need for a measure to gauge how end users perceive their system. It is very important to eliminate bias in the evaluation process (Mathieson, 1993) by considering the points of view of those affected by the system

who use it, rather than focusing on a particular group of end users. By utilising social media data, many end users' points of view are considered in a wider range than would be sampled if utilising questionnaires that typically target a specific group of end users. In the context of e-government IS, the targeted end users of this research are citizens that comprise all of society.

2.6 Summary

Following the review of the literature on measuring the effectiveness of IS and measuring end users' satisfaction with IS as a surrogate to system success, this chapter shifts the focus to research design and methodological methods employed in e-government research to investigate end users' satisfaction with IS. Based on a review of research design and methodology employed by e-government researchers focusing on users' satisfaction that covered a period between 2000 and 2012, Irani et al. (2012) found that most studies employed a quantitative approach with survey data collection and statistical analysis, but relatively few studies employed a qualitative approach. Therefore, this study contributes to research methodology by using a quasi-experimental research design in the form of a behavioural experiment that investigates end users' perceptions and evaluation of a system by utilising and analysing social media data. The findings are compared with the quantitative analysis employed by the End-User Computing Satisfaction (EUCS) instrument (Doll & Torkzadeh, 1988) that has been identified as a valid and reliable measure in the literature.

Chapter 3: Theoretical Framework

This chapter begins with a review of theories adopted for understanding end users' satisfaction formation in the context of information systems (IS). The theoretical framework for this research is then proposed as Social Exchange Theory (SET). Finally, applications of the theory are discussed within and beyond the context of information systems (IS).

Theories are employed for different purposes in research, such as to help to understand, explain or predict the issues under investigation, and could be used as a guide for research design, data collection and analysis (Walsham, 2006; Gregor, 2006). Bryman and Bell (2011) argue that 'the most common meaning of the term 'theory' is as an explanation of observed regularities'. Theories are a conceptualisation of real world phenomena, including social behaviour and other interactions that are subjective in nature and complex in their essence. Theories emerge and are developed as explanations capable of making measurable predictions, which give rise to the possibility of testing them and verifying their validity, or lack of validity over time (Creswell, 2009). Therefore, identifying and applying a theory is an essential step in an attempt to explain and make sense of collected raw data and to use this to enhance understanding of the issues under investigation. Theories provide insight and empowerment that contribute to knowledge by exploring and explaining social and natural phenomena. This research uses Social Exchange Theory (SET) as a lens for interpreting the data in terms of the theoretical constructs and to organise the analysis of data, so that SET works as a lens to help to interpret collected data and explain this in a meaningful way.

The following sections identify and introduce theories that have been adopted to make sense of IS satisfaction formation processes in the literature, and how they have been used to help to explain IS end users' satisfaction formation.

3.1 Theories Employed to Understand IS End Users' Satisfaction Formation

The following theories have been employed to understand satisfaction formation with IS. These theories were identified while reviewing the literature on IS effectiveness in terms of users' satisfaction as a surrogate for IS success (see Table 2.7). Assumptions, concepts/constructs and roots for each of these theories are reviewed.

3.1.1 Expectation Disconfirmation Theory (EDT) (Oliver, 1980)

Expectation Disconfirmation Theory (EDT) explains the process of satisfaction formation, and posits that satisfaction is 'a function of expectation and expectancy disconfirmation' (Oliver, 1980). In other words, satisfaction is formed as a result of a comparative process between prior-use expectation and post-use evaluation. If the outcomes of the comparative process meet the prior-use expectation, then expectation is confirmed and satisfaction is formed. Disconfirmation as a result of the comparative process can be zero, positive or negative. Post-use evaluation that meets prior-use expectation results in zero disconfirmation with satisfaction formed. Post-use evaluation that exceeds prior-use expectation result is positive disconfirmation, in which satisfaction is formed with performance exceeding initial expectations. Lastly, post-use evaluation that falls below prior-use expectations results in negative disconfirmation, with dissatisfaction formed. The resulting satisfaction/dissatisfaction then has an influence on users' intentions and attitudes in the future.

EDT constructs include expectations, disconfirmation, satisfaction, behaviour, attitudes and future intentions (Oliver, 1980). The discrepancy between the prior-use expectation and post-use evaluation is captured by the construct of disconfirmation. Disconfirmation and expectation together result in forming subjective perceptions of disconfirmation in which satisfaction or dissatisfaction is formed. The resulting satisfaction has an effect on attitudes, behaviour and future intentions. The predictive capacity of EDT may be employed to understand and predict satisfaction in many contexts in an effort to influence future intentions and behaviour. This approach is commonly used to understand consumers' satisfaction (Oliver, 1993; Oliver & Swan, 1989; Oliver & DeSarbo, 1988) and consumers' behaviour (Santos & Boote, 2003). It is also applied in other contexts, such as understanding satisfaction in a negotiation

process (Oliver, Balakrishnan & Barry, 1994) and in tourism satisfaction (Pizam & Milman, 1993).

EDT contributes to enhancing understanding of IS end users' satisfaction formation, and the problem of 'acceptance-discountenance anomaly' in which end users stop using the system after they had initially accepted it (Bhattacherjee, 2001). Forming a positive perception towards use of IS is a critical factor that influences IS success in terms of IS satisfaction, acceptance and continued use of the system. EDT is utilised to contribute to understanding IS end users' behaviour, and factors that influence and change users' perceptions towards using the system (Venkatesh & Goyal, 2010; Bahattacherjee & Premkumar, 2004). EDT also helps understanding of IS end users' satisfaction and the factors that influence continued use of IS (Bhattacherjee, 2001; Ryker, Nath & Henson, 1997; Venkatesh & Goyal, 2010).

Expectation disconfirmation theory is criticised by Au, Ngai and Cheng (2002; 2008), who argue that end users' expectations do not necessarily lead to end users' satisfaction in the context of IS, as there are other factors that need to be considered, such as equity, where users perceive that the 'benefit' gained from using the system is worth the 'effort' of using the system. Another criticism is that initial expectations (prior use) of end users of IS might not exist, because no initial expectations are formed or users have insufficient information to form an expectation of how the system could be supportive (Au, Ngai & Cheng, 2008). Venkatesh and Goyal (2010) criticise the way EDT is applied to IS research for two reasons. First, the construct of 'confirmation/disconfirmation' is measured directly instead of measuring its antecedent constructs (expectation and perceived performance) separately, and direct measures distort the effects of individual component measures, which can comingle to affect each other in various outcomes, and merge two distinguished constructs into one single measure. Also, direct measures imply that users form subjective perceptions of confirmation/disconfirmation by mentally comparing initial expectations to post-use evaluation, so that the direct measure becomes affected by users' abilities to recall previous initial expectations that were formed before actual use, and the accuracy of this recall could be unreliable (Irving & Meyer, 1995; Ross, 1989). In addition, EDT

inherits the limitations of linear models that may fail to explain the complexity inherent in understanding technology adoption, where satisfaction is depicted as a result of subjective perceptions of discrepancy between prior expectations and results in disconfirmation that influences future intentions.

EDT posits that satisfaction is formed as a result of discrepancy between initial expectations and post-use evaluation (Oliver, 1980), but other researchers suggest that satisfaction can be formed as a direct effect of evaluating actual use, regardless of expectation (Churchill & Surprenant, 1982). Also, EDT ignores the continuing changes in users' expectations, which consequently impact subsequent satisfaction and attitudes, and expectations may be conceptualised differently by different researchers (Bhattacherjee, 2001).

3.1.2   Equity and Needs Theory

Au, Ngai and Cheng (2008) contribute to enhancing understanding of the processes of IS end users' satisfaction formation by theoretically combining and integrating three theories into 'An Equitable Needs Fulfilment Model'. Theories of expectancy, equity, and needs are integrated in an effort to overcome the criticisms of each taken individually, and to contribute to enhance understanding of the influence of expectation, equity and various needs for IS end users' satisfaction (Au, Ngai & Cheng, 2008). The theory of expectancy has previously been discussed, and the other two theories are discussed as below:

3.1.2.1   Equity Theory (Adams, 1965)

Equity theory posits that satisfaction can be anticipated as a perception of equity: an individual's satisfaction is formed by evaluating his/her 'input' to the gained 'output' in exchange relations. The perception of 'justice' or 'fairness' can contribute to satisfaction formation and influence an individual's attitude and behaviour (Pritchard, 1969). Perceptions of inequity generate a feeling of tension proportional to the inequity perceived, and that influences attitudes and behaviour, such that the individual will be motivated to reach equity and eliminate inequity (Adams, 1963).

Equity theory focuses on the exchange process itself and seeks to understand the consequences of inequity in social exchanges (Adams, 1965). Perception of inequity has implications for work productivity and quality. Individuals continuously adapt their attitudes and behaviours to achieve equity by comparing and adjusting their 'input' to the 'output' in exchange relations (Adams, 1963). Input and output of exchange processes are interrelated and influenced by perception of inequity, in which individuals are motivated to achieve equal input-output ratios and change their attitudes and behaviours accordingly (Adams, 1963).

Equity theory is a useful construct with myriad applications; for example, it has been adopted to understand consumers' satisfaction (Oliver & Swan, 1989; Oliver & DeSarbo, 1988); however, in relation to this current research, equity theory has been adopted in IS research as a framework to understand and predict IS end users' attitudes and behaviour. Joshi (1989) identifies three dimensions of equity in an IS context, which are procedural fairness, distributive fairness and reciprocal fairness. In the context of IS, equity is shown to be a strong influential factor of IS satisfaction (Joshi, 1992). One criticism of equity theory in this regard is that 'input' and 'output' of IS are not completely and clearly identified (Au, Ngai & Cheng, 2008).

3.1.2.2 Needs Theory (Alderfer, 1969)

Needs theory (Alderfer, 1969) posits that there are three core needs that individual's strive to fulfil: existence needs, relatedness needs and growth needs (E.R.G.). Existence needs include tangible and physical needs. Relatedness needs include social aspects involving sharing with relating with others. Growth needs include needs that contribute to growth and development.

E.R.G. theory focuses mainly on understanding the relation between needs satisfaction and the intensity of needs desire (Alderfer, 1969). Individuals are motivated to satisfy each of these needs, and the less each need is satisfied the more it is desired, with the exception of growth needs, in which the less needs for growth are satisfied the less they are desired (Alderfer, 1969). E.R.G. theory is comprised of the two constructs of needs satisfaction and desire, each of which can be measured in various ways.

The concept of needs fulfilment is adopted in many contexts including consumers' satisfaction, as it found to have an influence on satisfaction (Oliver, 1995). In the context of IS, adopting the concept of needs fulfilment is criticised, as it focuses on specific and extrinsic needs, such as IS work related needs, but ignores the fact that IS end users have intrinsic needs that need to considered and fulfilled (Au, Ngai & Cheng, 2008). As a result, Au, Ngai and Cheng (2008) adopted E.R.G. theory on the assumption that the three core needs identified by E.R.G. theory take into account the needs of IS end users.

Need fulfilment alone does not result in IS end-user satisfaction, as there are other factors and influences that should be considered, such as the effort and input required by users to fulfil these needs (Au, Ngai & Cheng, 2008).

3.1.3   Utility Theory (Bentham, 1781)

Based on the principle of utility, individual behaviour may be seen as being governed by perceptions of pain and pleasure, as posited by Bentham (1781): 'mankind is under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do'. In other words, the principle of utility governs individual behaviour by distinguishing between right actions that promote happiness and pleasure and wrong actions that diminish happiness and result in pain.

Utility theory is widely used in economics and has influenced policies and legislation by setting the goal creating collective pleasure and/or happiness. However, the definition of utility theory has changed over time (Kahneman, Wakker & Sarin, 1997).

Utility is an attribute of objects for which the expected outcome includes benefit, advantage, pleasure and happiness, as identified by Bentham (1781). In the context of IS, utility theory is adopted to perceived IS outcomes, in particular the resulting satisfaction and happiness of using IS, which is a utility that IS end users gain by using the systems (Sun, Fang & Hsieh, 2014). Utility theory also contributes to improved understanding of IS end users' satisfaction formation by depicting satisfaction formation as a consumption process influenced by the law of diminishing marginal

utility, which states that the more something is consumed, the less marginal utility (benefits/happiness) will be gained with additional units of consumption.

3.1.4 Theory of Reasoned Action (TRA) (Fishbien & Ajzen, 1975)

The Theory of Reasoned Action (TRA) (Fishbien & Ajzen, 1975) is a conceptual framework comprised of four constructs related through a causal chain, and are beliefs, attitudes, intentions and behaviours. TRA depicts the relationship between them as following 'a causal chain linking beliefs, formed on the basis of available information, to the person's attitudes, beliefs, and attitudes to intentions, and intentions to behaviour' (Fishbien & Ajzen, 1975). The predictive ability of TRA has been adopted to understand and predict individual behaviour in different contexts (Sheppard, Hartwick & Warshaw, 1988), including consumer behaviour (Ryan & Bonfield, 1980).

The importance of the construct of attitude is its influence on individual behaviour and its contribution to explain and predict an individual's behaviour (Fishbien & Ajzen, 1975). In the context of IS, TRA is adopted to understand IS end users' satisfaction in an effort to predict IS end users' intentions and behaviour to use the system (Thong & Yap, 1996). The construct of IS end users' satisfaction is identified as an attitude in the literature (Doll & Torkzadeh, 1988). Also, TRA is used to understand and predict technology and IS adoption and acceptance using the Technology Acceptance Model (TAM), which is based on the principles of TRA (Davis, 1993).

3.2 Theoretical Framework: Social Exchange Theory (SET)

There are a number of theories that have been adopted to explain IS end users' satisfaction formation, as previously discussed. This research contributes to exploiting and using social media as a new and powerful technology in the context of e-government, in particular, in a way that influences the evaluation process of e-government IS in terms of evaluating IS end users' satisfaction. This research also contributes to measuring and understanding IS end users' satisfaction. Social media allows and enables social interactions and exchange in cyberspace, in contrast to the physical interactions and exchanges present in 'real' social life, i.e., in real space rather

than cyberspace. Blau (1986) conceptualises social relationships and interactions between colleagues as a social exchange in case studies conducted for his PhD thesis, and motivates this current research to apply and adopt social exchange in the realm of cyberspace in the form of the digitalised interactions and exchanges of social life in the information age, in which physical and cultural boundaries that previously constrained social relationships and interactions have been at least partly eliminated. In this research, social media interaction is conceptualised as an instance of social exchange in which there are actors involved in an exchange process with resources (information) to be exchanged. The social exchange approach views the social behaviour and interaction between public sector organisations and users of social media as an exchange.

Social Exchange Theory (SET) is adopted to understand the interactions and exchanges between public sector organisations and end users of e-government through social media. This research proposes that successful exchange can be used as a basis for e-government end users' satisfaction, in which the exchange process is in the form of end users expressing their perceptions of e-government IS, and public sector organisations reciprocating by addressing and considering these issues to improve provided information and services, which results in meeting end users' needs and satisfaction as 'exchange theory analyses the reciprocal incentives that sustain social relations' (Blau, 1986). Such interaction through social media is utilised, captured and analysed to evaluate e-government IS in terms of end users' satisfaction and perceptions, which in turn are used as indicators to measure IS effectiveness (success).

Social Exchange Theory (SET) is a frame of reference of which there are various views. Homans (1974) and Thaibaut and Kelley (1959) view SET from a psychological perspective of social behaviour, while Blau (1986) views it from a social perspective of exchange. In spite of their differences, these views do share a common set of concepts and assumptions including actors, exchange resources, exchange structures and processes (Molm, 2003; Hall, 2003).

Social Exchange Theory (SET) was developed in the 1920s (Cropanzano & Mitchell, 2005). Two important researchers in the field are Blau (1986) and Homans (1958).

Blau's (1986) observations of social relationships between colleagues, made when he was conducting a case study for his PhD thesis, led him to conceptualise such an interaction as a social exchange. Homans (1958), influenced by Blau's conceptualisation, published his first paper about exchange theory in 1958. Blau then wrote more on the topic of exchange theory, in part to respond to Homan, who attempted to derive a basis for exchange theory based on the idea that psychological principles drive individual motives. Blau had a different focus: that of the social nature of exchange. He analysed reciprocal processes composing exchange instead of trying to explain exchange in terms of individual motivation.

Blau (1986) states that social exchange involves unspecified obligation, and that while social exchange may start out from a motive of self-interest, this eventually builds trust in social relations as they recur over and over again. He posits that social exchange tends to cause feelings of personal obligation, gratitude and trust, which qualities are not necessarily present in purely economic exchange.

The basic concept of social exchange theory is that social exchange is compromised of a series of interactions that produce or initiate a sense of commitment or responsibility that develops over time (Molm, 2003). This sense of commitment eventually leads to trust, loyalty and mutual commitment (Cropanzano & Mitchell, 2005). Homans defines exchange theory as 'an exchange of activity, tangible or intangible, and more or less rewarding or costly, between at least two persons' (1961 in Blau, 1986). Within these exchanges there are rules and norms to be abided by Cropanzano and Mitchell (2005).

Looking at the social exchange elements identified by Meeker (1971), there are 'actors' - either persons or entities - between which the exchange process will take place. The 'act of exchange' is performed by the actors and the 'value of the act' either as a reward received or as a cost paid, will be experienced by the actor.

Exchange relations develop when beneficial acts create reciprocal benefits. The fact that the same action can complete one exchange while simultaneously initiating another can make it difficult to identify discrete transactions in a reciprocal exchange. A better way of viewing an exchange relation is as a series of sequentially contingent

acts (Molm, Peterson & Takahashi, 1999). Equity and benefits associated with reciprocal exchange develop over time (Molm, Peterson & Takahashi, 1999). Actors involved in reciprocal exchange need to be aware of the long-term nature of this relationship, as it develops and proves itself over time.

Exchange processes develop a structure of dependency either as a relation between two actors or relations involving networks of people. The structure of exchange can influence the relations that emerge from exchange processes, such as power, trust and commitment (Molm, 2003).

SET is underpinned by conceptions or concepts from which its explanatory power is derived (Cropanzano & Mitchell, 2005). These conceptions are rules and norms of exchange, resources exchanged and relationships that emerge (Cropanzano & Mitchell, 2005).

Rules and norms of exchange guide and influence the exchange process. Researchers have distinguished between different types of reciprocity and forms of social exchange. Gouldner (1960) identifies three types of reciprocity: reciprocity as a pattern of mutually contingent exchange, reciprocity as a folk belief and reciprocity as a moral norm. He also discusses the function of norms of reciprocity as 'stabilising' and 'starting' mechanisms in social interactions. Molm (2003) compares two forms of social exchange, negotiated and reciprocal. Reciprocal exchanges are differentiated from negotiated exchanges in that one actor initiates the exchange by providing some benefit to the other without knowing when, or if, the other actor will reciprocate a similar benefit, or any benefit at all. By contrast, in negotiated exchange both actors are involved in a joint decision to seek an exchange where the benefit to each is understood and agreeable (Molm, 2003). Reciprocal and negotiated exchange each deal with risks to the actors in their own ways. In reciprocal exchange, actors have the chance to prove their trustworthiness, thus enabling trust over time. In negotiated exchange actors receive assurance through binding agreements agreed to by both parties (Molm, Takahashi & Peterson, 2000). However, these considerations are fairly general, as actors in social exchange can be either individuals or groups. While both reciprocal and negotiated exchange may be observed in the social context, negotiated

exchange has become more dominant in social exchange research (Molm, Takahashi & Peterson, 2000; Molm, 2003).

The idea that trust is developed without explicit negotiation or binding agreements is posited by Molm, Takahashi and Peterson (2000), who argue that reciprocal exchange creates stronger trust than negotiated exchange. Another contribution of their work considers the factor of uncertainty and risk in social exchange.

Meeker (1971) identifies six exchange rules that can function as exchange norms in an effort to predict the decisions that will be taken by participants in the exchange process. These rules are rationality, reciprocity, altruism, status consistency, completion and group gain. They can contribute to predict outcome decisions of exchange in which the decisions will be consistent with the adopted exchange rules.

Strategies to alleviate the risks inherent in reciprocal and negotiated exchanges are discussed in Molm, Peterson and Takahashi (1999). To focus on reciprocal exchange, the risk of reciprocal exchange is that the actor initiating the exchange may receive no benefit from the other actor. One strategy to increase the chance of receiving a benefit is to participate in more exchanges. One cost of this approach is the actor will have to forego further exchanges with partners who do not respond. Applying this in the context of social media, this allows for risk reduction in reciprocal transactions, even the elimination of risk, through its very nature. This is due to the fact that the actor initiating the exchange will be engaging all the other actors at one time. Some of these actors will respond, and the received reciprocal benefits of these actors may exceed the zero returns of others who do not respond. Thus neither increasing frequency of interaction nor foregoing some actors in favour of others in future interactions will be necessary. In addition, it may be that not forgoing future offers of exchange with those who have not reciprocated thus far will make it possible for those actors to have the opportunity to reciprocate to other offers of exchange in the future. Exchanging and interacting simultaneously with others can reduce the costs associated with social exchange by providing social rewards and benefits simultaneously (Blau, 1986).

Resources of exchange have been identified and classified using resource theory (Foa & Foa, 1974), and six exchange resources are identified: love, status, information, money, goods and services. These exchange resources are classified into 'particularism' versus 'universalism' in which resource value varies based on its source, and 'concreteness' versus 'symbolism' in which the resource benefits can be either tangible or symbolic. Looking at these exchanges resources from an organisational science perspective, they can be interpreted as economic and socio-emotional resources that vary based on the exchange rules employed (Cropanzano & Mitchell, 2005). Economic outcomes relate to financial benefits while socio-emotional outcomes relate to social and emotional needs.

Emerson (1972a, 1972b) approaches social exchange theory as a power-dependence theory that proposes the dependency between actors in the exchange process is what determines the structural power of an actor in the exchange process. In this schema, the value or benefit that one of the actors can provide to the other with less available alternatives will give advantage and power over others. Distribution of power in exchange relations in traditional exchange theories (Emerson, 1972a; 1972b) is changed when using e-government IS and social media. Traditionally, public sector organisations in exchange relations hold an advantage over others in exchange relations, as they hold the value and benefit and can control how it is provided to others, while other actors have a high degree of dependence on public sector organisations, with less available alternatives. E-government end users are empowered by voluntary use of the system, and can choose whether to engage or not with public organisations through e-government. Social media also empowers IS end user by giving them the opportunity of being an active participant generating content and information instead of consuming information available on cyberspace by public organisations. Such empowerment of IS end users has implications for exchange relations.

An important facet of social exchange is that the relationship resulting from exchange has value in itself. This gives a rationale for one party to provide benefit to the other without receiving immediate material benefit in return: immediate quid pro quo is not

necessary. While it is true that there is an asymmetry in immediate material benefit to the two parties, this is made up for in the value of the relationship of trust thus forged (Deckop, Mangel & Cirka, 1999).

Another factor related to the efficacy of social exchange is the ideology each party has regarding the benefits and risks of reciprocity or exchange ideology (Sinclair & Tetrick, 1995; Andrews, Witt & Kacmar, 2003; Witt & Broach, 1993). Exchange ideology refers to the circumstance when individuals hold various levels of belief with regard to reciprocation when they participate in social exchange (Andrews, Witt & Kacmar, 2003). Each individual's exchange ideology will affect the individual level of engagement in a reciprocal exchange, as it will colour perceptions of possible costs and benefits. There are settings that are exceptions, and Sinclair and Tetrick (1995) studied exchanges that took place in a labour union setting, where it was found that exchange ideology did not play any moderating role in the relationship between the union and its members. This was attributed to the different context and nature of the relationship between the union and other organisations in which the relationship between the union and its members involves a required payment by members in order to be a part of this relationship.

The focus of this research is limited to reciprocal exchange. Negotiated exchange is beyond the scope of this research, as excluding negotiation is what distinguishes social and economic exchange (Blau, 1964), and this research is more concerned with social exchange. In particular, this research considers e-government IS and social media within the framework of reciprocal social exchange theory. Public sector organisations as entities in the exchange process initiate and maintain exchanges with the public on social media in the form of e-government information and services. Therefore, two outcomes are proposed for the exchange process: first, that it is generally the case that governments use social media without accurate knowledge of the costs and benefits they are getting (Kavanaugh et al., 2012). Building and maintaining successful social exchange between public sector organisations and e-government end users will contribute to the benefits of users' satisfaction and trust. Second, the exchange

process is utilised to evaluate e-government IS in terms of how this is perceived by end users to evaluate satisfaction as a surrogate for e-government IS effectiveness.

In summary, social exchange theory provides a useful framework in which to examine the potential of social media as an enabler and platform for exchange in the information age, and how social media might be exploited to measure the effectiveness of e-government in terms of IS end users' satisfaction. The ways in which social media might be used as a tool to facilitate social exchange between public organisations and citizens in order to strengthen the quality of information exchanged and the degree of trust between them, and to measure the effectiveness of e-government, is explored and evaluated. Consideration is also given to how social media might play a formative role in policy planning and implementation by informing government of the levels of citizens' satisfaction and citizens' needs, and helps government to increase citizens' perceptions of government levels of support and commitment.

Social Exchange Theory (SET) (Blau, 1986) is employed to analyse social media data captured on social media between public sector organisations and e-government end users. In particular, the exchange process is examined between the public sector organisation that is providing e-government information and services and people who are the end users of e-government IS. Consistent with SET, the exchange process is a relationship that does exist and there is a sense to reciprocate with a favourable action initiated by another person or entity. This has implications for public sector organisations to utilise social media as an exchange channel in order to build a sense of commitment and satisfaction between the organisation and its end users through initiating and maintaining favourable actions using social media.

Focusing on such social exchange relationships can build a strong belief and trust in public services and e-government IS, and should initiate a sense of responsibility and commitment and eventually contribute to trust and satisfaction. Consistent with SET and as posited by Blau (1986), 'Only social exchange tends to engender feelings of personal obligation, gratitude and trust; purely economic exchange as such does not'.

Exchange behaviour is identified by Blau (1986) as 'voluntary actions of individuals that are motivated by the returns they are expected to bring'. Thus, SET is used to evaluate satisfaction not by asking end users to complete questionnaires, but to examine their involvement in exchange processes to discover if they are motivated by returns they are expecting in the form of an improvement in fulfilling their needs. This is measured by evaluating systems involved in the exchange process with public sector organisations.

Viewing the end users' satisfaction evaluation process of e-government IS as a case of social exchange theory (SET), end users can influence the process of IS development and evaluation through a productive social exchange with the public sector organisation through the use of social media. Constructive social exchange can be utilised to measure end users' satisfaction with IS. Public sector responsiveness can influence end users' perceptions of the public sector by improving the system to meet users' needs, and by contributing to public sector accountability and trust. The end users' perceptions of public sector responsiveness can be an important antecedent of IS end users' satisfaction. Consistent with SET, users' perceptions of the responsiveness of their social exchange partners can influence IS end users' satisfaction by confirming their expectations and addressing their needs (Gefen & Ridings, 2002). The social exchange process between users and public sector organisations using social media should influence end users' perceptions of IS, and in particular IS satisfaction.

3.3   Social Exchange Theory (SET) in Information Systems (IS)

Social Exchange Theory (SET) is adopted and utilised in the context of Information Systems (IS), as it has the potential to help to explain, understand and predict the social aspects embedded and encompassed in information systems as socio-technical systems that include social behaviour and interactions at its core through its life cycle starting with IS design and development until reaching the stage of system implementation and usage. Also, SET may be adopted to understand the evolution of social interaction and communication that are built and based on technology that enables social networks and collective knowledge to emerge in this digital age.

Social Exchange Theory (SET) adopted to extend the Technology Acceptance Model (TAM) that perceives the process of Information Systems (IS) development as a social exchange that affects perceived usefulness (PU) and perceived ease of use (PEOU), the two constructs of TAM (Gefen & Keil, 1998). These researchers identify the relationship between users and developers as a social exchange, using developers' responsiveness as an antecedent of perceived usefulness and perceived ease of use and as an influential factor of perceived IS benefits, which ultimately leads to and influences IS adoption and use.

In the context of IS development and implementation, SET is applied to Customer Relationship Management (CRM) implementation, in which social exchange during the implementation process between end users and implementation teams influences users' perceptions of system acceptance and use due to better team responsiveness (Gefen & Ridings, 2002). Their explanation is that team responsiveness works as an indicator of their intention to cooperate with end users to help them to reap the expected benefits from the implemented system, and consequently results in meeting users' needs and influence their perceptions of system acceptance and use. Kern and Willcocks (2000) adopted SET to understand the relationships in 'outsourcing partnership' between clients and suppliers, and as a result developed a framework that conceptualised this relationship in an effort to contribute to manage this complicated involvement successfully. Lee and Kim (1999) utilise SET to focus on the quality aspects of outsourcing relationships as an antecedent of successful IS outsourcing.

In the context of knowledge sharing, knowledge has become an organisational asset that plays an important role in gaining competitive advantage, which motivates organisations to focus on understanding the processes and the influential factors related to sharing knowledge, in order to encourage such behaviour (Bock & Kim, 2002). SET is used as a framework to understand the process of knowledge sharing utilising an intranet in distributed organisations (Hall, 2003), and to understand IS use of Knowledge Management (KM) systems, by focusing on the cost and benefits of using the system incurred by knowledge contributors (Kankanhalli, Tan & Wei, 2005).

Furthermore, SET is applied in other contexts of IS use, such as inter-organisational systems (IOS) that connects organisations with their partners in the value chain (Son, Narasimhan & Riggins, 2005).

Outside of an organisation's boundaries, knowledge sharing is facilitated and enabled as a result of the advancement in technologies including Web 2.0 applications that enable user-generated content. Wasko and Faraj (2000) distinguish between knowledge as private and public assets, and consider how that influences individuals' involvement in the exchange process. They also perceive knowledge sharing within electronic communities of practice as an exchange of knowledge in the form of a public asset, in which individuals involve themselves in the exchange process for knowledge sharing, while perceiving knowledge is a private asset that is exchanged for self-interest.

SET is utilised to understand the incentives that motivate individuals to use IS, as it successfully explains and predicts outcomes of such relations in terms of costs and benefits of being involved in the exchange process. Many previous studies of IS have focused mainly on the technical aspects of designing and implementing successful IS, and on the acceptance of systems by end users (Ba, Stallaert & Whinston, 2001). Accordingly, Ba, Stallaert and Whinston (2001) identify and introduce a third dimension when studying IS as 'incentive alignment' that focuses not only on linking systems success to acceptance by end users, but extends IS to include incentives for using the system by end users and consequently contributes to system success and achieves overall organisational objectives that consider SET.

The theory of information sharing (Constant, Kiesler & Sproull, 1994) is based on and influenced by the interdependencies posited by SET (Thaibaut & Kelley, 1959). This study considered the influence of organisational context and social desirability of information exchange and distinguished between written information as a 'product' and information as 'expertise' that influences individual's attitudes towards information exchange. The motivation for this study was to understand the importance of information sharing in organisations to contribute to achieving

organisational objectives, and the importance to understand individuals' attitudes towards information sharing to encourage such behaviour.

3.4 Social Exchange Theory (SET) beyond Information Systems (IS)

Most studies apply Social Exchange Theory (SET) in the context of organisational behaviour, in order to understand the social relationships between the organisation and its employees (Cropanzano & Mitchell, 2005). Social Exchange Theory (SET) is one of most applicable frameworks for studying organisational behaviour (Cropanzano & Mitchell, 2005) and studying individual behaviours and attitudes in working environments (Sinclair & Tetrick, 1995).

Social exchange theory has been applied in the context of organisations at different levels, from organisational teams (Bishop et al., 2005) to supervisors and leaders (Wayne et al., 1997), being viewed in terms of perceived commitment and support related to employees' behaviours and attitudes as a reciprocal social exchange (Bishop, Scott & Burroughs, 2000).

Social exchange theory has also been applied to the context of organisational commitment and support (Bishop et al., 2005). Eisenberger et al. (1986) investigated the relationship between how employees perceived organisational support and employees' commitment to the success of the organisation. Outcomes positively support the social exchange theory model. Bishop, Scott and Burroughs (2000) argue that, based on social exchange theory, perceived organisational support is associated positively to organisational commitment. Also, perceived team support is associated positively with team commitment. The context for this study was the working environment between organisations and their employees.

Bishop et al. (2005) discuss the implications of reciprocity in the context of organisational commitment and support, and suggest that employees who perceive that their organisation cares about their well being are more likely to put greater effort into the organisation. These employees also believed that these supportive organisational behaviours represented the underlying beliefs and values of the organisation (Bishop et al., 2005). Therefore, social exchange theory in a team-based

organisation consists of two areas of focus: teams and organisations. Employees can engage in four potential types of exchange with each of these focus areas. In this model, employees have social exchanges with more than one entity in the organisation, with each of these different exchanges having its own level of reciprocity.

Sommerfeldt (2013) studied social exchange in the context of civic society, and the role individual society members play by participating in reciprocal behaviours and attitudes in order to develop and maintain social capital, which is achieved primarily through frequency of communication and quality of relationships. As mentioned by Sommerfeldt (2013), 'Good relationships are organisational social capital, and vice versa', and report that quality relationships benefit the entire civic sector, as well as individual organisations. One mechanism for this is that quality relationships tend to result in more cooperation and exchange of information. Another finding was that quality relationships could be measured in terms of satisfaction and commitment (Sprecher, 2001).

Social exchange theory is applicable to a variety of contexts; for example, Sprecher (2001) applies social exchange concepts in the context of social science to predict relationship satisfaction, commitment and stability in dating couples. Another application was to explore the relationship between support and commitment in the relationship between a labour union and its members (Sinclair & Tetrick, 1995).

An underlying framework for social exchange theory in the context of organisations is provided by Wayne, Shore and Liden (1997), who identify two types of social exchange in an organisation: between the employee and the employing organisation, and between the employee and supervisor. A key metric in these interactions is employees' perceptions of organisational support, or POS. High levels of POS inculcate a feeling of obligation in employees, and encourage reciprocal exchange on the part of employees in the form of commitment to and support of the organisation's goals and objectives. Another important metric is quality of relationship, as this has a positive impact on employees' behaviours and attitudes. In a high quality relationship,

employees often perform beyond stipulated obligations, in order to contribute to the success of the organisation.

3.5   Summary

This chapter reviews theories adopted for understanding users' satisfaction formation in the context of IS, and proposes the theoretical framework of Social Exchange Theory (SET). In the context of public sector organisations, SET is applied to understand and distinguish between different types of government organisations and public relationships (Alford, 2002), in order to contribute to delivering public value by understanding and meeting different needs of each type. In this research, SET (Blau, 1986) is employed to examine the exchange process on social media of Twitter and to help to understand and explain interactions on this social platform and, utilise it as a basis for users' satisfaction with IS. Constructive exchanges on these social platforms can be utilised for systematic evaluation of users' satisfaction, and could contribute to the process of system improvement and development. This has implications for public sector organisations seeking to utilise the promising venue of social media platforms to constructively interact with IS users in order to build a sense of commitment and satisfaction through initiating and maintaining favourable actions using social media.

Chapter 4: Research Design

In the previous two chapters, relevant literature and key theories of IS end users' satisfaction are reviewed to shed light on previous research in this area and to provide a context for the contributions of this current research study. A theoretical framework, Social Exchange Theory (SET), is been identified to explain and understand research questions that aim to examine using social media to measure end users' satisfaction, and is used as a lens to interpret collected data. This chapter presents the research methodology that compromise the researcher's philosophical assumptions and research methods. This chapter presents the research design and philosophical assumptions guiding this research and achieving empirical research in order to achieve the research aims and objectives.

This chapter begins with a brief introduction to the research paradigm as embraced by the researcher, including beliefs and assumptions of how reality is perceived and knowledge is gained to carry out this research. Then, quantitative approaches to studying IS end users' satisfaction is discussed, and followed by the proposed research approach of using social media. The context of social media is introduced, using the example of 'Twitter' in particular, which is employed to provide empirical materials for this research. This context is reviewed in order to clarify what is different about social media and the potential to leverage the data in research in order to extract value and draw inferences. Influenced by the philosophical assumptions of the researcher and the research questions, a research design is developed, introduced and justified as an appropriate research design, specifying research methods and how data needs to be collected and analysed effectively to answer the research questions. Finally, ethical issues associated with using social media data are identified and discussed, followed by methodological rigour and research relevance.

4.1   Research Paradigm

A research paradigm is a philosophical framework that guides the process of designing and carrying out research (Collis & Hussey, 2009). It is underpinned by philosophical

assumptions about how reality is perceived (ontology) and knowledge is gained (epistemology), and influences the process of developing a research design and data collection and analysis. Researchers need to identify and clarify their philosophical position in terms of ontology and epistemology, and they often do so implicitly. This is reflected in their approach in carrying out empirical research. Researchers embrace a research paradigm with beliefs and assumptions about the social world that influences their approach towards studying social reality and creating new knowledge. Therefore, ontological and epistemological assumptions embedded in a research paradigm influence researchers' perspectives to approaching and understanding social reality.

There are a number of different research paradigms that have different assumptions and beliefs in regard to perceiving the social world (ontological assumptions), and how knowledge of this social world can be created and gained (epistemological assumptions). Ontological and epistemological assumptions cannot be separated as each influences the other in the way social reality is perceived, influencing the way knowledge is created from social reality, and vice versa (Blaikie, 2007).

Ontology is defined as 'a branch of philosophy that is concerned with the nature of what exists' (Blaikie, 2007), and is concerned with the issue of the nature of social reality and how social reality can be perceived in order to be studied and investigated. The ontological assumptions of the social world are viewed along a continuum (Burrell & Morgan, 1979). At one end is the subjective view of the social world in which reality is subjective and constructed by individuals giving it names and meanings (Burrell & Morgan, 1979). At the other end of the continuum lies the objective view of the social world, which has a reality of its own that exists external to and independent of an individuals' involvements (Burrell & Morgan, 1979). Between these two extremes a variety of ontological assumptions exist.

Epistemology is defined as 'a theory or science of the method or grounds of knowledge' (Blaikie, 2007), and is concerned with the issue of how knowledge is produced and gained, and what could be considered to be appropriate knowledge. The epistemological assumptions of the social world are also viewed along a continuum (Burrell & Morgan, 1979). At one end is the subjective view of the social world in which

knowledge is considered to be 'relativistic', being produced and gained from individuals' perceptions and involvement in the social world (Burrell & Morgan, 1979). At the other end of the continuum lies the objective view of the social world in which knowledge already exists and just needs to be observed and discovered by researchers. A variety of epistemological assumptions exist between these two extremes.

Understanding of ontological and epistemological assumptions is a fundamental starting point for social enquiry, as it shapes and influences the approach taken to study the social world. Adopting a research paradigm allows researchers to create connections between ideas, social experiences and social realty (Blaikie, 2007). This study adopts qualitative research approach with 'interpretive' underlying philosophical assumptions that are underpinned by socially constructed knowledge by carrying out various interpretive practices by the researcher, who aims to understand social reality from individuals' perceptions. The paradigm, methodology and methods that are adopted for studying social reality and creating knowledge are clarified and discussed in this chapter.

4.2   Quantitative Approaches to IS End-User Satisfaction

Identified satisfaction measures in the literature use scales to measure IS users' satisfaction are developed by using statistical methods to assess the correlations between variables, and reflect the positivist paradigm. This approach of quantitative research was dominant until the mid-1990s, and was considered the only scientific and rigorous approach to conduct research (Sarker, Xiao & Beaulieu, 2013; Orlikowski & Baroudi, 1991). Subsequently, IS discipline has moved to adopt various philosophical assumptions to enhance understanding of IS phenomena, and in particular to consider the importance of interpretive research in IS, as this produce insights that difficult to obtain by quantitative research (Orlikowski & Baroudi, 1991; Gephart, 2004; Walsham, 2006; Bansal & Corley, 2011).

Quantitative and attitudinal approach have become predominantly adopted to study IS end users' satisfaction. The dominance of quantitative approach is clarified previously,

and the dominance of attitudinal approach to study IS end users' satisfaction contributes to the satisfaction definition from the literature as an 'attitude' (Doll & Torkzadeh, 1988). The most widely accepted definition of attitude is that 'a person's attitude represents his evaluation of the entity in question' (Ajzen & Fishbein, 1977).

The key construct of Bailey and Pearson (1983) and its derivatives contribute to provide a standard measure with established validity and reliability to measure IS end users' satisfaction. The predominance of this key construct came to dominance because of its importance to both practitioners and researchers as an evaluative measure for IS success (Baroudi & Orlikowski, 1988; Au, Ngai & Cheng, 2002). This construct of end users' satisfaction is widely adopted as a single measure for IS success, as it has a face validity in which satisfied users indicate the success of the system, and in comparison with other success measures, end users' satisfaction construct is well-defined conceptually and empirically easy to obtain (DeLone & McLean, 1992). This construct provides a standard measure and allows comparisons among different systems, users and organisations (DeLone & McLean, 1992; Baroudi & Orlikowski, 1988).

This research aims to contribute to the body of knowledge on measuring IS end users' satisfaction, where the issue was investigated in prior studies using quantitative research under a positivist paradigm (Bailey & Pearson, 1983; Baroudi & Orlikowski, 1988; Baroudi, Olson & Ives, 1986; Doll & Torkzadeh, 1988; Leclercq, 2007) that employed instruments to measure IS satisfaction. The approach of using instruments and scales to capture perception is considered by some to provide an artificial account of the social world (Bryman, 2012). Although it is important to note that although these IS end users' satisfaction instruments are developed and validated by employing interviews and questionnaires, they are still less naturalistic as people are not placed and studied in their natural social world and context.

This research is different from previous studies of measuring IS end uses' satisfaction as it focuses on investigating measurement of IS satisfaction by employing qualitative and interpretive research and investigating IS end users' perceptions in a natural setting, in which people are placed and studied in natural settings while they are using

and interacting on social media. This research investigates and examines the factors that influence IS end users' satisfaction in natural settings that are 'naturally occurring' as a perception of IS end users on social media, by capturing their perceptions regarding the system they use, in contrast to the approach of previous studies that derived such factors by employing interviews and questionnaires based on reviewing the existing body of knowledge of the subject (Bailey & Pearson, 1983; Baroudi & Orlikowski, 1988; Baroudi, Olson & Ives, 1986; Doll & Torkzadeh, 1988).

Adopting an interpretive perspective with social media data might help to understand influences on the satisfaction of end users of IS in ways other than that captured by using scales and questionnaires designed under a positivist paradigm.

Survey analysis data and results are compared with social media analysis results. Since surveys are a more established and better understood method of analysis, the survey results are used as a gauge against which social media results can be compared, in order to look for possible inferences on how social media might best be used, and how it might be analysed effectively, with the ultimate aim of evaluating e-government information systems based on end users' perceptions and evaluation of their experience with the system.

In spite of the differences in underlying philosophical assumptions of qualitative and quantitative data, combining them is supported and encouraged in order to develop new theoretical contributions, as emphasised by Venkatesh, Brown and Bala (2013): 'Our view is consistent with researchers who suggest that a peaceful coexistence of multiple paradigms is feasible in a research inquiry. In fact, we suggest that if a mixed methods approach helps a researcher find theoretically plausible answers to his or her research questions and if the researcher is able to overcome the cognitive and practical barriers associated with conducting mixed methods research, he or she should undertake such research without much consideration of paradigmatic or cultural incommensurability'.

Venkatesh, Brown and Bala (2013) add: 'we encourage IS researchers to engage in mixed methods research to provide rich insights into various phenomena and develop

novel theoretical perspectives'. They justify the mixed methods approach by noting the current ubiquitous nature of IS, and the continuous advancements in technology, including networking and social media, that challenge existing theories and findings in the rapidly evolving context of IS. Thus, combining various research methods and approaches should contribute to enhance understanding of research phenomena (Weber, 2004).

The following section discusses what is different about social media, which is then utilised to investigate IS end users' satisfaction by providing the empirical material for this research.

4.3   Social Media

This section highlights what is different about social media that could be utilised in this research. Social media are web-based applications that empower end users to create and exchange information and content in various forms in cyberspace, instead of being passive consumers of static information. Social media is facilitated by advancements in technology and is built on Web 2.0 technology; a technology characterised with user-generated content (O'Reilly, 2007).

Various forms of social media applications are available, including online social networking applications, such as Facebook (founded 2004) and Twitter (founded 2006), photo and video sharing applications, such as Flicker and YouTube, and many others including blogging and chat forums. A list of popular social media applications along with associated age groups of their users around the world is included in Appendix A.

Within the context of social media, there are rich and massive qualitative sources of data in the form of social interactions, behaviours and exchanges. Social media applications allow users to communicate and stay connected, which probably influences social relationships and interactions. The intense volume of data produced by social media use comprises a rich and promising resource for studying socially constructed language, interactions and behaviours. These data are characterised by a qualitative and unstructured nature that manifests in the form of social interaction

using words, either written or spoken, that naturally leads to using a qualitative approach in this research.

Social media data in the form of textual data has the distinctive features of text described by Krippendorff (2013) as 'text means something to someone, it is produced by someone to have meanings for someone else, and these meanings therefore must not be ignored and must not violate why the text exists in the first place'.

Various studies have utilised social media data for conducting research, including studying social relationships (Mamic & Almaraz, 2013; Lee, Oh & Kim, 2013), virtual ethnography (Carter, 2005), and measuring and evaluating the impact of electronic word of mouth in marketing (eWoM) (Jansen et al., 2009; Hu, Liu & Zhang, 2008).

There has been a continuous increase in the number of Internet users (Internet World Stats, 2012), and in particular in users focused on the use of social media applications that have been adopted continually by various age groups (GlobalWebIndex, 2014). Thus social media is a promising venue for conducting research by utilising and understanding social media data on these social platforms. On the other hand, the nature of social media data, with its massive volume and unstructured format, poses challenges to the analysis process, how value might be created and ethical issues associated with its use.

Utilising the Internet in general and social media in particular for the purposes of conducting research strongly influences research methodology. Traditional research methods usually focus on direct interaction between the researcher and the participants in order to collect data. Different forms of traditional research methods including interviews, observations, ethnography and quantitative studies using questionnaires all require the researcher to be personally involved from the early stage of designing and developing the research instrument, to the process of analysing and validating the data. With social media, researchers have the option to observe and investigate social interaction in a specified context by capturing and analysing social media interaction without being personally involved. Thus, researchers immerse themselves with captured social media data as 'text'. Such involvement poses

challenges to researchers, and in particular to identify and locate appropriate data to be collected and develop an appropriate research design that analyses data to its full potential and best answers the research questions with valid findings.

The context of social media and the nature of data produced and exchanged by using such media impact the research design of this research. Social media data in a specific context (e-government IS) is captured and analysed, and with a focus on analysing and understanding the 'nature and meaning of words' exchanged on a particular topic in order to understand and contribute to the issue under investigation.

Twitter is employed to provide empirical materials for this research. The micro blogging feature of Twitter allows users to exchange short messages of up to 140 character 'tweets', and the hashtag (#) feature that organises information into a particular topic constitutes the core data collection method in this research. Also, exchanges using Twitter are suitable to fit with the framework of social exchange theory (SET), which is the adopted theoretical framework for this research. Another important feature that distinguishes Twitter from other social media is connectivity, as it works as a broadcast channel that allows its users to follow other public Twitter accounts without privacy and invitation restrictions. Twitter is simply about 'keeping you updated', a feature that has importance in the context of e-government and public sector organisations in order to communicate with the public regarding provided information and services. Other social networks are more about closed social friendship networks, and typically with restrictions to provide privacy.

Using Twitter in the context of conducting research has been employed by many researchers as a way to understand the nature and influence of interactions on social media (Jansen et al., 2009; Kassens-Noor, 2012; Rui, Liu & Whinston, 2013). Captured communications and interactions on Twitter are exploited to serve various purposes, including getting feedback, building relationships and being informed about what is going on in the world. The interconnectivity feature of Twitter is exploited by business orgainsations as a marketing strategy to promote their products and services, and as a communication channel with their customers in order to provide customer services and to gain a better understanding of their expectations. In this research, the

interconnectivity feature of Twitter is employed to contribute to measuring the effectiveness of e-government IS in terms of IS end users' satisfaction.

This chapter now discusses how the empirical materials of social media are incorporated in this interpretive research approach.

4.4   Approaches to Social Media Research

A briefly review of approaches to social media research allows a holistic picture of how social media is utilised methodologically in previous research. There are various methodological approaches to social media, but mostly are qualitative in nature, such as blogs analysed using meaning extraction method (Argamon et al., 2007), Twitter adopted as a qualitative research method (Chew & Eysenbach, 2010; Dann, 2010; Marwick & Boyd, 2010), in experiment setting (Kassens-Noor, 2012) and data analysed using content analysis and grounded theory approach. Also, Twitter is employed for data mining and clustering approach (Lee & Chien, 2013), and online communities studied as netnography, which is an ethnography approach for studying cultures and communities within cyberspace (Kozinets, 2002). Social networks, such as Facebook and LinkedIn, data are employed for qualitative discourse analysis approach (Papacharissi, 2009).

As mentioned earlier, most approaches to social media research are qualitative and interpretive. Qualitative research is a 'methodology' or 'general orientation', and is defined as 'a research strategy that usually emphasises words rather than quantification in the collection and analysis of data' (Bryman & Bell, 2011). Gephart (2004) explains that 'Qualitative research starts from and returns to words, talk and texts as meaningful representations of concepts', in contrast to quantitative research that 'codes, counts and quantifies phenomena in its effort to meaningfully represent concepts'.

In order to carry out this research, the researcher needs to clarify the approach (methodology) in conducting the study and how identified research questions are answered. The motive of adopting qualitative research as a methodology is the researcher's interest in socially constructed reality and knowledge that is used to

enhance understanding. Adopting a qualitative research methodology appears to be the most appropriate approach for conducting this research, because of the qualitative nature of social media data that is employed and the exploratory and explanatory nature of this research towards exploring the feasibility of using social media in the context of e-government IS evaluation to explain its meaning for the evaluation process. In addition, adopting a qualitative approach is reflected by the researcher's philosophical assumptions and beliefs of how the social world is perceived and how knowledge could be produced, which are that social entity is socially constructed and knowledge is produced by understanding individuals' perceptions and conceptualisations of the social world. The researcher's aim is to understand social reality by employing social media to capture the interactions and exchanges between individuals involved, in order to socially and constructively create knowledge of this social reality.

The ontological position of qualitative research is constructionist and the epistemological position is interpretivist (Bryman & Bell, 2011). The constructionist position is based on the assumption that the social world is not an independent external reality, but rather is socially constructed by individuals through their shared understanding of ideas, and through their involvement and interaction with the social and physical world (Blaikie, 2007). The interpretive position is based on the assumption that understanding and explaining the social world is achieved from individuals' perspectives involved directly in social activity (Burrell & Morgan, 1979). By adopting qualitative research, knowledge of social reality is socially constructed by carrying out various interpretive practices by the researcher who aims to understand social reality from individuals' perceptions. Thus, the researcher plays an important role in constructing knowledge of the social world.

Qualitative research involves a set of interpretive practices that the researcher needs to conduct as an observer of the world who studies issues of interest in their natural settings (Denzin & Lincoln, 2013). The use of the term 'observer' is associated with the positivist epistemology in which researchers create knowledge by observing and searching for social reality to be discovered, while with interpretive epistemology using

such an approach is rejected as knowledge can only be produced by 'occupying the frame of reference of the participant in action' (Burrell & Morgan, 1979). Qualitative research helps to make sense of the world and further understanding of the issues under investigation by conducting interpretive practices of various empirical materials that act as a representation of the world, and hold the meaning of individual perceptions (Denzin & Lincoln, 2013).

The qualitative researcher makes interpretations of social reality and observations through the eyes of the people under study, and is stated by Bryman and Bell (2011): 'the social world must be interpreted from the perspective of the people being studied'. Knowledge is constructed by the researcher through the process of constructive interpretation of empirical materials (Denzin & Lincoln, 2013). One of the strengths of qualitative data is stated by Miles, Huberman and Saldana (2014), as 'focus on naturally occurring, ordinary events in natural settings'.

Miles, Huberman, and Saldana (2014) point out that personal and social life contains gaps and inconsistencies, so that describing and explaining them poses considerable challenges for the qualitative researcher.

Rather than confining this approach to one stance, the research adopts two stances: as an expert and as a learner (Blaikie, 2007). The motive is to compare and contrast the findings in order to examine the validity of social media for IS evaluation processes. Also, each one of these stances looks at reality from a different perspective, thus combining them should enrich understanding of the research issue. The researcher becomes an expert and is influenced by an existing body of knowledge of the research topic and employs a previously identified measure of IS end users' satisfaction to evaluate the IS system under investigation. The researcher becomes a learner and is involved in a learning process of how the system under investigation is perceived and conceptualised by IS end users, and avoids employing the existing body of knowledge and focuses instead on learning.

These two adopted researcher's stances, as 'an expert' and as 'a learner' are reflected in the two perspectives that are applied to collected qualitative data. These two

perspectives are the positivist perspective and the interpretive perspective. The positivist perspective focuses on quantifying collected data, the interpretive perspective focuses on the meaning of collected data. The former applies a deductive approach and is associated with a high level of reliability, while the latter applies an inductive approach and is associated with high level of validity (Collis & Hussey, 2009). By combining these two perspectives, the researcher compares and synthesises the findings in order to improve data integrity. The motive is to enhance knowledge in order to understand end users' satisfaction of IS better, and to contribute to improving e-government IS effectiveness.

Combining positivist and interpretive approaches help to improve the researcher's understanding of collected data, and to support the researcher in investigating and understanding qualitative collected data (social media, and in particular Twitter data), as each approach should allow the researcher to look at collected data from different angles, so that they combine and support each other (Lee, 1991). Applying both positivist and interpretive perspectives of the same data set is applied by Trauth and Jessup (2000), who report that each perspective reveals a different understanding than the other. Thus, the motive of applying two perspectives in this research is to comprehensively understand collected social media data from both perspectives, as if one perspective was solely applied the understanding of the second perspective might be missed. The motive of this research is to investigate the validity of social media in the context of IS evaluation and to understand the meaning of this data. Thus, social media data need to be analysed from different perspectives in order to be comprehensively understood.

The outcomes of this qualitative research are then contrasted with quantitative data. On the one hand, quantitative data collected using structured questionnaires that examine precise defined constructs of End-User Computing Satisfaction (EUCS) used that were developed by and reflect the researcher's point of view. On the other hand, qualitative data collected using unstructured social media data are used to uncover the meaning of the construct EUCS from participants' points of view inductively from collected social media data. The feature of qualitative data as mentioned by Miles,

Huberman and Saldana (2014) is that 'qualitative data are useful when one needs to supplement, validate, or illuminate quantitative data gathered from the same setting'. In this research, qualitative data is used to validate the quantitative data and investigate the feasibility of data in the context of e-government IS evaluation, and in particular IS end users' satisfaction.

Having clarified the research methodology and the researcher's philosophical position, the detailed research design is explained in the next section.

4.5   Research Methods: Quasi-Experimental Design

After reviewing the literature, identifying research contributions in the form of research questions, and clarifying the researcher's philosophical position, the researcher needs to develop an appropriate research design capable of providing appropriate data to address the research question. Research design is defined as 'the logic that links the data to be collected (and the conclusions to be drawn) to the initial questions of study' (Yin, 2008). The importance of the research design lies in helping to keep the focus on carrying out the research in a consistent, appropriate way and to keep the process of data collection and analysis aligned to the research question. Also, research design implicitly reflects the adopted philosophical assumptions embraced by the researcher of how the social world is perceived and how knowledge can be produced.

This research investigates 'using social media' to measure the effectiveness of e-government IS in terms of IS end users' satisfaction. Thus, to investigate the feasibility of social media, quasi-experimental design is chosen as an appropriate research design to answer research questions, as this allows the researcher to examine and compare variable outcomes in a real-world setting using two different methods to measure IS end users' satisfaction: social media and EUCS instruments adopted from Doll and Torkzadeh (1988). Contrasting these methods should achieve enhanced understanding of the similarity and differences between ways of capturing IS end users' perceptions and inferring the effect and influence of each.

Experiments are a 'test' that aim to understand and explain the causal link between the independent variables, 'the cause', and the dependent variables, 'the effect' (Cook & Campbell, 1979). Thus, experiments usually take place in a laboratory setting in which the researcher is capable of controlling and manipulating variables that may infer causation. In this research, inferring causation is not the primary motive - rather the focus is on inferring effect (outcome variables), correlations and influence by examining the feasibility of using social media data to measure IS end users' satisfaction, for IS evaluation and contrasting the findings with tradition IS satisfaction measures. In IS research, the social context of information systems may not be replicable in a laboratory setting (Oates, 2006) in which the researcher needs to go beyond the boundaries of a laboratory setting and embrace the real-world setting to investigate and capture IS influence in its real-world and social context.

The lack of control by the researcher in field settings leads to the emergence of quasi-experiments (Cook & Campbell, 1979). Quasi-experiments (also called field experiments) take place in real-world settings, which imply that some variables cannot be controlled and manipulated. This has implications in inferring precise causation (Oates, 2006). There are various designs of quasi-experiments (Shadish, Cook & Campbell, 2002) and the researcher needs to choose the most appropriate design to be employed in order to obtain appropriate data to answer the research questions and achieve the research objectives. In this research, one-group post-test only design (using multiple post-tests) is adopted, as IS end users' perceptions of satisfaction are formed only after using and experiencing the benefits associated with the IS. Thus, a quasi-experimental treatment group is used to evaluate IS using two different methods, and their perceptions of IS satisfaction are then captured and analysed in order to allow the researcher to compare and contrast outcome variables. The aim of a comparing and contrasting process is to challenge previously identified measures (EUCS instrument) in light of social media data, and to examine the feasibility of social media data to evaluate IS effectiveness.

Adopting quasi-experimental design in this research allows the researcher to examine, analyse and interpret both social media data and questionnaire-based survey data, in

an experiment conducted in a real-world setting and social context. This research is focused on measuring IS end users' satisfaction, and in examining such issues in a real-world setting, that considers the social context of IS in which the system is used and evaluated by end users, is more appropriate, enabling the capture of precise perceptions of IS satisfaction.

The justification for employing both qualitative and quantitative data in this quasi-experimental design, in spite of the differences of underlying philosophical assumptions, is that the research aim and questions seek to simultaneously validate previously identified measures of End-User Computing Satisfaction (EUCS) and examine the effectiveness of social media to evaluate IS end users' satisfaction. By combining both qualitative and quantitative data, the researcher should be able to address confirmatory and exploratory research questions simultaneously (Teddlie & Tashakkori, 2013; 2009 in Venkatesh, Brown & Bala, 2013). The methodological aspect of this research is presented in Table 4.1.

Table 4.1: Methodological Aspects of the Study

Aspect of the Study	Methodological Considerations	Illustration
Organisation Choice	Theoretical Sampling	Theoretical sampling can be defined as 'a means ''whereby the analyst decides on analytic grounds what data to collect next and where to find them.'' ' (Strauss, 1987). Thus, the researcher is deciding what data is needed and how they can be collected based on the theoretical purpose and contribution that researcher aimed to achieve.
Data Collection	On-Line Based Survey	Using online based software.
	Social Media (Twitter)	Using hashtag to ensure collected tweets are related to research issue with specified IS context.
Data Analysis	Analysis of On-Line Based Survey	Statistical Analysis using SPSS to perform descriptive analysis, and AMOS to perform Confirmatory Factor Analysis (CFA).
	Analysis of Social Media (Twitter Data)	Three different analysis will be applied, to perform: Deductive Analysis Key-words Analysis Inductive Analysis

4.5.1 Pilot Study

Because of the evolutionary nature of this research, the researcher started by conducting a pilot study prior to proceeding to actual data collection, which involves two main studies. Each of these studies focuses on a unique characteristic of IS end users' use of the system, enabling the researcher to learn from each of them and sequentially incorporate acquired knowledge. The pilot study was conducted prior to the main data collection in order to ensure research design feasibility and to overcome any methodological and practical limitations that might emerge.

4.5.1.1 Data Collection

Pilot study respondents were asked to evaluate the Agresso system, using the EUCS instrument. Agresso is a college financial system adopted by Royal Holloway, University of London (RHUL) to manage expenses and customer invoicing, and to produce financial reports. Users of the system include college staff among various administrative levels including top management, administrators and academic staff. Thus, the information system use is mandatory, yet specific use varies depending on the job nature of the IS end-user. A summary of data collection is presented in Table 4.2.

Data screening was conducted to eliminate missing data and identify data entry errors in order to prepare the collected data for subsequent analysis. Then descriptive statistics using SPSS determined the mean and standard deviation for each of the measured items in order to have a broad picture of the collected responses: see Table 4.3. Finally, an exploratory and confirmatory factor analysis was conducted to evaluate the validity and reliability of the theoretical construct, and the EUCS instrument (Doll & Torkzadeh, 1988).

Table 4.2: Pilot Study: Agresso Financial System

IS Profile	Subject's role with IS	Aspect of the Study	Illustration	Lesson Learned
Agresso Financial System	IS end-user as employee with mandatory IS use.	On-Line Based Survey using Qualtrics	Total number of participants was 870. The number of responses is 105. The number of usable responses is 91. Started on 3rd Feb 2014 and completed in approximately one month.	Participants were eager to participate as evidenced by the email replies we received, and expressed their dissatisfaction with the system, as they have to use it as part of their job.
		Social Media (Twitter)	Using the following hashtag #rhulstudy on Twitter, started on 3rd Feb 2014 and completed in approximately one month. Total number of 3 Tweets.	Most participants refused to tweet about their system, as they perceived that to be related to their employer. Participants would not tweet negatively about the system, as they perceived it as talking negatively about their employer in public.

Table 4.3: Sample Descriptive Statistics for Agresso System EUCS (End-User Computing Satisfaction)

EUCS Items	Mean	Standard Deviation
C1: Does the system provide the precise information you need?	2.87	1.22
C2: Does the information content meet your needs?	2.85	1.28
C3: Does the system provide reports that meet your needs?	2.52	1.26
C4: Does the system provide sufficient information?	2.82	1.20
A1: Is the system accurate?	3.35	1.29
A2: Are you satisfied with the accuracy of the system?	3.20	1.38
F1: Do you think the output is presented in a useful format?	2.37	1.16
F2: Is the information clear?	2.40	1.27
E1: Is the system user friendly?	2.22	1.21
E2: Is the system easy to use?	2.32	1.19
T1: Do you get the information you need in time?	2.70	1.35
T2: Does the system provide up-to-date information?	3.05	1.41

4.5.1.2 Data Analysis

4.5.1.2.1 Exploratory Factor Analysis (EFA)

An Exploratory Factor Analysis (EFA) was conducted to assess the construct validity of the theoretical construct of End-User Computing Satisfaction (EUCS), and to identify the underlying factorial structure and components of the collected data. Construct validity 'is the extent to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure' (Hair et al., 2006). Thus, Exploratory Factor Analysis (EFA) was conducted on 12 items that compromise the

End-User Computing Satisfaction (EUCS) measure (Doll & Torkzadeh, 1988) by using Principal Component Analysis (PCA) as recommended by Straub (1989). PCA is commonly used to assess construct validity, and is adopted by many researchers (Straub, 1989; Doll & Torkzadeh, 1988; Aggelidis & Chatzoglou, 2012; Chen et al., 2000).

A principal component analysis (PCA) was conducted on the 12 items with orthogonal rotation (varimax). The sample size in this pilot study (91 respondents) gives a 7:1 ratio of observations to variables, which falls within acceptable limits (Hair et al., 2006). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, with KMO=.911 ('superb' according to Field, 2009), and all KMO values for individual items were > .877, which is well above the acceptable limit of .5 (Field, 2009). Bartlett's test of sphericity gave x^2(66) = 1159.087, p < .001, indicating that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Without specifying the number of factors, two components emerged that had eigenvalues over Kaiser's criterion of 1 and in combination explained 78 % of the variance. The scree plot showed inflection that would justify retaining two components, and this is the number of components that were retained in the final analysis. Given the sample size of 91, factor loadings of .60 and above are considered significant for interpretation purpose (Hair et al., 2006). The loading of all the 12 items (for factor loading .60 or above) on each factor is depicted in Table 4.4. Only one item (T1) 'Do you get the information you need in time', had a cross-loading above .60 on both factors. Thus, (T1) was eliminated in order to identify distinct underlying constructs. See Table 4.5. The identified two components, the Perceived Ease of Use and Perceived Usefulness, all had high reliability, with Cronbach's α = .94. The five constructs of EUCS, combined in two constructs by conducting EFA. Originally, Doll and Torkzadeh (1988) forced the five-factor structure by specifying the number of factors to be extracted as best representative of the theoretical construct of EUCS. The structure of five-factors of EUCS is still valid in this study when forcing the EFA to extract five-factors.

Table 4.4: Pilot Study- Rotated Factor Loading: Full sets of Variables

	Component	
	1	**2**
E1	**.886**	
E2	**.854**	
F2	**.841**	.416
F1	**.817**	
A1		**.887**
A2		**.870**
T2	.483	**.741**
C1	.560	**.653**
C4	.553	**.650**
C2	.574	**.640**
T1	**.603**	**.638**
C3	.585	**.613**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.[a]
a. Rotation converged in 3 iterations.

Table 4.5: Summary of Exploratory Factor Analysis Results for Agresso EUCS, Rotated Factor Loading with T1 Deleted

	Component	
	1 Perceived Ease of Use	**2 Perceived Usefulness**
E1: Is the system user friendly?	**.888**	
E2: Is the system easy to use?	**.856**	
F2: Is the information clear?	**.841**	.415
F1: Do you think the output is presented in a useful format?	**.816**	
A1: Is the system accurate?		**.889**
A2: Are you satisfied with the accuracy of the system?		**.870**
T2: Does the system provide up-to-date information?	.480	**.730**
C1: Does the system provide the precise information you need?	.560	**.656**
C4: Does the system provide sufficient information?	.555	**.655**
C2: Does the information content meet your needs?	.576	**.646**
C3: Does the system provide reports that meet your needs?	.587	**.619**
Eigenvalues	4.51	4.16
% of variance	41.04	37.86
A	.94	.94

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalisation.[a]

a. Rotation converged in 3 iterations.

The two factors identified as 'Perceived Ease of Use' and 'Perceived Usefulness', are interpreted in light of the two constructs of the Technology Acceptance Model (TAM) (Davis, 1989). Perceived Ease of Use is identified as 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989). In the organisational context, Perceived Usefulness is identified as 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis, 1989). Based on the basic definition of the word useful as

'capable of being used advantageously' (Davis, 1989) and to fit the context of this research of e-government IS, perceived usefulness can be identified as 'the degree to which a person believes that using a particular system would enhance his or her productivity in completing their own responsibilities'. Thus, adopting e-government IS by end users will be reinforced by fulfilling end-users needs, in contrast to the IS end users in the organisational context that reinforced the adaptation of organisational IS to achieve 'use-performance' rewards (Davis, 1989).

The instrument of Doll and Torkzadeh (1988) was originally developed to evaluate a specific application in work settings, and in the context of e-government IS other elements need to be added to cover using the system over the cyberspace and including the unique characteristics of voluntary use systems to complete one's own responsibilities.

4.5.1.2.2 Confirmatory Factor Analysis (CFA)

As described above, EFA was conducted in order to explore the underlying structure of the collected data, and based on that identified a two-factor structure in order to represent the underlying structure of collected data. In this section, CFA is conducted to confirm the specification of the theoretical measurement of the EUCS to fit collected data (Hair et al., 2006).

Confirmatory Factor Analysis (CFA) requires a prior identification and specification of a measurement model that depicts the theoretical relationship between constructs and related measured variables in order to allow testing theoretical measurements in relation to reality (our sample of collected data) (Hair et al., 2006). The hypothesised theoretical measurement of EUCS is comprised of five first-order factors and one second-order factor (EUCS) (Doll & Torkzadeh, 1988).

The overall fit summary of the CFA results is provided in Table 4.6. The overall model x^2 is 89.130 with 49 degrees of freedom. The p-value associated with this result is .000. This p-value indicates a statistically significant difference between the covariance matrix of the observed data and the estimated covariance matrix derived from the theoretically specified model of EUCS. Thus, x^2 goodness-of-fit statistic indicates a poor

fit between the observed and estimated covariance matrices. However, given the problem associated with using x^2 goodness-of-fit statistic as a sole indicator and its sensitivity to the sample size and the number of the observed variables (model complexity), other fit statistics are examined (Hair et al., 2006; Fornell & Larcker, 1981). The goodness-of-fit indices as suggested by Hair et al. (2006) are used based on the sample size, and presented in Table 4.6.

Table 4.6: Overall Model Fit Indices of the EUCS Measurement Model of the Agresso study

	P-value	CFI	TLI	RMSEA
Recommended value (Hair et al., 2006)	Value >0.05	.97 or better	.97 or better	Value < .08
EUCS measurement model	.000	.965	.953	.095
Meaning	Not Supported	Supported	Supported	Supported

Hair et al. (2006) suggest at least one absolute fit index and one incremental fit index must be used to evaluate the overall fit in addition to x^2 goodness-of-fit statistic. The value for RMSEA gives an absolute fit index of 0.095. This value is slightly higher than the 0.08 guideline for a model with 12 measured variables and a sample size of 91 (Hair et al., 2006). The value of the CFI, an incremental fit index, is 0.965. This value approximately equals the 0.97 guideline for a model of this simplicity with small sample size (Hair et al., 2006). Other fit indices are the value of the TLI, which is .953, which is slightly lower than the .97 guideline. As there is no cut-off value for fit indices and provided values just serve as guidelines to distinguish between acceptable and unacceptable model-data fit (Hair et al., 2006), and overall the measurement model of EUCS provides a reasonable fit for the collected data.

The factor loadings estimates are first examined, and Table 4.7 provides the default maximum likelihood loading estimates. All loadings are highly significant and provide a useful starting point in assessing the convergent validity of the EUCS measurement model. Figure 4.1 provides completely standardised loadings (standardised regression weights). All loadings are highly significant and above the 0.7 standard (Hair et al., 2006). The variance-extracted estimates and the construct reliabilities are shown at the end of Table 4.8. The variances extracted from the first-order constructs range from 78.23 per cent for content to 88.7% for format. The variance-extracted of the second-order construct (EUCS) is 75.98%. All exceed the 50% standard and indicate

adequate level of convergence (Hair et al., 2006). Construct reliabilities of the first-order constructs range from 0.84 for the timeliness construct to 0.92 for the format construct. Construct reliably of the second-order construct (EUCS) is 0.92. All exceed the 0.7 standard of good reliability (Hair et al., 2006). Taken together, the convergent validity of the EUCS measurement model is supported. In other words, the measured variables of EUCS reflect the theoretical latent constructs they are supposed to measure, and that is indicated by a high common proportion of variance among measured variables of a construct. Also, high construct reliability estimates indicate the internal consistency among measured variables of a construct, and they consistently represent the same latent theoretical construct.

To establish the discriminant validity, variance-extracted estimates for each factor is compared with the squared interconstruct correlations associated with that factor (Fornell & Larcker, 1981; Hair et al., 2006) and the former value should be greater than the latter. Table 4.9 presents the standardised Amos output for the construct correlation matrix of the EUCS Measurement Model of the Agresso system, which is then squared to obtain the squared correlation estimates. By comparing average variance extracted (AVE) with squared correlation estimates in Table 4.10, discriminant concerns are found, as the AVE of one or both factors is greater than the squared correlations between these factors.

Figure 4.1: Amos output for the Standardised Factor Loading Estimates of the EUCS Measurement Model of the Agresso system
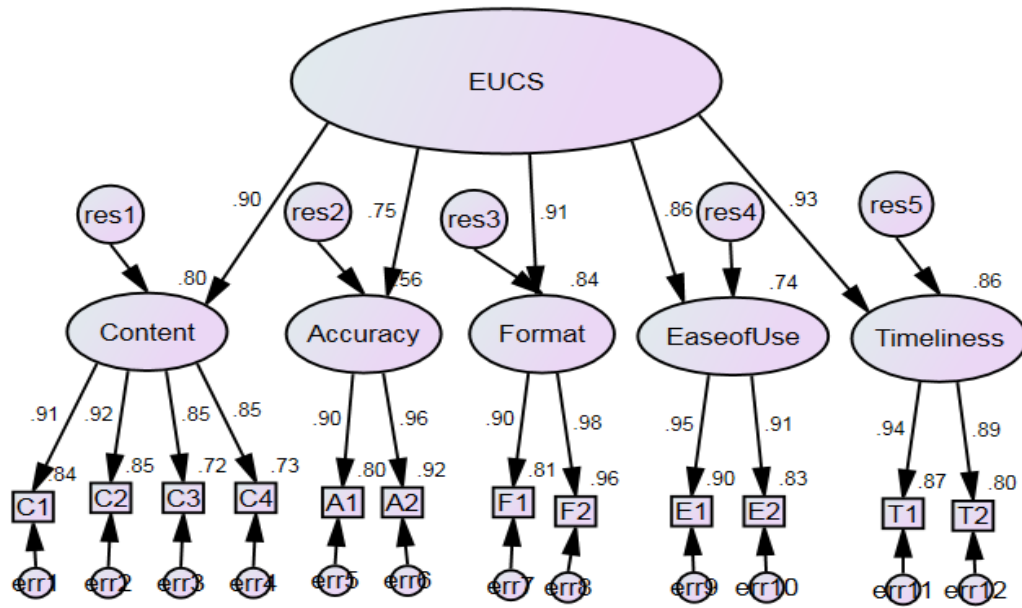
Table 4.7: Selected AMOS output, Maximum Likelihood Factor Loading Estimates 'Regression Weights' of the EUCS Measurement Model of the Agresso system

			Estimate	S.E.	C.R.	P	Label
Content	<---	EUCS	.909	.105	8.659	***	
Accuracy	<---	EUCS	.985	.127	7.733	***	
Format	<---	EUCS	1.135	.105	10.786	***	
EaseofUse	<---	EUCS	.926	.107	8.684	***	
Timeliness	<---	EUCS	1.158	.123	9.416	***	
C4	<---	Content	1.000				
C3	<---	Content	1.049	.100	10.492	***	
C2	<---	Content	1.154	.095	12.127	***	
C1	<---	Content	1.094	.091	11.991	***	
A2	<---	Accuracy	1.000				
A1	<---	Accuracy	.881	.074	11.899	***	
F2	<---	Format	1.000				
F1	<---	Format	.838	.053	15.914	***	
E2	<---	EaseofUse	1.000				
E1	<---	EaseofUse	1.056	.077	13.747	***	
T2	<---	Timeliness	1.000				
T1	<---	Timeliness	1.000	.075	13.300	***	

Table 4.8: Completely Standardised Factor Loadings, Variance Extracted, and Reliability Estimates of the EUCS Measurement Model of the Agresso system

	EUCS	Content	Accuracy	Format	EaseofUse	Timeliness
Content	.896					
Accuracy	.752					
Format	.915					
EaseofUse	.860					
Timeliness	.925					
C4		.852				
C3		.850				
C2		.919				
C1		.914				
A2			.958			
A1			.897			
F2				.981		
F1				.901		
E2					.909	
E1					.947	
T2						.893
T1						.935
Variance Extracted*	**75.98 %**	**78.23 %**	**86.05 %**	**88.7 %**	**86.15 %**	**83.55 %**
Construct Reliability**	**0.92**	**0.90**	**0.88**	**0.92**	**0.90**	**0.84**

*VE=$\frac{\sum_{i=1}^{n} \lambda_i^2}{n}$ computed using the average squared standardised factor loading (squared multiple correlation).

**CR $= \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)}$

Table 4.9: Amos output for the Construct Correlation Matrix (standardised) of the EUCS Measurement Model of the Agresso System

Constructs	Content	Accuracy	Format	Ease of Use	Timeliness
Content	1				
Accuracy	.716	1			
Format	.807	.631	1		
Ease of Use	.728	.545	.875	1	
Timeliness	.858	.806	.807	.763	1

Table 4.10: Squared Correlation Estimates and AVE of the EUCS Measurement Model of the Agresso system

Constructs	AVE	Content	Accuracy	Format	Ease of Use	Timeliness
Content	. 782	1				
Accuracy	. 861	.513	1			
Format	. 887	. 651	.398	1		
Ease of Use	. 862	.530	.297	.766	1	
Timeliness	. 836	.736	.650	.651	.582	1

4.5.2   Full Studies

Within the context of e-government IS, the adoption and satisfaction of e-government IS by end-users is reinforced by fulfilling end users' needs as postulated by Social Exchange Theory (SET), in contrast to the IS end users in the organisational context that reinforces the need to adopt organisational IS to achieve 'use-performance' rewards (Davis, 1989).

In this context of e-government, IS end-users are placed outside the organisational boundaries, and communicate and interact across cyberspace. In contrast, are the internal IS end users, who are placed inside the organisational boundaries, are familiar with organisational processes, have access to IS support, are provided with required IS training, and are surrounded by colleagues to ask for support or help. With e-government, IS end users or the public use the system mandatory or voluntarily to complete their personal responsibilities, which contrasts to end users who have mandatory use of IS in places of work, who use IS to achieve organisational objectives, but have access to IS support and help. Full studies of this research are summarised in Table 4.11.

Table 4.11: Investigated IS as main studies

The Organisation	IS Profile	Role of subjects with IS	Nature of the System	Targeted IS End Users	Data Collection
Transport for London (TFL), London, UK	Oyster System	IS end users as customers (i.e. Oyster card users)	Public Transportation System (As ticketing payment system)	End users with IS mandatory use[1].	On-Line Based Survey
					Social Media (Twitter)
Ministry of Higher Education, Saudi Arabia	Ambassador System (Students Portal)	IS end users as students	Scholarship Students System (As digitalised requests system)	Students as IS end users with IS mandatory use, but use it occasionally as needed to place requests.	On-Line Based Survey
					Social Media (Twitter)

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[1] Oyster system is mandatory for users, yet end users have the option to buy their tickets from the tickets office. Using Oyster cards for public transportation of buses is mandatory.

4.5.3 Data Collection

The aim of this research is to investigate the feasibility of using social media to measure the effectiveness of IS in terms of IS end users' satisfaction as a surrogate for IS effectiveness. Thus, social media data are collected, and compared and contrasted with traditional methods of measuring IS satisfaction that usually takes the form of questionnaire-based surveys. Based on these considerations, two data collection methods are employed in order to allow the findings of each one of these employed methods to be compared and contrasted. The End-User Computing Satisfaction (EUCS) instrument is first used, which is an online questionnaire-based survey that was identified when reviewing the literature in chapter two. Then, social media data are used in the form of end users' Tweets using Twitter to capture IS end users' perceptions of IS.

Each of these research methods contains implicit or explicit assumptions about the nature of reality and knowledge, and captures particular aspects of reality differently (Mingers, 2001). Combining them is encouraged and supported, as it contributes to producing a richer understanding and better insights into research phenomena (Venkatesh, Brown & Bala, 2013; Weber, 2004).

With regard to the sampling from which data will be collected and analysed, theoretical sampling is adopted. Theoretical sampling is defined as 'a means ''whereby the analyst decides on analytic grounds what data to collect next and where to find them.'' ' (Strauss, 1987). Thus, the researcher decides what data are needed and how this can be collected based on the theoretical purpose and contribution the researcher aims to achieve.

Based on adopting theoretical sampling, the researcher identifies a particular e-government IS that is used by the public. Also, identified e-government systems need to be in a mature stage, as advised by Gupta and Jana (2003), in order to evaluate e-government IS effectiveness adequately.

4.5.3.1 Questionnaire-Based Online Survey Data Collection

In order to measure IS end users' satisfaction, data are collected using the End-User Computing Satisfaction (EUCS) instrument developed by Doll and Torkzadeh (1988). The EUCS instrument is identified as a validated and reliable instrument in the literature review (see Chapter 2). The EUCS instrument has a 12 item-scale using a five-point Likert-type scale covering five IS dimensions: content, accuracy, format, ease of use and timeliness (see Figure 2.1). The five-point Likert-type scale is as follows, 1= almost never, 2=some of the time, 3=about half of the time, 4=most of the time, 5=almost always.

4.5.3.2 Twitter Data Collection

Twitter is one of the social web-based applications based on Web 2.0 technology that facilitates user-generated content. Twitter is 'a real-time information network powered by people all around the world that lets users share and discover what is happening now' (Twitter, 2013). It connects its users and keeps them updated by allowing them to post short text entries up to 140 characters long that can include photos, videos or conversations called 'Tweets' (Twitter, 2013).

Contextual Twitter data is collected using specific software with the motive to use it to support the research methodology. Twitter data are collected by using a specific hashtag in order to ensure collected data is organised around and related to the research issue. Research methods for collecting data usually focus on identifying appropriate research participants, typically in the form of identifying particular groups of participants or a representative sample of population. Using social media with the focus on Twitter enables data collection from a wider range of participants in a particular context without any prior identification, and produces a comprehensive picture and understanding of the issue under investigation and how it is perceived by participants. Instead of identifying research participants as a priority, end users of e-government that use Twitter have the opportunity to contribute their perceptions and experiences of e-government, which allows the researcher to reach more participants and have a wider understanding of the issue under investigation. Textual data

generated by using Twitter in the forms of social interaction and communications are used as a primary data source.

Using hashtag sampling as a theoretical sampling technique ensures that collected data are relevant to the research issue. It is also important to note that such an approach to data collection implies that collected data is limited to social media users, in particular to the participants of a particular hashtag on Twitter. The Figure below, Figure 4.2 clarifies the age groups of Twitter users.

Figure 4.2: Active Users of Twitter Around World, by Age, Adopted from GlobalWebIndex (2014)
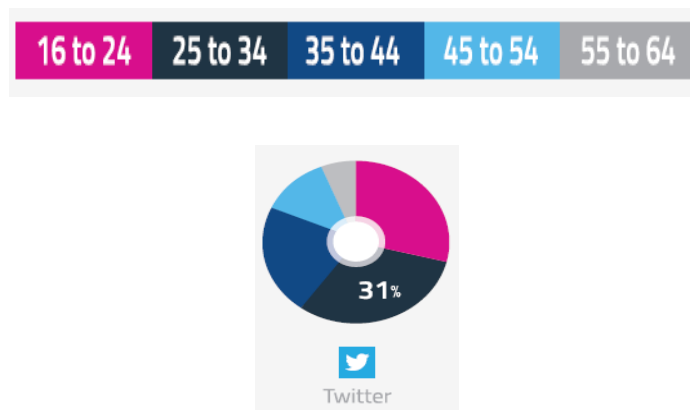
4.5.4   Data Analysis

This section discusses analytical approaches that are applied to analysing collected quantitative and qualitative data. After analysing collected data by adopting two analytical approaches and procedures, the researcher compares and synthesises the findings with the goal of devising a conceptual framework or to revise and challenge the theoretical measurement of EUCS based on digitalised social exchanges on Twitter.

4.5.4.1   Analytical Approaches of Questionnaire-Based Surveys

Data collected by using a questionnaire-based online survey adopted from Doll and Torkzadeh (1988) is analysed 'statistically' using Confirmatory Factor Analysis (CFA). The employed instrument is identified as a standard, validated and reliable measure of IS end users' satisfaction in the literature, and detailed in chapter 2. Thus, by applying CFA, the EUCS is tested in the context of e-government IS with end users placed beyond the organisational context and using the IS to enhance their productivity in completing their own responsibilities. In this context, the adoption and satisfaction of

e-government IS by end users is reinforced by fulfilling end users needs and self-responsibilities, in contrast to the IS end users in the organisational context that adopt organisational IS to achieve 'use-performance' rewards (Davis, 1989).

4.5.4.2   Analytical Approaches of Social Media Data

Figure 4.3: Three Analytical Approaches, applied to Twitter Social Media Data

Deductive Approach   Key-word Searching   Inductive Approach
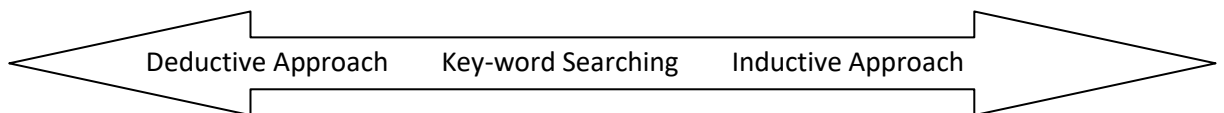
In order to analyse empirical data to their full potential, three analytical approaches are applied (see Figure 4.3). The analytic process of qualitative research is criticised for failing to analyse qualitative data to its full potential, because of the subjectivity involved in designing the analytic process and the dominance of quantitative research over qualitative research (Gephart, 2004). Thus, three modes of analysis that can be viewed as a continuum is applied to empirical data of social media from 'Twitter'. At one end is the 'Deductive Approach' which utilises a pre-defined identified measure of EUCS. At the other end of the continuum lies the 'Inductive Approach' which seeks to examine and understand the social interactions from the gathered data and to use this understanding to extract constructs and variables that influence end users' perceptions of specific e-government IS, and to use them to form a measure. Between these two extremes lies the method of key-word analysis, which focuses on investigating how particular words (adjectives) are used.

The analytical approaches of qualitative empirical data collected using social media are now addressed in greater detail. The inductive and deductive approaches contribute to presenting knowledge differently (Blaikie, 2007). Denzin and Lincoln (2013) emphasise that 'qualitative researchers deploy a wide-range of interconnected interpretive methods, always seeking better ways to make more understandable the worlds of experience that have been studied'. The motive of combining these different analytical

approaches is to allow the researcher to understand collected data better, and to look at it from different perspectives in order to comprehensively construct knowledge.

4.5.4.2.1 Deductive Approach

In this approach, the researcher is an expert and is influenced by the existing body of knowledge, and adopts a positivist perspective of qualitative data. The IS end users' satisfaction instrument is used from the literature and is applied to the qualitative collected data.

The positivist approach is an epistemological position and is based on the assumption that the social world is explained by observing and searching for reality, regularities and relationships that need to be discovered (Burrell & Morgan, 1979), and only knowledge that can be perceived and confirmed by the senses is considered as true knowledge (Bryman, 2012). The underlying assumption of the positivist perspective is that there is an independent and external reality that can be discovered by the researcher. Bryman and Bell (2011) explains that 'Positivism is an epistemological position that advocates the application of the methods of the natural sciences to the study of social reality and beyond'.

The positivist perspective is applied by quantifying collected qualitative data using structured content coding. Starting the analysis process by adopting a deductive approach has advantages, as this allows the researcher to relate the research to the literature and use the identified theory/framework as an initial analytical framework comprised of a number of variables and constructs to explore collected data based on them (Saunders, Lewis & Thornhill, 2002), which might influence and inform the development of the framework in subsequent analysis.

As the analysis commences with a reliable and validated measure identified during the literature review in chapter two, the focus is on investigating the feasibility of that measure. The focus is to determine if the identified measure, developed in 1988 in the context of mandatory system use in workplace environments and considered as a standard IS end users' satisfaction measure, is capable of capturing all variables and constructs affecting end users' satisfaction with an identified e-government IS.

Consistent with the assumptions of content analysis, the extent of the manifest of previously identified categories in the text is taken as an indicator of the association between them (Weber, 1990).

Content analysis is defined as 'the systematic, objective, quantitative analysis of message characteristics' (Neuendorf, 2002). The researcher remains objective, follows clear procedures and applies a priori defined categories. The researcher is also systematic, being consistent with the process of category allocation based on a prior identified categories (Bryman, 2012). The aim of conducting content analysis is to produce a numerical summary of collected qualitative data, and Neuendorf (2002) describes this as 'a content analysis has as its goal a numerically based summary of a chosen message set. It is neither a gestalt impression nor a fully detailed description of a message or message set'. Krippendorff (2013) extends the definition of content analysis to include the importance of the researcher's role and analytical context into the interpretation process, and describes this as 'there is nothing inherent in a text; the meaning of a text are always brought to it by someone. Ordinary readers and content analyst merely read differently'.

Social media data collected using Twitter, in the form of 'Tweets' by IS end users constitute the empirical materials and textual data for this research. Each 'tweet' constitutes a unit for the analysis process. By applying structured content analysis, the researcher remains objective and systematic in quantifying and classifying the textual units of collected 'tweets' based on its type of best fit into a priori defined categories in terms of IS end users' satisfaction components (Doll & Torkzadeh, 1988), see Figure 4.4. Satisfaction components include content, accuracy, format, ease of use and timeliness. The focus is on the type of each 'tweet', but not on the meaning of the 'tweet'. This approach of content analysis is associated with reliability in which replication is possible and identified variables are validated, and allows the researcher to draw valid inferences from text. After the content is analysed, the researcher draws inferences based on identified contexts, and interprets and relates these findings to the identified EUCS instrument. By considering the context of IS evaluation, in particular IS end users' satisfaction, the researcher interprets the quantified findings of

content analysis and makes sense of these data by placing them into context. Counted collected data alone is meaningless unless it is placed in its context, allows its meaning to emerge, and allows the researcher to relate these to the research questions. Adopting content analysis allows the researcher to produce reliable and valid inferences, and Krippendorff (2013) emphasises 'content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use '.

Also, content analysis allows the researcher to link and relate collected data to IS end users' computing satisfaction (EUCS) to investigate the relationship between them. Neuendorf (2002) suggests that comparisons are possible, because 'content analysis as a research method is consistent with the goals and standards of survey research. In a content analysis, an attempt is made to measure all variables as they naturally or normally occur'.

The motive of this research is to gauge the effectiveness of social media data in the context of IS evaluation, and by adopting and applying content analysis the researcher is informed about the content of social media data, produces valid inferences from these data in regards to evaluating the effectiveness of e-government IS, and allows the researcher to draw valid inferences from text (Weber, 1990).

Figure 4.4: Content Coding Categories: Prior-Identified IS End-User Satisfaction (EUCS) instrument, Adopted from Doll & Torkzadeh (1988)
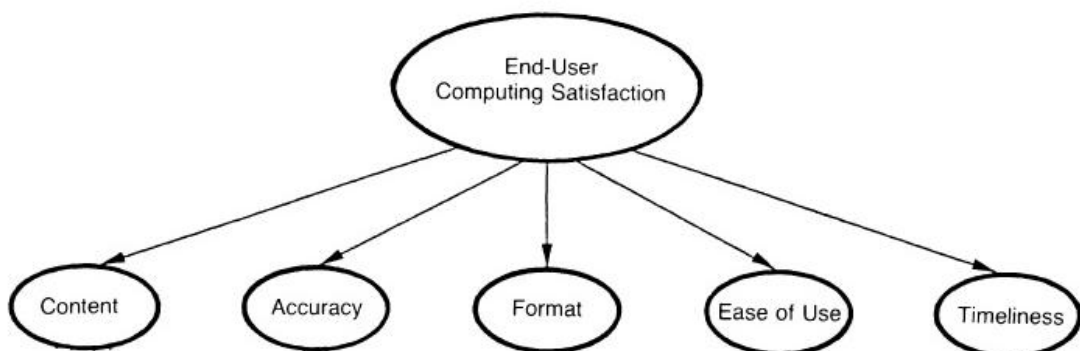
4.5.4.2.2 Key-word Searching

The work of Bailey and Pearson (1983) is described as 'the basic source for constructing new information systems user-satisfaction questionnaires' (Zviran & Erlich, 2003). Bailey and Pearson (1983) use adjectives to measure IS end users' satisfaction, and argue that 'since people use adjectives to explain their perceptions of things, adjectives can be used to measure those perceptions'. Therefore, the adjectives that they developed are used as 'key-word' searches to investigate how they are used in the context of social media data by IS end users to express their perceptions in regards to IS evaluation. Table 4.12, is the 'Key-word' list that is used for key-word searching analysis.

Table 4.12: Adjectives Pairs, adopted from Bailey & Pearson (1983) to be used for key-word searching

Adjectives Pairs		
strong vs. Weak	user-oriented vs. self-centered	complete vs. incomplete
consistent vs. inconsistent	cooperative vs. belligerent	easy-to-use vs. hard-to-use
good vs. bad	courteous vs. discourteous	concise vs. redundant
significant vs. insignificant	positive vs. negative	necessary vs. unnecessary
productive vs. destructive	regular vs. irregular	useful vs. useless
rational vs. emotional	acceptable vs. unacceptable	relevant vs. irrelevant
low vs. high	short vs. long	secure vs. insecure
harmonious vs. dissonant	dependable vs. undependable	available vs. unavailable
fair vs. unfair	fast vs. slow	pleased vs. displeased
just vs. unjust	timely vs. untimely	optimistic vs. pessimistic
precise vs. vague	simple vs. complex	easy vs. hard
reasonable vs. unreasonable	flexible vs. rigid	encouraged vs. repelled
known vs. unknown	skilled vs. bungling	involved vs. uninvolved
cooperative vs. uncooperative	eager vs. indifferent	precise vs. vague
candid vs. deceitful	clear vs. hazy	liberating vs. inhibiting
meaningful vs. meaningless	efficient vs. inefficient	valuable vs. worthless
current vs. obsolete	organized vs. disorganized	appropriate vs. inappropriate
sufficient vs. insufficient	easy vs. difficult	progressive vs. regressive
superior vs. inferior	accurate vs. inaccurate	flexible vs. rigid
readable vs. unreadable	punctual vs. tardy	versatile vs. limited
useful vs. useless	definite vs. uncertain	successful vs. Unsuccessful
powerful vs. weak	adequate vs. Inadequate	

4.5.4.2.3 Inductive Approach

In this approach, the researcher is a learner engaged in a learning process carrying out constructive interpretive practices on collected qualitative data in order to learn IS end users' perceptions and conceptualisations of the IS system under investigation.

Interpretive is an epistemological position and is based on the assumption that social reality is subjective based on individual perceptions and beliefs (Collis & Hussey, 2009). Lee (1991) defines the term 'subjective' as 'the meaning held by the observed human subject' that explains how they perceive the world and create and attach meaning to it, and it is not the same as 'opinion' or 'bias' (Lee, 1991). The motive behind applying an interpretive perspective on qualitative collected data is to gain in-depth and rich insights into the issue under investigation. The analysis process that reflects the interpretive paradigm might reveal new and better insights into collected data: thus themes, variables or constructs might be uncovered. Constructs that influence IS end users' satisfaction of e-government is extracted from social interactions and exchanges on Twitter. An interpretive perspective allows the researcher to explore collected data inductively that allows patterns, variables and constructs to emerge (Collis & Hussey, 2009) based on social interactions captured by Twitter.

Collected data is explored and analysed similar to a grounded theory approach without any prior identified theory or framework. The focus is on exploring what constructs or patterns might emerge by analysing participants' interactions and viewpoints using social media. The findings constitute a formulation of constructs and variables that are used as a base for measuring IS end users' satisfaction with e-government IS.

Interpretive analysis is typically applied to qualitative data in the form of written communications generated by using common research methods, such as interviews and observations. This research applies interpretive analysis for social media data, and in particular Twitter. Data are collected in the form of Tweets in order to capture social interactions and exchanges, and capture participants' perceptions and views in regard to the identified IS under investigation. Applying an interpretive perspective allows analysis of the meaning of the 'tweet', instead of quantifying 'tweet' type. Thus, themes, constructs and variables are uncovered and extracted in an inductive approach to understand the dimensions of satisfaction of end users of IS. The analysis process incorporates the context of identified e-government IS, and in the light of that the meaning of data are justified and validated.

This allows the researcher to measure satisfaction based on variables derived from a bottom-up approach in which variables are identified and extracted from social interactions of participants, in contrast to identified and validated scales in the literature of IS, which are usually developed by using variables derived from a top-down approach.

Identification of categories emerges inductively from social interactions in a natural setting and are captured by using social media, which allows the researcher to have better insights into the social world and how end users perceive the system under investigation. Therefore, knowledge is constructed by carrying out successive iterations of investigations and interpretations. The analysis process is adapted from that developed by Trauth and Jessup (2000), who derive this process from various interpretive traditions, including ethnography, hermeneutics and grounded theory, and describing this as 'our development of our interpretation, involving ''breakdowns'' and ''absurdities'' and their resolution'.

The adopted interpretive analysis starts with open coding, which is used to identify themes and categories in a grounded approach, starting with identifying the initial coding of 'tweets' and continually examining and comparing new emerging codes with previous codes until a final set of codes is identified. This hermeneutic circular process of going back and forth between 'tweets' while conducting the coding process aims to evolve interpretation by understanding the parts of the whole, and the whole in respect of the parts, in order to further understanding of the collected text 'tweets' and identify meaning and constructs by carrying iterative and cross examinations of 'tweets' and to adjust the code accordingly.

Trauth and Jessup (2000) in their interpretive process segmented their text into a 'strip' to be analysed and examined. During the coding process, each 'strip' is examined and coded in the light of previous identified codes, with adjustments being made accordingly. Trauth and Jessup (2000) adopted the language of Agar (1986) of 'breakdown' and 'absurdities' and applied this approach of breakdown resolution, in which an 'anomaly strip' that neither fits into identified codes nor can be used to produce new code leads the researcher to 'breakdowns' of identified categories into

subcategories. Each 'breakdown' needs to be resolved by revising identified code 'categories' and adjusting accordingly in order to accommodate any anomaly strip found. This requires the researcher to revise identified categories with emerging subcategories and going back to revisit coded strips to make further adjustments in the light of modified codes.

In this research, each 'tweet' is considered as a 'strip' to be coded and examined. Individual 'tweets' are short enough by their nature, with a maximum length of 140 characters, and do not need to be segmented. The researcher needs to examine each 'tweet' individually and carry out the coding process inductively and iteratively in light of identified categories. Any anomaly 'tweets' are resolved by revising and breaking down previous categories. Thus the researcher is involved in a hermeneutic circle of going back to coded strips and making needed adjustments as understanding evolves with each iteration by relating individual meanings of tweets to the whole. Such an interpretive process requires the researcher to use iterative practices of coding, revising and adjusting accordingly. Identified categories should have two aspects, and Day (1993 in Saunders, Lewis and Thornhill, 2002) argues that 'Categories must have two aspects, an internal aspect - they must be meaningful in relation to the data - and an external aspect - they must be meaningful in relation to the other categories'.

The aim of such an approach is to understand the meaning of collected data in the form of 'tweets' in order to investigate its effectiveness in the context of IS evaluation processes. Uncovering the meaning of collected data means uncovering IS end-users perceptions and behaviours and identifying factors and constructs that have influences on their satisfaction in using IS. Such an approach allows the researcher to ground identified factors and constructs based on collected data based on social reality, which leads to a better fit (Saunders, Lewis & Thornhill, 2002).

4.6 Ethical Considerations of Social Media Data

Research ethics are defined as 'the appropriateness of your behaviour in relation to the rights of those who become the subject of your work, or affected by it' (Saunders, Lewis & Thornhill, 2002). In any social enquiry, there is researcher involvement and

interaction with human subjects in the social and real world. Thus a number of ethical issues arise that need to be considered. The researcher needs to consider ethical issues during all stages of research, including research design, conducting the research, up to the final stages of presentation and evaluation of findings, as implied ethical issues influence the analysis process and research findings (Miles, Huberman & Saldana, 2014).

Ethical issues are an integral part in any social enquiry and need to be considered and respected. In this research, there is an additional ethical issue associated with using social media data, in particular 'Twitter' that constitutes the empirical data for this research. Participants' privacy rights and all issues related to that such as their confidentiality, their informed consent to participate or not, and their right to know the purpose of the study and the purpose of their participation need to be addressed. The focus of this research is on collecting and analysing social media data, in the form of 'Tweets' in order to achieve the aim of the research, which is to evaluate IS end users' satisfaction of a particular e-government IS under investigation. The researcher needs to collect and handle data carefully in order to comply with the ethics of conducting research, because the nature of this research depends on gathering social interactions, behaviours and exchanges of participants.

Confidentiality and anonymity are two ethical issues that need to be considered when conducting research by collecting data from cyberspace (Saunders, Lewis & Thornhill, 2002). The nature of cyberspace allows the researcher to identify participants with the potential that they can be traced and tracked, which contrasts to traditional data collection methods when participants are able to participate anonymously. Thus, the researcher needs to ensure that these ethical issues are addressed and considered in order to comply with the research ethics of participants' rights of confidentiality and anonymity. Another implication occurs when using quotations to support the validity of findings and to contribute to research transparency. Collected data is gathered using Twitter, in the form in 'tweets' that means using quotations of collected tweets will result in the possibility that participants might be traced and identified, because data are already available online. Any quotations used can be traced by copying and pasting

into a search engine, but as theses data have limited lifespans, these data might not be available after a period of time. The issue of using direct quotations to support research validity and transparency is considered in the Ambassador study, as participants were asked by the researcher to participate using the designated hashtag of Twitter. So the meaning of a particular quotation might be extracted and used to support research validity and transparency rather than using a direct quotation. While for the Oyster study, direct quotations are used as data is considered to be organic data on a public space of social media of Twitter, without the researcher's intervention.

Another ethical issue associated with social media data is whether data might be considered as public or personal data. Personal data are defined as 'any information relating to identified or identifiable persons' (Saunders, Lewis & Thornhill, 2002). Based on this definition, collected data are treated as personal, because of the possibility that it might be traced and linked to a particular participant by using a search engine. It is important to consider this issue to comply with data protection of personal data. Thus, the researcher collects social media data that is publicly is available, but treats the data as personal data to address confidentiality and privacy issues.

Objectivity is another ethical issue that needs to be considered during the analysis process and when writing research findings (Saunders, Lewis & Thornhill, 2002). Objectivity ensures that the interpretation of collected data is accurate, valid and not biased by the researcher's point of view, which strongly influences research findings.

Social media data in this research constitutes the empirical data. Thus it is important to consider the ethical issues associated with using social media data. These issues include participants' permissions to collect and analyse the data that they post using social media and permissions to capture their communications and interactions on social media.

Twitter users acknowledge that by using Twitter, social interactions and content they post are publicly viewed by default unless they change the settings to be private

(Twitter, 2013). Under the terms of service of Twitter, users give the right to Twitter to capture their data as stated explicitly in the terms of service of Twitter, as follows:

> 'By submitting, posting or displaying Content on or through the Services, you grant us (Twitter) a worldwide, non-exclusive, royalty-free license (with the right to sublicense) to use, copy, reproduce, process, adapt, modify, publish, transmit, display and distribute such Content in any and all media or distribution methods (now known or later developed).' (Twitter 'Terms of Service', 2013).

Social media data are collected by using software that searches and retrieves 'Tweets' by accessing the Twitter API (Application Programming Interface[2]). Neither users nor their personal profiles are traced or analysed. Thus collected data are analysed anonymously. Only data that are publicly viewed are collected. To comply with the ethical issue of collecting data, there is a general statement in the online survey to inform participants that both the data from the survey and a particular 'hashtag' is collected and analysed for research purposes that aims to improve the process of information systems development, and to increase the level of end users' satisfaction with using the system. Using a general statement, end users are assured that their participation is important to enhance their experience with a particular e-government system and that participation contributes to improvements to the system. Obtaining informed consent from all participants would be impossible in the context of using social media in general and from Twitter in particular, because of the difficulty to access and communicate with each participant individually. Also, there is a restriction when using Twitter: you cannot communicate privately with a particular user unless both follow each other.

The concept of informed consent in social media research is criticised by Nunan and Yenicioglu (2013) as being inappropriate, and they clarify the reason as 'informed consent carries assumptions about the nature of privacy that are not consistent with the way that consumers behave in an online environment'. Alternatively, they propose the concept of 'uninformed consent' in which consent gained by the social networks

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[2] 'The set of streaming APIs offered by Twitter give developers low latency access to Twitter's global stream of Tweet data'. (Accessed on 22nd March 2014 https://dev.twitter.com/docs/api/streaming).

through its terms of service, and the concept of 'participatory consent' in which consent is gained as an ongoing process between the researcher and participations.

The complexities and ethical issues associated with conducting research by using cyberspace are discussed by McKee and Porter (2009), who argue that ethical considerations when using cyberspace vary depending on the research itself, and whether it is text-based or person-based.

There is debate about how to distinguish between public and private information on cyberspace: should the information be considered public as it is accessible online and thus made available for public use without any need to get informed consent, or should the data be considered as private which restricts its use and imposes the need to acquire informed consent (McKee & Porter, 2009). McKee and Porter (2009) suggest that the issue of whether informed consent is needed or not is related to participants and to identify variables that influence such a decision based on topic sensitivity, subject vulnerability, degree of interaction and the type of information that is public or private. The identified variables are subjective in nature and affected by cultural and contextual factors, so the researcher needs to consider these factors to ensure the research is conducted ethically.

The following Table summarises the key ethical issues that the researcher believes need to be considered in this research, see Table 4.13

Table 4.13: Ethical Issue Arise when Using Social Media Data of Twitter

The Ethical Issue	The Nature of the Ethical Issue
Informed Consent	The type of information needed for this research is text-based information not person based. In other words, the focus is on the content and the meaning of collected 'Tweets' not on the participants. Thus, there is no need to get informed consent (McKee & Porter, 2009). Also, consent is inferred implicitly as consent is gained by the social networks through their terms of service, which provide data to be collected.
Anonymity	Because of the nature of social media of sharing and exchanging on digitalised platforms using 'user names', anonymity of individual's whose data collected using Twitter seems difficult or impossible to be assured. However, the researcher analyses data anonymously as the research focus is on the content not on individual participants.
Confidentiality	Collected data is treated with confidentiality. During the analysis process no individual participant is identified or traced.
Personal Data	Personal data defined is *'any information relating to identified or identifiable persons '* (Saunders, Lewis & Thornhill, 2002), and based on this definition collected data is considered as personal because of the possibility to trace and identify a particular user by using its 'Tweet'. Yet, as 'Tweets' have a limited lifespan, this would not be an issue in this research as 'Tweets' would not be exist after a period of time. Thus, for the purpose of protecting the privacy of data, the identifiable user name of participants is not used or disclosed.
Privacy	The privacy of collected data is respected and protected, as there is no disclosure in regard to any part of collected data or users' names. Collected data are employed to achieve the aim of the research which focuses on analysing and understanding captured social reality and to extract variables and constructs that influence users' satisfaction with a particular e-government IS.

4.7 Methodological Rigour

The feature of qualitative research is that it conveys the phenomena under investigation and conceptualises the social reality to the reader through the researcher's interpretation of the investigated social world underlying by socially constructed knowledge (Bansal & Corley, 2011). This includes a high level of transparency in which the researcher is involved, providing better insight into the issue under investigation through the process of intense description of what has been done and how it has been done. Such an approach of intense description requires the researcher to draw a coherent logic and connection between research findings and theoretical contributions and how it is derived from the process of data collection and analysis, in order to answer identified research questions. This kind of transparency allow the researcher to have better insights and understanding of the conducted research starting with the process of collecting data until the final stage of making a theoretical contribution through rich understanding, detailed descriptions, clear presentation of findings, data collection and analysis, which establishes

methodological rigour by creating a sense of authenticity of the research (Bansal & Corley, 2011).

Reliability is established by providing rich detailed descriptions of data collection and analysis in order to ensure that research is carried out systematically and rigorously. Such descriptions also allow the reader to have better insights into research procedures.

Despite the use of a single social media source, 'Twitter', the generalisability of research findings is not affected, because Walsham (2006) argues that 'generalisations can take the form of concepts, theories, specific implications or rich insights'.

In undertaking qualitative research, and in particular research with 'interpretive' underlying philosophical assumptions, as adopted by the researcher in this research, there is no 'right answer' to the way of crafting and evaluating qualitative research. Such an approach enables innovation and creativity in which the researcher has the opportunity to craft the research and employ various available resources that are appropriate in order to construct knowledge without being restricted or limited. At the same time, such an approach is challenging in term of evaluating the 'truth' and 'appropriateness' of produced knowledge, because the researcher is the instrument of observation and analysis. To address this issue, evaluation criteria is identified and applied to establish rigour in the research findings.

There are three criteria identified, and one is chosen and applied to evaluate interpretive findings. These criteria are first, the principle of conducting and evaluating interpretive research by Klien and Myers (1999); second, three criteria of authenticity, plausibility and criticality by Golden-Biddle and Locke (1993); and third, four criteria of triangulation, authenticity, breakdown resolution and replication that is applied by Trauth and Jessup (2000).

To carry out interpretive research rigorously, formative and summative validity needs to be established (Lee & Hubona, 2009). Lee and Hubona (2009) classify the evaluation criteria by Klien and Myers (1999) and Trauth and Jessup (2000) to include both formative and summative validity criteria. Thus, criteria of triangulation, authenticity,

breakdown resolution and replication applied by Trauth and Jessup (2000) is chosen for this research.

Initial assumptions of this research study were that the Ambassador and Oyster case studies would be conducted with similar methods. However, over time the researcher found that the process used for each study needed to be slightly different, as a result of the nature of each system and its end-user groups. This variation in data collection influenced the resulting data, as well as how it was analysed and evaluated. Thus, the requirement of establishing rigour in the research findings required that the criteria applied to each study had slight differences in its application.

For the Ambassador Study, rigour in the interpretive findings is established by the analysis approach. To evaluative the findings and whether research rigour is established, four criteria are used: triangulation, authenticity, breakdown resolution and replication, which are chosen and applied by Trauth and Jessup (2000). The researcher triangulated by applying various analysis techniques in order to corroborate the findings, and applied content analysis, hermeneutic circle and key-word searching for the same data set, which supported and reinforced the findings. Combining and applying both positivist and interpretive perspectives of the same data set supports the validity of these research findings and conclusions (Neuendorf, 2002).

Authenticity is viewed as being genuine to the research experience, as supported by Golden-Biddle and Locke (1993):

> 'The text makes appeals of authenticity on readers when two conditions are met: assurance that the researcher was there, and was genuine to the experience in writing up the account.'

The researcher conveys understanding and the process of writing interpretations of the research phenomena from the outset, which traces how understanding evolved. Hermeneutics are used to achieve this and through the use of direct translated quotations to convey the language and meanings used by IS end users. Interpretation also incorporates various perceptions of IS end users in terms of how they perceive the system. The research phenomena under investigation are conveyed with detailed

descriptions of the analysis process, and how understanding evolved from initial understanding to the findings. The researcher interacts with IS end users by using a designated Twitter hashtag (as presented in the discussion chapter). Interactions between the researcher and participants provide further corroborated evidence of authenticity.

Breakdown resolution is at the core of the hermeneutic approach of analysis, in which data are analysed through an iterative process of breakdown resolution. Such an iterative approach ensures that data are analysed systematically and rigorously (Saunders, Lewis & Thornhill, 2002). The hermeneutic circular process of continuous examination through understanding the parts in the light of the whole, and vice versa, allow the development of a coherent understanding of the research issue under investigation, and allows for new interpretations to emerge.

Replication is established by incorporating the qualitative data in comments that were received as part of the research survey. These comments are considered as a 'replication' of the initial data set, and this approach allows the researcher to examine and evaluate the interpretation and evolve understanding, and provides corroborated evidence for the findings.

For the Oyster study, because of the volume of data as a result of harvesting social media of Twitter data automatically, rigour was established by applying the same evaluation criteria of the Ambassador study, but in a slightly different way.

Triangulation was established in almost the same way in the Ambassador study, by using triangulation in term of various analysis techniques of content analysis, open coding, and key-word searching on the same data set, all of which supported and reinforced the findings.

Authenticity is established in almost the same way in the Ambassador study, with two differences. First, evolved understanding and interpretations of the research phenomena are conveyed by using open coding instead of using a hermeneutic circle. Second, the researcher was not able to interact with IS end users as a result of harvesting data rather than using a designated Twitter hashtag.

The evaluative criteria of breakdown resolution is applied in terms of the Fundamental Principle of the Hermeneutic Circle as conceptualised by Klien and Myers (1999). This evaluative criterion involves understanding the parts and the whole in relation to each other, in order for coherent understanding and new interpretations to emerge.

Replication is established by examining various archives of data, and considered to be a 'replication' of the initial data set. Examining and evaluating the findings from the initial data set through cross-validation across archives of data corroborated the findings.

4.8 Research Relevance

In general, each research endeavour aims to produce knowledge, make an impact and create value to further understanding of the research field. IS research has contributed significantly to establish rigour and quality in the field and develop cumulative knowledge of theoretical contributions, but IS research is been criticised for its lack of relevance to practice (Benbasat & Zmud, 1999; Lee, 1999; Lyytinen, 1999; Davenport & Markus, 1999). Therefore, being able to communicate research findings in order to influence IS practices and enhance IS adoption effectively is a very important objective. This research focuses on investigating the measurement of the effectiveness of e-government IS, because it provides necessary data for cost-benefit analysis of governmental investment in technology and the value it creates, which allows decision makers to judge whether required and specified needs are met successfully. Thus, having an appropriate measure is critical to evaluate adopted IS, because an inappropriate measure could be worse than having no measure, which leads to ineffective data for decision makers (Benbasat & Zmud, 1999). This research addresses an issue of concern to many public sector organisations all around the world that have adopted e-government IS. Most governments around the world have continuously adopted e-government (United Nation E-Government Survey, 2012), and part of this endeavour is the measurement process of the effectiveness of this investment.

Another impact of this research is to ground the use of social media by governments, including public sector organisations, on a theoretical basis using Social Exchange

Theory (SET). This contribution should help governments to understand and predict how social media could play an effective role in e-government endeavours, as social media has continuously and increasingly been utilised by governments as part of their e-government strategies. Kavanaugh et al. (2012) investigated the use of social media by government and reports that local government departments often use social media without knowing its cost and benefits or who their actual audience is, and neglect to consider what effect their social media communications have on the public.

Benbasat and Zmud (1999) identify four dimensions of relevance including interesting, applicable, current and accessible in order for research in IS to be related and interesting to IS professionals and to have an influence and impact on IS practices.

4.9   Summary

This chapter presents the research methodology, including philosophical assumptions and research methods. A detailed research design is presented and justified that guides this research into an empirical investigation to achieve identified research aims and objectives. This is followed by discussion of the pilot study that was conducted prior to proceeding to actual data collection, which involves the two main studies of Ambassador and Oyster. Ethical considerations of using social media data, methodological rigour, and research relevance are also discussed. A summary of data collection and the context of investigated systems for the pilot and main studies are presented in Table 4.14 and 4.15.

Table 4.14: IS studies of this research, each with different IS end users and context where the measurement theory of EUCS is applied and challenged

IS Profile	Role of subject with IS	Aspect of the Study	Illustration
Agresso Financial System	IS end users as employees with mandatory IS use.	On-Line Based Survey	Utilising the EUCS instrument, data collected over one month. Total number of participants is 870 participants. The number of responses is 105. The number of usable response is 91.
		Social Media (Twitter)	Using a specific hashtag #rhulstudy on Twitter. Total number of 3 Tweets.
Oyster Study	IS end users as 'public' with mandatory IS use.	On-Line Based Survey	Utilising EUCS instrument, data collected over eight months. The number of responses is 201. The number of usable response is 105.
		Social Media (Twitter)	Utilising Twitter, data harvested using existing tweets by using existing hashtags of Twitter and keywords. Thus, resulted in a volume of data over a million tweets
Ambassador Study	IS end users as 'students' with mandatory IS use.	On-Line Based Survey	Utilising EUCS instrument, data collected over eight months. The number of responses is 529. The number of usable response is 336.
		Social Media (Twitter)	Utilising Twitter, data collected using a designated hashtag (قيم_سفير#). '#Evaluate_Ambassador' is the English translation for the Arabic hashtag. Thus, all collected tweets are relevant and usable and resulted in collecting 297 usable tweets.

Table 4.15: Holistic Picture of Studies of this Research, Systems with different Contexts

IS	IS Context
Agresso	Financial system in work setting. Package and closed user groups. Compulsory use.
Saudi System Ambassador	A specific organisationally bound system. Unique and closed user groups. Human involvement. Compulsory use.
Oyster System	Unique and Publically accessible system. Unique and open user groups. Automation. Compulsory use.

Chapter 5: First Study: Saudi System Ambassador

This chapter presents the analysis and findings of the first main study, the Ambassador System, which begins by briefly introducing the context of the Ambassador System, the nature of its end users, data analysis and findings.

5.1   The Ministry of Higher Education in Saudi Arabia

The Ministry of Higher Education in Saudi Arabia governs and supervises the education processes in the kingdom. In order to achieve its vision, it continuously revises strategies and works on the advancement of educational outcomes, and on enhancing the processes and delivery of services to all beneficiaries. The nature of the Ministry may be characterised as having complex and wide communication processes with a centralised decision-making hub. With an increasing number of Saudi students studying abroad, the volume of data has increased and it is becoming more challenging to handle, manage and process organisational operations and communications. Thus, investment by the Ministry has expanded to adopting and transferring processes to e-government to simplify the organisational process for all beneficiaries, and to increase the efficiency of operations and communications.

The Ministry has identified it needs an integrated system that facilitates placing and following up on electronic requests and supervision of Saudi students studying abroad, and enables decision makers by giving them access to required data faster and with less effort. In 2008, it launched an electronic system, Ambassador, and has been working on developing various systems of electronic products and services to be offered by this system. It is important to mention that the total number of sponsored Saudi student studying abroad exceeds 150,000 across more than thirty countries around the World (MOHE, 2014).

The Ambassador system aims to support Saudi students studying abroad by providing electronic services characterised by high levels of speed, convenience, access and governance, in addition to achieving control, transparency and decision-making support (MOHE, 2015). The beneficiaries of the system include various departments in

the Ministry, Cultural Bureaus, Saudi students and travel agencies. The system allows all these various parties located in different physical locations around the world to communicate and work together in order to simplify organisational processes and communications.

5.2 The End-Users of the Saudi System Ambassador

End users in this context are Saudi students studying abroad sponsored by the Saudi Ministry of Higher Education (MOHE). The Ambassador system, developed and operated by the Ministry, allows Saudi students to communicate with the Ministry and Saudi Bureaux in the country they are studying in. The Ambassador provides Saudi students with electronic online services allowing them to place various types of requests, such as financial and educational requests electronically, which are later processed by the Ministry and related bureaux where students are based.

The electronic services provided by the Ambassador system are not automated services, as in the case of the Oyster Card system, which is considered in the second study of this research. This system is a specific organisationally closed system with closed user groups and compulsory use. Students are only allowed to place requests, and to follow the progress of their requests, electronically online. An important consideration in such systems is the role that human intervention plays in processing requests, and how that influences the IS end users' perceptions of their system and their level of satisfaction. A summary of collected data is presented below in Table 5.1, along with the profile of survey respondents in Table 5.2.

Table 5.1: Summary of collected data of the Saudi System Ambassador study

Research Methods	Collected Data
Online Survey	Total number of survey responses is 529, and usable responses are 336.
Social Media Data of Twitter	By using a designated hashtag (#قيم_سفير), all collected tweets are usable and result in collecting 297 usable tweets.

Table 5.2: Profile of Survey Respondents of the Saudi System Ambassador (Total Usable Responses are 336)

		Frequency (Persons)	Frequency (%)
Gender	Male	236	70.2
	Female	100	29.8
Age	Less than 20	5	1.5
	20-24	38	11.3
	25-29	92	27.4
	30-34	119	35.4
	35-39	64	19
	40-44	14	4.2
	45-49	4	1.2
	50-54	0	0
	55 or above	0	0
Educational Background	High School Cert	20	6
	Diploma	9	2.7
	Bachelor	90	26.8
	Masters	116	34.5
	Doctorate	99	29.5
	None	0	0
	Missing	2	.6
Marital Status	Single	91	27.1
	Married	237	70.5
	Widowed	1	.3
	Divorced	7	2.1
	Separated	0	0
How often do you use the Scholarship Students Portal ' Ambassador'?	Never	0	0
	Rarely	3	.9
	Occasionally	109	32.4
	Regularly	92	27.4
	Don't Know	0	0
	Whenever need it	131	39
	Missing	1	.3

5.3　Results

Data was collected over eight months, starting in September 2014 and finishing April 2015. The total survey responses are 529, and usable responses are 336. The survey link (see Appendix B) was distributed using social media including Twitter and mailing list through Saudi Society clubs in the UK, USA, Ireland, and Australia and more through emails. The social media data was collected using a specific Twitter hashtag designated for this study (#قيم_سفير) and resulted in collecting 297 usable tweets. '#Evaluate_Ambassador' is the English translation for the Arabic hashtag. The following section presented the statistical and interpretive analysis of collected data by using both survey and social media of Twitter.

The sample descriptive statistics for Ambassador EUCS are presented in Table 5.3. This presents a holistic picture of the collected responses by summarising and describing data. The profile of survey respondents is presented in Table 5.2, which enables the characteristics of responses to be described.

Table 5.3: Sample Descriptive Statistics for Saudi System Ambassador EUCS (End-User Computing Satisfaction)

EUCS Items	Mean	Standard Deviation
C1: Does the system provide the precise information you need?	3.24	1.110
C2: Does the information content meet your needs?	3.28	1.175
C3: Does the system provide reports that meet your needs?	3.03	1.268
C4: Does the system provide sufficient information?	3.00	1.130
A1: Is the system accurate?	3.11	1.230
A2: Are you satisfied with the accuracy of the system?	3.04	1.267
F1: Do you think the output is presented in a useful format?	3.38	1.196
F2: Is the information clear?	3.12	1.142
E1: Is the system user friendly?	3.41	1.247
E2: Is the system easy to use?	3.63	1.254
T1: Do you get the information you need in time?	2.95	1.254
T2: Does the system provide up-to-date information?	2.91	1.284

5.3.1 Confirmatory Factor Analysis (CFA)

The overall fit summary of the CFA results is presented in Table 5.4. The overall model x^2 is 100.020 with 49 degrees of freedom, with a p-value of .000. This p-value associated with the result indicates there is a statistically significant difference between the covariance matrix of the observed data and the estimated covariance matrix derived from the theoretical measurement model of EUCS. Thus, x^2 goodness-of-fit static indicates a poor model-data fit and by considering the issue of using this x^2 goodness-of-fit statistic alone other fit indices are examined based on the sample size of 336, as suggested by Hair et al. (2006). The value of CFI, an incremental fit index, is .984. This value is above the 0.97 guideline for a model of this simplicity with sample size of 336 (Hair et al., 2006). Another fit index is the value of the TLI which is .979, and that is above the .95 guideline. The value of RMSEA, an absolute fit index, is .056. This value is below the .07 guideline for a model with 12 measured variables and a sample size of 336 (Hair et al., 2006). All these index values are supportive: thus the CFA

results support the model of EUCS and provides a good fit for the collected data of IS end users of the Saudi system Ambassador.

Table 5.4: Overall Model Fit Indices of the EUCS Measurement Model of the Saudi System Ambassador

	P-value	CFI	TLI	RMSEA
Recommended value (Hair et al., 2006)	Value >0.05	.97 or better	.95 or better	Value < .07
EUCS measurement model	.000	.984	.979	.056
Meaning	Not Supported	Supported	Supported	Supported

To establish the construct validity of EUCS in this context, convergent and discriminant validity is examined. Factor loading estimates are first examined, and the default maximum likelihood loading estimate is presented in Table 5.5: all loadings are highly significant and exceed the .7 standard (Hair et al., 2006). The completely standardised loadings (standardised regression weights) are presented in Figure 5.1, which shows that all loadings are highly significant and above the 0.7 standard (Hair et al., 2006). The variances-extracted estimates and the construct reliabilities are presented at the bottom of Table 5.6. The variances extracted from the first-order constructs range from 66.7% for content to 81.6% for accuracy and ease of use. The variance extracted from the second-order construct (EUCS) is 79.5%. All exceed the 50% standard and indicate adequate levels of convergence (Hair et al., 2006). Construct reliabilities of the first-order constructs range from 0.77 for the timeliness construct to 0.85 for the content construct, accuracy and ease of use. Construct reliably of the second-order construct (EUCS) is 0.94. All exceed the 0.7 standard of good reliability (Hair et al., 2006). Taken together, the convergent validity of the EUCS measurement model is supported. All variances-extracted estimates exceed .5 and the reliability estimates all exceed .7. Furthermore, the EUCS measurement model fits well. Therefore, all items are retained and the convergent validity of the model is evidenced.

To establish the discriminant validity, variance-extracted estimates for each factor are compared with the squared interconstruct correlations associated with that factor (Fornell & Larcker, 1981; Hair et al., 2006) and the former value should be greater than the latter. Table 5.7 presents the standardised Amos output for the construct correlation matrix of the EUCS Measurement Model of the Ambassador system, which

is then squared to obtain the squared correlation estimates. By comparing average variance extracted (AVE) with squared correlation estimates in Table 5.8, discriminant concerns are found due to the AVE of one or both factors being less than the squared correlations between these factors. Thus, discriminant concerns are found with these four constructs of content, accuracy, format and timeliness, and discriminant concerns are found with the construct of content with accuracy, format and timeliness. Also, the construct of format with timeliness and accuracy.

Figure 5.1: Amos output for the Standardised Factor Loading Estimates of the EUCS Measurement Model of the Saudi system Ambassador
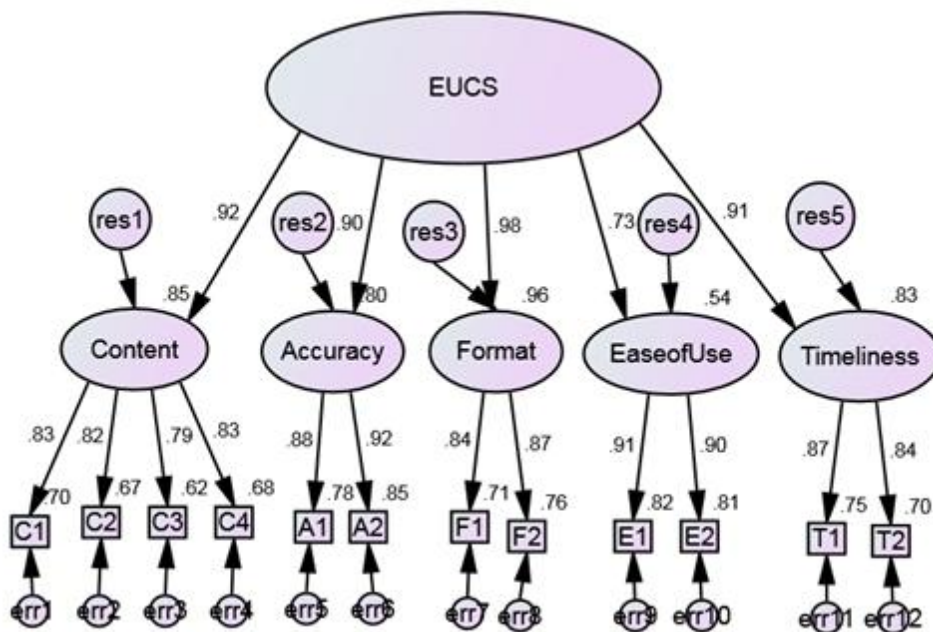
Table 5.5: Selected AMOS output, Maximum Likelihood Factor Loading Estimates 'Regression Weights' of the EUCS Measurement Model of the Saudi system Ambassador

			Estimate	S.E.	C.R.	P	Label
Content	<---	EUCS	.861	.052	16.412	***	
Accuracy	<---	EUCS	1.044	.058	18.145	***	
Format	<---	EUCS	.973	.051	19.038	***	
EaseofUse	<---	EUCS	.825	.062	13.240	***	
Timeliness	<---	EUCS	.979	.061	16.136	***	
C4	<---	Content	1.000				
C3	<---	Content	1.066	.064	16.560	***	
C2	<---	Content	1.030	.059	17.593	***	
C1	<---	Content	.992	.055	18.087	***	
A2	<---	Accuracy	1.000				
A1	<---	Accuracy	.931	.040	23.205	***	
F2	<---	Format	1.000				
F1	<---	Format	1.010	.051	19.885	***	
E2	<---	EaseofUse	1.000				
E1	<---	EaseofUse	1.001	.052	19.173	***	
T2	<---	Timeliness	1.000				
T1	<---	Timeliness	1.008	.055	18.324	***	

Table 5.6: Completely Standardised Factor Loadings, Variance Extracted, and Reliability Estimates of the EUCS Measurement Model of the Saudi system Ambassador

	EUCS	Content	Accuracy	Format	EaseofUse	Timeliness
Content	.923					
Accuracy	.895					
Format	.979					
EaseofUse	.732					
Timeliness	.911					
C4		.827				
C3		.786				
C2		.819				
C1		.835				
A2			.922			
A1			.884			
F2				.872		
F1				.841		
E2					.900	
E1					.906	
T2						.838
T1						.865
Variance Extracted*	**79.5 %**	**66.7 %**	**81.6 %**	**73.35 %**	**81.6 %**	**72.6 %**
Construct Reliability**	**.94**	**.85**	**.85**	**.80**	**.85**	**.77**

*VE=$\frac{\sum_{i=1}^{n} \lambda_i^2}{n}$ computed using the average squared standardised factor loading (squared multiple correlation).

**CR $= \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)}$

Table 5.7: Amos output for the Construct Correlation Matrix (standardised) of the EUCS Measurement Model of the Saudi System Ambassador

Constructs	Content	Accuracy	Format	Ease of Use	Timeliness
Content	1				
Accuracy	.837	1			
Format	.909	.868	1		
Ease of Use	.607	.671	.743	1	
Timeliness	.853	.805	.879	.692	1

Table 5.8: Squared Correlation Estimates and AVE of the EUCS Measurement Model of the Saudi system Ambassador

Constructs	AVE	Content	Accuracy	Format	Ease of Use	Timeliness
Content	.667	1				
Accuracy	.816	.701	1			
Format	.734	.826	.753	1		
Ease of Use	.816	.368	.450	.552	1	
Timeliness	.726	.728	.648	.773	.479	1

5.3.2 Social Media Analysis

This section presents the analysis of data collected using a specific Twitter hashtag designated for this study (قيم_سفير#) that resulted in 297 usable tweets. Collected social media data of Twitter is analysed using positivist, interpretive and key-word analysis approaches in order to allow the researcher to analyse the empirical data to their full potential, and to examine the data from different perspectives. All collected tweets were in Arabic, but analysed and interpreted in English. All included quotations are direct translations to convey end users' perceptions of the system and to strengthen the research arguments. In addition, analysis the 102 comments received are included as part of the research survey, which resulted in a total of 399 entities to be analysed.

5.3.2.1 The Positivist Approach to Social Media (Twitter) Analysis

The analysis of qualitative data including social media data from Twitter and qualitative comments starts with a positivist approach to analysing the collected data. A positivist perspective is applied by quantifying and classifying collected tweets using structured content coding by utilising the five constructs of EUCS as follows, content, accuracy, format, ease of use and timeliness, and shown in Figure 5.2. The aim of applying content analysis is to quantify the types and total numbers of collected tweets, and to be informed of the content of collected social media data consisting of

Twitter 'tweets' in relation to the EUCS constructs that measures IS end users' satisfaction. The focus is on the type of each collected tweet; not the meaning of tweets as expressed by IS end users.

Figure 5.2: Content Coding Categories (Adopted from Doll & Torkzadeh, 1988)
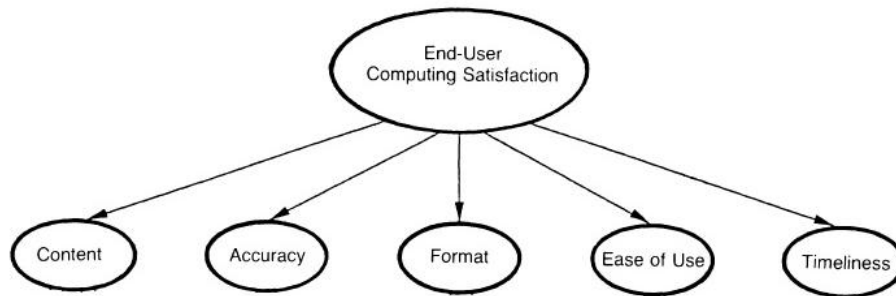
The 297 collected tweets plus 102 received comments that comprise this part of the survey are content coded using the content coding categories presented in Figure 5.2. This approach allows the researcher to gauge the existence of these established constructs in collected data in relation to IS end users' satisfaction. Each tweet is read and placed into its best fit of these five constructs of IS end users' satisfaction. The positivist analysis results are presented in Table 5.9. All of the EUCS constructs are manifested in collected tweets, and support the validity of this established construct of EUCS in the context of e-government of the Saudi system Ambassador.

Table 5.9: Content Analysis Results of Collected Social Media Data of Twitter of Saudi System Ambassador and Survey Comments (Total collected tweets (297 tweets) and qualitative data (102 comments), in total 399)

Content Coding Categories	Frequency	Percentage
Content	214	53.63
Accuracy	204	51.13
Format	184	46.12
Ease of Use	217	54.39
Timeliness	154	38.60

During the process of placing each tweet in its best fit, some tweets expressed IS end users' satisfaction with the system by using words, such as 'great', 'excellent', 'superb', and its synonyms that respondents used to express their satisfaction and positive attitudes towards the system. Such words do not explicitly fit into one of the EUCS constructs, so these words were interpreted by the researcher to be placed into the

four constructs of content, accuracy, format and ease of use, that reflect mainly the system itself in this study except for the construct of 'timeliness' that was found to reflect mainly the timeline of human response to requests and transactions using the system, instead of being a sole reflection to the timeliness of the system itself as is the case of the fully automated IS.

The construct of 'timeliness' is found to have a different meaning in this context of 'IS in-between' in which the timeliness is reflected and influenced by the person processing the requests, and it is no longer the timeliness of the system itself. Thus, all tweets that expressed timeliness issues either by the system itself, or the speed of getting a response by users' processing requests, are coded under the construct of timeliness. Furthermore, any timeliness issues expressed by IS end users coded under the construct of timeliness, such as the timeliness issue that was influenced by the organisational policy and rules and perceived as a waste of time for both employees and students. The focus is on the type of each tweet, not its meaning and is based on all timeliness concerns despite its meaning being coded under the timeliness construct.

The construct of 'content' used by an IS end user may have two different meanings: the content of the system itself and the content of the received responses of requests and transactions. All tweets about the content of the system or received responses through the system are all placed under the content construct. Also, all tweets related to content issues expressed by IS end users, such as asking for more content (information/services), asking for automated services, or asking for modifying existing contents are all placed under the construct of content, as the focus is on the type of each tweet, not its meaning.

All tweets expressing accuracy concerns are coded under the construct of accuracy in spite of the different meanings of accuracy in this context, as it is found to be related to the accuracy of the system itself and the accuracy of received responses from the employees through the system.

Any tweet related to any of the EUCS constructs was placed under that construct as a best fit based on tweet type, not the meaning. During the process of content coding,

the main focus was on classifying each tweet based on its type, but the researcher found that it was important to clarify that different meanings of the same construct emerged during the coding process: but for the purposes of content coding considering the type of each tweet only was the approach taken.

5.3.2.2 The Interpretive Approach to Social Media (Twitter) Analysis

An interpretive approach is used to collected tweets to learn how IS end users perceive and conceptualise Ambassador, and to explore what constructs or patterns emerge, but without utilising a previously identified theory or framework. A hermeneutic circle is applied for each tweet will is interpreted in light of the entire set of collected tweets, and vice versa, until final understanding of tweets is achieved. The use of hermeneutics enables understanding to continuously evolve from initial understanding until an understanding of sufficient depth is reached.

The analysis process starts with open coding by inductively developing provisional categories and constructs, and continuously examining and comparing new emerging categories with previously coded data, and subsequently adjusting existing categories as new categories emerge or are discarded. The emerged categories and their subcategories from the open coding process are presented in Table 5.10.

Three types of information exchanges on Twitter emerged that are information about the system itself (technological aspects), information about human and organisational aspects, including involvement of the employees (those who are using the system to process received electronic requests), and information about the organisation (mainly how its policies and regulations influence dealing with requests that are placed through IS), and lastly about the IS ubiquitousness. Tracing the development of these information types using open coding shows how the researcher's understanding of collected tweets evolved and how IS end users perceive and conceptualise their satisfaction with Ambassador.

Table 5.10: Results of the Open Coding of Social Media Data of Twitter of Saudi System Ambassador

Results of the Open Coding: The Information Exchanges on Social Media Using Twitter Designated Hashtag (قيم_سفير#)	

System	**Content**
	    Content of IS
	        Sufficient Content
	        More Content
	    Content Received by Human Involvement

	Accuracy
	    Accuracy of IS
	    Accuracy of Human Involvement

	Format (system output presented in useful format)
	Ease of Use (ease of use of the system)

	Timeliness
	    Timeliness of IS
	    Timeliness of Received Response/Human Involvement

	Ease of Communication
	Automated Services
	End-User Effort Using the System
	IS updates
	Technological Advance
Human & Organisational	**Responsiveness (perceive responsiveness of human involvement)**

	IS Support
	    End-user Tainting
	    Technical Support
	    End-user Guidance

	Employees/ Human Involvement Competence
	Organisational Influence
	Organisational Productivity
	Employees Surveillance
	Awareness of System Features
	Reduce Fraud & Manipulation
Ubiquitous IS	**Accessing and Using the System**

The language of Agar (1986) was used, as applied by Trauth and Jessup (2000), and each tweet or short message of up to 140 characters constituted a strip, which is a term used to label various phenomena as data against which the researcher to tests initial understanding. The researcher's understanding evolved continually by revising the schema, so that understanding increased through the process of resolution of anomalies. Each anomaly encountered provoked a breakdown that needed to be resolved, and each strip was then coded provisionally based on the content of that tweet. This started with the initial understanding of IS end users' satisfaction as conceptualised by the five constructs of content, accuracy, format, ease of use and timeliness.

During the coding process, not all strips fitted into the EUCS five constructs of IS end users' satisfaction, which provoked a breakdown that needed to be resolved in order to accommodate all strips of tweets. Some Tweets or strips were substantially different than existing categories, and did not suggest a new subcategory. This exposed an anomaly, and the first anomaly encountered was tweets talking about using and accessing the system through smartphone platforms and enabling all features that are available when using the system from personal computers (PCs). This breakdown was resolved by identifying a new category of 'Ubiquitous IS'. The first strip of this type is the following:

> 'It will not convince me greatly until activated uploading files and placing requests on smart device platforms in order to avoid the problems of delay in the submission of requests due to the current limited use that face us as students and I think this is one of the most important features that are expected to be present years ago'.

This breakdown was resolved by revising the schema to incorporate an emerged understanding of this strip. The schema revision was the assumption that content exchanged by tweets was limited to the five constructs of EUCS, and this understanding was revised to acknowledge that IS end users' perception of satisfaction with the system was not limited to the five constructs of EUCS, but was extended to include the ubiquitousness of IS and to be accessible and usable on various types of technological platforms. At the core of the hermeneutic circle is the process of making an interpretive guess followed by a deductive test. Thus previous coded strips were revisited and re-examined in light of this new category of Ubiquitous IS, and the coding process continued. End users expressed their satisfaction with the system as being effective and accessible everywhere by accessing it through their smartphone platform. Here are examples of strips:

> 'Effective system and provides us with the convenience in which it is available on smart devices platforms means upload request wherever we are'

However, in other examples in the following strips, end users expressed their concerns about the smartphone version of the system:

'The system is sort of good but we wish the smartphone platform application will be developed, because it is so, so, so slow'.

'The application on the smartphone platform is really bad… we can do nothing with it except follow-up requests and even this not dependable'

End-users expressed the limitation of accessing the system through smartphone platforms and requested it to enable all features as if accessed from personal computers (PCs) in order to make using the provided services easier and faster, here are some examples:

'Good and useful application in general but I wish it provide all the features of the website like uploading requests and editing these and so on'

'Easy to use system with many featured services. I wish it could be developed and allow us to upload requests from smartphone platforms in order to make services easier and become faster'

In another example of a strip, end users expressed their satisfaction with the ubiquitous feature of the system as one of the best things developed by the organisation (Saudi Bureau):

'Honestly one of best things done by the bureau is to develop the Saudi system Ambassador in which you're capable of using the system by accessing it through smartphone platforms and upload all the files through it'.

It is noted that at the start, end users expressed the need and the importance of placing requests and uploading documents using smartphone platforms, and later some end users expressed their satisfaction by accessing the system using smartphone platforms and became convinced that using the smart device versions saved time and effort, which allowed the placing requests and uploading documents anywhere. This contradiction is due to the fact that during the process of data collection the new version of smartphone platforms application (version 2) launched that incorporated these new features of placing requests and uploading documents. In the previous smartphone platforms application (version 1), end users were only allowed to follow-up the status of their request. The duration of data collection of Ambassador lasted

eight months, but during that time many developments were made on the smartphone platform version of the system (smartphone application).

As the coding progressed, some strips talked about the content, but did not fit the content construct as they were intended to be about the content of received responses of human involvement through the system. This strip was another anomaly that provoked a breakdown. The resolution of this breakdown was to revise the schema of the construct of content of information systems. Understanding evolved that the construct of content was not just about the system itself, but included the content of received responses by human involvement. This breakdown was resolved by expanding the category of content into two subcategories: the content of IS itself and the content of received responses through the system, as clarified in this strip:

> 'The system is good and easy to use, it lacks supervisors understanding how to respond and deal with each case accordingly'

The perception of end users of the response of human involvement through the system has an influence on perceiving the system itself, as a facility of using electronic services to fulfil individuals' needs that were not achieved, because of the poor quality and uselessness of received responses. Here is an example of a strip clarifying this point:

> 'Many of the students were forced to visit the bureau in-person, because of the ambiguity of supervisors' replies to enquiries and lack of knowledge of the student how to place some requests through the system'

As the coding processed, this category of content needed further adjustment, and another breakdown provoked by some strips talked about more content of IS. This subcategory of the content of IS was adjusted further, as further breakdowns were provoked by some strips that talked about more content, where IS end users expressed their needs to be incorporated into the current system. This breakdown was resolved by expanding the category of content of IS into two subcategories: sufficient IS content and more IS content. We had to revise the schema of the content of IS to acknowledge multiple interpretations that while at the first level of interpretation, content of IS is perceived by some IS end users as sufficient content, but when

penetrating deeper we found that other IS end users expressed the need for more IS content. Understanding evolved to acknowledge that the content of the system is perceived differently by IS end users.

End users expressed their satisfaction with content of the system as being efficient and fulfilling their needs. Here are some examples of strips:

> 'Excellent with 90% of the options needed'

> 'Superb program and integrated in all aspects... until now haven't seen any flaws'

By penetrating deeper into the understanding of IS content, some end users expressed their need for more content. These 'more content' strips were found to be about using the system, about communication and about transparency and evaluation.

Some of these 'more content' strips related to use of the system, such as the addition of search engines in order to search for a particular service, providing YouTube channels to clarify how to place requests and all required documents associated with that request, icons for clarification besides the provided services in order to clarify the process of placing a request, how to modify requests, documents required so end users would be able to follow these instruction easily, manuals to assist end users using the system and ensure complete requests are placed to avoid delay in processing requests and rejection, checklists to ensure all required documents are included in order to save time and effort by placing another request, and finally including forms in the system that students are required to complete for easy access and completion, in order to save time and effort.

Other 'more content' strips are related to communication issues, as end users expressed their need to be provided with multiple and alternative communication channels. They asked if the system could incorporate a live chat and Skype calls for ease and faster communication with the employees, and alternative contact information. They asked for incorporation of links to related social clubs, forums, related city guidance, and advice related to a particular city in which a student is based. Receiving texts on mobile phones for request updates and status, incorporating

updated news into the system, and enabling more options regarding students' requests such as objection of requests were also mentioned. The importance of these communication concerns reveals the need to fulfil students' needs and enable ease of communication.

The remaining 'more content' strips were related to transparency and evaluation additions, and transparency elements included providing the name of the employees processing a request, and allowing end users to evaluate the employees after each request.

Table 5.11 summarises 'more content' strips on use of the system, communication, transparency and evaluation, with examples of strips.

Table 5.11: The Subcategory of 'More Contents' of IS, with it Example of Strips

1. More Content about Using the System	Example of Strips
Search Engine	'You need to contact the bureau to clarify how to place a request, another problem is that there is no search engine for services'.
You-Tube Channels	'It would be great if they dedicated a YouTube channel with short videos and direct URLs explaining request types, how to place it through the system, and documents needed all briefly and clearly'.
Clarification Icon	'Ambassador (the system) services are good but we need to have an icon showing us everything we would like to do, add or edit; like just following the steps of that icon'. 'We wish to add simple descriptions of each icon in the request list so that the student knows if he's doing the right thing as he wants'. 'Suggestion: to put for example some description on the icon for some requests (that needed) and once the cursor is positioned on the icon, the description pops up'.
End-user Manuals	'To support the system with a clear user guide to save the effort and coordination between the student and the supervisor along with avoiding the request being rejected more than once'.
Request Checklist	'The best thing is that each request page has to have a request requirements; the placed request was rejected more than once with no clear explanation to the applicant'. 'We wish to add Check list in all requests so it won't be rejected'.
Provide Related Forms	'The forms the students are asked to placed should be added to the students' portal (the system)'.
2. More Content about Communication	Example of Strips
Provide End-users with Multiple and Alternative Communication Channels	'It lacks so much and the most important is lack is there has to be links to contact the right person in ministries and bureaux'. 'Honestly Ambassador (the system) is excellent; but the enquiry process is really slow because supervisors are late in replying (I suggest having a better contact method) like providing direct contact with supervisors'. 'Providing written and instant conversation through Ambassador (the system) from the student's account in the system'.

Live Chat	'A great system and we wish it will be more developed with my suggestion to add live chat feature for inquiries during working hours to save time and calls'. 'It is a great system with relatively high quality functioning saving students both time and effort… I wish they would add Live Chat feature and also activate it'
Link the System to Related City, Guidance, Provide Advices, Skype Calls	'Ambassador (the system) should be, along with electronic services, there must be links to students clubs, town guide and authorised advices along with live Skype calls available with the employees of the bureau'.
Link the System to Social Clubs and Forum	'The process of linking between students clubs websites is not that hard; just by linking the club website to the system and on clicking the city name, the link will appear to the user'. 'I suggest, adding forums for each scholarship country under the bureau management. As all the Saudi scholarship students now seek forums in the first place; which is really important and helpful'.
Receiving Text on Mobile Phone	'The system is good but I suggest the system should link between the student and the supervisor's numbers in case the student placed a request through the system; there should be a phone message showing that'.
News	'That each bureau should have a page providing its news actively and interactively'.
More Options Regarding Student Requests Such as Objection of Requests	'Ambassador (the system) was developed to make students affairs easier while they study; however, unfortunately, it doesn't provide objection services that makes student go to the bureau itself to solve the issue… this happened with two of my colleagues'.
3. More Content about Transparency and Evaluation	**Example of Strips**
Providing the Name of the Employees Process Request	'A great system they should be thanked for but I wish the students could know the name of the supervisor completing his request process; because some of them just kid'. 'The system really saves a lot of time but I wish there were some interactive communication to follow-up with the request and who processing it'. 'A simple and easy to use system; it made communication better… but I wish the placed request would be aligned with the employee's name who is processing it so the student will be able to follow-up the request'.
Allow End-user to Evaluate the Employees after Each Request	'The names of those who follow-up with the placed requests and reply to them should be revealed as well as a feedback service after completing the request'.

During the coding process, another anomaly was encountered, as some strips talked about accuracy, but did not fit the construct of accuracy of IS, as it is intended to be about the accuracy of received responses of human involvement through the system. This strip is an anomaly that provoked a breakdown, and the resolution of this breakdown was resolved by revising the schema of the construct of accuracy of information systems. Understanding evolved that the construct of accuracy is not just about the system itself, but includes the accuracy of information and received responses by human involvement. This breakdown was resolved by expanding the category of accuracy into two subcategories: the accuracy of IS itself and the accuracy of received responses through the system, as clarified in these strips:

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'Ambassador (the system) is not the problem… it is people who reply within the system. Some of them just don't give direct answers and make things more complicated rather that easier'.

The accuracy of received responses through the system depends on the human involved in processing that request. Thus in some cases, end users do not receive appropriate responses through the system, and users' needs are not fulfilled, and their perceptions are negatively influenced. These examples are examples of strips:

'Enquiries are sent many times to get clearer answers… many questions are not enlisted by regulation so we get many individual answers'

'The system Ambassador is a brilliant idea… the problem lies in the supervisors' replies that are like mere templates copied and pasted'

'Some replies through Ambassador (the system) are pre-prepared and we hope the answers should be more based on the students' requests'

The accuracy of the system itself can be perceived either as the accuracy of provided services or the accuracy of provided requirements and information by the system. In this example of a strip, the end user comments on the accuracy of provided information and requirements by the system:

'The best suggestion is that any request has a list of requirements needed by student. Placed requests are being rejected many times with no clear explanation of the reason'

The coding process also found some strips that talked about the format of information presented by the system, as in this example of a strip:

'A lot of information is presented on the screen in each request'

End users perceived the large volume of output of information presented as a negative aspect of the system and clarified in aforementioned strip.

Another anomaly encountered during the coding process was a strip that talked about timeliness, but did not fit the construct of timeliness of IS, as they were about the timeliness of received responses of human involvement through the system. This strip

was an anomaly that provoked a breakdown, and the resolution of this breakdown required revision of the schema regarding the timeliness of information systems. Understanding evolved that the construct of timeliness is not only about the system itself, but includes the timeliness of information and received responses by human involvement. In this study, the responses relate to academic supervisors at the Saudi Ministry and Bureaux who responded within the system (Ambassador) to students. This breakdown was resolved by expanding the category of timeliness into two subcategories: the timeliness of IS itself and the timeliness of received responses through the system as clarified in these strips:

> 'Ambassador system is amazing with many features, but the speed of processing requests depends on the receiver (employee) processing that request… I wish the system would support uploading files from mobile phone platforms… thanks'

End users associate the timeliness of received responses through the system with the system itself as shown in this example of a strip:

> 'Ambassador (the system) began to be excellent and replies were really fast; however, now it takes long time more than two weeks sometimes, and replies are rejected and are required to be resubmitted'

In this example of a strip, end users associate their perceptions of the slowness of the system to the response time by employees:

> 'Ambassador (the system) is an electronic system that needs fast response from supervisors or anyone that has a request on the system.. Sometimes one feels that the system is really slow'

The timeliness of received responses of human involvement was found to be an influential factor on end users' perceptions of the system and found to be associated with the system itself, as in these strips:

> 'Ambassador (the system) is such an amazing system… I don't see any flaws about it except for the delayed responses of the supervisions for placed requests through the system. It is not a problem with the system, but it is with those who use it'

> 'The electronic system is just saving paper, but the job is the same.. processing requests take too long'

During the coding process, another breakdown occurred related to strips that did not fit any of the coded categories. This breakdown was resolved when it was recognised that a new category of information being exchanged was ease of communication. The resolution of this breakdown was resolved by revising the schema. Understanding evolved that IS end users expressed their satisfaction with the system when they perceived ease of communication by using the system. The schema that needed to be revised was to acknowledge ease of communication as an influence of IS end users' satisfaction. Ease of communication is interpreted as an outcome achieved by the ubiquitous features of IS. End users perceived ease of communication by using the system in terms of physical distance and fastness, as in these examples of strips:

> 'We thank the Ministry of Higher Education for this system by which we can get all procedures done from home without having to travel and suffer'

> 'The system and its services are good and facilitate the communication with the bureau, and helping one to get things done faster'

> 'Simply three words; it saved effort'

> 'An amazing system that saved the effort of going to the bureau to get things done… now we can do them through the electronic portal'

Also, end users perceived they saved time and effort by using the system as part of ease of communication, as in these examples of strips:

> 'Ambassador system really developed specially after launching the smartphone platform application. We are expecting more from it as it saves both time and effort'

> 'I thank everyone working on the Ambassador system. An easy system that saves the student the effort of calling or emailing and also saving students' rights… all the best'

Another perception of ease of communication expressed in terms of making the process of following requests faster and easier:

'An excellent system with noticeable development that represents an electronic communication circle making it easy for supervisors to supervise students… and making it easier for the student saving him the effort of travelling… by enabling him to follow-up his requests electronically'

The following example of a strip shows perceived ease of communication provided by the system (Ambassador), and end users wanted these electronic services to be adopted by other governmental organisations.

'I think it is superb so far… it saved time and effort… I wish some governmental entities would benefit from this experience by applying it in their fields'

Despite the convenience of ease of communication, end users still consider the influence of human factors of employees (supervisors) on the system.

'It is a useful system for everyone saving much time and effort… yet the human intervention has a big influence on processing the requests'

The coding process revealed another anomaly and provoked a breakdown. This breakdown was resolved by recognising that a new type of information being exchange expressed IS end users' perceptions of automated services. IS end users expressed the need for automated services provided by their systems, as clarified in this strip:

'There are easy procedures that should be done automatically without employee's approval (human intervention)… like confirmation of student status letter that should be received within seconds with an electronic signature'

Some strips talked about automated services and how that would fulfil their needs when it comes to some procedures that do not require human intervention, such as identification letters. The resolution of this breakdown was resolved by revising the schema to acknowledge the automated services of IS and incorporate that as an influence of IS end users' satisfaction with the system. Automated services are interpreted as the means by which ubiquitous IS can be delivered to end users. Here are examples of strips, and how end users perceived the automated services as a development of the system:

'I consider it as one of the best electronic governmental systems in Saudi Arabia so far… yet it still needs some developments to process the work/requests automatically'

'We could have done without that intruding by the mere electronic solution in some request specially those requiring confirmation of status letter and so on'

During the coding process other breakdowns provoked adjustments when strips were encountered that did not fit into existing categories. It was recognised that a new category of information being exchanged expressed end users' efforts expended in using the system. The resolution of this breakdown required revision of the schema to acknowledge the influence of end users' efforts when using the system on IS end users' satisfaction. End users conceptualised the effort of using the system as part of their perceptions of IS satisfaction. IS in the context of e-government, is used by IS end users to fulfil an individual's responsibilities and needs, in contrast to IS in workplace settings when using the system is supported by the need theory (Alderfer, 1969), and that using IS fulfils three needs of IS end users in terms of work performance fulfilment, relatedness fulfilment, and self-development fulfilment (Au, Ngai & Cheng, 2008). Understanding has evolved to incorporate this new understanding, and here are some examples of categorising effort when using the system.

These are first efforts of using the system and end users' efforts of placing new requests instead of modifying or revising rejected requests. End users' efforts of placing a new request are also included, which considers a simple mistake while placing the request. As expressed in these examples of strips:

'A good system that saves a lot of effort… what's bad about it is that requests are supposed to be resubmitted all over again once something is not there… the smartphone platform application is inadequate'

'Unfortunately it is complicated… once you submit an incomplete request, you have to redo that all over again!! Supervisors have made it even worse'

'Exactly, the same here… because the scholarship student has no time to submit his request and upload the files all over again'

'Providing the feature for replying to previous requests will make it easier to follow-up with the request rather than submitting another new one that might be received and processed by another supervisor'.

By returning requests to students instead of rejecting them and asking students to place new ones will save time and effort for both employees and students, as expressed by end users in these example of strips:

'Instead of rejecting the request for a document or two that are not there… it is better to send the student a notice of what is missing to provide it without submitting another new request'.

One end user proposed a positive solution to the issue of rejecting requests and asking students to place a new one, this is an issue that resulted either because of missing documents or modifications that are required to be added:

'The thing that will reduce working pressure on the employees and make it easier for the employees of the bureau and save their time and the student's is the issue of rejection request… I got many requests rejected because of a mistake leading me to resubmit the same request with the same documents until it was approved after wasting my time, the employee's time and the department head's time… what I suggest that the student gets a message about the rejection with the right to complain within three days otherwise the request will be closed automatically, this is the note that might make things better instead of placing a new request'

The second category of effort involved in using the system is the volume of documents required by students to upload that already exist in the system or have been attached before. These are clarified in the strips below:

'The bad thing about it is the many file uploads one has to do with each request through they are already there in the system and can be easily reached by employee. The system is good and easy to use, yet it needs some technical amendments to make using files easier, such as files that were previously uploaded by the student'.

This feature using existing documents that were uploaded earlier is now included in the system with the launch of version 2 of the system.

A third consideration of effort when using the system is the repetition of requirements in each request and the effort required by end users to complete them each time. As in this example of strip:

> 'Some orders in requests are replicated which make it boring for completing a request'

Another breakdown was provoked when strips talked about new types of information being exchanged as end users expressed their satisfaction with the system when they perceived IS updates. The resolution of this breakdown was resolved by revising the schema and incorporating this new category of IS perception by end users. Understanding evolved that IS end users expressed their satisfaction with the perceived IS updates, which are a continuous process of identification of end users' needs and system areas for improvements, and incorporates that into a current system as system updates. Here is an example of satisfaction expressed by end users when they perceived IS updates, and in particular the smartphone platform application:

> 'I liked the rapid development in the service specially for the smartphone platform application… of course it needs some more development; but as a start-up, it is very good… thanks for you and for them'

Another example is a strip expressing an end user's satisfaction regarding the improvement in the system as a result in the latest IS update:

> 'I perceive the system performing as very excellent, especially after the latest system updates'

Despite end users expressing their satisfaction with the system, they still ask for updates for system improvements, as clarified in these examples of strips:

> 'As I mentioned the system is superb but its performance should be more developed with no flaws…'

> 'It is good, but needs enhancement'

The coding process also provoked another breakdown when strips were encountered that did not fit any of the existing categories. The resolution of this breakdown needed revision of the schema, so that satisfaction of IS should not be limited to previously

identified categories of IS satisfaction, to acknowledge the importance of responsiveness in human involvement and to incorporate that as an influence of IS end users' satisfaction with the system. Responsiveness of human involvement through the system was expressed by end users in different ways. One example of a strip expressed an appropriate time:

> 'What is the point of providing the students with information and services when there is no one to reply to their requests and needs in the ministry or the bureau'

> 'The system Ambassador is a brilliant idea... the problem lies in the supervisors' replies that are like mere templates put by the supervisor'

In another example of strip comments, end users expressed perceived responses and replies in terms of a response that may result in not ignoring individuals' needs, as a result of lack of responsiveness through the system. For example:

> 'The system developed to make it easier for students and eliminate the need of going to the bureau... yet the way employees deal with the requests is what makes the students have to go to the bureau in-person'

> 'If the system really did what students needed to be done, there wouldn't be students who go so far to get to the bureau for simple requests'

End users link responsiveness of human involvement through the system to their satisfaction with the system. The underlying assumption is that using the system is to obtain responses to end user requests, but if that is not achieved due to lack of responsiveness by human involvement, it will result in disaffection with the system.

> 'It is an effective and excellent system that resulted in a great development.. yet the problem is that 60% of employees just don't read what is sent to them... they just reject the request'

In another example of strips, end users expressed their satisfaction as a result of perceived responsiveness, as in this example of strip:

> 'It made many things easier for us.. fast response.. reviewing and follow-up requests... easy to use.. saved time and effort for inquiries'

Another breakdown was provoked as we again encountered strips that did not fit into existing categories. We recognised that a new category of information involving exchanges about the technological advances of the system was needed. The resolution of this breakdown was resolved by revising our schema. We needed to revise our schema to acknowledge the role of technological advance of the system in relation to IS end users' satisfaction. Understanding evolved that at first levels of interpretation end users expressed their satisfaction with the system in general, as in this example of strips:

> 'Technically, great! But practically, it depends on the request receiver of staff at the bureau..'

However, in depth analysis showed that some IS end users talked about some technological elements of the system and others expressed the importance of the technological advances to be incorporated in the system. Some of these technological elements include system speed, system restriction to complete a request in a specific time limit, system hang-up, system performance on different platforms and browsers, and uploading documents (see Appendix C).

In this example of a strip, the system was perceived as being poor technologically, in the light of technological advancements available:

> 'Generally, I consider Ambassador System as (poor) compared to the modern technologies we have…'

That implies that the system may be perceived differently by different end users with differing technological skills, needs and expectations. While some perceive it as an excellent system, others perceived it as lacking technological advance as in examples mentioned earlier.

Another anomaly encountered during the coding process related to strips talking about IS Support, and this breakdown was resolved by revising the schema and identify this as a new category of factors influencing IS satisfaction. The importance of this factor is evident in the DeLone and McLean IS success model that identifies service

quality of providing IS support along with system and information quality to be influential factors for IS end users' satisfaction (DeLone & McLean, 2003).

During the coding, some strips talked about IS support in ways that did not fit the category of IS support, but mainly referred to end users' training. This strip was an anomaly that provoked a breakdown, but was resolved by identifying end users' training as a subcategory of IS Support. Here is an example of a strip:

'Students should be given guiding workshops including how to use the system'

However, it was found that this category of IS support needed further adjustment as further breakdown was provoked by strips talking about technical support. The resolution of this breakdown was resolved by identifying technical support as a subcategory of IS support. As in this example of strip:

'It is excellent and saves time and effort.. However, it has some flaws like the lack of technical support team response'

'I once waited for two weeks for a fault to be solved'

Other breakdowns were due to some strips that talked about end users' guidance, and was resolved by identifying end users' guidance as a subcategory of IS support, and the schema was revised. Understanding evolved that the category of IS support should be expanded into three subcategories of end users' training, technical support and end users' guidance.

End users expressed the importance of end users' manuals for using the system and services, and what was required in each request, because the lack of a manual meant that end users had to telephone the bureau in order to clarify the process of placing requests:

'Another problem is there is no search engine for the service'

'You need to call the bureau to clarify how to place a request using the system'.

'It is a good system, but most of the request requirements are not clear. The evidence is that a request got rejected more than once. What we want is to clarify the requirement for each request in order to avoid being rejected'

End users expressed their desire to have a user manual, which should make the process of placing requests easier, and save time and effort:

> 'To support the system with a clear user guide to save the effort and poor coordination between the student and the supervisor along with avoiding the request being rejected more than once'

As suggested by end users, end users' guidance could take various forms, such as YouTube channels as expressed in this example strip:

> 'It would be great if they dedicated a YouTube channel with short videos and direct URLs explaining request types, how to place it through the system, and documents needed all briefly and clearly'

Guidance in terms of received responses by employees, as in this example of strip:

> 'It is a great system… there is only some misunderstanding from supervisors to some students inquiries; some of their replies are not that useful leading the student to ask other students'

Guidance in term of icons that allow for more clarification, as in this example of strip:

> 'Ambassador (the system) services are good but we need to have an icon showing us everything we would like to do, add or edit; like just following the steps of that icon'

> 'We wish to add simple description of each icon in the request list so that the student knows if he's doing the right thing as he wants'

Another breakdown was provoked when strips talked about new categories of information being exchanged that did not fit existing categories. The breakdown was resolved by identifying a new category of employee/human involvement competence, and the schema was revised to incorporate this new understanding. End users expressed how human involvement competence influenced their perceptions of satisfaction with the system. Understanding evolved to acknowledge that as there is human involvement dealing with the system, the perceptions of system satisfaction are influenced significantly by the competence of human factors, which become an integrated part of the system and have an influence on system outcomes. Human competence is important in processing end users' requests, as does the ability to write

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an appropriate response that addresses and fulfils end users' needs. An example of a strip in this category is:

'Some supervisors' replies are neither simple nor clear, and sometime indicate the supervisor didn't understand the request'

The quality of replying and responding to requests by people influences the way end users perceive the system. End users conceptualise the system itself as a good system, but at the same time might not perceive satisfaction with the system, as the benefits promised by the system were not achieved: that often depends on the performance of the receiver of the request.

'The system is very good but some supervisors are misusing it'

'The system is amazing, the problem is the employees'

'Technically great! But practically, it depends on the request receiver of staff at the bureau...'

'A superb system and good service but the issue is lack of flexibility and efficiency of some people (employees using the system)'

End users of the system suggested that human resources implementing the system need to be improved, as human competence in implementing the system has an influence on end users' perceptions. It is important to note that the need for improvement was not solely required by end users for the system as identified and discussed earlier as IS updates, but end users also asked to improve the skills of persons implementing the system, as in this example of strips:

'It needs development specially the human resources using the system in terms of supervisors and employees'

Another breakdown was provoked when strips were encountered that did not fit existing categories, and talked about organisational influences on the system, including how organisational policy and procedures influence the way of dealing with requests placed through the system. In spite of the fact that end users were asked to evaluate the system, some strips talked about the organisational influence on the system and how that influenced perceptions of the system, as in the following strips:

'The electronic system is clear, yet the administrative one applied to requests is not… the request is uploaded to different supervisors and has different replies'

'The problem is with the rules and regulations along with the employees'

This breakdown was resolved by identifying 'organisational influence' as a new category, so that understanding evolved with a realisation that organisational influence has an indirect influence on end users' satisfaction through the system (Ambassador).

The method of processing students' requests is in part a reflection of organisational policy and procedures that are found to be an influential factor on system satisfaction. Inappropriate responses to requests from end users results in them not being provided with clear understanding about their issues, and this leads to end users perceiving use of the system to be a waste of time and effort, as in the following example:

'Ambassador System is of the merits of the ministry facilitating supervising sponsored students easily… Ambassador as a system is superb but rejecting requests from the first time are strange and really exhausting to the student in terms of time'

The organisational policy regarding dealing with requests influences the perceptions of the system by end users, as in this example:

'The system is not the problem; the problem lies in the unclear rules and the poorly worded language of supervisors, and the way they speak and behave'

The human interaction involved in dealing and communicating with students also influences end users' perceptions of the system, as in this example of strips:

'Technically the system is excellent. Administratively, it has many problems manifesting in indifference in supervisions by rejecting requests for no good reason… and also the poor communication'

'As I have been a sponsored student before and after the development of the Ambassador system... I found the system is really excellent but needs to be easier in some procedures'

Some end users perceive the way the system is managed by the organisation so negatively that it makes the system useless in their opinion, as in this example of strip:

'Using the system as a student is good but by considering the way it is mishandled by the bureau is what makes it useless… most students prefer going to the bureau to complete their requests as it takes about an hour… while on the system we wait at least a week to get a reply'

Another anomaly encountered during the coding process related to strips talking about organisational productivity, as a result of using the system. This breakdown was resolved by identifying a new category of organisational productivity and incorporating this into the schema. End users perceive the system as playing a role in increasing organisational productivity in terms of saving time and effort, and increasing their productivity of work; for example this strip regarding saving time and effort:

'Ambassador is a useful system and kind of helped in increasing the dynamic of the work…unlike previous years before the system, we used to deal with post'

Another example is when a strip talks about organisational productivity in terms of the process of dealing with students' requests by using the system:

'The utility of returning requests to students instead of rejecting them, is to save time and effort for students and the bureau employees who dealt with it after a long time of going here and there'

Another anomaly encountered during the coding process was strips talking about employees' surveillance. This breakdown was resolved by identifying a new category called employees' surveillance, and the schema was revised to incorporate this new understanding. End users comment about the importance of employees' surveillance as that influences the process and quality of processing requests.

'A great system and it makes things easier, the good thing is their sophisticated smartphone platform application, but the problem is not with the system, it is those who apply it… we seek supervisors' monitoring'

'Superb system with a great role in qualifying the student to fully focus while studying… yet the problem is some supervisors who should be tracked down and dealt with'

Also, end users perceive the importance of employees' evaluation and ask that employees be evaluated after each request, as expressed in this example of strip:

> 'The system is not the problem, it is who works on it… there should be an evaluation for all employees of the bureau who are processing students requests'

Employees' surveillance and evaluation are not part of the system, but the human factor is shown to be an influential factor related to how end users perceive the system and their satisfaction with it.

Another anomaly encountered related to strips talking about the awareness of system features, which provoked a breakdown that was resolved by identifying this new type of information being exchanged as the category of awareness of system features. Understanding evolved to consider the importance of increasing the awareness of system features, as this enables end users to know how the system can be used to fulfil their needs. Here is an example of a strip:

> 'A great service for students, I wish from those working at the Saudi communities to provide detailed presentation to explain the system in detail along with the services it provides to students'

Another breakdown was provoked due to strips that did not fit the existing categories, and was resolved by identifying a new type of category called reduce fraud and manipulation. The concept of fraud was identified in collected tweets and was part of end users' perceptions of the system (Ambassador). End users perceive the system positively in terms of reducing fraud and manipulation.

Understanding evolved to incorporate end users' perceptions of how the system is designed to reduced fraud and manipulation due to human involvement.

> 'Generally, the system is good and solved many serious issues… speeding up work and reducing corruption. It's bad for its slow performance'

In another view, end users' perceived the system as being subject to manipulation by persons involved in using the system; thus asking to improve the system.

> 'The system needs to be radically developed to reach the goal for which it has been developed. Unfortunately, it is easy to be manipulated and get through by supervisors'

In summary, all five constructs of EUCS emerged in the Ambassador data, which are content, accuracy, format, ease of use and timeliness. The constructs of content, accuracy and timeliness, which are part of EUCS, emerged but with a different meaning. We found that the meaning of content related to be more about the content of IS itself and the content of received responses by human intervention through the system. The meaning of accuracy was found to also differ and to be more about the accuracy of information of the system itself and the accuracy of received responses by human intervention through the system. The construct of timeliness was more about the timeliness of the system itself (system speed) and the timeliness of human responses through the system (replying speed).

In addition to the five constructs of EUCS that emerged, new constructs emerged that were not part of EUCS, which helped to extend understanding regarding the constructs of IS end users' satisfaction in an e-government context. These constructs are summarised in Table 5.10, including the artefact of IS itself, the influence of organisational and human factors on IS end users' perceptions, and the ubiquity of access and use of the system to fulfil needs of IS end users.

5.3.2.3 Key Word Searching

The last mode of social media analysis is key word searching, which enables better understanding of the nature of the content of the data collected, and to establish rigour in these findings. Adjectives are used by end users to explain their perceptions, and the frequency of these adjectives is used as a measure of these perceptions (Bailey & Pearson, 1983). In this study, these adjectives are used to measure end users' perceptions of the system in terms of IS end users' satisfaction. This study investigates how end users perceive the system and how the adjectives, used by end users and taken from collected Tweets in regard to IS evaluation, reflects how the system is perceived. The findings show that from 118 adjectives, 62 adjectives were used, 2 adjectives used were irrelevant, and 54 adjectives were omitted. The adjectives most used were 'superior', 'good', 'easy', and 'timely'. The adjectives' pairs and frequencies are presented in Table 5.12 in antecedent order along with the context in which they

were used. Key word search findings corroborate the findings in previous positivist and interpretive analyses.

Table 5.12: Adjectives Pairs, adopted from Bailey & Pearson (1983) to be used for key word searching. (297 tweets + 102 comments=399)

Adjectives Pairs	Frequency	The Context of its Use
Superior vs. Inferior	78 vs. 0	System described as superior.
Good vs. Bad	49 vs. 6	System and provided services described as good Bad used: • To describe delayed response of human involvement. • Smartphone platforms version, the way system used and managed. • The perception of human factor.
Easy vs. Difficult	41 vs. 2	Easy used as: • To describe the system as easy to use and to communicate. • System perceived as easy to be manipulated by employees. • System needs to be easy in some procedures. Difficult used to: • Talk about the process of connecting social club to the system, and that would not be difficult.
Easy vs. Hard	41 vs. 2	Easy, see above. Connecting social clubs to the system described as not difficult.
Timely vs. Untimely	25 vs. 1	Timely used as: • System perceived to save time and effort. • Provide timely information by system and human involvement. Untimely used as: • Untimely response by human involvement.
Significant vs. Insignificant	14 vs. 6	System described as significant. Insignificant used as: • Smartphone platforms version described as insignificant. • The process of dealing with end users requests and rejection of most requests perceived by end users to be for insignificant reason. • Human factor dealing with end users requests perceived as lacking understanding and rejecting requests for insignificant reason.
Cooperative vs. Uncooperative	14 vs. 1	Emphasis is placed on human involvement to be cooperative. Human involvement of those who dealt with and used the system described as uncooperative, as reflected in their responses through the system and process end users' requests. Thus, end users had to personally visit bureaux in regard to process their requests.
Cooperative vs. Belligerent	14 vs. 0	Cooperative, see above.
Fair vs. Unfair	14 vs. 0	System perceived as fair, also responsiveness of human involvement.
Just vs. Unjust	13 vs. 0	Just used by end users to emphasise a particular point that they perceived to be a problematic.

Adjectives Pairs	Frequency	The Context of its Use
Complete vs. Incomplete	11 vs.7	Complete used as: • System described as complete and helping students to focus completely on their study. • The process of placing a request, the need of a complete list of request requirements, and complete and clear responses. • Because of a minor mistake a complete request need to be placed. Incomplete used as: • System described as incomplete because of the difficulty using the system and the way placed requests handled by employees. • Incomplete content of system such as contact information to involved persons. • The rejection of incomplete placed requests instead of return it to end-users and ask to be completed.
Useful vs. Useless	11 vs. 2	System described as useful Useless used as: • System requires some useless information to be completed by end-users • The way of managing and using the system by bureaux make the system useless.
Simple vs. Complex	10 vs. 5	Simple used as: • To describe the system as simple to use. • To ask for simple clarification with each icon and provided services. • To mention simple issues with the system, such as freezing some times, and the restriction of uploading documents that are not required. • Simple and weak programming language used to develop the system, and the process of connect the system with social club would be easy. Complex used as: • To describe the system. • To describe the process of placing a request, and its required documents. • The influence of human involvement on the system, which make it more complex.
Precise vs. Vague	10 vs. 4	System described as precise in general. And the word used as not precise in : • Received responses and guidance by human involvement, • Information provided by the system. • In request requirements in term of required documents. Vague in: • Administrative rules and human system of processing end users' requests. • In a process of submitting a request and its requirements as it is unclear. • In received response and guidance by human involvement.
Easy-to-use vs. hard-to-use	10 vs. 0	System described as easy-to-use.
Efficient vs. Inefficient	8 vs. 1	Efficient used as: • System perceived as efficient and end users expressed the importance of the system to be efficient • End user asks for efficient evaluation for employees using the system and processing end-users request. Inefficient used as: • To describe inefficiencies of the human factor in dealing and processing requests through the system.

Adjectives Pairs	Frequency	The Context of its Use
Fast vs. Slow	7 vs. 8	Fast used as: • End-users expressed their satisfaction as a result of fast improvement in the system. • Provided services by the system described as excellent and fast. • Received responses through the system described as fast. • Time restriction of placing a request in a specific time, and enforce end user to complete a request fast. Slow used as: • System perceived as slow, in terms of enquiries and received responses of persons involved. Also, slow in technical terms. • Smartphone platforms version perceived to be slow.
Necessary vs. Unnecessary	6 vs. 0	End users expressed that some system modification as being necessary, updating request requirements is necessary and including forms in the system to be downloaded.
Clear vs. Hazy	5 vs. 5	Clear used to: • Describe the system. • Ask for clear manual. • The effort of sending many requests to get a clear response. While hazy used to: • Describe the system. • Unclear response received by persons involved. • The process of placing a request. • The administrative regulation governed processing requests and request requirements.
Positive vs. Negative	5 vs. 3	End-users described the system as positive, but mentioned the existence of some negative aspects of the system.
Sufficient vs. insufficient	4 vs. 3	System described as sufficient. Insufficient used to talk about: • The way of processing requests, and rejecting them instead of asking to complete missing documents, which resulted in placing a new request by end-user and all associated time and effort. • Information content of the system, in particular insufficient information about rules and regulation.
Harmonious vs. Dissonant	3 vs. 2	Harmonious between: • End-user need and the right person to be contacted. • IS services and its associated service clarification. • Provided information through the system and its timely manner. Dissonant between: • Received responses and guidance from different human involvement, which result in confusion, delays, and wasted time and effort for both student and employees.
Reasonable vs. Unreasonable	3 vs. 2	System described as reasonable, also the responsiveness of human involvement. Unreasonable to ask end users to upload all their documents with each request they placed.
Adequate vs. Inadequate	3 vs. 1	Adequate used as: • Adequate place, adequate person, and adequate information, in the context of asking for system improvement to know these things. Smartphone platforms application described as Inadequate.
Available vs. Unavailable	3 vs. 0	Received responses by human involvement described as available template used by employees.
Current vs. Obsolete	2 vs. 2	Current is used to talk about current time/situations. End users reported that using the system substituted for personally visiting bureaus and ministry to submit their requests. Obsolete used to talk about some obsolete information held in the system.

Adjectives Pairs	Frequency	The Context of its Use
Short vs. Long	2 vs. 2	Short used as: • To emphasise an end user's point, such as 'in short'. • End user asks to provide short-clips on YouTube channel to support using the system. Long used as: • System of how to use the system can be remembered even when used infrequently. • The benefit of returning placed requests to the student to complete any missing documents, instead of just rejecting the request, in saving time in processing requests, which is sometimes quite long.
Accurate vs. Inaccurate	2 vs. 2	System perceived as accurate. Inaccurate used as: • Inaccurate of received responses by human involvement. • Inaccurate in the content of information received by the system.
Successful vs. Unsuccessful	2 vs. 1	System described as successful. System described as unsuccessful.
Appropriate vs. Inappropriate	2 vs. 1	Appropriate used as: • Improvement by end-users expressed as needing more clarification for icons and services to know they placing the appropriate requests and contacting the appropriate persons. Inappropriate used as: • System described as provide information in inappropriate time because sometimes end users need to communicate with a person through the system to answer their question.
Acceptable vs. Unacceptable	2 vs. 0	System described as acceptable in general, also the responsiveness of human factor.
Punctual vs. Tardy	1 vs. 8	System described as not punctual because of human involvement processing end users' requests and the delay resulting because of that. Tardy used as: • System perceived as tardy, and in receiving response by employees. • In uploading documents.
Powerful vs. Weak	1 vs. 3	Powerful used just once, end user expressed his passion with technology, but despite that didn't use social media. Weak used as: • Communication between end users and the other side described as weak, human factor in term of communicating and explaining.
Concise vs. Redundant	1 vs. 2	Concise used to talk about the system in general as an excellent system. System requested end users to fill out redundant information.
Relevant vs. Irrelevant	1 vs. 1	Relevant used to: • Ask for employees' evaluation who are relevant to processing requests using the system. End user described a received response by human involvement as irrelevant to place requests.
Productive vs. Destructive	1 vs. 0	Productive used not related to the study.
Involved vs. Uninvolved	1 vs. 0	Involved used not related to the study.
Rational vs. Emotional	1 vs. 0	It is irrational to ask end users to upload all documents with each request placed through the system.
Valuable vs. Worthless	0 vs. 2	Worthless used as: • System on mobile phone platform described as worthless. • System described as a great system but the way it is used and handled by employees makes it worthless.

Adjectives Completely Omitted		
Known vs. Unknown	Flexible vs. Rigid	Pleased vs. Displeased
Candid vs. Deceitful	Skilled vs. Bungling	Optimistic vs. Pessimistic
Meaningful vs. Meaningless	Eager vs. Indifferent	Encouraged vs. Repelled
User-oriented vs. Self-centred	Organized vs. Disorganised	Liberating vs. Inhibiting
Courteous vs. Discourteous	Definite vs. Uncertain	Progressive vs. Regressive
Regular vs. Irregular	Readable vs. Unreadable	Versatile vs. Limited
Dependable vs. Undependable	Secure vs. Insecure	Low vs. High

5.4   Summary

This chapter presents the analysis of the first study, Ambassador, and discusses the context, data collection and data analysis. After conducting a CFA analysis, discriminant concerns were identified with the theoretical measurement model of EUCS, and the social media part of this study involved analysis of data collected from Twitter. Twitter data were collected by using a designated hashtag for this study, which resulted in collecting relevant data with a volume that was manageable. Twitter data were analysed by applying three modes of analysis, the positivist approach, the interpretive approach, and key word searching, in order to understand the data better and comprehensively construct knowledge and establish rigour from the data. By applying a hermeneutic circle, a constructive interpretation was carried out by continually seeking to understand the various parts in light of the whole, and the whole in the light of the various parts, until a final understanding was reached regarding how IS end users perceive and conceptualise the Saudi system Ambassador. All five constructs of EUCS emerged in the Ambassador Study, but some of these diverged in meaning. In addition to fourteen emerged constructs relating to the system itself, human and organisation constructs, and lastly the ubiquity of IS were also considered. The next chapter presents the analysis of the second study, Oyster.

Chapter 6: Second Study: The Oyster System

This chapter presents the analysis and findings of the Oyster System study, which started with the assumption that the analysis of this study would follow the analysis of the first study Ambassador, but the researcher found that the social media analysis is different, because of the nature of the collected data.

Harvesting tweets by using various keywords and hashtags resulted in a huge volume of data of 1,577,232 tweets. Auto-coding was used to analyse the data and extract constructs, but this did not return useful results. Thus the data was resampled in order to obtain a representative sample of tweets to be analysed manually, with the aim of extracting value and meaning.

Analysis of the sample of tweets led to identify the tweets harvested by using the keyword 'Oyster card' as being relevant to this research question, and data related to this keyword was then chosen as the main source of data to be analysed. This chapter begins with the context of the Oyster system, followed by analysis and findings.

6.1 Transport for London (TFL)

Transport for London (TFL) is a local government organisation responsible for the majority of London's public transportation system. Its main role is to implement the Mayor's Transport Strategy (MPS) (TFL, 2015e), which is a key part of a strategic policy framework to support and influence the social and economic development of London (TFL, 2015d). One element of this strategy is the ticketing system Oyster, which was implemented and operated as an integrated part of the public transportation network. With the continuous increase in London's population (currently 8.4 million people, and predicted to be 10 million in the 2030s), TFL has continuously developed its services to support growth, and to fulfil various users' needs by using public transportation in an efficient and effective way (TFL, 2015e).

The Oyster system was first launched in 2003 and has become the ticketing system of choice for public transportation users, with 85% of all fare transactions completed by

using the Oyster system, and with 14 million transactions a day (Transport Committee, 2011). The adoption of the Oyster system was motivated by the need to solve the ticketing issue (Oyster card briefing, 2009). First, to solve congestion at stations by using paper tickets and increase the capacity of user throughput at gates. Second, to reduce the number of tickets sold as the operational process of selling tickets was considered to be too high. Third, to reduce fraud such as over-riding, and using lost and stolen tickets.

Despite the success of the Oyster system, it has been continuously developed to improve users' experience, to reduce costs associated with using the system, and to overcome challenges of the current system.

Using an Oyster card is the way to use and access the Oyster system, allowing end users to use public transportation in a fast and easy way. TFL describes an Oyster card thus:

> 'Oyster is a smartcard which can hold pay as you go credit, Travelcard and Bus & Tram Pass season tickets. Use it to travel on bus, Tube, tram, DLR, London Overground, TfL Rail and most National Rail services in London.' (TFL, 2015c)

The property set of the Oyster card in terms of standards and technology is unique to TFL, which is conducive to its interoperability with other transportation systems (Transport Committee, 2011). Furthermore, the Oyster card was designed so that information is held on the card itself, which means having physical access to the card is necessary in order for refunds or corrections to be applied to users' accounts, which are recorded on the card itself (TFL, 2014a). The Oyster card is one example of how TFL has continuously worked to identify opportunities to harness new advents in technology to overcome current challenges of the Oyster system, and to improve its operations and services with less cost.

TFL has expanded the use of the Oyster system by integrating the use of contactless bank payment cards compatible with the card readers used by the Oyster system. This integration was motivated by the need to achieve efficiency and reduce costs

associated with using the Oyster system, as mentioned in the report by the chair of the transport committee, Caroline Pidgeon (Transport Committee, 2011):

> 'The current Oyster system, though very popular, is expensive and complex to administer. Contactless bank cards use existing technology, responsibility for issuing cards would lie with the banks rather than TFL, and the operating costs should be lower.'

In addition to delivering organisational value, the new technology of contactless bank payment card also aims to deliver benefits to users of public transportation by providing faster and easier alternatives in their commute.

The term 'polymeric' is used to model and describe the way in which IS systems evolve, so that the small subsystems that connect to make use of the Oyster system, or other systems, act in a similar way to molecules bonding to form a polymer. In a molecular process, the molecules bind in such a way as to minimise potential energy. This is akin to the goal of utilising IS to achieve efficiency and effectiveness in organisations, and minimise costs (Avison & Fitzgerald, 2006). The process of continuous evolution and integration describes polymeric IS.

In 2012, TFL launched the initial phase of using contactless payment technology across public transportation networks of London; first on buses, and later expanding across the TFL public transportation network in 2014 (TFL, 2015a, 2014b). The adoption of contactless technology by TFL aims to increase its efficiency and effectiveness (TFL Written Submission, 2011). First, by reducing costs of revenue collection and costs associated with using Oyster cards in term of commissions paid to other parties, amounting to £6M per year. Second, by reducing the number of Oyster cards issued by 20% per year. Third, by increasing revenue through increasing overall user travel by ten million pounds per year. Fourth, by improving users' experiences by saving time and effort of travel journey in term of easier and faster payment.

Based on the aforementioned adoption of contactless technology, TFL recognised the further benefits and savings that could be achieved by expanding the Oyster system to a polymeric IS, and prepared the system to be integrated and used with other

technologies. In addition to contactless payment cards, smartphone payment was also made available for end users. All of these various payment options fulfil various needs of end users' usage, while at the same time increasing the efficiency and effectiveness of TFL.

This section has discussed the system, and in the following section the end users of the Oyster system are analysed.

6.2   End Users of the Oyster System

The system is a publically accessible system with open user groups who make use of public transportation in the city of London. These users can be anyone who lives in or visits the capital, and the Oyster system provides fully-automated services to its end users, who use it to pay fares for travel and to maintain their accounts. A summary of collected data is presented below in Table 6.1, along with the profile of survey respondents in Table 6.2.

Table 6.1: Summary of collected data of the Oyster study

Research Methods	Collected Data
Online Survey	Total survey responses are 201, and usable responses are 105.
Social Media Data (Twitter)	Twitter data was harvested using Webometric software. Tweets were harvested using Twitter hashtags and specific keywords, resulting in collecting 1,577,232 tweets. These hashtags include TFL and underground, and keywords include oyster, oyster card, TFL and underground.

Table 6.2: Profile of Survey Respondents of the Oyster Study (Total Usable Responses are 105)

		Frequency (Persons)	Frequency (%)
Gender	Male	72	68.6
	Female	32	30.5
	Missing	1	1
Age	Less than 20	1	1.0
	20-24	11	10.5
	25-29	22	21
	30-34	35	33.3
	35-39	7	6.7
	40-44	12	11.4
	45-49	10	9.5
	50-54	4	3.8
	55 or above	3	2.9
Educational Background	High School Cert	3	2.9
	Diploma	2	1.9
	Bachelor	17	16.2
	Masters	41	39
	Doctorate	39	37.1
	None	3	2.9
Marital Status	Single	38	36.2
	Married	63	60
	Widowed	0	0
	Divorced	4	3.8
	Separated	0	0
How often do you use the Oyster System (at underground stations)?	Never	0	0
	Rarely	11	10.5
	Occasionally	30	28.6
	Regularly	63	60
	Don't Know	1	1.0
How often do you use the Oyster Online (by accessing the Transport for London website)?	Never	49	46.7
	Rarely	30	28.6
	Occasionally	17	16.2
	Regularly	9	8.6
	Don't Know	0	0

6.3   Results

The data were collected over eight months, starting in September 2014 and finishing in April 2015. There were a total of 201 survey responses. Upon initial analysis, 105 of the survey responses were found to be usable.

The survey link (see Appendix D) was distributed using social media including Twitter, Facebook and online forums. The social media data were harvested using a Webometric tool. Twitter data were harvested by using hashtags of evaluate_oyster, TFL, and underground. Also, data were harvested by using keywords including oyster, oyster card, TFL and underground. This resulted in collecting a massive number of

tweets. The following section presents the statistical and social media analysis of collected data by using both survey and social media from Twitter.

Sample descriptive statistics for the Oyster Card system EUCS are presented in Table 6.3. These statistics enable the data to be summarised and described, and to provide a holistic picture of the collected survey responses. The profile of survey respondents is presented in Table 6.2, enables the characteristics of survey responses to be described.

Table 6.3: Sample Descriptive Statistics for Oyster System EUCS (End-User Computing Satisfaction)

EUCS Items	Mean	Standard Deviation
C1: Does the system provide the precise information you need?	3.52	1.194
C2: Does the information content meet your needs?	3.62	1.121
C3: Does the system provide reports that meet your needs?	3.44	1.143
C4: Does the system provide sufficient information?	3.57	1.091
A1: Is the system accurate?	3.72	1.213
A2: Are you satisfied with the accuracy of the system?	3.66	1.108
F1: Do you think the output is presented in a useful format?	3.49	1.110
F2: Is the information clear?	3.64	1.119
E1: Is the system user friendly?	3.54	1.160
E2: Is the system easy to use?	3.63	1.103
T1: Do you get the information you need in time?	3.49	1.161
T2: Does the system provide up-to-date information?	3.77	1.195

6.3.1 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) is used to test the hypothesised measurement model of End-User Computing Satisfaction (EUCS) and compare it to reality, as represented by collected data (Hair et al., 2006) of IS end users in the context of ubiquitous use of the Oyster system to fulfil individual needs of those using the Oyster Card and Transport for London services.

Summary statistics for the CFA results are presented in Table 6.4. The overall model x^2 is 81.139 with 49 degrees of freedom, with a p-value .003. This is an indication that the model is a poor fit for the data. However, considering the problem of using the x^2 goodness-of-fit statistic alone and its sensitivity to the sample size and model complexity, other fit statistics are examined (Hair et al., 2006; Fornell & Larcker, 1981). Thus, other goodness-of-fit indices were selected based on the sample size, as suggested by Hair et al. (2006): the statistics for these alternative measures are also presented in Table 6.4**.**

Overall, these statistics show that the measurement model of EUCS provides a reasonably good fit for the collected data of IS end users of the Oyster system. The value of RMSEA, an absolute fit index is .079: this value is below the .08 guideline for a model with 12 measured variables and a sample size of 91 (Hair et al., 2006). The value of CFI, an incremental fit index, is 0.965. This value is close to the 0.97 guideline for a model of this simplicity and small sample size (Hair et al., 2006). Another fit index is the value of the TLI which is 0.953, slightly lower than the 0.97 guideline, but close enough to indicate an acceptable model-data fit, as these cut-off values are meant to be used as guidelines, not exact values (Hair et al., 2006). All of these index values are supportive of the model being an acceptable fit. Thus, it can be concluded that the CFA results of EUCS support the model and provide a reasonably good model-data fit.

Table 6.4: Overall Model Fit Indices of the EUCS Measurement Model of the Oyster study

	P-value	CFI	TLI	RMSEA
Recommended value (Hair et al., 2006)	Value >0.05	0.97 or better	0.97 or better	Value < .08
EUCS measurement model	0.003	0.965	0.953	0.079
Meaning	Not Supported	Supported	Supported	Supported

To assess the construct validity of the EUCS in the context of the Oyster system, convergent and discriminant validity is examined, which begins with examining the factor loading estimates.

The default maximum likelihood loading estimates are presented in Table 6.5, and show that all loadings are highly significant and exceed the 0.7 standard (Hair et al., 2006). The completely standardised loadings (standardised regression weights) are presented in Figure 6.1 and show that all loadings are highly significant and above the 0.7 standard (Hair et al., 2006).

The variance-extracted estimates and the construct reliabilities are presented at the bottom of Table 6.6. Variances-extracted from the first-order constructs range from 65.7% for content to 79.45% for accuracy. The variance extracted of the second-order construct (EUCS) is 82.48%. All exceed the 50% standard and indicate an adequate level of convergence (Hair et al., 2006).

Construct reliabilities of the first-order constructs range from 0.75 for the timeliness construct to 0.86 for the content construct. Construct reliably of second-order constructs (EUCS) is 0.96. All exceed the 0.7 standard of good reliability (Hair et al., 2006).

Taken together, the convergent validity of the EUCS measurement model is supported. All variance-extracted estimates exceed 0.5 and the reliability estimates all exceed 0.7. Furthermore, the EUCS measurement model fits reasonably well. Therefore, all items are retained and the convergent validity of the model is supported.

To establish the discriminant validity, variance-extracted estimates for each factor are compared with the squared interconstruct correlations associated with that factor (Fornell & Larcker, 1981; Hair et al., 2006). Table 6.7 presents the standardised Amos output for the construct correlation matrix of the EUCS Measurement Model of the Oyster system, which are then squared to obtain the squared correlation estimates. Variance-extracted estimate values should be greater than the interconstruct correlations to establish validity. By comparing average variance extracted (AVE) with squared correlation estimates in Table 6.8, some concerns are found regarding discriminant validity. The AVE of one or both factors is less than the squared correlations between these factors. Specifically, discriminant concerns are found with the five constructs of content, accuracy, format, timeliness and ease of use. Discriminant concerns and found with the construct of content with regard to both format and timeliness, and the construct of format with regard to both ease of use and timeliness.

Figure 6.1: Amos output for the Standardised Factor Loading Estimates of the EUCS Measurement Model of the Oyster system
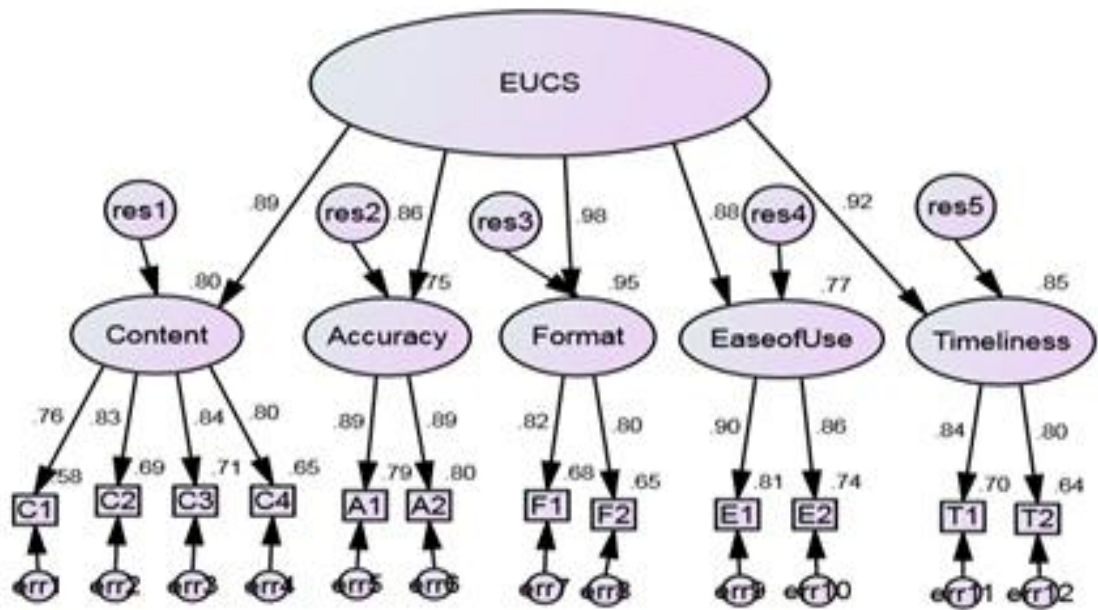
Table 6.5: Selected AMOS output, Maximum Likelihood Factor Loading Estimates 'Regression Weights' of the EUCS Measurement Model of the Oyster system

			Estimate	S.E.	C.R.	P	Label
Content	<---	EUCS	.780	.092	8.487	***	par_8
Accuracy	<---	EUCS	.850	.093	9.095	***	par_9
Format	<---	EUCS	.874	.094	9.298	***	par_10
EaseofUse	<---	EUCS	.829	.094	8.815	***	par_11
Timeliness	<---	EUCS	.877	.103	8.512	***	par_12
C4	<---	Content	1.000				
C3	<---	Content	1.095	.113	9.680	***	par_1
C2	<---	Content	1.059	.112	9.487	***	par_2
C1	<---	Content	1.040	.122	8.536	***	par_3
A2	<---	Accuracy	1.000				
A1	<---	Accuracy	1.094	.094	11.691	***	par_4
F2	<---	Format	1.000				
F1	<---	Format	1.015	.109	9.312	***	par_5
E2	<---	EaseofUse	1.000				
E1	<---	EaseofUse	1.105	.099	11.173	***	par_6
T2	<---	Timeliness	1.000				
T1	<---	Timeliness	1.022	.113	9.013	***	par_7

Table 6.6: Completely Standardised Factor Loadings, Variance Extracted, and Reliability Estimates of the EUCS Measurement Model of the Oyster system

	EUCS	Content	Accuracy	Format	EaseofUse	Timeliness
Content	0.893					
Accuracy	0.865					
Format	0.976					
EaseofUse	0.879					
Timelines	0.924					
C4		0.805				
C3		0.841				
C2		0 829				
C1		0.765				
A2			0.892			
A1			0.891			
F2				0.804		
F1				0.822		
E2					0.859	
E1					0.902	
T2						0.798
T1						0.839
Variance Extracted*	**82.48 %**	**65.7 %**	**79.45 %**	**66.15 %**	**77.6 %**	**67.1 %**
Construct Reliability**	**.96**	**.86**	**.85**	**.76**	**.85**	**.75**

*VE=$\frac{\sum_{i=1}^{n} \lambda_i^2}{n}$ computed using the average squared standardised factor loading (squared multiple correlation).

**CR $= \dfrac{\left(\sum_{i=1}^{n} \lambda_i\right)^2}{\left(\sum_{i=1}^{n} \lambda_i\right)^2 + \left(\sum_{i=1}^{n} \delta_i\right)}$

Table 6.7: Amos output for the Construct Correlation Matrix (standardised) of the EUCS Measurement Model of the Oyster System

Constructs	Content	Accuracy	Format	Ease of Use	Timeliness
Content	1				
Accuracy	0.845	1			
Format	0.856	0.800	1		
Ease of Use	0.703	0.771	0.912	1	
Timeliness	0.857	0.761	0.899	0.811	1

Table 6.8: Squared Correlation Estimates and AVE of the EUCS Measurement Model of the Oyster system

Constructs	AVE	Content	Accuracy	Format	Ease of Use	Timeliness
Content	**.657**	1				
Accuracy	**.795**	0.714	1			
Format	**.662**	0.733	0.64	1		
Ease of Use	**.776**	0.494	0.594	0.832	1	
Timeliness	**. 671**	0.734	0.579	0.808	0.658	1

6.3.2 Social Media Analysis

This section presents an analysis of social media data, which starts with harvested data using Twitter hashtags and specific keywords, which resulted in collecting a very large numbers of tweets: 1,577,232 tweets. The hashtags included 'TFL' and 'underground', and keywords included 'oyster', 'oyster card', 'TFL', and 'underground'.

The analysis process indicated that applying the same analysis approach of the first study Ambassador was not applicable, because of the very large volume of data. Thus, auto-coding was used for analysis provided by ATLAS.ti (Qualitative Analysis Software) to help to manage the huge volume of data, and classify data into the five constructs of the EUCS for the analysis and interpretation processes. Unfortunately, using auto-coding to extract constructs did not return useful data, as extracted tweets were found to be irrelevant.

Therefore, the data needed to be sampled in order to provide a representative sample of tweets that could be analysed manually with the aim to extract value and meaning. A representative sample allowed the researcher to make inferred generalisations, and based on this need, a random sample was drawn and analysed manually.

Twenty archives were harvested that varied from 3093 to 266034 tweets each. In order to analyse this large number of tweets, representative sampling was applied to reduce the number of tweets, with the assumption that the sample adequately represented the population of all collected tweets. The sample size comprised .002% of the tweets in each archive, resulting in 3155 tweets to be analysed manually. These 3155 tweets constitute the representative sample.

The very large volume of data that was harvested using the Webometric tool resulted in collecting Tweets that were not specifically related to this study. After thoroughly examining these tweets, most were found to be irrelevant to the research questions. This led to identifying the tweets harvested by using the keyword of 'Oyster Card' as being related to this research question. These tweets were selected as the main source of data to be analysed.

As a result, these archives revealed additional insights and new interpretations of the construct of End-User Computing Satisfaction in the e-government context. The following section presents the analysis of tweets harvested using the keyword 'Oyster Card'. All collected tweets were in English, and were analysed and interpreted in English.

6.3.2.1 The Positivist Approach to Social Media (Twitter) Analysis

As mentioned earlier, only tweets harvested using the keyword of 'Oyster Card' were analysed, as these tweets were found to be relevant to the research questions. Due to the very large volume of harvested tweets, auto-coding was adopted by using the ATLAS.ti software, which allowed the researcher to apply the positivist approach to this study by quantifying and classifying the huge volume of 37,814 harvested tweets, using structured content coding and the five constructs of EUCS: content, accuracy, format, ease of use and timeliness. These are presented in Figure 6.2.

Figure 6.2: Content Coding Categories (Adopted from Doll & Torkzadeh, 1988)
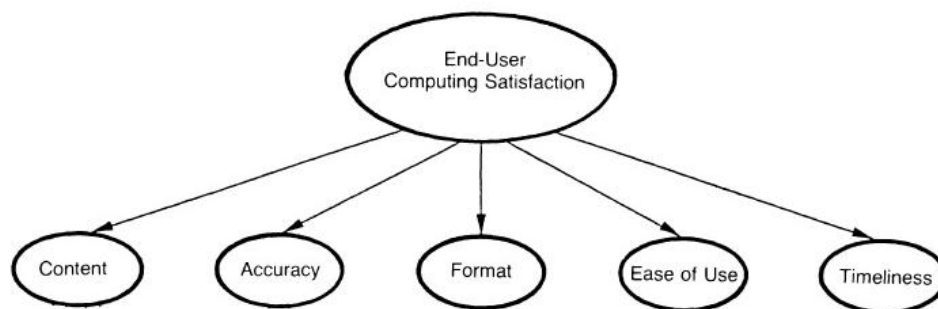
Auto coding made applying the positivist perspective more manageable, as data can be cleaned and counted to add additional related tweets to the study. The final auto coding result is presented in Table 6.9. The aim of applying content analysis is to quantify the types of tweets in relation to the total numbers of harvested tweets, and to be informed about the content of harvested social media data of Twitter 'tweets' in relation to the EUCS constructs measuring IS end users' satisfaction. The focus is on the type of each collected tweet; not the meaning of tweets as expressed by IS end users. Three of the EUCS constructs were revealed in collected tweets, which are

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accuracy, ease of use and timeliness, which supports the validity of these established constructs of EUCS in the context of the Oyster system.

As mentioned earlier, not all harvested tweets were found to be relevant to the purpose of this study, and the numbers between brackets indicates the number of relevant tweets found after being examined manually for relevance.

Table 6.9: Auto Coding Content Analysis Results of Harvested Social Media Data of Twitter (using the keyword of Oyster Card) of Oyster System (Total harvested tweets 37814 tweets)

Content Coding Categories and its synonymous	Frequency*	Percentage of Auto-Coded Tweets
Content	8 (0)	0.02 %
Accuracy	4 (1)	0.01 %
Format	85 (0)	0.22 %
Ease of Use	813 (42)	2.15 %
Timeliness	950 (47)	2.51 %

* Frequency numbers produced using auto-coding, numbers in brackets indicate the number of tweets that were found relevant to this study after being examined manually.

For the construct of content, the auto coding feature of ATLAS.ti was used to extract 8 tweets. When examined manually, none of these were found to be relevant, as in these examples of tweets:

> 'I'm content with my 16+ Oyster card even'

> 'I guess I'm gonna have the contents of my suitcase on the floor in a min'

For the construct of accuracy, the auto-coding feature of ATLAS.ti, extracted 4 tweets. When examined manually only one tweet was found to be relevant, as in this example:

> 'Topped up £20 on my oyster and it didn't credit the card but I still got charged #tfl precision: Oyster card is in the UK, primarily use for public transports'

Here are other examples of irrelevant tweet involving accuracy:

> 'I had to leave London. There was only 20p left on my Oyster card. #precision #symmetry'

> '100% accurate holder for my Oyster card #me #shopping #travel'

For the construct of format, the auto coding feature of ATLAS.ti extracted 85 tweets. When examined manually, none of these were found to be relevant, as in these examples:

'The people that designed the Oyster card reader, should design the signals that keep failing.'

'I would still love to get my hands on an Oyster card to read the data structure in the card.'

'They've changed the design on the Oyster card machines '

For the construct of ease of use, the auto coding feature of ATLAS.ti extracted 813 tweets. When examined manually, 42 tweets were found to be relevant, as in these examples:

'Topping up my Oyster Card online is a nightmare I want to use a bus not a train but I have to nominate a station, what is all this'

'We were down at the weekend I used my oyster and jay used his debit card he said it was much easier'

Here is another example of an irrelevant tweet related to ease of use:

'Londoners: What's the best/cheapest to use for a few days in and around London - an Oyster card or a contactless debit card?'

For the construct of timeliness, the auto-coding feature of ATLAS.ti extracted 950 tweets. When examined manually, 47 tweets found to be relevant as in these examples:

'You know your oyster card is starting to break when you have to tap it about three times for it to work '

'@TfLWaystoPay I topped up at Woolwich arsenal and you took money from my card but when I tapped to update oyster, it did not update'

'I understand why it's slow, they have to verify the card each time..'

Here is another example of an irrelevant tweet related to timeliness:

'Why my oyster card takes so much money off me for a journey at this time is baffling.'

'Used me contactless card for first time on #tube tonight!'

6.3.2.2 The Interpretive Approach to Social Media (Twitter) Analysis

Due to the volume of harvested tweets, the interpretive approach followed is different to the approach used in the first study of the Saudi system Ambassador. The total

number of tweets harvested using the keyword of 'Oyster Card' was 37,814 tweets, which were identified earlier to be the main source for data analysis.

Two archives are first analysed, which comprised 6840 tweets, in order to extract constructs, search for EUCS constructs and synonyms, and to examine how people perceive the system and talk about this using the social media of Twitter.

The extracted constructs are then used to help filter the other archives, comprised of 30974 tweets, by searching through them using key word searches. This approach enables the validation of identified constructs across the larger data set of all the archives. Then a constructive interpretive practice was carried out on the harvested tweets, in order to learn how IS end users perceive and conceptualise the Oyster card system in relation to identified constructs.

The researcher also attempts to explore which constructs or patterns might emerge when previously identified theory or framework is not utilised to enhance understanding of the construct of the EUCS in relation to the harvested tweets of the Oyster system, and their meaning in the context of publicly accessible systems with mandatory use. By inductively developing provisional categories/constructs, continuously examining and comparing new emerging categories with previously coded data, and subsequently adjusting existing categories, some new categories emerge and some existing categories are discarded. The emerging categories and their subcategories from the open coding process are presented in Table 6.10.

Four types of information exchanged on Twitter emerge from this work: information about the system itself and its use (technological aspects), information about types of social exchanges on Twitter in relation to the Oyster system (social exchange aspects), information about human and organisational aspects, including responsiveness and perception of competence of the employees (who are providing IS support) and information about the organisation (its policy and regulation influencing travel pricing through IS), and information about the ubiquitousness of information systems.

Tracing the way these information types developed using open coding, shows how understanding of collected tweets evolved, and how IS end users perceive and conceptualise their satisfaction with the Oyster public transportation system.

Table 6.10: Results of the Open Coding of Social Media Data of Twitter of Oyster System (Data harvested using the keyword of 'Oyster Card')

Results of the Open Coding: The Information Exchanged on Social Media using Twitter	

System	**Technological faults**
	   Faulty Card Reader
	   Faulty Oyster Card
	   Faulty Oyster Machine
	   Faulty Oyster Website
	   Faulty Connection to other Contactless Technology Elements.

	Accuracy
	   Accuracy of the System itself
	   Accuracy of Charged Travel Prices by the System

	Technological Advances
	End User Effort Using the System
	Timeliness of the Technological Response to End-users
	Ease of Use
Social Exchange on Twitter	**Sharing Experience of Using Oyster System in Daily Life**
	Disseminate Public Transport Updates

	Contacting Customer Support
	   To Receive Advice and Help
	   To Report Issue and Improvement Suggestion

Human & Organisational	**Responsiveness (perceived responsiveness of IS support)**

	IS Support
	   End-user Training
	   Technical Support

	Human Competence of Employees of TFL & Quality of Received Support
	   Positive Perception of Staff
	   Negative Perception of Staff

	Organisational influence
Ubiquitous IS	**Technological Competition (in which a newer technology introduced, its use overweight, replaced, or compete with the existing one)**
	Accessing the System (lack of ubiquity in term of smart-phone platform)
	Making Use of the System (sufficient ubiquity fulfil various end-users needs)
	Technological Compatibility

Tweets harvested using the keyword of 'Oyster Card' were identified to be strongly related and relevant to the research questions, based on the process of manually examining the sample Tweets. By focusing only on Tweets containing this keyword, the researcher found that end users of the oyster system talk about the system on social media with Twitter in many ways. For identifying related constructs to this study and

examining their validity against other archives, open coding was used to trace how these constructs were identified (Walsham, 2006), in order to see how understanding evolved and how IS end users perceive and conceptualise their satisfaction with the Oyster public transportation system.

This study focused on Tweets only containing the key word 'Oyster Card' and investigated how end users of the Oyster card system talk about the system using Twitter, and developed interpretations that furthered understanding with regard to the construct of End-User Computing Satisfaction (EUCS).

End users were found to share their experiences of using the Oyster system in their daily life; thus new constructs emerged that are not part of EUCS. In one example an end user shared an experience about the compromise between using an oyster card to travel when using public transportation while carrying heavy luggage, and driving that is easier with luggage but takes longer:

> 'I have an Oyster Card, not good to use mass transit when relocating with giant luggage.   Driving was the best option - but LONG!'

Other examples of tweets are of end users sharing their experience of using the Oyster system, and their satisfaction with the customer support they received as:

> 'London's Oyster card and Underground system is the best payment and underground railway system I've used yet'

> '#Transport for #London's Oyster card is great, a time; money saver for #travellers; well worth getting hold of, even for short visits.'

> '@TfLOfficial just had amazing customer service trying to sort out issues with oyster card very helpful telephone chat with options thanks'

Due to the nature of the Oyster system as a publicly accessible transportation system that becomes an integrated part of end users' lives, it appears in the harvested tweets that end users do talk about the system and share their experiences, either positive or negative, regarding using the system and all related issues, and when and how they use it.

There are two parties involved in social exchanges on Twitter regarding the Oyster system: end users of the system, and operators of the system, which in this case is Transport for London (TFL) and its partners, and both parties use Twitter to connect with each other. The operator of the system (TFL) uses Twitter to disseminate public transport updates and information, such as keeping their customers informed about the status of the provided services, including information regarding good services to travel, closures or failures on some travel lines, and any other related issues.

On the other hand, end users use Twitter to be connected and stay updated with provided services as public transportation becomes as integrated part of their daily commute. In other words, end users become consumers of these provided updates. TFL conscientiously tweets about the status of their services and reports any failures on lines, and any other issues related to public transportation, to their end users, as in these examples of tweets:

> 'Earl's Court station - Oyster users are unable to top-up their Oyster card with a payment card due to technical problems. Updates to follow'

> 'Earl's Court station - Following earlier technical problems, Oyster users can now top-up their Oyster card with bank cards.'

In addition to end-users being connected to the TFL on Twitter to keep updated, end users of the Oyster system also used Twitter to contact customer support of the Transport of London (TFL) in two-way communications, but not just as a consumer of information. First, to receive advice and help as in these examples of tweets:

> '@LDNOverground Hello. Oyster machine failed to read my bankcard but money was taken from my account. How can I get it back?'

> '@TfL can you tell me how I update my online account with my new oyster card number. I have a new card due to last one being faulty. Thanks'

Second, to report issues and give suggestions for improvement. End users use Twitter to report issues they face as part of using the Oyster system, including lost cards and reporting faulty issues at the station, as in these examples:

> 'The oyster card machine is not working again on the 82 bus.'

'@TfLOfficial reported my lost student oyster card A WEEK AGO, fully topped up for a monthly travel card, and still haven't received a new one'

Here are examples of tweets giving suggestions by end users that related to the Oyster system:

'Dear @TfLOfficial find a way to make it that you can use a contactless payment or an oyster card to use the toilets at Euston. #desperate'

'@MayorofLondon I have an idea. Wouldn't it be worth putting oyster card top up machines at bus stops?'

'In a perfect world I could tap in with my Oyster card to use one of those Blue Hire Bikes. @TfL wouldn't that be wonderful? '

As in the aforementioned examples, end users want to expand the use of the Oyster system to cover other facilities, as they perceive the ease of using the system in terms of saving them time and effort.

Other tweets talked about end users moving to adopt the newest technology of contactless payment bank cards instead of the Oyster card for public transportation. TFL (the system operator) extended the ubiquity of the Oyster system by introducing this new technology of contactless payment bank cards for public transportation. This is conceptualised as being technological competition, and a newly emerged construct not part of EUCS, in which newer technology takes over or competes with or replaces an existing technology, because the new technology offers the benefits of requiring less time and effort. Ease in terms of time and effort facilitates using contactless payment with bank cards to access the Oyster system instead of using Oyster cards, as Oyster cards need to be topped up continually and regularly, requiring additional effort. End users described their adaptation of this new technology of contactless bank payment in these examples of Tweets:

'Why do people go through the effort of withdrawing money to top up their oyster when they can just use their card?'

'This contactless payment thing is brilliant, I've not used my Oyster card in about six months.'

'London's Oyster card also requires a physical visit to load credit to card. Contactless taking over from Oyster now'

Other examples of Tweets show end-users expressing their satisfaction with using this new technology of contactless payment card:

'I love contactless. I use it as an Oyster card don't even bother to top up as much. No more waiting at a ticket station; missing the train.'

'I love that you can use your bank card on buses now, is a life saver when you run out of oyster money.'

'Contactless card; great for travelling when you've no money on your Oyster card.'

The new contactless technology also fulfils the need of irregular commuters and visitors: end users who visit London city, as perceived in this Tweet example:

'Being able to just swipe your debit card on the oyster points now is so brilliant if you are not a regular commuter, no more queuing! #tfl'

In another example a visitor end user attending an annual festival in London for a couple of days says:

'My Hungarian PayPass MasterCard worked perfectly during MozFest - never needed an oyster card during any of the 4 days... :)'

A publicly accessible system is used by a wide variety of end users, and this new technology of using contactless payment cards was perceived differently by different end users. In the following examples of tweets, end users perceived it negatively as a result of bad experiences when using it at the station:

'@TfLWaystoPay 'contactless' payment sucks. 1st day today; have to get visa card out and push against reader for it 2 work. Back to Oyster!'

'I gave up on contactless on the tube. Too slow and faulty. Back to my old trusty speedy 2005 oyster card which works perfectly...'

Some end users found that using the new technology of contactless payment cards seemed slower than using Oyster card, as in these examples of tweets:

'You also need to hold the card on the reader until the green light shows, this can take a little longer than Oyster.'

'@TfL tried used my contactless card for a day on tfl, but the extra delay at barriers makes it too slow to use; back to Oyster'

Other end users considered security concerns associated with using a contactless payment card in a public setting, such as typically encountered when using public transportation:

'Thoughts on using contactless bank cards instead of an Oyster? I'm not sure I like exposing my bank card to London! #vulnerable'

'Dear @Tfl, stop pushing this contactless card stuff! I much rather get my Oyster out of my wallet instead of my bank card in a busy station!'

'Since I carry the Oyster card in my pocket, take it out and handhold it on the sensor so no risk to debit card elsewhere in wallet'

In addition to using contactless and Oyster card technology, some end users preferred using a traditional paper ticket. One end user commented, in regard to accessing public transportation by traditional paper tickets, that it fulfilled his/her travel needs better than contactless or Oyster card:

'I only visit every couple of months so like to keep paper tickets. Not keen on Oyster and def wouldn't use my bank card!'

These examples of tweets reveal differences in end uses' perceptions of the system, end users' needs when using public transportation, and how the choice of paying for public transportation differs based on selecting a payment method that fulfils individual needs.

The process of examining harvested tweets found that end users often relate their perceptions of the quality of system support to the human competence of employees of TFL. This perception can be either positive or negative regarding the competence of TFL employees; for example, these tweets clarify how end users link the quality of received support to employees' competence of TFL negatively:

'Complete incompetence from the @TfL staff who 'manage' #Oyster issues. Somehow unable to transfer balance from a lost Oyster card to a new 1'

'Ticket office people are so lazy. @TfLOfficial Oyster card dropped on tracks not a care for the amount i have spent nor an effort to retrieve'

In another example, an end user expressed positive perceptions of competence of employees as a result of the quick service they received:

'Fair play to the oyster card people I ordered it yesterday and it arrived this morning. Was not expecting it so quick.'

The nature of the Oyster system as a public transportation system has become an integrated experience for regular commuters, but some tweets highlighted the lack of ubiquity to access and maintenance of the system in some locations, which reveals ubiquitous IS as a newly emerged construct to access and maintain the Oyster system. Oyster cards need to be maintained and top-upped so they can be used for travel, and can be accessed and maintained by various methods, including the Oyster website online, through Oyster machines that are available at the stations, or at a ticket office. However, these methods do not fulfil individual needs of all end users, as they are not always available. The ubiquitous feature of IS refers to the system being accessible and usable by various types of technological tools and platforms. One example of lack of ubiquity mentioned in the following tweets relates to no smartphone platform application available to the end-user:

'There should be an app to show you how much money you've got left on your Oyster card'

'Why is the @TfL Oyster card site perpetually shitty and broken the whole time? I just want to check my journey history! Why is there no app?'

Another Tweet comments about accessing an end user Oyster account using a smartphone application platform, but wants to facilitate use of the smartphone application as a virtual Oyster card:

'@TfLWaystoPay need to design an app where you can load your #oyster to your mobile. Have lost my card more times than I care to count.'

In addition to the lack of a smartphone platform, other comments suggest that some end users believe there are insufficient facilities to access the Oyster system that indicates a lack of IS ubiquity, as in this tweet:

'There are not enough ticket machines nor Oyster card readers and payment points. #TFL'

The Oyster system can now be used with other transport facilities to provide interoperability and enhance end users' experiences of using public transportation, but evaluation of the system suggests its ubiquity can be challenging. In the following tweet, the lack of IS ubiquity relates to insufficient Oyster machines, but is not associated with TFL (the main operator of the system), as this relates to another partner making use of the Oyster system:

'@greateranglia Oyster card machine at Enfield Lock not working properly again! If you had more than 1 machine there that would help!'

Thus, evaluation of insufficient IS ubiquity could depend on the facilities provided by a specific transport operator, but lack of IS ubiquity and inefficient access to the system influence end users' satisfaction with the system overall, as their needs are not being fulfilled.

Ubiquity of IS can also be in seen in terms of making use of the system, and end users' tweets about ways of using the Oyster system can be viewed from using the term. Current methods of using the Oyster system include paper tickets, the Oyster card, contactless bank card payments, contactless mobile payments and other forms. The ubiquity of making use of the Oyster system fulfils different end users' needs, including regular and irregular commuters. Also, new technology has expanded the ubiquity of the Oyster system, as clarified in these tweet examples:

'As much as I hate using contactless, in times like today, when I forget my Oyster card. I become exceedingly grateful.'

'Oyster card stopped working x.x thank goodness I have my contactless.'

'Lost my Oyster card. Thank god for contactless.'

In another Tweet example, an end user suggests extending the ubiquity of using the Oyster system by using a key fob for more convenience:

'It would be great to have #oyster as a key fob? Less plastic, no card clash and always at hand. Every little helps...'

Due to the wide variety of end users of the publicly accessible Oyster system, the newly emerged factor of IS support also highlights end users' training to use the system in some of the harvested tweets, as in these examples:

'@TFL By any chance do you give 1 to 1 training sessions to incompetent commuters on how to use an Oyster card?'

'I have an oyster card from last year and I don't know how to use it.'

As Oyster system is used by a variety of end users, including visitors, some end users need to be provided with support to understand and use the system effectively. Also, technical IS support needs to be provided to enhance end users' experience when they face difficulties, which is exemplified in these tweets asking for technical support with the system:

'@TfLOfficial Am trying to login; top up oyster card but system keeps saying 'Error 691 - Unexpected error' any advice?'

'@TfLWaystoPay your oyster card #topup #online is not working....'

Some end users express their dissatisfaction with faulty technology they experience when using the Oyster system, and technological components that could compromise the system include the Oyster card itself, the card readers, top-up machines, and the Oyster website, as well as contactless payment bank card and contactless mobile payments. Any technological fault in one of these elements of the system could result in end users' dissatisfaction that may affect the frequency, ways they access the system and efficient use of public transportation, which can cause related consequences in delays and costs.

Also, as the system has become polymeric, these changes pose a challenge to the process of system evaluation, as end users now interact with different interfaces that need to be considered separately in order to evaluate the overall effectiveness of the

system. Examination of the harvested tweets show that end users express their dissatisfaction with different elements of the Oyster system; for example, these tweets highlight perceptions of faulty technology they have faced:

> 'Furious that' TFL and their faulty Oyster card has cost me £12 this week which is 'non refundable' in spite it being no fault of my own.'

> 'Getting a bit sick of my contactless card stopping working on Oyster readers. @TfLWaystoPay is this a known issue? It's not convenient'

> '@greateranglia u really need 2 get another Oyster top up machine at Brentwood, 1 that accepts cash, there is only 1 and the card 1 never works'

> 'Not a good day for Oyster cards today. The website is "experiencing difficulties" and it turns out your bank card could be cheaper.'

Occasional faults in technology are not unusual, but fast responses to solve technological issues and provide end users with various technological alternatives (IS ubiquitous) to keep disturbances to a minimum are crucial, especially in dynamic context of the Oyster system.

The artefact of the IS needs to be designed to be easy, clear and also sophisticated, and is an aspect of system design and development that is well-established in the literature. The fact that the Oyster system is publically accessible makes this point crucial. The artefact of the system as a technological advance is conceptualised as a new emerged construct in which the system is sophisticated and utilises advancements in technology to consider and fulfil individuals' needs. The following tweet examples of end users' perceptions of technological advances of the Oyster system question its ease of use and describe the Oyster website as inaccurate:

> 'Went to top-up my oyster card using the TFL website but gave up halfway through creating an account due to sheer number of questions.'

> 'It's so weird that the @TfLOfficial website drops you into the old version of the site when you try and manage your Oyster card'

> '@TfLOfficial Oyster card history not available online, when will this feature work again?'

In-depth analysis reveals that some tweets are not just about the technologically advanced elements of using the system, but extend to system restrictions. The harvested tweets show that there are some system restrictions that end users perceive as negative aspects of the system, and influence end users' satisfaction with the system as a whole. One of these restrictions is the way the system works in order to top-up the Oyster card online successfully, in which the end-user is required to complete that process by touching the Oyster card using an Oyster reader at a station, instead of directly crediting the Oyster card without the need of an Oyster reader. The effort associated with this process for busy users is shown in this Tweet example:

> 'Topping up my Oyster Card online is a nightmare I want to use a bus not a train but I have to nominate a station, what is all this crap ARGH'

Also, the same restriction applies with refunds, as in this example of tweet:

> 'Just had email re Oyster card refund. To get it must tap in and start journey at Aldgate, where I hardly ever go. Odd.'

This restriction is associated with the way the Oyster card is designed with information held on the card itself, so that direct access to the physical card is needed for refunds or corrections on users' accounts to be reflected (TFL, 2014a). Therefore, any disruption in accessing the system and maintaining the Oyster card account has an influence on end users' satisfaction, such as problems in topping-up the Oyster card using the online facility in these Tweet examples. Another tweet example highlights reaction when end users face problems when accessing the top-up machine at a particular station:

> '@TfLOfficial C2C have removed Oyster card top up from ticket machines at Upminster. This is not acceptable. Please ensure this is rectified.'

Thus any lack of accessibility, such as system faults or system restrictions that prevent end users from making use of and benefiting from services provided by the system results in dissatisfied end users. In the previously mentioned Tweet example, 'C2C' is a train operating company that shares use of the Oyster system, so that interoperability of the Oyster system poses challenges to evaluating the overall system, as it is operated and shared by various parties.

Another restriction is the cashless bus system, as end users can no longer pay with cash to use buses, and end users expressed their inconvenience caused by this policy in the following Tweets:

> 'I hate not being able to use cash on buses it's so inconvenient especially since not every shop does Oyster card top ups'

> '@TfLOfficial think it's absolutely awful now you got rid of paying cash on bus. If you lost your oyster or contactless card you're stuck!'

> 'Once again, tourists being denied entry into the bus, because they only have cash and no Oyster card or Contactless? @TfL @MayorofLondon'

The last aforementioned Tweet mentions that 'visitors' to the city of London are restricted from using buses and asks the Mayor of London to consider this issue, so travel on London buses is restricted to using an Oyster card or any form of contactless technology. These decisions appear to be based on organisational policy to create greater savings in terms of cost and time (TFL, 2013), but restrict the ubiquity of using the system by end users.

Analysis of harvested tweets indicate that various elements come together to form the Oyster system as a whole, so that the researcher conceptualises the system as a polymeric IS (Information System), a new emerged conceptualisation comprised of element bonds that interact together to form the Oyster system as one, and that supports the ubiquity of IS as the system is expanded and connected with other technological elements for ease of use, such as Oyster machines, Oyster readers, the Oyster website and Oyster cards. In addition to these elements, there are other external elements that are compatible with the Oyster system that can be utilised to bond with the system, including the new technology of contactless bank payment cards, contactless mobile payments, and other forms of contactless technology. All these elements bond together as molecules to enable use of the Oyster system.

Therefore, technological compatibility between these molecular elements must exist for the system to work. The introduced new technology on the wider transport network enables contactless bank payment cards to be used with the Oyster system, but as both Oyster cards and bank payment cards are based on contactless technology,

a mishap might occur, such as a card clash. In these examples of tweets, some end users experienced a mishap of card clash:

> '@TfLWaystoPay Given I had my 1st card clash mishap that cost extortionate £20.70 for 1 eve's journeys, do I now really need an Oyster card?'

> 'I've been told that my Oyster card and contactless card are not friends, and so should be segregated'

> 'Charging people twice is what I call bad system engineering, not 'card clash @TfL'

In another circumstance, the card reader detected the existence of two contactless cards, an Oyster card and a bank payment card: the Oyster system alerted the end user to place the contactless card the end user intended to use, as in this example of tweet:

> 'Took my brand new bank card today along with my oyster, but when I touched the gates remained closed and a message flashed up use 1 card only ???'

Thus, TFL increased awareness for end users when using contactless technology, either in terms of Oyster card or bank payment card, and advised they be kept separated to avoid card clash. Also, end users advise each other to avoid card clash, as in this example of a Tweet:

> 'Don't scan your Oyster card next to your bank card or you get charged twice with NFC wireless technology'

All of these technologies are compatible, and provide end users with alternative options for using the public transportation system (Oyster system) based on convenient choices that fulfil their needs. One negative result relates to the problem of 'card clash'. The Oyster Card reader that detects more than one contactless card cannot distinguish which card end users intend to use. Thus, end users that adopt this new technology must be aware of how to use the technology to avoid being over charged, which results in being charged the maximum rate for both cards, inconvenience caused as a result of card clash, cost, time and effort to solve this issue.

It is reported by TFL that the number of contactless users has continuously increased, and that 'Over 180 million contactless journeys were made in one year' (TFL, 2015a).

The large number of passengers associated with the adoption of contactless technology justifies this technology adoption, as it results in providing ease in terms of saving time and effort when using cards or smartphone platforms.

Apple Pay is another example of compatible mobile contactless technology that enables end users to use their Apple smartphones, iPads or Apple watches to make contactless payments. These other types of contactless mobile payment are highlighted in this Tweet example, when an end-user expressed perceptions of using this technology for public transportation (Oyster system):

> 'Being able to use my phone on public transport rather than an oyster card is so amazing'

> 'Just used #ApplePay at the subway turnstiles on the London Underground. Pretty cool that it works! No need for an Oyster card.'

The Oyster system has evolved so that it can be used in different ways to provide end-users with simple, fast and easy options for using public transportation, depending on their needs, as clarified by TFL:

> 'We accept some mobile payment applications, key fobs, wristbands, payment stickers and tags, including Apple Pay, bPay, EE Cash on Tap and Vodafone SmartPass applications for pay as you go where contactless is accepted.' (TFL, 2015b)

Analysis of harvested Tweets found end users highlighting the accuracy of the Oyster system, which is a construct of EUCS. The nature of the Oyster system is a payment system with fully automated services, so the term 'accuracy' reflects the accuracy of the system itself, and the accuracy of travel prices charged by the system. The accuracy of the system is clarified in these Tweet examples:

> '@TfLWaystoPay tried to renew oyster season ticket on ur website. Kept saying it didn't work. But U charged my credit card 4 times! Pls help'

> 'Fuming! Topped up oyster at machine using my card. Said there was an error. Removed card, no money on oyster, but money has left my account!'

> '@TfLWaystoPay my card was debited but oyster card wasn't updated. I used a foreign card'

Inaccuracies were also found in deducted prices by the system highlighted in harvested Tweets, which have a negative influence on end users' perceptions of the system, and the operator of the system, as in these examples:

'@TfLWaystoPay I would use my card, but as Oyster are always refunding me for their mistakes (another £5.70 this morning), I don't trust it.'

'@TfLWaystoPay; As per the attached picture the Oyster card system erroneously overcharged me £4.80 for an off-peak journey.'

'Why does my @TfLOfficial Oyster card keep overcharging me? It's your gates that don't work! Complete rip off!'

The accuracy of the Oyster system influences end users' perceptions of the system, and is clarified in these examples:

'The amount of times tfl have refunded my Oyster card is making me lose faith in the system.'

'In summary, if #Oyster takes more money off your card than journey cost, it is very time consuming; expensive to sort out... @TfLWaystoPay'

As well as the accuracy issues that take place within TFL (The operator of the system), these issues might also happen with other parties. As a polymeric system that is connected and shared with other operators and partners, the accuracy issue with third parties makes evaluation of these constructs challenging, and is clarified in this example:

'@TfLWaystoPay I've just topped up my oyster in a shop and it hasn't credited my card. Shopkeeper says that it went through! HELP #stranded'

Analysis of harvested tweets show new emerged factor of end user effort in using the system, because the Oyster card requires end users to maintain their Oyster card account regularly to ensure enough credit exists to allow them to use travel services. In these examples of tweets, end users described the effort required to maintain the Oyster card compared to contactless technology:

'Used contactless bank card for the #tube, just like Oyster, avoiding the massive ticket queue...winning! Thanks'

'I need to go top up my oyster card but I'm too lazy'

The Oyster card system allows end users to maintain their account using online services as an alternative method to access the system to be accessed that provides convenience for end users, and saves time and effort to maintain Oyster accounts, instead of using Oyster machines available at stations, as in this Tweet example:

'The smartest thing I ever done was pre-load my Oyster card online. The queues are crazy @ London Euston st.'

The new contactless technology of using a bank payment card that allows end users to use public transportation services without the need to have an Oyster card saves them time and effort to maintain it regularly, and their perceptions are reflected of using payment card technology in this example:

'Using your credit card like a Oyster card on the tubes to save time is a great idea'

Various options are shown to exist for using the Oyster system, and the two main options are paying by using the Oyster card or a contactless bank payment card, depending end users' individual needs. In some cases, and for regular users of public transportation and users entitled to discounted travel journeys, they might prefer using the Oyster card rather than payment cards, because discounts cannot be claimed when using bank payment cards, as clarified in this example:

'Hi, discount entitlements can't be added to a contactless card. If eligible, you should continue using your existing Oyster card'

In other cases, such as some irregular commuters, it might be a convenient option to use a bank payment card rather than an Oyster card, as clarified in this example:

'Being able to just swipe your debit card on the oyster points now is so brilliant if you are not a regular commuter, no more queuing! #tfl'

Therefore, deciding which option to use when it comes to using the Oyster system depends on end user' individual needs, as contactless technology when using bank payment cards requires less effort for public transportation, but that may not fulfil

other needs of end users. Thus, end users' preferred methods for payment depend firstly on fulfilling their needs.

The construct of timeliness of EUCS is about acquiring adequate information on time, and does emerge in the data, but with different meanings. As the system becomes ubiquitous, the construct of timeliness becomes ubiquitous too. IS was first accessed and used through computers, but as the system has evolved and become ubiquitous it is now accessible and used on different technological platforms, which has resulted in its own timeliness.

This study shows that the Oyster system can be accessed in ubiquitous ways including Oyster websites, contactless websites, Oyster card machines (top-up machines) at stations and the Oyster reader. Thus evaluating the timeliness of the Oyster system is a challenging process with various technological platforms that need to be considered to evaluate the overall system. Analysis of harvested tweets shows that as the Oyster system provides fully automated services, the construct of timeliness becomes more about the timeliness of the technological responses to end users, as clarified in these examples:

> 'Contactless card still slower than Oyster at opening the ticket gates.'
>
> 'TfL contactless website has improved since I trialled it and is now superior to Oyster. But the card reading still noticeably slower.'
>
> 'With contactless card please leave it a bit longer than usual on the reader rather than a quick touch like Oyster.'
>
> 'Have you tried it on buses ; trains? Ticket machines seem to respond slower to bpay vs oyster card'
>
> '@TfLWaystoPay My @AmexUK contactless card worked well yesterday, but the response time needs improving. During rush hour, Oyster wins.'
>
> 'Tube gate readers beep/blink immediately as you tap your Oyster, but only after the card is removed if you're using a contactless bank card '

The ease of use of the system is one of the constructs of EUCS and of the Technology Acceptance Model (TAM) (Davis 1989). During analysis of tweets the construct of ease

of use was highlighted in tweets as end users expressed difficulty and lack of understanding of the content when using the Oyster website, as in these Tweet examples:

> 'Decided to buy Oyster card online from @TfLOfficial but Options make it tricky. Do I want a Pay as you Go or Travelcard? Just Oyster card!'

> 'The Oyster card website is stupid I don't have time for it'

As a publicly accessible system for public transportation that is used by a wide range of end users, either residents or visitors, the construct of ease of use becomes an important factor, and can be supported by providing end users with more clarification and support options. This becomes crucial in order for the system to be understood and used easily by a variety of end users, and to allow them to make use of the system successfully. These considerations are clarified in this Tweet example:

> '@TfL tourist next to me had no clue how to get Oyster card due to poor explanation on ticket machines.'

In other instances, analysis of Tweets shows end users' perceptions of ease of use of using Oyster system as:

> 'The Oyster card works perfectly, still has money on it and everything after all this time. Easy to top up.'

> 'Just did my online application for 60+ Oyster card!! Easy peasy!!!'

> 'Oyster cards are easy to use, you pay £5 for the card then just top it up I went to London for a weekend and only spent like £20'

Organisational influence in terms of policy governing the Oyster system and fares are shown to influence perceptions of the Oyster system by end users. One of these policies is travel prices, and these Tweet examples question the difference in price for the same route:

> '@SW_Trains Vauxhall-Surbiton is £8.60 if u buy ticket @SWT ticket office but only £8 if u use Oyster card. Isn't it the same route? #thieve'

> '@LondonDLR not happy I've been charged 3 times the amount just because I don't have an oyster card or contactless card'

The public transportation system has links with buses and links with other rail networks, so that any of these other providers could have an influence on travel prices when buying tickets from any of the involved organisations. Looking at why and how travel prices differ in regard to accessing and operating the Oyster system is beyond the scope of this research, but the difference results in negative perceptions of the operator of the system, and might be a result of lack of understanding of the nature of the cooperation between all involved parties to run a public transportation system and the way the system has to be operated and shared.

Analysis of harvested tweets shows the new emerged factor of perceived responsiveness of IS support, and due to the nature of the Oyster system as a public transportation payment system, responsiveness of IS support to end users is found to be important for many reasons. First, the Oyster system is a payment system that has become an integrated part of end users' daily life: they need it and use it for public transportation, as clarified in these examples:

> 'Am spending lunchtime on phone to #tfl trying to get stolen Oyster card blocked after it auto-topped up. 33 minutes wait so far. Hopeless.'

> '@TfL Need help - Oyster card not working, station staff say I must phone u. Have been on hold for 25mins... Given up - please advise'

Harvested tweets also highlight a lack in responsiveness in the Oyster context that can result in financial cost incurred by end users, as clarified in these examples:

> '@TfLWaystoPay I lost my Oyster card this evening; I assume that by the time ur website is back up someone will have spent my money! Great!'

> '@TfL lost my Oyster card last night. Oyster website is down and customer support page is too.... Any other way to cancel it?'

> 'Hey @tfl, your 'Oyster' team isn't available until Monday, and your Oyster website down. How to report a lost auto-top-up card then?'

Although there are various options that exist to report such issues, including calling customer service and using the Oyster website online, the researcher found that these were insufficient to support the ubiquity of providing end users with multiple and various channels. With the existence of technological faults and the restrictions of

opening hours, alternative channels and automated options are needed, in particular to deal with the existence of technological faults.

In other tweets, end users expressed their satisfaction, as a result of perceived responsiveness of IS support they received, as in these examples:

> '@TfL impressive service, excellent support with lost #oyster card. Thank you to the gentleman on the other end of helpline.'

> '@TfL just received my Oyster card, only ordered it Thursday! Talk about fast delivery! Must say I am very impressed! Can't wait to use it!'

These examples show various perceptions held by end users about responsiveness of support based on their experience with system support. Analysis of Tweets reveals another issue that emerged, as the Oyster system is a polymeric IS, customer support becomes more challenging when end users face an issue with other elements of contactless technology, as these elements are controlled by other parties and not TFL, as clarified in these examples:

> '@NatWest_Help card won't be read by the contactless Oyster machines. Supposedly you're having issues?'

> '@TfL is there a reason why my Contactless card won't work but I've got money in my account? Had to buy another Oyster. Inconvenient'

> '@TfL 25mins and counting...4 different people....now on hold - just to sort out a refund for the card clash on my oyster!!! #sortitout'

These Tweets show that in the first Tweet a bank issuer was contacted for support with card issues, while in the second Tweet, TFL was contacted for support.

In summary, only three constructs of EUCS emerged in the Oyster data: accuracy, ease of use and timeliness. The other two constructs of EUCS, content and format, did not emerge in the data and is justified due to the nature of Oyster as a payment system of automated services.

The constructs of accuracy and timeliness, which are part of EUCS, did emerge, but with a different meaning. The meaning of accuracy diverged to be more about the accuracy of information and the accuracy of the functionality of the system. The

construct of timeliness was found to be about the timeliness of technological responses to IS end users, but not the timeliness of information.

As IS has evolved, the outcomes of the system are not limited to information, but extend to be more about technological responses regarding automated services. Understanding has evolved in regard to the construct of IS end users' satisfaction, as new constructs have emerged in the data that are not part of EUCS. These constructs are summarised in Table 6.10, including the influence of technological faults on IS end users' perceptions, in addition to the artefacts of IS itself: effort of using the system, end users' support and responsiveness, and ubiquitous of accessing and making use of the system to fulfil various needs of end users.

6.3.2.3   Key Word Searching

Key word searching is the final mode of social media analysis applied to enhance understanding of data content, to corroborate the findings and to establish rigour. ATLAS.ti (Qualitative Data Analysis Software) was used to automatically search for key word adjectives and to investigate how they were used by IS end users of the Oyster system to describe their perceptions of the system. The researcher aimed to investigate how end users perceive the system and how these adjectives are used by end users analysed from harvested Tweets relate to IS evaluation and how the system is perceived, which was also the approach adopted for the first study of the Saudi system Ambassador. A summary of the adjective pairs used is presented in Table 6.11 in antecedent order, along with the context in which they were used. The researcher found that out of 118 adjectives, 55 adjectives were used, 16 adjectives were used in irrelevant or unclear tweets, and 47 adjectives were omitted. The most used adjectives were 'low', 'good', 'bad', 'easy' and 'hard'. The findings of key word searches corroborate the findings in previous positivist and interpretive analyses.

Table 6.11: Adjectives Pairs, adopted from Bailey & Pearson (1983) to be used for key word searches (Total numbers of tweets is 37814, harvested using the key word of 'Oyster Card')

Adjectives Pairs	Frequency *	The context of use
Just vs. Unjust	2278 vs. 0	Just used by user to emphasise their perception in regards to various aspects of the Oyster system.
Low vs. High	1561 vs.52	Low used: • Talk about Oyster card credit, and its fares. • To talk about the low credit of Oyster card and the restrictions of cashless payment on buses. High used: • To talk about the Oyster card, its effectives and its fares.
Good vs. Bad	478 vs. 150	Good used as: • To share experiences when good or not to use an Oyster card for public transportation. • To talk about public transportation. • To talk about received customer support of Oyster system. • To talk about the Oyster card and Oyster website. Bad used: • To talk about fare charging process of Oyster system (system engineering). • To talk about contactless payment card technological faults.
Easy vs. Hard	115 vs. 153	Easy used: • About using the Oyster system. • To talk about using the Oyster card. Hard used as: • To talk about the Oyster card. • To talk about claims issues.
Easy vs. Difficult	115 vs. 22	Easy see above. Difficult used to: • Talk about the Oyster system and its usage. • Talk about the Oyster card top-up and refund issue. • Talk about the Oyster website and using it.
Complete vs. Incomplete	69 vs.5	Complete used is identified as unrelated to this study. Incomplete used to: • Talk about issue of incomplete journey and refund.
Current vs. Obsolete	67 vs. 2	Current used is identified as unrelated to this study. Obsolete used as (Could not understand the meaning as tweets were unclear).
Fair vs. Unfair	59 vs. 2	Fair used to: • Talk about public transportation fares. • Talk about policy governing using the Oyster system. • Talk about response time by customer support. Unfair used to: • Talk about policy influencing public transportation fares. • Talk about response time by customer support.
Easy-to-use vs. Hard-to-use	55 vs. 48	Easy to use used: • To talk about the Oyster card. Hard-to-use used: • To talk about using contactless payment cards.
Definite vs. Uncertain	54 vs. 0	Definite used: • To talk about Oyster system and its usage.
Available vs. Unavailable	49 vs. 2	Available used: • To talk about the availability of the Oyster system facility including the Oyster card and contactless facility, Oyster machines, and Oyster online. Unavailable used: • To talk about unavailable system features/services.

Adjectives Pairs	Frequency *	The context of use
Fast vs. Slow	41 vs. 50	Fast used: • To talk about fast responses of Oyster card, and the issue of direct refunds. • To talk about the improved process of Oyster card top-ups. Slow used as: • To talk about slowness of responses of Oyster card, and contactless technology to use the Oyster system. • To talk about slowness of the Oyster website.
Regular vs. Irregular	41 vs. 1	Regular used: • To talk about regular commuters of public transportation and regular types of Oyster card. Irregular used: • To talk about irregular commuters of public transportation.
Clear vs. Hazy	40 vs. 0	Clear used as: • Not clear information provided on the Oyster website.
Simple vs. Complex	33 vs. 2	Simple used: • To talk about the Oyster system and its use. Complex used: • To ask about how the Oyster system works.
Short vs. Long	26 vs. 537	Short used is identified as unrelated to this study. Long used: • To talk about customer support issues relating to the Oyster system, including delivery time and response time. • To talk about contactless payment cards as taking a longer time to respond rather than the quick touch of the Oyster card.
Known vs. Unknown	22 vs. 3	Known used: • To talk about the Oyster card. Unknown used as (Could not understand the meaning as the tweets were unclear).
Encouraged vs. Repelled	15 vs. 0	Encouraged used is identified as unrelated to this study.
Acceptable vs. Unacceptable	13 vs. 2	Acceptable used: • To talk about end users' perceptions in regard to the Oyster system and its use. Unacceptable used as (Could not understand the meaning as unclear tweets).
Useful vs. Useless	12 vs. 26	Useful used: • To talk about the Oyster card, and top-up issues. Useless used as: • To talk about the Oyster card, its top-up and refund issues. • To talk about human involvement of customer support and services provided. • To talk about the Oyster website.
Secure vs. Insecure	12 vs. 2	Secure and Insecure used is identified as unrelated to this study.
Successful vs. Unsuccessful	12 vs. 1	Successful used: • To talk about using the Oyster system, including the Oyster card and the process of topping-it up. Unsuccessful used: • To describe using the Oyster card.
Reasonable vs. Unreasonable	11 vs. 0	Reasonable used: • To talk about prices of using public transportation.
Necessary vs. Unnecessary	10 vs. 5	Necessary used: • To ask about ways of using the Oyster system regarding what is necessary and what is not. Unnecessary used: • To compare between using Oyster cards and other contactless payment technologies.

Adjectives Pairs	Frequency *	The context of use
Relevant vs. Irrelevant	10 vs. 3	Relevant used to: • Ask question regarding the Oyster system and its use. Irrelevant used is identified as unrelated to this study.
Timely vs. Untimely	10 vs. 0	Timely used: • To talk about public transportation services. • To talk about Oyster card issues and delivery.
Efficient vs. Inefficient	9 vs. 0	Efficient used: • To describe the Oyster system and cash-free payments. • To describe customer support as perceived by users.
Appropriate vs. Inappropriate	8 vs. 3	Appropriate used as: • Oyster system provides appropriate fares based on users' journeys. • To question the way human involvement deals with user regarding using the Oyster card. Inappropriate used to describe: • Deducted prices by the Oyster system.
Sufficient vs. Insufficient	7 vs. 2	Sufficient and Insufficient used: • To talk about funds and using the Oyster system.
Valuable vs. Worthless	7 vs. 0	Valuable used: • To talk about the Oyster card.
Pleased vs. Displeased	7 vs. 0	Pleased used to: • Talk about users' experiences when obtaining and using the Oyster card.
Productive vs. Destructive	6 vs. 0	Productive used is identified as unrelated to this study.
Involved vs. Uninvolved	6 vs. 0	Involved used is identified as unrelated to this study.
Positive vs. Negative	5 vs. 25	Positive used: • To describe users' experience after using public transportation. • To talk about staff attitudes when dealing with customers. Negative used as: • To talk about negative balance of Oyster cards.
Superior vs. Inferior	4 vs. 0	Superior used to describe: • Oyster card readers. • TFL contactless website as superior to the Oyster website.
Accurate vs. Inaccurate	4 vs. 0	Accurate used to: • Describe the Oyster system as not accurate, in terms of deducted prices.
Precise vs. Vague	3 vs. 4	Precise used to: • Talk about the precision of the Oyster system and deducted fares. Vague used to: • Describe the Oyster system as vague and unworkable.
Flexible vs. Rigid	3 vs. 0	Flexible used as: • Talk about the Oyster system and its online website.
Significant vs. Insignificant	3 vs. 0	Significant used to: • Describe the significance of Oyster card for its users.
Powerful vs. Weak	2 vs. 12	Powerful used as (Could not understand the meaning as the tweets were unclear). Weak used is identified as unrelated to this study.
Liberating vs. Inhibiting	2 vs. 0	Liberating used is identified as unrelated to this study.
Organised vs. Disorganised	2 vs. 0	Organised used is identified as unrelated to this study.
Adequate vs. Inadequate	1 vs. 0	Adequate used to: • Describe the Oyster system fares as not adequate.
Readable vs. Unreadable	1 vs. 0	Readable used as (Could not understand the meaning as tweets were unclear).

Adjectives Pairs	Frequency *	The context of use
Rational vs. Emotional	0 vs. 176	Emotional used as: • To talk about the Oyster card, in case of losing the card or no longer being entitled to a free card. In general, they use the word 'emotional' when talking about their experience of using the Oyster card.
Versatile vs. Limited	0 vs. 75	Limited used: • To talk about unlimited types of Oyster cards and travel cards.
Concise vs. Redundant	0 vs. 2	Redundant used: • To talk about the Oyster card as being redundant as contactless technology is now introduced for public transportation.
Adjectives Completely Omitted		
Harmonious vs. Dissonant		Dependable vs. Undependable
Candid vs. Deceitful		Cooperative vs. Belligerent
Meaningful vs. Meaningless		Skilled vs. Bungling
User-oriented vs. Self-centred		Eager vs. Indifferent
Courteous vs. Discourteous		Optimistic vs. Pessimistic
Punctual vs. Tardy		Progressive vs. Regressive
Cooperative vs. Uncooperative		

*Frequency numbers were produced automatically by using auto-coding, yet all were not necessarily relevant to this study. The frequency numbers are reported to prove these words have been used in study context.

6.4   Summary

This chapter presents the analysis of the second study, Oyster, including discussion of context, data collection and data analysis. After conducting a CFA analysis, which identified discriminant concerns with the theoretical measurement model of EUCS, the researcher considered the social media element of this study by analysing data from Twitter. Twitter data was harvested automatically using software, and analysed with the assistance of qualitative analysis software, which helped to manage the very large volume of data. Twitter data was analysed by applying three modes of analysis, the positivist approach, the interpretive approach, and key word searches, in order to understand the data better and comprehensively use it to construct knowledge and establish rigour. By applying open coding, the researcher inductively developed provisional constructs, and continually examined and compared newly emerged constructs with previous coded data, and adjusted data accordingly until a final understanding was reached to learn how IS end users perceive and conceptualise the Oyster system. Just three constructs of EUCS emerged from the Oyster Study, which are accuracy, ease of use and timeliness, but some diverged in meaning. In addition to fourteen emerged constructs relating to the system itself and its use, the constructs of human and organisational aspects, social exchange aspects and the ubiquity of IS were

also considered. In the next chapter, the findings from the two studies of Ambassador and Oyster are discussed in relation to each other, to EUCS and to the literature.

Chapter 7: Discussion

The previous two chapters present analysis of the empirical studies of the Ambassador and Oyster systems that started with an established instrument, EUCS, to measure end-user satisfaction using statistical analysis that shows discriminant validity concern. The empirical study of Twitter social media data is discussed that was framed and constructed by the researcher to further understanding of the construct of IS end users' satisfaction within an e-government context. This chapter discusses findings that highlight how IS has evolved in ways that have implications for the evaluation process of its effectiveness.

One of the key findings grounded in data is the evolution of IS into monomeric IS and polymeric IS. The following section evaluates the evolution of information systems and differentiates between the use of IS in a work setting and its use to fulfil individuals' needs, and is followed by a discussion of the empirical and theoretical aspects of the subject.

7.1   IS Evolution

Before discussing the empirical findings, this section explains how IS has evolved over recent years in terms of its context, objectives and influence, as these have implications for system evaluation of success (Petter, DeLone & McLean, 2012). IS evolution is divided into five eras in which change and evolution of these systems have influenced system perceptions and evaluation of the system (Petter, DeLone & McLean, 2012).

The first era of IS evolution focuses on data processing from 1950 to 1960, when systems were used to increase efficiency by automating processes of work. The systems were exclusively adopted by the military and financial sectors to be used by a small number of trained and knowledgeable end users. This era has an immature IS discipline, because evaluating systems were based solely on technical aspects that achieved identified goals of the system.

The second era of IS evolution occurs between 1960 and 1980 and involves management reporting and decision support, so that systems were used in work settings to produce reports and information to assist in routine decisions making. These systems were adopted in work settings, so use of systems was limited to end users who were trained to use the system as part of their work. In this era, system evaluation was extended to include human factors that involved using information produced by the system and system use, and in addition to considering the technical quality.

The third era of IS evolution between 1980 and 1990 involves strategic and personal computing, which recognises the potential for using IS to achieve strategic organisational goals. The personal computer was also introduced, which changed ways of using and evaluating IS. Strategic use of IS imposes evaluating systems based on the alignment between systems and strategic organisational goals, and on system impact. Also, the introduction of personal computing shifted using the system from back-end users to front-end users. As a result, system use expanded to involve more end users, and evaluation measures expanded to include end-user perceptions of the system. Most of the established measures introduced in this era were a result of introducing end-user based systems with user-friendly interfaces, in a work setting. These measures include the Technology Acceptance Model (TAM) (Davis, 1989), the End-user Computing Satisfaction (EUCS) (Doll & Torkzadeh, 1988) and the IS Success Model (DeLone & McLean, 1992).

The fourth era of IS evolution between 1990 and 2000 involves enterprise systems and networking, so that advancement in technology and networking allowed information and systems to be shared and connected, which influenced and expanded the use of IS by organisations. This change in mode of use of IS has influenced system evaluation, as users are able to connect and share systems and resources. In this era, evaluation measures focus on measuring enterprise systems in term of productivity, team performance and system support.

Finally, the fifth era of IS evolution is customer-focused, and extends from 2000 to the present day. In this era, the use of IS expanded beyond the work-setting, so that

individuals directly access the system through cyberspace in order to use the system for individual needs. Thus, evaluation measures no longer focus on organisations and individuals within a work setting, but these are expanded to cover measuring systems for individual needs.

As IS evolved in its use and role, its end users expanded to include users placed outside organisational settings with various levels of understanding, use of technology and dealing with systems. In this era, measuring systems have become more challenging to ensure that benefits are produced for both organisations and end users to meet individual needs.

This overview of the eras of IS evolution describe how this evolution has influenced measuring system success and effectiveness. This research is based on our analysis and conceptualisation of monomeric and polymeric IS, and suggests that as systems become accessible by various technological platforms, this imposes challenges for the evaluation process due to variations of these technological platforms and how each influences end users' perceptions accordingly.

Evaluation of polymeric systems is shown to become even more challenging by the various numbers of stakeholders involved, and the expanded numbers of end users. Thus, using social media for system evaluation, particularly in an e-government context, proves to be an effective evaluation measure. The following section discusses empirical insights in terms of similarity and variations between emerged constructs in the Ambassador and Oyster studies, along with their relation to the construct of End-User Computing Satisfaction (EUCS), and to the literature.

7.2   Empirical Insights

Initial assumptions of the hypothesised theoretical measurement of EUCS were the starting point for conducting this research, because initial understanding and assumption work as 'a starting point for knowledge production' as it conceptualises reality and holds a belief for an issue under investigation (Alvesson and Sandberg, 2011). Starting by challenging the assumptions of existing knowledge, results in producing interesting research (Davis, 1971; Alvesson & Sandberg, 2011) that

challenges the assumptions of existing knowledge, rather than reinforcing and confirming the assumptions of existing knowledge.

After applying Confirmatory Factor Analysis (CFA) and identifying a discriminant concern with the established EUCS instrument in the context of e-government IS, the researcher investigated the construct of IS end users' satisfaction further by utilising Twitter social media data. By challenging a well-established construct of EUCS that was conceptualised and developed in the late 1980's in the context of mandatory use of systems in a work setting, this research accommodates the evolutionary nature of IS and its expansionary nature that can be adopted in various contexts, such as e-government, which results in implications for measuring its effectiveness. Therefore, this distinguishes between evaluating IS adopted for a work setting from that adopted for an e-government context to fulfil the individual needs of IS end users. IS evolves not only by being shared, interconnected and adopted by various contexts, but also evolves in the way that it is accessed and used by end users. End users interact with systems by various interfaces and technological platforms to use the system for individual needs, which contrasts to the use of systems in a work setting.

After applying the conventional approach of using instruments and designated surveys to collect data utilising the EUCS instrument of Doll and Torkzadeh (1988), this study then adopts the social media approach, which facilitates new understanding and new interpretations of the construct of IS end users' satisfaction within an e-government context.

The positivist perspective of the EUCS approach was applied to social media data obtained from Twitter to gain understanding of the content in relation to the EUCS constructs. All five constructs of EUCS emerged in the Ambassador Study, while only three constructs emerged in the Oyster study: accuracy, ease of use and timeliness. To explain this variation of emerged constructs, the nature of each system is carefully considered.

The nature of Oyster as a ticketing payment system for public transport means constructs of accuracy, ease of use and timeliness are most relevant to end users,

compared to the constructs of content and format. Although, it could be interpreted that the two constructs of content and format are met end users' needs for the Oyster system, as they are basic and static constructs in the context of IS. Thus, it is understandable they do not emerge in Twitter social media data.

Ease of use varies from one end user to another, and the constructs of accuracy and timeliness depend in part on the sophistication of a system's design and development. In the Ambassador System, all constructs of EUCS emerge and contribute to the nature of Ambassador in which end users apply the system to place educational and financial requests to fulfil individual needs. Use of this system requires communication between end users and the organisational personnel who process received requests through the system. Therefore, constructs, such as content and format, are relevant to end users' needs, which contrasts to the nature of the use of the Oyster system.

After applying the positivist perspective of social media data from Twitter, the researcher applied the interpretive perspective in which new understanding develops in relation to the construct of IS end users' satisfaction. From the positivist perspective, this study attempted to analyse and understand the content of tweets in relation to EUCS. From the interpretative perspective, this study constructed a new interpretation and new understanding emerged that was grounded in Twitter data. Using social media data from Twitter allows the researcher to be involved in a learning process about how systems are perceived and conceptualised by end users. The researcher learns about the issues under investigation by utilising a wider perception of IS end users without theoretical and methodological boundaries being drawn.

Next, each emerged construct is individually examined to understand the meaning of how each construct evolved, and begins with the emerged constructs related to the EUCS constructs.

The construct of content relates to the information content provided by the system (Doll & Torkzadeh, 1988). By investigating the construct of content in the two different studies of the Ambassador and Oyster systems, a new meaning emerged, which led to the formulation of a new interpretation of this construct.

In the Ambassador study, where the system involves human intervention in receiving and processing digital requests, the construct of content diverges from its meaning used in the work of Doll and Torkzadeh (1988), as this relates to content of received information by human involvement and the content of information of the system itself.

In the Oyster study, where the system provides fully automated services, the construct of content does not emerge at all. This could be due to the Oyster system operating in the context of paying for public transportation, and that end users perceive the constructs of effort in using the system and time to be relevant and important.

The construct of accuracy involves the accuracy of information provided by the system (Doll & Torkzadeh, 1988). In the Ambassador Study, the construct of accuracy diverges from the meaning used by Doll and Torkzadeh (1988) and relates to the accuracy of received responses by human involvement and the accuracy of the system itself. In the Oyster study, the construct of accuracy diverges into the accuracy of fares automatically deducted by the system (the accuracy of information provided by the system) and the accuracy of the system itself (the accuracy of the functionality of the system).

The construct of format is about the output of information presented by the system (Doll & Torkzadeh, 1988). The construct of format emerges in the Ambassador study, but does not emerge in the Oyster study. This is attributed to the nature of use of each system. In the Oyster study, end users use the system to pay for public transportation. In the Ambassador study, end users communicate through the system by receiving information and uploading documents, so that the construct of format becomes relevant. In this system, end users consume the information that is provided and presented by the system, so that the format of information becomes an important and relevant construct for the Ambassador system.

The construct of ease of use is manifested in both the Ambassador and Oyster systems. Ease of use is one of the constructs of the Technology Acceptance Model (TAM) (Davis 1989), and is considered to be an important factor in enabling end users

to easily use the system, which has implications for their perceptions of system acceptance and satisfaction with using the system. The construct of ease of use becomes even more crucial in the context of voluntary use of systems, when end users choose to use or not use the system, so that the system is partly based on their perceptions and satisfaction with the system, and negative perceptions result in not achieving organisational objectives that justify investment in these systems, because there is no obligation for end users to use the system. In an e-government context, system qualities, such as ease of use, are found to have a significant impact on IS satisfaction (Wang & Liao, 2008).

The construct of timeliness is about 'in time' and 'up-to-date' information provided by the system (Doll & Torkzadeh, 1988). In the Ambassador study, the construct of timeliness diverges into the timeliness of received responses by human involvement and the timeliness of the system itself (technological response speed of the system). In the Oyster study, the construct of timeliness relates to the timeliness of the response of the technological elements to end users (system speed). The Oyster system involves various technological elements including the Oyster website, the Oyster reader, the Oyster card, and the contactless bank card. Each of these technological elements has its own degree of timeliness regarding its technological response. Thus, evaluating the timeliness of polymeric systems becomes a challenging task, as omitting timeliness of some technological elements might not produce a meaningful holistic evaluation of the system. Furthermore, the task of considering all technological elements using the conventional instrument of a designated survey may be too lengthy and daunting for end users to complete. In addition, some parts of such a survey might prove irrelevant for individual end users who only use some facilities of the system. Therefore, alternate evaluation tools might be better suited for a polymeric system and these are discussed later in this chapter (in ubiquity, section 7.5).

Consideration of the aforementioned constructs in relation to information quality, such as content, accuracy, format and timeliness, are found to be influential factors of IS end users' satisfaction in previous research in the e-government context (Wang & Liao, 2008), and in the context of mandatory IS use in a work setting (Iivari, 2005). The

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constructs were identified as influential factors of IS end users' satisfaction in the DeLone and McLean IS success model (DeLone & McLean, 1992, 2003). This research found that the constructs emerged at various levels in the studies of the Ambassador and Oyster systems. Three common constructs emerged in both studies in a positivist and interpretive analysis approach based on social media: accuracy, timeliness and ease of use. These findings are consistent with previous research studies, as these constructs are considered to be core constructs for system success, regardless of the nature and complexity of the system (Petter, DeLone & McLean, 2012).

In addition to the aforementioned constructs taken from the EUCS model, there are a number of other common constructs that emerged in both the Ambassador and Oyster studies (see Table 7.1). These constructs are end users' effort in using the system, responsiveness to IS end users, level of advancement of utilised technology, IS support, human competence, organisational influence and level of ubiquitousness of IS. End users' effort when using the system is shown to be an influential factor of IS end users' satisfaction and is associated with end users' time of use. These findings are consistent with previous studies that found end users' effort in terms of Perceived Cognitive Effort (PCE) have a significant negative influence on satisfaction in the context of voluntary IS use (Sun, Fang & Hsieh, 2014). Also, this construct of 'time' in terms of saving end users' time is identified as a net benefit derived by using e-government (Scott, DeLone & Golden, 2015). This point is clarified in this example of a tweet from the Oyster study:

> 'Wish someone would create the equivalent of an Oyster card for travelling around Surrey. It would save me so much time and effort!'

Table 7.1: The Emerged Constructs in both the Ambassador and Oyster Studies

Constructs that Emerged in both the Ambassador and Oyster Studies
End users' effort when using the system
Responsiveness to IS end users
Level of advancement of utilised technology
IS support
Human competence
Organisational influence
Level of ubiquitousness of IS

The emerged construct of responsiveness is interpreted in two different ways. In the Ambassador system, responsiveness is about human involvement in processing received requests through the system, while in the Oyster system, responsiveness is related to perceived responsiveness of system support. Perceived responsiveness in an IS context is found to have a positive influence on IS end users' evaluation of the system (Gefen & Ridings, 2002), and is identified to be an important factor in evaluating service quality of IS in a work setting (Pitt, Watson & Kavan, 1995). Responsiveness and constructive exchange can result in fulfilling IS end users' needs, and influence their perceptions of the system, as postulated by SET (Social Exchange Theory). The construct of technological advance, as conceptualised earlier as an artefact of IS itself, in which a system is designed and operated in a sophisticated way that utilises advancements in technology to fulfil end users' needs and achieve organisational objectives, is a useful measure of system quality. This is supported by the fact that technological advance is found to be an influential factor of IS end users' satisfaction in previous research in the e-government context (Wang & Liao, 2008), and in mandatory IS use in a work setting (Iivari, 2005). These results are supported by the empirical data gathered from the Ambassador and Oyster systems.

The construct of system quality is also identified as a success factor of the DeLone & McLean IS success model (DeLone & McLean, 1992, 2003). One element of the technological advance construct is system restrictions that impose restrictions on the way the system works or is accessed. Such system restrictions have a negative influence on end users' perceptions and satisfaction with the system.

Another construct is IS support in terms of end users' training and system support, in addition to end users' guidance requested by some end users of the Ambassador system. This construct of system support is identified in the DeLone & McLean IS success model (DeLone & McLean, 2003). The influence of IS end users' training and support on end users' perceptions of the system is found to be corroborated in a work setting context (Igbaria, Guimaraes & Davis, 1995). In the e-government context, the impact of the construct of the quality of IS support, in terms of service quality for end users' satisfaction, is only marginally supported (Wang & Liao, 2008). In spite of the mixed results observed with regard to the influence of service quality on IS end users' satisfaction (Petter, DeLone & McLean, 2008), the importance of the construct of service quality, as supported by SET (Social Exchange Theory), supports the findings of this study that constructive exchange and fulfilling needs are influential factors of satisfaction.

Another construct, human competence, is been found to play an important role for end users' perceptions. Factors, such as human competence, are found to be an influential factor on IS end users' satisfaction in terms of the competence of IS function in the context of mandatory use of IS in a work setting (Leclercq, 2007). In the Ambassador system, human factors become an integrated part of the system as they processed digital requests through the system. End users in the context of e-government use of IS attempt to fulfil individual needs, thus anything that hinders or distracts may result dissatisfied end users, as the original purpose of using the system - fulfilling individual needs - is not achieved. In the Oyster system, human competence is about the human factor involved in system support, which in this case involves people responsible to support end users whenever they have difficulties or issues while using the Oyster system. This study finds that solving end users' issues with the system results in positive perceptions of human competence, while lack of support results in negative perceptions of the human factor.

The researcher also finds that end users link the quality of received support to the competence of employees that represent the organisation and are responsible for the system. Organisational influences are found to influence end users' perceptions of the

system. In the Ambassador system, processing end users' requests made through the system is shown to be governed by organisational policies and procedures. Thus, the method of dealing with requests is governed by organisational policy, and requests made through the system have an influence on end users' perceptions of the system.

In the Oyster system, organisational policy that governs prices and automatically deducts payments for public transportation is shown to affect end users' perceptions, as end user compare differences in prices when using the system with other alternatives. These issues may result in negative perceptions of the organisational entity itself, and dissatisfied users.

This could be attributed to a lack of understanding by end users in both the Ambassador and Oyster studies, either of the policies governing dealing with students' requests through the system, or on policies governing how fares are deducted and are implemented.

A relationship of trust between government and end users is found to be positively correlated to perceived effectiveness of e-government systems (Teo, Srivastava & Jiang, 2009). This is consistent with previous studies that suggest that organisational influence in terms of leadership, strategic planning and customer and market focus influence perceptions of the quality of e-government systems by employees, and has a direct impact on e-government net benefits (Prybutok, Zhang & Ryan, 2008).

The construct of being ubiquitous, in the sense of the system being readily accessible and usable in various ways, has slightly different interpretations in each study. In the Ambassador study, which is conceptualised as a monomeric IS, the system can be accessed and used by various technological platforms. In the Oyster study, which is conceptualised as a polymeric IS, there are various technological elements and platforms connected together that can be used to access and use the system. As the Oyster system evolved into a polymeric IS, various technologically compatible elements were utilised, which extends the ubiquity of use and access of Oyster.

Ubiquity has become a crucial factor in the IS context for many reasons. First, allowing end users to have ubiquity in terms of alternative access to using the system, rather

than enforcing a particular mode of access, fulfils various end users' needs. Second, providing end users with ubiquitous technological platforms mitigates the effects of technological failures, as end users have other alternatives.

Constructs such as 'convenience' facilitate using e-government, and are identified and described as net benefits derived by utilising e-government (Scott, DeLone & Golden, 2015). The correlation between net benefits and IS end users' satisfaction is found to be strongly supported (Petter, DeLone & McLean, 2008, 2013).

There are seven constructs that emerge in the study of Ambassador: ease of communication, automated services, IS updates, organisational productivity, employees' surveillance, awareness of system features, and reducing fraud (see Table 7.2). End users expressed their satisfaction with Ambassador as they perceive ease of communication facilitated by the system, because end users submit digitalised requests through the system with less time and effort.

Table 7.2: The Emerged Constructs in the Ambassador Study

Constructs that Emerge in the Ambassador Study
Ease of Communication
Automated Services
IS Updates
Organisational Productivity
Employees' Surveillance
Awareness of System Features
Reducing Fraud

The construct of communication that is identified as a public value created by utilising e-government is also a net benefit of such adoption (Scott, DeLone & Golden, 2015). Also, this finding is consistent with previous research that report end users of e-government to be more satisfied with responsiveness and contact experience than those who use traditional contact methods with government departments (Cohen, 2006). This study found that end users express their need of automated services for some procedures that do not necessarily require human involvement. This approach facilitates faster services for end users without the need for human intervention,

which supports perceptions of public value creation and net benefit of using e-government reported by Scott, DeLone and Golden (2015).

The researcher also found IS updates to have an influence on end users' perceptions of the system, as system updates are shown to consider and incorporate end users' needs for continuous system improvement.

Organisational productivity is positively perceived by end users as a result of using the Ambassador system, as they perceive the system saves time and effort, and increases the productivity of work at the organisational level. This observation supports the positive perceptions of end users in using technologies and electronic services provided by e-government organisations.

Human factors play an important role within the system to complete end users' requests, and end users ask for employee surveillance as a way of improving the way received requests move through the system, and to influence end users' perceptions of the system and people using the system.

Another construct is awareness of system features, as end users are shown to be aware of how to use the Ambassador system to fulfil their needs and are aware of available features within the system. Constructs of 'well-informedness' are identified as a public value and a net benefit created by using e-government (Scott, DeLone & Golden, 2015).

The construct of fraud is an element of end users' perceptions of Ambassador, as some respondents consider the system positively reduces fraud and manipulation, but others consider the system facilitates fraud and manipulation. The researcher concludes that end users do not have only one perception regarding use of the system and satisfaction with the system, as end users' perceptions are extended to include perceptions about various aspects of the system adopted by the organisation and its employees.

There are four constructs that emerge in the study of Oyster: technological faults, technological competition, technological compatibility, and social exchange (sharing, disseminating and contacting) (see Table 7.3).

Table 7.3: The Emerged Constructs in the Oyster Study

Constructs that Emerge in the Oyster Study
Technological Faults
Technological Competition
Technological Compatibility
Social Exchange (Sharing, Disseminating and Contacting)

The researcher conceptualises that the construct of technological fault covers any fault in any core technological element of Oyster or compatible elements that are used with the system. Technological faults are shown to be an influential factor for end users' satisfaction with the system, as these cause inconvenience when using the system. The Oyster system is shown to have evolved into a polymeric information system, but faults with technological elements of polymeric systems pose challenges due to interconnectivity among various organisational parties and among technological elements. In the case of technological faults with a particular element, confusion among end users relating to who to contact can complicate the process of providing end users with appropriate system support. These following examples of tweets show how end users often contact two different organisational parties to resolve Oyster system issues. In the first tweet, an end user contacted Greater Anglia (transport partner) for an Oyster issue, while in the second tweet an end user contacted the TFL for an Oyster issue that related to another transport partner (C2C), as clarified below:

> '@greateranglia Oyster card machine at Enfield Lock not working properly again! If you had more than 1 machine there that would help! #kmt'

> '@TfLOfficial C2C have removed oyster card top up from ticket machines at Upminster. This is not acceptable. Please ensure this is rectified.'

In another tweet example, a technological fault involved a contactless payment bank card issued and managed by banking and financial organisations that was compatible

with the Oyster system. In the first tweet, an end user contacted the banking organisation to resolve an issue when using the contactless payment bank card, while in the second tweet an end user contacted TFL for a similar contactless issue, and clarified in these examples of tweets:

> '@NatWest_Help card won't be read by the contactless Oyster machines. Supposedly you're having issues?'

> '@TfL is there a reason why my Contactless card won't work but I've got money in my account? Had to buy another oyster. Inconvenient'

Thus, interconnectivity of polymeric systems imposes challenges to providing IS support to end users. In this example, the influence of the issue of technological faults is expressed by Oyster end users:

> '@LDNOverground Great until you get a faulty Oyster/Contactless Card and no-one to help at a station, or on a bus, esp late at night!'

The researcher also conceptualises the construct of technological competition as a newer technology that competes with or replaces the existing one, so that it can be used with less time and effort. In the context of continuously developing technologies, technological competition remains important.

For the Oyster system, harvested data is considered to be organic data, as it is self-generated by end users without the intervention of the researcher. Organic data is found on social media platforms in the form of social exchanges. When analysing Oyster organic data the researcher found that social exchanges occur at three levels. The first level involves sharing end users' experiences of using the Oyster system through social media from Twitter. The second level involves disseminating public transportation updates and information. System operators are shown to continuously disseminate public transportation information to keep their customers updated and informed, as updates include official news feeds of news and information about the status of provided services. Also, the researcher found that end users often connected to the provider of public transportation services on social media of Twitter, and are

considered to be consumers of these news feeds that provide information about services to keep users updated. The third level of exchange involves contacting customer support, as end users use social media on Twitter to ask for advice and help, and report issues and provide suggestions for improvement. Thus, end users' roles are not limited to that of consumers of information, but are extended to be involved in social exchanges. Perceptions of users' involvement is supported as a direct and positive influence of IS end users' satisfaction in the context of system implementation in a work setting (Amoako-Gyampah & White, 1993).

In the last part of the analysis of social media from Twitter, the researcher examined particular adjectives developed by Bailey and Pearson (1983) in order to investigate how end users perceive their system, based on the frequency of use of these adjectives, and to establish rigour in these findings of positivist and interpretive analyses. In both studies, the researcher discovered that some adjectives are used while others are omitted. In the Ambassador study, 62 adjectives were used out of 118 possible adjectives. The most used adjectives were 'superior', 'good', 'easy', and 'timely'.

In the Oyster analysis, 55 adjectives were used out of 118 possible adjectives. The most used adjectives were 'low', 'good', 'bad', 'easy', and 'hard'. It is important to mention that the frequency of occurrence of these adjectives in the Oyster study does not necessarily reflect the frequency of meaningful occurrence, as these numbers are produced automatically from auto-coding, and some occurrences are not necessarily relevant to this research, due to nuances of English language usage. The researcher ensured that at least one occurrence for each adjective was relevant by examining the results manually.

This discussion of the empirical aspects of this study also reflects on the conceptualisation of monotonic and polymeric IS. This analysis began with the Ambassador Study that uses a conceptualisation of a monotonic IS where the system is accessed through various technological platforms. The Ambassador Study sheds light on the importance of ubiquitous IS, as end users express their satisfaction with using

the system through smartphone platforms, which they perceive as a benefit of ease of use, and requires less time and effort when using this system.

The analysis of the Oyster study shows various technological elements connected together, either as core elements of the Oyster system, or as external elements that are compatible for use with Oyster. This led to the conceptualisation of polymeric IS, as the Oyster system exhibits characteristics of a polymeric structure, because it is a system that connects various technological platforms through various organisational entities (public transport partners). Thus, performing studies of two different IS systems enhance understanding in ways that would not have been possible if only one study had been conducted.

The construct of IS end user satisfaction (EUCS) developed by Doll and Torkzadeh (1988) focuses on the product of IS and ease of use. This approach is more appropriate for use and application when IS is used in a work setting, rather than in an e-government context. IS used in an e-government context has evolved due to the need for better methods of evaluation of its effectiveness, because other important constructs need to be incorporated to consider the ubiquitous nature of e-government, and the importance of responsiveness to IS end users.

The following section presents a discussion of theoretical insights gained from these findings.

7.3   Theoretical Insights

The previous discussion of empirical insights was grounded in data. In this section, the researcher relates new understandings and insights that have emerged from a theoretical perspective.

As discussed in Chapter 3 Section 1, titled Theories Employed to Understand IS End-User Satisfaction Formation, there are various theoretical perspectives that are employed to help understand IS end users' satisfaction (see Table 7.4), but none of these is capable of explaining or helpful when attempting to understand the social media data obtained from Twitter.

Table 7.4: Theoretical Underpinning for IS User Satisfaction

Theoretical Underpinning for IS Use Satisfaction
Expectation Disconfirmation Theory (EDT) (Oliver, 1980)
Equity Theory (Adams, 1965)
Needs Theory (Alderfer, 1969)
Utility Theory (Bentham, 1781)
Theory of Reasoned Action (TRA) (Fishbien & Ajzen, 1975)

The failure of some current theoretical paradigms to help understand or explain this social media data is attributed to the need for a contextual jump from IS in the work setting to other venues, such as IS in an e-government system setting.

Related existing theoretical perspectives are considered individually, starting with the Expectation Disconfirmation Theory (EDT) (Oliver, 1980). EDT posits that satisfaction is formed as a result of confirmation of expectation. In both the Ambassador and Oyster systems, no constructs emerge that relate to the EDT; neither expectation constructs nor disconfirmation constructs.

Previous studies show the influence of end users' expectations on perceptions of satisfaction with IS in a work setting (Ryker, Nath & Henson, 1997; Staples, Wong & Seddon, 2002), and with IS end users in an online banking setting (Bhattacherjee, 2001). Other studies show contrasting findings to the construct of confirmation of expectation to IS end users' satisfaction in a work setting (Au, Ngai & Cheng, 2008) and in the context of consumers' satisfaction (Churchill & Surprenant, 1982; Tse & Wilton, 1988).

EDT was integrated theoretically by Au, Ngai and Cheng (2008) with equity theory (Adams, 1965) and needs theory (Alderfer, 1969) in an endeavour to enrich the theoretical framework in order to understand the process of IS end users' satisfaction better.

Equity theory (Adams, 1965) posits that individual perceptions of equity in relating exerted input to received or achieved output can determine satisfaction formation for end users. Needs Theory posits that there are various needs among individuals

(Alderfer, 1969). The correlation between fulfilling needs and satisfaction has been empirically supported (Oliver, 1995). Alderfer (1969) posits that there are three core needs that individuals strive to fulfil, which are existence, relatedness and growth (E.R.G.). These needs and their associated equity perceptions are more relevant when applied to the study of IS end users' satisfaction in a work setting, as applied by Au, Ngai and Cheng (2008). The researcher found that end users in an e-government context use IS to fulfil their individual needs to achieve responsibilities, in contrast to end users in work settings, who are motivated by work conditions and incentives.

The aforementioned theories of EDT, Equity and Need are considered to be well-founded theories of motivation (Au, Ngai & Cheng, 2008), but the researcher found that satisfaction with IS in an e-government context is derived from fulfilling IS end users' needs in terms of achieving responsibility with less time and effort. This finding that IS end users' satisfaction depends on fulfilling IS end users' needs is supported in IS in work settings in terms of work performance and relatedness fulfilment, but not self-development fulfilment (Au, Ngai & Cheng, 2008). The nature of IS end users has changed from using systems in work settings to accessing IS from outside organisational boundaries, where IS systems can be used to achieve individual responsibilities. Thus, underpinning theoretical justification of the aforementioned motivational theories is insufficiently capable of explaining IS end users' satisfaction in a complex system composed of technology, humans, communications, organisational polices, and ubiquity, such as e-government IS rather than when in organisations and work settings.

By adopting utility theory (Bentham, 1781), satisfaction is conceptualised as a utility consumed by IS end users as a result of using the system (Sun, Fang & Hsieh, 2014), rather than a formation. In this research, the focus is on investigating the construct of IS end users' satisfaction and how the system is perceived by IS end users, resulting in satisfaction being formed. Thus, theories assuming a consumption nature of IS end users' satisfaction are not applicable in this research.

Next the Theory of Reasoned Action is considered (TRA) (Fishbien & Ajzen, 1975). This theory is comprised of four constructs: belief, attitude, intention and behaviour. Based

on TRA, the relationship between these constructs is depicted as a causal chain in which belief influences attitude, belief and attitude influence intention, and attention influences behaviour. IS end users' satisfaction is identified as an attitude in the literature (Doll & Torkzadeh, 1988), so that TRA may be utilised as a theoretical underpinning to help to understand the construct of IS end users' satisfaction (Thong & Yap, 1996). In this research, the researcher investigated the construct of IS end users' satisfaction by attempting to understand how end users perceive their system and their satisfaction with the system, regardless of placing this in the causal chain of TRA.

Identifying either a precise measure or a set of measures for system effectiveness is described as 'pointless' by Thong and Yap (1996), because of the variation in the definition of criteria of effectiveness among organisations. Thus, in this research the researcher proposes using social media data derived from Twitter, and to utilise the social exchange on this media in the evaluation process of system effectiveness. Responsiveness as a result of social exchange can result in IS end users' satisfaction that is based on SET.

7.4   Social Exchange Theory (SET)

In this research, the theoretical framework of Social Exchange Theory is adopted (SET) in order to explain data and further understanding of the issues under investigation. Social media data from Twitter are perceived and interpreted as social exchanges between end users of the system and e-government organisations. Based on SET, 'Only social exchange tends to engender feelings of personal obligation, gratitude, and trust; purely economic exchange as such does not' (Blau, 1986). Also, consistent with SET, perceptions of the responsiveness of social exchange partners can impact IS end users' perceptions through addressing and fulfilling end users' needs (Gefen & Ridings, 2002). Thus, successful exchanges and perceived responsiveness can be used as a basis for IS end users' satisfaction.

SET helps to understand and explain social exchanges on social media using Twitter. It is understood that some social exchanges on social media platforms are similar to social exchanges in the physical world, as conceptualised by Blau (1986). Actors on

social media platforms, such as public sector organisations and their end users, utilise the platforms to exchange information. The aim of this study is to understand social exchanges on the Twitter social media platform, and specifically what motivates people to be involved and what the outcomes of the social exchanges of Twitter are to develop a better understanding of how social exchanges over social media can be utilised in the context of e-government and IS evaluation.

As mentioned earlier, local government departments often use social media without understanding its costs and benefits, or who the actual audience is, without designating who in the organisation should monitor communications, and how and when they should respond (Kavanaugh et al., 2012). They also neglect to consider what effects their social media communications efforts have on the public.

SET posits that individuals are motivated to be involved in social exchanges by the return they expect to receive. Exchange behaviour is defined by Blau (1986) as 'voluntary actions of individuals that are motivated by the returns they are expected to bring'. SET helps to better understand the motives of individuals who are involved in social exchanges with public sector organisations, and to better understand the outcomes of those exchanges in terms of users' satisfaction, in terms of responsiveness, constructive exchange or fulfilling individual needs from the systems. Individuals are motivated to be involved in social exchanges by the return they expect in terms of system improvements to fulfil their needs. SET provides a framework for helping local government and other organisations understand the benefits and results of their social media communication efforts better.

Therefore, the researcher has justified and delineated the appropriateness of using SET - yet there exists another theoretical framework that might also be considered: Actor-Network Theory (ANT). This study seeks to identify a theoretical framework that enables the investigation of IS users' satisfaction and to understand the socio-technical nature of IS to explain users' satisfaction constructs. ANT examines the motives and actions of groups of actors that form a heterogeneous network of human and non-human actors, such as technological artefacts with aligned interests (Walsham, 1997). In the ANT framework, social and technical elements are considered as inseparable.

ANT posits that 'people and artefacts should be analysed with the same conceptual apparatus (Walsham, 1997). The focus of ANT is to trace and explain the process whereby relatively successful networks have established and maintained themselves, and also to evaluate case studies where network formation and/or maintenance has failed, in order to examine the reasons for such failure (Walsham, 1997).

Using ANT as a theoretical framework requires the researcher to obtain appropriate levels of organisational access and support in order to study the process of network creation and maintenance in depth, along with all involved actors, in order to create a holistic picture of actor-network interaction that includes and considers organisational entities, technological artefacts and IS end users. In this study, various factors are identified of technological aspects, human and organisational elements, and ubiquity of IS that join together to influence end users' perceptions regarding the systems they interact with. Therefore, tracing and explaining the process whereby successful (and unsuccessful) networks are established and maintained would be helpful to understand the reasons that facilitate or prevent the creation and maintenance of relatively successful networks. IS do not exist in isolation in terms of their development, design, management and operations, as these factors are integrated with later development and adaptations, and all this determines how an organisation delivers IS as an artefact.

Alternatively, a smaller network might be studied that allows IS end users and technological artefacts to be studied in depth in order to trace precise actions and identify technological devices involved in forming the actor network, in order to trace back sources of dissatisfaction with IS. Using ANT requires time and resources to collect in depth data and information to allow the researcher to trace back actions and motives of the actor network. Thus, combining ANT with the use of social media data from Twitter, which provides short text messages that, while useful, are of insufficient depth to trace back process and action, and present challenges. Data that provides more depth and detail are more appropriate for the ANT framework; examples of rich-data sources include interviews, documentation and ethnographic studies.

Based on these considerations, the researcher concludes that the actor-network theory can be used to investigate IS users' satisfaction and help to understand the socio-technical aspects of IS - yet using social media data from Twitter would not sufficiently provide the required in-depth and rich data for the analysis.

In the study of Ambassador, the researcher launched and used a designated Twitter hashtag allowing IS end users to participate in commenting on their perceptions of the system, and about various aspects of the system. However, the researcher is not able to respond and fulfil IS end users' needs.

In contrast, in the Oyster study, social exchanges took place between the system operator of Oyster and Oyster end users, and the researcher found that when Oyster end users participated by expressing their perceptions of the system and the issues they faced, the operator of the system responded to fulfil end users' needs. In this example tweet an end user expresses an issue of using the enquiry process by using the Oyster website as clarification:

> '@TfLOfficial why can I only make an online enquiry by supplying Oyster Card NUMBER details? I have a freedom Pass!'

End users of public transportation do not necessarily have an Oyster card number, because there are alternatives to use the Oyster system, such as the 'Freedom Pass'. The Freedom Pass grants free public transportation for eligible elderly and disabled persons (London Councils, 2015). The researcher checked the Oyster website to examine the issue of the enquiry process by filling out an online form, and found that end users have the option to complete the online form without the restriction of providing Oyster number details that was reported by the end user. The researcher believes that the system operators of TFL have incorporated end users' needs as part of their use of social media from Twitter, so that successful responsiveness and continuous evaluation approaches of the system by using social media from Twitter can influence end users' perceptions of satisfaction with the system.

As IS have evolved continuously into ubiquitous, complex and sophisticated systems, either as monomeric or polymeric IS, continuous evaluation becomes crucial to

achieving the aim of responding and fulfilling end users' needs as they emerge. Fulfilling end users' needs with the system is found to be an influential factor, and the origin of IS satisfaction in mandatory use of systems in a work setting (Leclercq, 2007). Systems are perceived differently by IS end users when they are empirically supported, as shown in the research data; therefore, an approach of continuous evaluation of social media allows various end users' perceptions to be captured and incorporated, instead of using a limited and restricted conventional approach to system evaluation, such as using a questionnaire and survey approach. Constructs, such as individual differences and their influence on system perceptions, are recognised in the literature (Zmud, 1979), and are identified to be a predictor for perceived usefulness and perceived ease of use in terms of computer self-efficacy and computer experience (Thong, Hong & Tam, 2002).

Also, IS have become sophisticated and ubiquitous when systems can be accessed and used by various technological platforms and with emerged understanding of monomeric and polymeric IS, so that continuous evaluation of social media allows the capture of various end users' perceptions. This helps to identify various aspects of system improvement that would have been difficult and challenging to incorporate into a conventional survey, because as mentioned previously, sophisticated systems require long and complex surveys that could include parts that are irrelevant to some end users.

Viewing social exchanges and interactions of social media from Twitter through the lens of Social Exchange Theory (SET) provides enlightenment in various ways. First, IS end users' satisfaction with using social media can be based on a well-established theoretical foundation that helps to explain and understand social media data from Twitter as a continuous system evaluation approach to establish IS end users' satisfaction. These exchanges and responsiveness can influence end users' perceptions of the system (Gefen & Ridings, 2002). Second, utilising social exchanges on the digitalised social media of Twitter provide a framework for understanding a continuous evaluation method that is capable of accommodating the evolving and ubiquitous capacity of information systems. The evaluation process of IS needs to be moved

towards a continuous process of identifying IS end users' needs, and a continuous process of responding to and fulfilling end users' needs by utilising social media from Twitter, instead of once-off evaluation surveys undertaken periodically. This is consistent with previous research findings when system effectiveness evaluation is perceived as a process rather than a single once-off evaluation event (DeLone & McLean, 1992, 2003). As IS have become an integrated part of end users' experiences, continuous responsiveness to their needs can influence their satisfaction with the system. Conceptualising social behaviour and interaction between public sector organisations and users on social media as digitalised exchanges of information helps to understand and explain the construct of IS end users' satisfaction.

7.5   Ubiquity

In the era of ubiquitous computing, accessing information and computers is everywhere. Computers are embedded and integrated into the everyday physical world, and may be used as needed (Weiser, 1991, 1993). Computer use has moved beyond the era of mainframe computers that were shared by many, to the era of personal computing, and finally to the era of ubiquity, where 'many computers serve each person' (Weiser, 1996).

This research revisits the construct of IS users' satisfaction as applied in the context of ubiquity. The analysis of social media as part of two IS studies provides greater understanding of ubiquity through the conceptualisation of monomeric and polymeric IS. In monomeric IS, as the case of Ambassador, the system can be accessed and used by using various technological platforms, such as personal computers, smartphones and tablet computers. In polymeric IS, in addition to accessing and using these systems by various technological platforms, these systems have evolved into a composite of various compatible technological elements that work together to allow users to make use of the system, and similar to molecules bonding to form a polymer. Such systems are not limited to the core technological elements of the organisational system, but have evolved and extended to be used by other technological elements developed by other organisations that are compatible to be used with each other. The Oyster system evolved to be compatible for use with other technologies issued and managed by

financial institutions, such as contactless bank payment cards. Another example is the contactless mobile payment technology produced and managed by Apple that is used for the Oyster system and other payment facilities. The distinction between ubiquitous, monomeric and polymeric IS, is summarised in Table 7.5. The evolution of IS in this way necessitates the need to revisit IS evaluation approaches, in order to accommodate and capture the ubiquity of IS for more effective IS evaluation.

Table 7.5: The Distinction between Ubiquitous, Monomeric and Polymeric IS

IS Evolution	
Ubiquitous IS	'Many computers serve each person' (Weiser, 1996). 'The use of heterogeneous devices under a fixed or mobile environment to access an application at any time and from anyplace.'(Alvarez & Pardue, 2003)
Monomeric IS	The system (a singular system) can be accessed and used by various technological platforms, such as personal computers (PC), smartphone platforms, tablet computers. Each one of these technological platforms has its own degree of timeliness regarding its technological response.
Polymeric IS	In addition to accessing and using the system by various technological platforms, in polymeric IS the systems have evolved into a composite of various compatible technological elements that work together to allow the user to make use of the system, acting similarly to molecules bonding to form a polymer. Such systems are not limited to the core technological elements of the organisational system, but have evolved and extended to be used by other technological elements developed by other organisations that are compatible for use with each other.

Alternative evaluation tools might be better suited for such a monomeric and polymeric system. The basis of one such alternative evaluation scheme could be the utilisation of social media data, such as data obtained from Twitter. The functionality provided by Twitter hashtags, as evidenced in the case of the Ambassador Study, prove to make analysis of Twitter social media data an effective evaluation tool in the context of e-government IS and beyond. The social media approach allows collected information regarding the system to be grounded in end users' perceptions. Such an evaluation process can be underpinned and explained by Social Exchange Theory (Blau, 1986), in which such exchanges and perceived responsiveness to end users' needs and concerns can result in positive IS end users' perceptions of the system by confirming end users' expectations and fulfilling their needs (Gefen & Ridings, 2002). In addition, fulfilling end users' needs in the e-government context has been found to be ranked higher than the artefacts of the system, its features and its ease of use (Kolsaker & Lee-Kelley, 2008).

7.6   Summary

This chapter discusses the findings and empirical insights into two different studies, Ambassador and Oyster, in relation to the construct of EUCS and to the literature. After briefly discussing the influence of IS evolution on IS evaluation, the researcher considers the research question in the context of evaluation of ubiquitous IS. This analysis contributes to finding ways to identify the ubiquity of IS through the conceptualisation of monomeric and polymeric IS to contribute to systems evaluation. This study finds that as systems become accessible by various technological platforms (monomeric IS) and become interconnected and compatible for use with other systems (polymeric IS), this imposes challenges for the evaluation process, due to variations of these technological platforms and how they influence end users' perceptions. These new understandings and empirical insights are related to previous theories adopted to understand satisfaction formation in the literature, and explain how they are incapable of adoption for this research, and justify the use of the theoretical framework of SET. SET is adopted as a theoretical framework to help to understand social exchanges on Twitter, and to explain the construct of IS users' satisfaction. Viewing social exchanges and interactions of social media from Twitter through the lens of Social Exchange Theory (SET) provides enlightenment in various ways that are discussed in this chapter.

Chapter 8: Conclusion and Future Research

This chapter summarises the findings of this research as a whole and presents the conclusions, which can be summarised in terms of knowledge contributions, methodological contributions and practical contributions. Also, this chapter provides suggestions for future research and a discussion of the limitations of this research.

8.1 Research Contribution

Research is conducted to produce knowledge and to make an impact on the field of study. Research should have value that contributes to further understanding of the world. This research summarises its contribution to knowledge of IS end users' satisfaction, and its methodological and practical contributions. These contributions are presented in the following sections.

8.1.1 Theoretical Contribution to Knowledge of IS End Users' Satisfaction

With the continuous increase in IS adoption and implementation in general, and e-government IS in particular, it has become crucial to have an adequate measure to evaluate and gauge the success of these efforts. Previous studies have identified end users' satisfaction as a surrogate measure for IS success/effectiveness, and this research focuses on investigating the construct of IS end users' satisfaction. This began with two main focal points, where the first focus was to investigate the construct of End-User Computing Satisfaction (EUCS) in the context of ubiquitous IS of e-government. The researcher wanted to discover whether evaluating e-government IS would be different or similar to evaluating conventional IS, such as in work settings. The second focus was to investigate the research issue by utilising social media data from Twitter, and use this data for IS evaluation. These findings demonstrate the feasibility of using social media data from Twitter in the context of IS evaluation, not just as a research method, but also as a tool to evaluate monomeric and polymeric IS as a result of conceptualisations made in this study.

This research contributes to the theoretical understanding of the construct of IS end users' satisfaction. The findings from research from the investigations of the Oyster and Ambassador systems form the summary conclusion that when evaluating IS users' satisfaction, it is important to distinguish between IS evaluation for IS with automated services, and IS with human involvement. The variations in IS evaluation between these two categories of IS are clarified and summarised in the two tables included below. The researcher proposes that based on this research constructs that emerge in the Oyster study relating to automating services could be generalised to other similar contexts. These constructs are summarised in Table 8.1.

Table 8.1: Automating Services Constructs

The Construct	Definition	Supporting Studies
Content of IS	Content of information provided by the system itself.	IS content, Doll & Torkzadeh (1988), DeLone & McLean (1992, 2003) Reporting, Whyte & Bytheway (1996)
Technological faults	Any technological fault with any core technological elements of the system or compatible elements to be used with the system.	Technical reliability, Verdegem & Verleye (2009) System quality, DeLone & McLean (1992, 2003) Reliability, Whyte & Bytheway (1996)
Accuracy of information provided by the system	Accuracy of information provided by the system itself.	IS accuracy, Doll & Torkzadeh (1988), Whyte & Bytheway (1996) Information quality, DeLone & McLean (1992, 2003)
Accuracy of the functionality of the system itself	Accuracy of the functionality of services provided by the system.	Accuracy, Whyte & Bytheway (1996)
Level of advancement of utilised technology	Technological elements of the system (Sophistication of IS artefact.)	System quality, DeLone & McLean (1992, 2003) Effectiveness, Control (1) & Specification, Whyte & Bytheway (1996)
End users' effort using the system	Effort required by end users in using the system.	Perceived Cognitive Effort (PCE), Sun, Fang & Hsieh (2014)

The Construct	Definition	Supporting Studies
Timeliness of the technological response to end users	Timeliness of the system itself (system speed and technological response). As the system has evolved and becoming ubiquitous in being accessible and used on different technological platforms, this has resulted in various technological platforms, each with its own timeliness.	Speed of the system, Verdegem & Verleye (2009) IS Timeliness, Doll & Torkzadeh (1988)
Ease of use	Ease of using the system by IS end users.	Ease of Use, Doll & Torkzadeh (1988), Davis, 1989 Friendliness, Whyte & Bytheway (1996)
IS Support: End users training and technical support	Support provided to IS end users.	Documentation, Training, Whyte & Bytheway (1996) Service quality, DeLone & McLean (2003)
Responsiveness to IS end-users (perceived responsiveness of IS support)	Responsiveness of human elements providing support for IS end users, in order to support the ubiquity of IS, and provide end users with multiple and various channels	Responsiveness, Whyte & Bytheway (1996), Pitt, Watson & Kavan (1995)
Human competence of employees and quality of received support	Human involvement level of competence of those dealing with the system and providing support for IS end users.	Competence, Whyte & Bytheway (1996) Service quality, DeLone & McLean (2003) Assurance, Pitt, Watson & Kavan (1995)
Organisational influence (organisational policies and procedures)	Organisational policy and procedures that influence the way users interact with the system during transactions, and processes involved while using the system.	Organisational governance rules, size and culture, Leclercq (2007) Leadership, strategic planning, and customer-focused, Prybutok, Zhang & Ryan (2008)
Level of ubiquitousness of IS	Ubiquitousness of IS and being accessible and usable on various types of technological platforms. Sufficient ubiquity will result in fulfilling various end-users needs.	Accessibility, Alawneh, Al-refai & Batiha (2013) Availability, Verdegem & Verleye (2009) Convenience, Scott, DeLone & Golden (2015)
Technological Compatibility	Compatible technological elements providing end users with alternative options for using the system based on convenient choices that fulfil their needs.	Integration & Complexity, Whyte & Bytheway (1996) Compatibility, Verdegem &Verleye (2009)

Constructs that emerge in the Ambassador study that are related to the importance and role of human involvement could be generalised to other similar contexts when human involvement is involved in processing requests. These constructs are summarised in Table 8.2.

Table 8.2: Constructs of IS with Human Involvement

The Construct	Definition	Supporting studies
Content of IS	Content of information provided by the system itself.	IS content, Doll & Torkzadeh (1988), DeLone & McLean (1992, 2003) Reporting, Whyte & Bytheway (1996)
Content of received responses by human involvement	Content of received responses and information of human involvement through the system.	Responsiveness, Whyte & Bytheway (1996), Pitt, Watson & Kavan (1995)
Accuracy of the system	Accuracy of information and functionality provided by the system itself.	IS accuracy, Doll & Torkzadeh (1988), Whyte & Bytheway (1996) Information quality, DeLone & McLean (1992, 2003)
Accuracy of information and received responses by human involvement	Accuracy of received responses and information by human intervention through the system.	Reliability, Whyte & Bytheway (1996)
Format	System output presented in useful format.	IS output format, Doll & Torkzadeh (1988) Front office, Whyte & Bytheway (1996)
Ease of Use	Ease of using the system.	Ease of Use, Doll & Torkzadeh (1988), Davis, 1989 Friendliness, Whyte & Bytheway (1996)
Timeliness of IS	Timeliness of the system itself (system speed and technological response). As the system has evolved and become ubiquitous by being accessible and available on different technological platforms, this has resulted in various technological platforms, each with its own timeliness.	Speed of the system, Verdegem & Verleye (2009) IS Timeliness, Doll & Torkzadeh (1988)

The Construct	Definition	Supporting studies
Timeliness of received response/human involvement	Timeliness of received responses and information through human involvement with the system.	Responsiveness, Whyte & Bytheway (1996), Pitt, Watson & Kavan (1995)
Automated services	The automated services of IS.	Time & Convenience, Scott, DeLone & Golden (2015)
End users effort using the system	The efforts required by end-user for using the system.	Perceived Cognitive Effort (PCE), Sun, Fang & Hsieh (2014)
IS updates	Continuous process of identification of end-users needs and system areas of improvement, and incorporating that into a current system as system updates.	Upkeep, Whyte & Bytheway (1996) Tangible, Pitt, Watson & Kavan (1995)
Level of advancement of utilised technology	Technological elements of the system (sophistication of IS artefact).	System quality, DeLone & McLean (1992, 2003) Effectiveness, Control (1) & Specification, Whyte & Bytheway (1996)
Responsiveness to IS end users (perceived responsiveness of human involvement)	Responsiveness of human involvement through the system in terms of perceived responses and replies to end users in prompt time.	Responsiveness, Whyte & Bytheway (1996), Gefen & Ridings (2002), Cohen (2006), Pitt, Watson & Kavan (1995)
IS support: end users' tainting, technical support, and end users' guidance	Support provided to IS end users.	Documentation, Training, Whyte & Bytheway (1996) Service quality, DeLone & McLean (2003)
Human Competence	Human involvement competence of those who dealing with the system and have an influence on system outcomes.	Competence, Whyte & Bytheway (1996) Service quality, DeLone & McLean (2003) Assurance, Pitt, Watson & Kavan (1995)
Organisational Influence (organisational policies and procedures, employees surveillance)	Organisational policy and procedures that influence the way of dealing with requests placed through the system, and employee surveillance that influences the process and quality of processing requests made through the system.	Organisational governance rules, size and culture, Leclercq (2007) Leadership, strategic planning, and customer focus, Prybutok, Zhang & Ryan (2008)

The Construct	Definition	Supporting studies
Awareness of system features	Awareness of features available in using the system that enable end users to know how the system can be used to fulfil their needs.	Awareness of public services, Alawneh, Al-refai & Batiha (2013) Awareness, Verdegem & Verleye (2009) Ease of information retrieval & Well-informedness, Scott, DeLone & Golden (2015) Marketing, Whyte & Bytheway (1996).
Level of ubiquitousness of IS	Ubiquitousness of IS and accessibility and usability on various types of technological platforms. Sufficient ubiquity will result in fulfilling various end users' needs.	Accessibility, Alawneh, Al-refai & Batiha (2013) Availability, Verdegem & Verleye (2009) Convenience, Scott, DeLone & Golden (2015)

Other constructs, such as accuracy, timeliness and responsiveness, emerge in both studies, but are difficult to generalise, because the meaning of these constructs should be considered within the specific context of IS when they occur.

Accuracy in the context of IS with automated services relates to the accuracy of the functionality of the system itself and the accuracy of information provided by the system. Accuracy in the context of IS with human involvement is extended to include accuracy of information and received responses obtained through human involvement.

Timeliness in the context of IS with automated services relates to the timeliness of the technological responses to end users, but in the context of IS with human involvement, timeliness is extended to include the timeliness of received responses from human involvement through the system. The variation of the meaning and relevance of the timeliness construct is considered in a previous study on Web-based context, and the findings suggest that the timeliness construct needs to be redefined to reflect the actual experience of users in terms of efficiency in obtaining information, and the time required to find information (Helm, Chaparro & Farmer, 2005).

Lastly, responsiveness in the context of IS with automated services relates to perceived responsiveness of IS support, but in the context of IS with human involvement it relates to perceived responsiveness of human interaction.

Organisational influence also emerges as a factor in both the Ambassador and Oyster studies, and is shown to play a role in influencing end uses' perceptions of the system. The importance of organisational influences is supported by previous studies in the context of work settings. Leclercq (2007) identifies organisational influences in terms of organisational governance rules, size and culture, while Prybutok, Zhang and Ryan (2008) identify organisational influence in term of leadership, strategic planning and customer focus.

This research study shows that organisational influences in both the Ambassador and Oyster studies relate to organisational policies and procedures that reflect on the system. In the Ambassador study, organisational influence extends to include employees' surveillance, as a result of the role of human involvement when processing requests through the system.

IS updates are identified in previous studies, such as maintaining up-to-date software and hardware to evaluate the quality of provided IS services (Pitt, Watson & Kavan, 1995), and to keep the system maintained and enhanced (Whyte & Bytheway, 1996). In this research on the Ambassador study IS updates are shown to be about identifying areas for system improvement, and incorporating end users needs into the current system as IS updates.

In previous studies, the construct of IS end users satisfaction is investigated by utilising conventional approaches of qualitative and quantitative methods. This study contributes to the knowledge of the construct of IS end users' satisfaction by investigating this with the use of social media data from Twitter, and utilising this data of Tweets to further understanding of IS end users' satisfaction in an e-government context. This study also differentiates between the evaluation process of IS in an e-government setting and evaluating IS in a work-setting context. This investigative approach reveals findings that would not have been achieved by more conventional

research methodology, which can restrict and limit findings due to theoretical and methodological boundaries.

Challenging well-established constructs of End-User Computing Satisfaction (EUCS) that were originally developed in work settings allows the researcher to address questions regarding its relation and applicability in an e-government context. This study findings that the five constructs that compromise the EUCS: content, accuracy, format, ease of use and timeliness, do manifest at various levels in the Ambassador and Oyster studies. The three common constructs that emerge in both studies are accuracy, timeliness and ease of use. Therefore, these are considered as core constructs for system evaluation, while considering the other two constructs as context specific.

This study finds that the constructs of content and format are context specific in the Ambassador system, but not in the Oyster system. These findings support the importance of the identified constructs of EUCS at various levels in an e-government context, and based on the nature of the system itself. Despite the importance of these constructs, the researcher attempted to focus on a conceptualised first layer of satisfaction formation based on these five constructs of the EUCS, and then extend these to a second layer of responsiveness and fulfilling IS end users' needs.

The ubiquitous nature of IS in the e-government context contrasts to IS in work settings, which requires a shift of focus to satisfaction formation, because e-government systems are accessed and used from various technological platforms, by various levels of IS end users who use the system to complete self-responsibilities instead of work-setting related tasks.

This shift of focus based IS end users' satisfaction is underpinned by Social Exchange Theory (SET) that conceptualises social exchanges and justifies satisfaction formation based on the constructive exchange of involved parties and responsiveness. This study contributes to enhancing understanding of the construct of IS end users' satisfaction by basing e-government end users' satisfaction on SET, and successful exchange processes between e-government organisations and their IS end users, which can

influence end users' perceptions with the system positively. This study also contributes to shifting the focus from once-off evaluation using conventional approaches of system evaluation, such as surveys that require large distribution, to the continuous evaluation approach made possible by using social media from Twitter. The researcher proposes and demonstrates the effectiveness of this approach for e-government systems evaluation in non-work settings in the Ambassador study. The pilot study examined IS in a work-setting, and found that employees do not use social media for work-related issues, as respondents perceived this as talking negatively about their employer. At the same time, they were willing to share and involve themselves in an exchange process in a closed social media environment, particularly, a closed environment related to the employer's organisation and its employees.

As IS have evolved a ubiquitous nature, this study also contributes to knowledge by conceptualising the terms of monomeric and polymeric IS in order to accommodate the emerging types of systems that are characterised by a polymeric nature. These polymeric systems achieve more efficiency and effectiveness than traditional IS. The researcher conceptualises the case of Ambassador as a monomeric IS, as the system is accessed and used by various technological platforms, while conceptualisation of polymeric IS based on the case of Oyster shows a system that evolves as a composite of various compatible technological elements that work together to allow users to make use of the system. Systems are not limited to the core technological elements of the organisational system, but have evolved and are extended for use by other technological elements developed by other organisations that are compatible for use with each other.

This can be perceived as adding a second layer of achieving more efficiency and effectiveness, where at the first layer monomeric IS are capable of achieving efficiency and effectiveness, but at the second layer polymeric systems achieve more efficiency and effectiveness.

To summarise the theoretical contributions of this research, the researcher proposes and demonstrates the feasibility of using social media data from Twitter for e-government system evaluation. Also, this approach of conducting research by utilising

social media data from Twitter helps to contribute to knowledge of IS end users' satisfaction in an e-government context, and to differentiate its evaluation process from that observed in IS in work settings. Thus, understanding of system evaluation of e-government is enhanced, and the concept of IS satisfaction formation in this context is grounded by SET, which gains greater understanding through the conceptualisation of monomeric and polymeric IS.

The following section presents the methodological contributions of using social media data from Twitter as a research method for this research.

8.1.2 Methodological Contributions

The issue of IS end users satisfaction has been investigated in previous studies mainly by utilising conventional qualitative and quantitative research methods. This current research contributes a methodology of conducting research using social media data from Twitter as a research method in general, and a research approach towards the study of IS in particular. Previous studies in various disciplines utilise social media in research by 'crawling' or harvesting data automatically, or by interacting with participants directly.

This research utilises crawling data automatically using specific software; for example, in the Oyster study the researcher harvested Twitter data. This approach is used in previous studies, but not in the context of IS and e-government. In addition, the methodology in this study utilises a designated Twitter hashtag, in contrast to gathering data by the crawling approach. This approach was used in the Ambassador study, when end users of the system were asked to participate in a designated hashtag with their perceptions of their systems, and how they evaluated these. To the knowledge of this researcher, this study is the first in which the approach of using a designated Twitter hashtag as a research method is taken.

The researcher conceptualises this data to be semi-organic data, as the researcher asked end users to participate, but had no influence on their responses. This type of data are user-generated, as the researcher asks for this, but this contrasts to the

organic data utilised in the Oyster study that was naturally user-generated with no requests by the researcher.

In the Oyster study, organic data were collected by harvesting data (tweets) that already existed, and without intervention by the researcher. Thus, the researcher observed and captured authentic and real social exchanges between a local government organisation (TFL) and its partners, and end users of the Oyster system. The findings derived from the Oyster study are based on a limited timeframe, and defined as the time interval over which tweets were harvested. It is possible that other findings might emerge based on a different set of harvested data; for example, if something dramatic or unusual occurred with the Oyster system during the timeframe of data collection, this could very possibly result in data that would modify and influence these findings.

The Ambassador study involved the collection of semi-organic data when the researcher launched a designated hashtag and asked end users to participate, but without exerting any influence on their responses. The designated hashtag allowed the researcher to collect and organise relevant data, so there was a role in establishing the exchanges between the researcher, Ambassador end users, and between end users themselves. The established and captured social exchanges were analysed, but the researcher could not respond and incorporate identified system concerns for system improvements, and could only observe and analyse these.

The Ambassador study involved the collection of data in a traditional fashion, and asked end users to complete a survey and to tweet their ideas and experiences by participating in an Ambassador designated hashtag on Twitter. This resulted in having similar end users. In the Oyster study, participants who completed the Oyster survey may have been different than those who tweeted about Oyster, as Twitter data was harvested, rather than being asked for it through use of a designated hashtag.

In both studies, end users reflected on the system being used, regardless of the way the researcher collected the data, or whether the data was generated with or without the researcher's intervention. These findings are consistent across both studies, as

emerged factors are related to the system itself, to human and organisational factors, and to factors related to the ubiquity of IS. The additional emerged factor in the Oyster study of social exchanges on Twitter is a result of true social exchanges being observed.

Utilising social media data from Twitter helps to create findings that would not have been produced by using conventional methods of undertaking research, either qualitative or quantitative, which are restricted by theoretical and methodological boundaries. New understanding emerges about the construct of IS end users' satisfaction based on using social media data from Twitter, and demonstrates this to be a promising tool for evaluating the effectiveness of the ubiquitousness of IS for e-government. This approach is presented and its feasibility is demonstrated in the Ambassador study.

The approach of using social media is used not only for data collection, but also extended as an e-government evaluation tool that facilitates a continuous evaluation process for the effectiveness of e-government systems, which contrasts to conventional approaches of using surveys for system evaluation. As discussed earlier in the section about SET, the approach of digitalised exchanges of social media from Twitter can result in satisfaction formation, as long as constructive exchanges are established. This study uses designated Twitter hashtags to collect data relevant to the research question, which contrasts to harvesting tweets as identified and used in the literature. Also, data derived from designated hashtags can be used by e-government organisations for system evaluation and improvement, which contrasts to the approach of harvested tweets that results in collecting large amounts of data, but not necessarily related to the issue under investigation. Harvested data also need to be cleaned or analysed automatically by using various software applications.

8.1.3   Practical Contributions

Research is mainly conducted to produce knowledge and to make an impact, so that the knowledge produced should be utilised to influence beliefs and practices, and make an impact. As governments around the world move to digitalised models of e-

government, and with increasing investment in e-government projects, it becomes necessary to evaluate the effectiveness of these investments. Measuring effectiveness are identified earlier (in chapter 2) may be accomplished by measuring IS end users' satisfaction that is used as a surrogate measure for IS effectiveness.

The researcher uses constructs of IS end users' satisfaction that are conceptualised and measured in previous studies, and in this research to challenge well-established theoretical measurements of EUCS developed in the context of work settings, so that they could be used in an e-government context. The motive was to distinguish between measuring ubiquitous e-government IS with IS in work settings, and wanted to make this distinction, as it is important to have adequate measures that can be used, because inadequate measures can result in inadequate data for decision makers (Benbasat & Zmud, 1999). Investments made by public sector organisations are considered to be large-scale investments with inter-organisational interdependency (Ctas-Baril & Thompson, 1995). Thus, evaluating the success/effectiveness of such investments is crucial. Also, IS have evolved from being used in workplace settings to fulfil organisational objectives and processes by a specific number of employees in the organisational context, to the contextual jump of e-government IS that are placed outside the organisational context and are used by a wider number of end users who are citizens seeking to fulfil self-responsibilities.

The contextual jump of adopting IS to an e-government context has implications for IS evaluation. The use of well-established constructs of EUCS in an e-government context is challenged in this study, because the constructs of EUCS are more suitable for use in work settings, when end users' access to the system is computer-based, and work-related tasks are performed mainly during working hours.

On the other hand, the ubiquity and nature of e-government IS, in which systems can be accessed and used through various technological platforms, and human involvement and intervention is required for some procedures, imposes the need for adequate measures to capture all these various technological elements to provide a holistic picture of the system under evaluation.

Therefore, evaluation measures need to recognise the ubiquitous nature of e-government systems. This investigation of the Oyster and Ambassador systems that are different in nature has produced findings that suggest and support a new approach for system evaluation that utilises the powerful technological platform of social media, and in particular the use of designated Twitter hashtags.

This research contributes enhanced understanding to shift the evaluation process of system effectiveness of e-government from the conventional approach of system evaluation, which is more suitable for use in work settings, to a new and more effective approach of continuous evaluation of e-government using social media from Twitter. This approach accommodates the ubiquitous nature of e-government.

This study identifies and demonstrates the use of social media from Twitter for e-government evaluation, and proves its effectiveness, as in the case of the Ambassador System. The continuous evolution of IS creates the need to identify measures that are more capable of capturing the ubiquity of evolved systems, and help e-government organisations in their endeavour to adequately evaluate their systems.

8.2   Future Research

This research study was conducted to complete a PhD thesis, so time was the main restriction. Motivated by an interest in utilising social media data to investigate the research questions, and being restricted by the time frame of completing a PhD study, the researcher restricted the focus to social media data derived from Twitter.

Future research could utilise other forms of social media data and investigate research questions by combining data from various social media platforms, either to enrich existing data to provide better insights, or to investigate how data differ on various social media platforms to respond to the research question being investigated.

Different social media platforms have different characteristics and different user groups, thus allowing researchers to use these data to further understanding and gain better insights of the issues under investigation. Challenges can emerge as the process of collecting and analysing data may be varied, and the high noise of social media, which may necessitate cleaning the data. Various social media platforms exist, and

each have unique features that provide promising venues to be exploited in the e-government context, and beyond.

Future research can exploit one or combined forms of the various social media data as a research method, and exploit its richness, and eliminate the theoretical and methodological boundaries of conventional research methods.

Furthermore, IS in various contexts can be studied by using social media data in order to see how findings relate to this current study and previous studies. Contrasting findings can help to further understanding about the issues under investigation, help us to enrich knowledge of IS evaluation in general, and specifically in the e-government context. As IS have been adopted in various contexts, adequate evaluation processes are needed to accommodate the influence of context of IS on its evaluation of effectiveness.

Also, positivist research can be used to validate and refine these findings and future findings that are generated by using social media data. Positivist research can be adopted with the aim to develop various measurements based on the nature of the system, in order to develop adequate measure for a particular context of IS.

Systems in the e-government context can take various forms of automated services and human intervention in processing requests through the system. Thus, future research could focus on developing adequate measurements that consider the nature of the system. In some cases, using the conventional approach of surveys may be preferred for e-government organisations, in contrast to using this approach of continuous evaluation using social media, as identified and supported in this research.

8.3   Research Limitations

Due to the nature of this research that uses social media data from Twitter, limitations emerged that are pertinent to the nature of the data. As each tweet is comprised of short text entries up to 140 characters long, the researcher was forced to deal with limitations due to this length restriction. Using designated hashtags, as in the case of the Ambassador Study, helped to eliminate the problem of short and unclear Tweets,

because they allow the researcher to interact with participants and ask probing questions as in these examples of Tweets:

'Ambassador (the system) still needs to be improved, slowness is one of its flaw # قيم_سفير'

'@researcher-to-participant[3]: Can you please advise us what's needs to be improved?'

'@ participant-to-researcher[4]: 1. providing the supervisor details (employee who processing requests placed through the system), contact numbers and email 2.enabling uploading requests 3-improve the interface of the system'

Furthermore, interaction and clarification takes place between end users themselves without the intervention of the researcher, as demonstrated in these examples of Tweets:

'When the supervisor (the employee) rejects a student request, the student will need to place a new one because of the missing requirements. If there was a way to modify existing requests and add missing requirements without the need to place a new request # قيم_سفير '

'@participant-to-participant[5]: such feature is existing in Ambassador, but unfortunately is not used by employees maybe they were not trained to use it. Few supervisors (employee) use it and return requests to students to modify it instead of rejecting the request and ask student to place a new one'

Here is another example of tweets that clarify the interaction among end users regarding the system:

'Ambassador as a system is excellent but rejecting requests for the first time seems odd and tiring for students in terms of time# قيم_سفير'

'@participant-to-participant: enforcing the employee to reply in two days as a maximum is the reason for such hasty responses sometimes'

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[3] Using the language of social media of Twitter, the researcher is asking the hashtag participant by using the symbol of '@' followed by participant username which is anonymous in this example of tweet.

[4] Using the language of social media of Twitter, the participant is replying to the researcher by using the symbol of '@' followed by researcher username which is anonymous in this example of tweet.

[5] In this example of tweet, end-users of Ambassador interacting with each other, as one end-user replied to another end-user who participated in the hashtag.

While harvesting Tweets as was adopted in the Oyster study, the researcher found during the analysis process collected data needs to be analysed without being able to penetrate deeper on unclear or ambiguous statements, as there is no way to ask for clarification. Thus, the researcher could only work with the data gathered; for example, one tweet could contain an interesting point to be investigated further, but unfortunately no more data could be found to explain this in more detail. Consider these two examples of organic (self-generated) tweets obtained without any intervention in the Oyster study:

'Yeah but the oyster card website won't accept that format'

'@ScotRail yes, which only confused me further because I was expecting an oyster-card type format'

Also, as data are harvested, the researcher needs to ensure the information and knowledge from Tweets is correct, as not all tweets contain correct information: some tweets contain misconceptions, opinions based on the experience of the person who wrote it, or obsolete information. In addition, tweets are not necessarily true, and all collected data cannot be assumed to be true, or up-to-date. Therefore, 'garbage' tweets are not just confined to irrelevant tweets, but also may be garbage due to lack of truthfulness or accuracy. Consider these examples of tweets, in which the Oyster website allows for enquiries without providing an Oyster card number, and where providing such number is optional:

'@TfLTravelAlerts site doesn't work unless you have oyster card number. Help, contact is useless if you don't know your card number.'

'@TfLOfficial why can I only make an online enquiry by supplying Oyster Card NUMBER details? I have a freedom Pass!'

This study recognises that findings are subject to limitations due to the nature of Tweets, but there are other challenges that emerged specifically to each study. In the Ambassador Study, a twitter hashtag was launched in the Arabic language. Therefore, the researcher had to collect tweets from participants manually, as available software for collecting tweets automatically does not support the Arabic language. In this case, the number of resulting Tweets by participants was manageable, and the number of

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received tweets was small enough to make manual processing feasible. Also, collected data from Tweets was often in the Arabic language, as participants tend to use their native language, Arabic, to talk about their system on Twitter. Thus, we had to use direct translations of Tweets for the quotations in our analysis in order to depict end users' perceptions, as close as possible to the opinions expressed by the end users, in order to allow transparency for readers, so they can read the tweets. However, language is nuanced, and it is certain that some information will be lost in translation.

The challenges that emerged in the Oyster Study included identifying relevant Tweets, and analysing the very large volume of data collected by the software used for automatically harvesting tweets.

In order to gain meaning from this massive number of Tweets and extract values to enhance understanding, the researcher had to focus on analysing particular Tweets harvested using the keyword 'Oyster Card' that were identified to be relevant after the process of Tweet sampling and manual examination. The very large volume of data harvested automatically imposed a challenge on the analysis process to extract value and meaning, because of the massive amount of data and the noise contained in it making some data not relevant. This study utilised the feature of auto-coding of ATLAS.ti to help in analysing Tweets that were identified to be relevant to the study and were collected by using the key word 'Oyster study', which were examined manually by the researcher with the support of the auto-coding feature.

8.4 Summary

This chapter summarises the research contributions in terms of its theoretical, methodological and practical contributions. Research was conducted to create knowledge that enhances current understanding and to make an impact in this research field. As IS have evolved, the construct of IS users' satisfaction is revisited, and contributes theoretically to users' satisfaction evaluation and formation. This study also contributes methodologically by utilising social media from Twitter for data collection, and extends that to be used as an e-government evaluation tool that facilitates continuous evaluation of IS. These findings could be of interest to

practitioners involved in IS evaluation, as these shed light on using social media of Twitter for IS evaluation, and in particular in the context of e-government IS. This study also sheds light on the importance of responsiveness to IS end users' needs and the importance of constructive exchanges between governmental entities and their users, as a base for satisfaction formation, as postulated by SET. This chapter also discusses research limitations pertinent to the nature of the data, such as the issue in the Ambassador study that data is in the Arabic language, and the very large volume of harvested data in the Oyster study. Further research is suggested, as there are promising venues to be explored and exploited in the e-government context, and beyond.

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Appendix A: Active Users of the Top 10 Social Platform, Around World, By Age

Active Users of the Top 10 Social Platform, Around World, By Age (Adopted from Global Web Index (January, 2014))
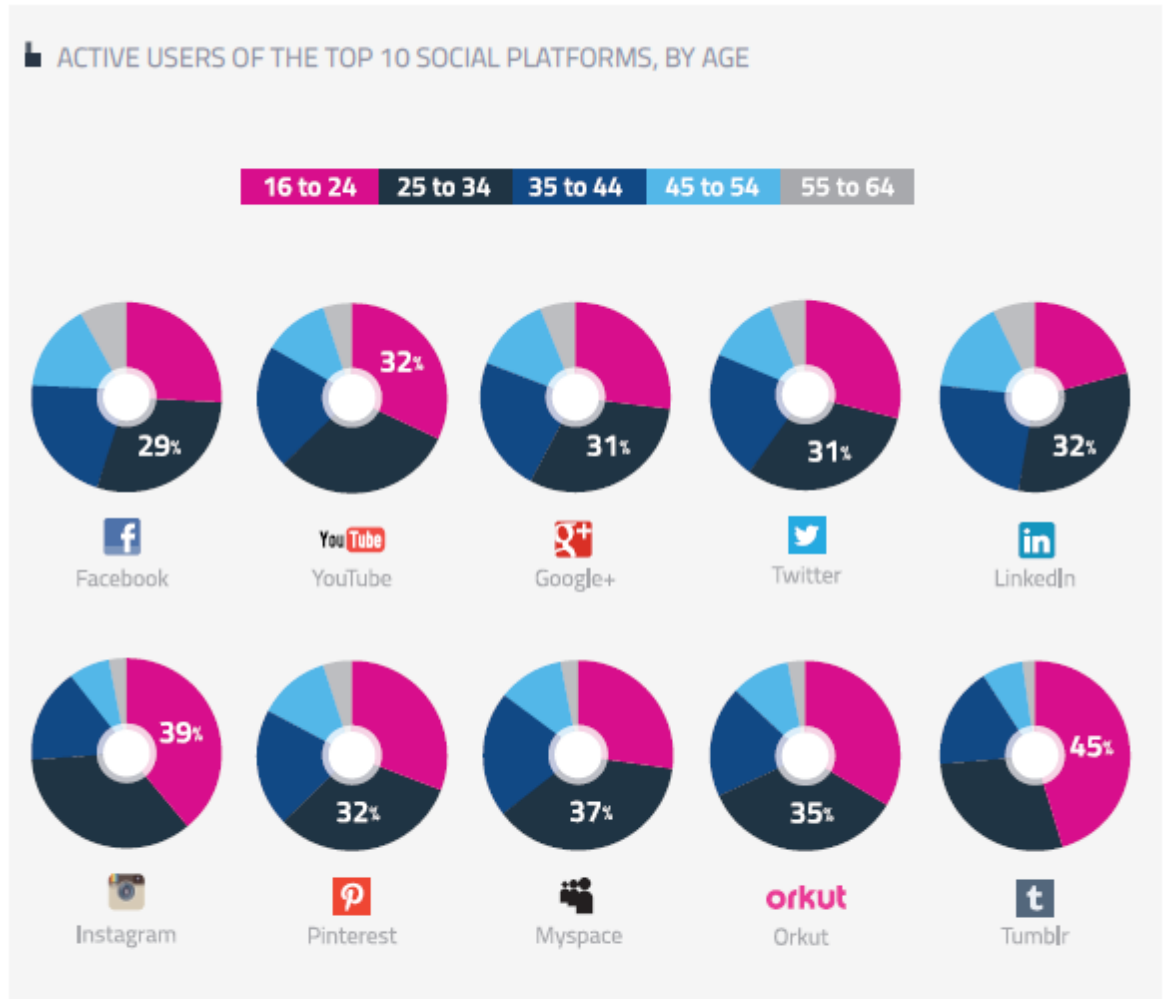
Appendix B: Ambassador Questionnaire-First Study

Could you please take just 5 minutes to answer the following questions about your experience with the Scholarship Students Portal 'Safeer' for online electronic services (نظام سفير للخدمات الإلكترونية). Participants who both complete this survey and participate in the provided hashtag as instructed in this survey will be entered into a Prize Draw to win an Apple iPad. To protect your privacy, this data will be collected anonymously. Thank You!

أرجو مشاركتكم بتعبئة هذا الإستبيان و الذي يهدف إلى تقييم البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير/الطلبة للخدمات الإلكترونية و في حالة مشاركتكم في الهاشتاق المرفق في هذا الإستبيان سوف يدخل اسمك السحب للفوز ب ايل ايباد للحفاظ على خصوصية البيانات سوف يتم تجميعها كمجهولة. هذا الإستبيان جزء من بحث الدكتوراة أرجو تعاونكم والمشاركة شاكرة لكم ذلك

Have you ever used the Scholarship Students Portal 'Safeer' ?

هل إستخدمت مسبقا البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير/الطلبة للخدمات الإلكترونية؟

○ Yes نعم

○ No لا

Submit

Could you please take just 5 minutes to answer the following questions about your experience with the Scholarship Students Portal 'Safeer' for online electronic services (نظام سفير للخدمات الإلكترونية). Participants who both complete this survey and participate in the provided hashtag as instructed in this survey will be entered into a Prize Draw to win an Apple iPad. To protect your privacy, this data will be collected anonymously. Thank You! البوابة تقييم إلى يهدف الذي و الإستبيان هذا بتعبئة مشاركتكم أرجو الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير الطلبة للخدمات الإلكترونية و في حالة مشاركتكم في الهاشتاق المرفق في هذا الإستبيان سوف يدخل اسمك السحب للفوز ب ايل ايباد للحفاظ على خصوصية البيانات سوف يتم تجميعها كمجهول. هذا الإستبيان جزء من بحث الدكتوراة أرجو تعاونكم والمشاركة شاكرة لكم ذلك

Are you using the Scholarship Students Portal 'Safeer' as
هل تستخدم البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير الطلبة للخدمات الإلكترونية

○ Student كطالب

○ Staff كموظف

Your Gender
هل أنت

○ Male ذكر

○ Female أنثى

How old are you?
كم عمرك؟

○ Less than 20 أقل من

○ 20-24

○ 25-29

○ 30-34

○ 35-39

○ 40-44

○ 45-49

○ 50-54

○ 55 or above أكبر من

Your Education
ماهو مستوى تعليمك الدراسي

○ High School Cert شهادة الثانوية

○ Diploma دبلوم

○ Bachelor بكالوريس

○ Masters ماجستير

○ Doctorate دكتوراة

○ None لايوجد

Your Marital Status
ماهي حالتك الإجتماعية؟

○ Single أعزب

○ Married متزوج

○ Widowed أرمل

○ Divorced مطلق

○ Separated منفصل

How often do you use the Scholarship Students Portal 'Safeer' ?
كل متى تقوم بتسجيل الدخول لإستخدام البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير الطلبة للخدمات الإلكترونية؟

○ Never أبدا

○ Rarely نادرا

○ Occasionally بين حين و اخر

○ Regularly بشكل دائم

○ Don't Know لا أدري

○ Whenever need it فقط عندما أحتاجه

Please choose the number that corresponds to your best description of the Scholarship Students Portal (نظام سفير) you use:

1=Almost Never   2=Some of the time   3=About half of the time   4=Most of the time   5=Almost always

الرجاء إختيار الرقم الذى يتوافق مع أفضل وصف بالنسبة لك لتقييم البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير الطلبة للخدمات الإلكترونية؟

1=أبدا

2= بعض الوقت

3= نصف الوقت تقريبا

4= معظم الوقت

5= دائما

1. Does the system provide the precise information you need? هل يوفر لك نظام سفير المعلومات التي تحتاجها بدقة	⌄
2. Does the information content meet your needs? هل محتوى نظام سفير من معلومات يفي بإحتياجك	⌄
3. Does the system provide reports that seem to be just about exactly what you need? هل يزودك نظام سفير بالتقارير التي تحتاجها بالضبط	⌄
4. Does the system provide sufficient information? هل يزودك نظام سفير بمعلومات كافية و وافية	⌄
5. Is the system accurate? هل تعتبر نظام سفير دقيق	⌄
6. Are you satisfied with the accuracy of the system? هل أنت راض عن دقة نظام سفير	⌄
7. Do you think the output is presented in a useful format? هل تعتقد أن المعلومات و الخدمات المقدمة من خلال نظام سفير معروضة بشكل مفيد لك	⌄
8. Is the information clear? هل نظام سفير يزودك بمعلومات واضحة	⌄
9. Is the system user friendly? هل تعتبر نظام سفير يمكن إستخدامه سهولة من غير تعقيدات	⌄
10. Is the system easy to use? هل نظام سفير سهل الإستخدام	⌄
11. Do you get the information you need in time? هل يوفر نظام سفير لك المعلومات التي تحتاجها في الوقت المناسب	⌄
12. Does the system provide up-to-date information? هل يوفر نظام سفير لك أحدث المعلومات	⌄

To enter the Prize Draw (to win Apple iPad) you must use the following Twitter hashtag #قيم_سفير to tweet about your experience of using Scholarship Students Portal 'Safeer', in particular its content, accuracy, format, ease of use, and timeliness (provide information you need on time and up-to-date), or simply about things you like, or don't like, about Scholarship Students Portal 'Safeer'.

لدخل إسمك في السحب للفوز ب اب اى اى باد عليك المشاركة في الهاشتاق التالي
#قيم_سفير
بإمكانك التغريد لتقييم البوابة الإلكترونية (بوابة الإبتعاث) المسمى ب نظام سفير الطلبة للخدمات الإلكترونية و بالتحديد من حيث محتوى نظام سفير، دقة النظام، سهولة إستخدامه، تزويده للمستخدم بالمعلومات في الوقت المناسب وتوفيره للمستخدم بمعلومات حديثة أو بالإمكان التغريد ببساطة عن مايميز نظام سفير بالنسبة لك أو مالاتحبذه بالنظام

Please enter your Twitter user name (this will only be used to confirm your participation using Twitter and that you completed the survey) in order to enter the Prize Draw

أرجو إدخال اسمك كمستخدم في تويتر مع ملاحظة أن هذه المعلومة سوف تستخدم فقط للسحب لإختيار أحد المستخدمين للفوز ب اب ايباد و التواصل معه ليستلم جائزته و التأكد من أن الرابح قد أكمل تعبئة الإستبيان و بعض الوقت شارك بالهاشتاق

@

Any Comments !
This is a PhD study focuses on studying the interaction and communication on social media @RHULPhDStudy

أى إضافة تود مشاركتها معنا
هذه دراسة لدرجة الدكتوراة و تهدف إلى دراسة التفاعل و التواصل بإستخدام مواقع التواصل الإجتماعي
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Appendix C: Technological Advance Elements, Ambassador Study

Technological Advance Elements, Ambassador Study

Technological Advance Elements	Example of strips
System Speed	'The system is good only for inquiries and follow-up request. One of its defects is its slowness… it needs more development'
System Restriction to Compete a Request in a Specific Time Limit	'It is a very good system yet its defect is not staying for time sufficient to get the process done'
System Hang-up	'You have to upload your documents and completing placing your request fast because if you are a little late the system freezes and requiring resubmission of the request from the beginning'. 'The system freezes sometimes… sometimes you can't find some information in the system; but it is a small issue that can be resolved with time'.
Working Properly on Different Platforms and Browsers	'Ambassador (the system) is kind of good, what it lacks is to be simpler; I find it complicated sometimes… and unclear some others… unfortunately it doesn't work properly on all browsers'.
Uploading Documents	'Yet it needs some development in term of file uploading and its speed. There can be nothing else wrong with the system once this issue with the file uploading is solved'.
Human-Computer Interaction (HCI) Design	'The drop down lists are not well organised nor accurate'.

Appendix D: Oyster Questionnaire-Second Study

Could you please take just 5 minutes to answer the following questions about your experience with the Oyster Card system (at underground stations) and the Oyster Online (by accessing the Transport for London website) to access and maintain your account? Participants who both complete this survey and participate in the provided hashtag as instructed in this survey will be entered into a Prize Draw to win an Apple iPad. To protect your privacy, this data will be collected anonymously. Thank You!

Have you ever used Oyster Card system (at underground stations) or Oyster Online (by accessing the Transport for London website)?

○ Yes

○ No

Submit

Could you please take just 5 minutes to answer the following questions about your experience with the Oyster Card system (at underground stations) and the Oyster Online (by accessing the Transport for London website) to access and maintain your account? Participants who both complete this survey and participate in the provided hashtag as instructed in this survey will be entered into a Prize Draw to win an Apple iPad. To protect your privacy, this data will be collected anonymously. Thank You!

Your Gender

○ Male

○ Female

How old are you?

○ Less than 20

○ 20-24

○ 25-29

○ 30-34

○ 35-39

○ 40-44

○ 45-49

○ 50-54

○ 55 or above

Your Education
- ○ High School Cert
- ○ Diploma
- ○ Bachelor
- ○ Masters
- ○ Doctorate
- ○ None

Your Marital Status
- ○ Single
- ○ Married
- ○ Widowed
- ○ Divorced
- ○ Separated

How often do you use the Oyster System (at underground stations)?
- ○ Never
- ○ Rarely
- ○ Occasionally
- ○ Regularly
- ○ Don't Know

How often do you use the Oyster Online (by accessing the Transport for London website)?

○ Never

○ Rarely

○ Occasionally

○ Regularly

○ Don't Know

Please choose the number that corresponds to your best description of using the Oyster Card system or Oyster Online:

1=Almost Never   2=Some of the time   3=About half of the time   4=Most of the time   5=Almost always

1. Does the system provide the precise information you need?	⌄
2. Does the information content meet your needs?	⌄
3. Does the system provide reports that seem to be just about exactly what you need?	⌄
4. Does the system provide sufficient information?	⌄
5. Is the system accurate?	⌄
6. Are you satisfied with the accuracy of the system?	⌄
7. Do you think the output is presented in a useful format?	⌄
8. Is the information clear?	⌄
9. Is the system user friendly?	⌄
10. Is the system easy to use?	⌄
11. Do you get the information you need in time?	⌄
12. Does the system provide up-to-date information?	⌄

To enter the Prize Draw (to win Apple iPad) you must use the following Twitter hashtag #EvaluateOyster to tweet about your experience of using 'Oyster Card system' or 'Oyster Online', in particular its content, accuracy, format, ease of use, and timeliness: provide information you need on time and up-to-date, or simply tweet about things you like, or don't like, about Oyster Card system and Oyster Online.

Please enter your Twitter user name (this will only be used to confirm your participation using Twitter and that you completed the survey) in order to enter the Prize Draw

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