

Diffusion and adoption of information and communication technologies in the public sector: the case of selected government departments in KwaZulu-Natal

ABSTRACT

This study seeks to shed some light on the types, usage and availability of information and communication technologies (ICTs) in four selected government departments in the KwaZulu-Natal government in South Africa. To achieve the stated aim, the study posed and then answered the following research questions: What types of ICTs are available in government departments? What is the purpose of using ICTs in government departments? What are the benefits of using ICTs in government departments? What are the ICTs that civil servants consider to be effective in improving work productivity in government departments? What are the civil servants' recommendations for improving ICT usage in government departments? The study was informed by the diffusion-of-innovations theory. Government departments considered to be central to service delivery were targeted by means of a survey. To obtain a representative sample, a systematic sampling method was applied. The collected data were analysed using thematic categorisation and tabulation, and the findings were presented descriptively. The results indicate that a variety of ICT tools and services have been adopted in the government departments included in the survey so as to facilitate information sharing and improve communication. All the civil servants surveyed indicated that they used ICTs to communicate with fellow colleagues and to disseminate departmental information. The most popular recommendations included the need for sufficient and coherent government policies to regulate the training of staff in the utilisation of ICTs in the sector. Detailed recommendations for further study are provided.

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INTRODUCTION AND BACKGROUND

Information and communication technologies (ICTs) are gradually becoming familiar tools in both the private and the public sectors and they have great potential for initiating revolutionary changes in respect of enhancing both work productivity and creativity (Mbatha, 2012). In their study, Khalo and Hu (2010:39) note that ICTs are radically redefining the world's social, economic and political landscape. The latter authors argue that as people live in the information age, their environment and needs are changed by the development of ICTs. In support of these views, Mbatha, Ocholla and Le Roux (2011) state that the employment of ICTs for the delivery of information and services has been considered to be a major objective of the modernisation agenda of government municipalities. It is worth mentioning that, in response to a view of government performance – particularly in the West – and increasing public demand for the delivery of 'better' services in terms of quality, accessibility and choice, the mode of operation of government departments in South Africa has been subject to major modernisation efforts (Khalo & Hu, 2010:39). South Africa has one of the most sophisticated ICT infrastructures in Africa and was one of the early adopters of the Internet on the continent (Brown, Collins, Maleka, Morrison, Muganda & Speight, 2007:148). Brown et al. (2007:161) further observe that the importance of ICTs for national development was recognised at the very top by the then South African president, Thabo Mbeki, who announced the formation of the Presidential International Advisory Council on Information Society and Development in 2001.

The value that government sees in the Internet is borne out by strides that the country has made in the establishment and sustainment of e-government. Nevertheless, the country still has some challenges to face in the information age (Khalo & Hu, 2010:39). Hence the government has embarked on a number of measures to ensure that ICTs play a significant role in society. In all the government departments that this study targeted, ICTs have a significant role to play with regard to improving work productivity and creativity. For example, a study conducted by Khalo and Hu (2010:39) established that the Department of Home Affairs (DHA) plays a central and indispensable role within the public service in that it impacts both on the lives of all the citizens of South Africa and on the people who visit South Africa. The DHA has felt the pressures emanating from South Africa's transition to democracy and a tremendous increase in the demand for its services. Based on the results of their study, Khalo and Hu (2010:39) have concluded that the DHA should adopt ICTs in its services so that it is able to deliver these conveniently and efficiently to citizens. E-government has been one of the many buzzwords formulated to modernise or transform public administration. Khalo and Hu (2010:39) note that, as is the case in many countries around the globe, the South African government has been undertaking reforms aimed at improving its responsiveness and efficiency, while simultaneously reducing the costs of public operations under the umbrella term *e-government*. In this context, the adoption of ICTs for the delivery of information and services has been considered a major objective of government's modernisation agenda. This study on ICT adoption by government is relevant to modern development – particularly in Africa, where the utilisation of ICTs is either low or underdeveloped (Kling, 2000; Mbatha, 2012; UNDP, 2000). Many research studies have established that in Africa – and in some municipalities in the province of KwaZulu-Natal (KZN) – service delivery is often

poor because modern communication technology is neither utilised nor is it available (Mbatha et al. 2011; Ntetha, 2010).

1. INFORMATION AND COMMUNICATION TECHNOLOGIES DEFINED

Many ICT enthusiasts, such as Rowland (2006), Ngeenge (2003:1), and Mbatha and Ocholla (2011) have defined ICTs and have perceived them as key catalysts in current and future social and organisational evolutions. In essence, 'information and communication technologies' (ICTs) can best be defined as a compound term that is used to refer to the convergence of a wide array of new technologies at present being developed and used in the creation, processing and transmission of information. Broadly, these technologies encompass all aspects of data and/or information recording, handling and transmission, and they include computers, telecommunications, satellites, fibre optics, video-based multimedia applications, automated speech outputs and electronic broadcast technologies (Mbatha, 2009; Ngeenge, 2003:1). Kling (2000) likewise describes ICTs as a combination of all of these elements, capped by a vision of how technology can help an organisation to reach its goals. In the South African policy landscape, the abbreviation 'ICT' is widely used and it encompasses the convergence of various communication technologies, such as computers, telephony, broadcasting, multimedia and the Internet (Al-zhrani, 2010:93).

Rowland (2006), on the other hand, describes ICTs as the combination of technologies – embodied in the Internet – that emerged in the early 1990s, and includes their more recent offspring – notably wireless technologies and social networking. Yet another definition of ICTs is provided by Borins (2007) who states that ICTs represent a once-in-a-generation shift, the implications of which are still playing out. He further argues that through their ability both to link entities and individuals in ways that cut across the standard organisation chart and also to be simultaneously centralising and decentralising within an integrated institutional environment, ICTs have transformative potential and lead to what has been described as IT-enabled government (Borins, 2007). This transformative potential has been described by Dunleavy, Margetts, Bastow and Tinkler (2006) as a digital-era governance. In support of these views, Bhatnagar, Jha and Singh (2011:4648) assert that *e-governance* is used as a synonym to describe an IT-driven system of governance that works better, costs less and is capable of servicing the needs of the citizens and businesses as never before. The goal of e-governance is to create a more responsive, productive and effective administration. According to these latter authors, e-governance is also referred to as SMART governance in that it aims to use IT to improve the processes of government functioning by bringing about simple, moral, accountable, responsive and transparent (SMART) governance.

In the context of transforming society, Abdul, Hamdan, Yahya, Shanudin and Mohd (2000) observe that the rapid development of ICTs has, from time to time, changed humans' way of life. Abdul et al. (2000) interpret ICTs as a discipline of science, technology, engineering and administration that is used to manage and process information, create interaction between humans and computers and describe the related social, economic and human culture and the environment. Lee, Tang and Trimi (2005:99) and Mbatha et al. (2011) maintain that e-government has achieved significant improvements by deploying many innovative applications and has therefore become a global phenomenon.

2. AIM OF THE STUDY

The study on which this article is based set out to examine the diffusion and adoption of ICTs as a mechanism for improving work productivity and creativity within the civil service work environment in the KwaZulu-Natal government. To achieve the aforementioned aim, the following research questions were addressed:

- What types of ICTs are available in government departments?
- What is the purpose of using ICTs in government departments?
- What are the benefits of adopting ICTs in government departments?
- Which ICTs do civil servants consider to be effective in improving work productivity in government departments?
- What are civil servants' recommendations for improving ICT usage in government departments?

3. THE USE OF ICTS IN ORGANISATIONAL AND SOCIETAL CONTEXT

A variety of ICT enthusiasts, such as Migiro and Kwake (2007:109), Trimi and Sheng (2008) and Mbatha (2012), have written extensively on the role being played by ICTs in both organisational and societal contexts. These authors concur that ICTs are key tools for transforming the way in which development is promoted and information is shared around the world. Migiro and Kwake (2007:109) and also Mbatha and Ocholla (2011) hold that as a power source for both facilitating and sharing information, ICTs are capable of either decoupling or separating information from its physical repository and they have also proved to be excellent channels of communication between one person and another. In their study, Trimi and Sheng (2008:53) concluded that since the 1990s, public-sector organisations across the globe have been applying Internet technology and other ICTs innovatively so as to deliver services, engage citizens and improve efficiency. It is worth mentioning that an explosion in the use of mobile technologies (m-technologies) – such as mobile phones, laptops and personal digital assistants (PDAs) – to connect to wireless networks has enabled governments to make the transition from e-government to mobile government (m-government).

The study conducted by Trimi and Sheng (2008:55) revealed that m-government increased the efficiency and the effectiveness of government employees. In addition, the latter authors believe that with the help of m-technology, government employees are able to access the required information in real time and to update records on the spot. They further argue that this not only reduces some logistical burdens and decreases data-entry errors, but it also helps employees to make informed decisions and take appropriate action. Not only has m-government proved to be effective within the civil services, but the citizens themselves have moreover benefited immensely from using m-technologies. As Trimi and Sheng (2008:53) aptly state, m-government can open up additional channels for citizen participation, thereby increasing constituent participation. Communication through mobile devices encourages citizens to make use of the technology to express their points of view to government officials, to lawmakers and to community representatives (Trimis & Sheng, 2008:53).

Akpan-Obong and Parmentier (2009:289) and Mbatha (2012) concur that ICTs are considered as tools with which to foster socioeconomic development. Technologies such as computers, telephones and the Internet are also critical for integration within and among countries in that they enhance the flow of communication, information and production. In that process, ICTs are considered to be both direct agents of development and also facilitators of integration, which, in turn, are likely to promote socioeconomic development. In line with the above views, Zawada, Wallmach, Ngcobo and Mabule (2007) are of the view that many countries, both developed and developing, are investing in ICTs to improve their lifestyles and business practices. The South African government has placed a strong emphasis on ICT-sector development through the implementation of a national ICT strategy, which proactively addresses ICT penetration, particularly for disadvantaged segments of society (Zawada et al., 2007). Al-zhrani (2010:93) notes that South Africa is one of the very first countries to embrace convergence in its telecommunications policy trajectory. According to Mostert and Ntetha (2008), ICTs are applied to access, analyse, evaluate, integrate, present and communicate information, while Mbatha (2011), argues that when utilised in these ways, ICTs could transform the business environment and increase productivity and incomes. Nasi, Frosini and Cristofoli (2011) share similar views by noting that ICTs have the potential to collect, store and manage large volumes of data and information that can be transferred and shared among public managers and on a government website on a real-time basis.

A recent study on e-government conducted by Odat (2012:1013) established that modern governments in many government states have embraced the concept of e-government to achieve a set of goals and objectives that will benefit all individuals, institutions and societies. Tobin, Porumbescu and Lee (2013:436) maintain that improved external accountability and organisational learning are logical corollaries of the increasing governmental use of ICTs to expand and diversify citizen interaction. The widespread adoption of ICTs results in structural changes, both in the internal organisation of the public service and in its external interfaces with the public and also with suppliers of goods and services to government (Borins, 2007:14). Within the public service, Borins suggests that ICTs will reshape the traditional departmental model in which each department has three capacities: policy development, service delivery and internal support services.

There is no doubt that ICTs have significantly expanded the power and potential of most information systems. Technology has created a data and information explosion in virtually all businesses in which the ability to harness and manage such data and information has become a critical success factor. Information systems in an organisation are dedicated to improving the performance of the organisation's knowledge workers through the application of information technology. A study by Zawada et al. (2007) established that in many countries –South Africa included – there is great improvement in telecommunications through different mobile cellular networks and computers, along with increased utilisation of the Internet for e-mail, e-commerce, e-searching and videoconferencing. The latter authors believe that this great improvement has immensely transformed the processes of sharing and disseminating information and knowledge.

It is true that ICTs have excelled – and are continuing to excel – when it comes to facilitating and improving communication among individuals worldwide. Hence Paul and Lorsch (1997:1) state that ICTs have allowed people to communicate with one another successfully, anywhere and at

any time. People around the world can get in touch with one another through the Internet, by cellphone, by fax, by means of videoconferencing and through other media. According to these authors, the world seems continually to be shrinking under the influence of ICTs. Mbatha (2011) and Tobin et al. (2013) share similar sentiments in believing that international boundaries are disappearing. Like many authors who write about government's adoption of ICTs, Tobin et al. (2013) point out that ICTs greatly influence better governance and service delivery.

Likewise, many authors such as Netchaeva (2002:467) and Silcock (2001:88) have acknowledged the crucial role that ICTs are playing in improving work productivity and creativity in government departments. The latter authors report that the benefits of e-government include improved efficiency, increases in the transparency and accountability of government functions, convenient and faster access to government services, improved democracy and lower costs in respect of administrative services. In corroborating the aforementioned views, Ndou (2004:8) outlines some of the benefits of applying ICTs in government departments. These are cost reduction and efficiency gains; improved quality of service delivery to businesses and customers; transparency, anticorruption and accountability; increases in the capacity of government; network and community creation; improvements in the quality of decision making; and, promoting the use of ICTs in other sectors of society. For example, a study conducted by Khalo and Hu (2010:42) revealed that the Department of Home Affairs – as an essential service delivery department in South Africa's democracy – implemented an aspect of ICTs via e-government to achieve higher levels of service delivery to meet the needs of the citizens. The application of e-government allows citizens to interact with government seven days a week and twenty-four hours a day through various media such as the Internet and e-mail.

4. METHODOLOGY

A survey targeting key government departments was used to collect data. Because of the diverse and dispersed nature of the public sector in South Africa, the scope of the study was limited to government departments in KZN. In order to obtain a representative sample, the systematic sampling method was applied. In this technique, five out of eleven suitable district municipalities were selected by utilising every second district from a list. The sample size for the entire study was two hundred and sixty managers. A total of 152 questionnaires were completed and returned. The five (5) district municipalities selected were uMgungundlovu, uMzinyathi, Zululand, uThungulu and Sisonke. In these districts, four government departments were targeted, namely those of Arts and Culture, Home Affairs, Education and Health. In this study, the researchers wished to investigate suitable departments that had a considerable reach and were quite service intensive (Mbatha, 2011). Also, the researchers wanted to investigate government departments that were scattered across the province and could be found in both rural and urban areas with a view to determining whether their decidedly dispersed nature had any influence on their uptake of ICTs. These departments were sampled using purposive and systematic sampling techniques. Three selection strategies were utilised: i) identifying highly dispersed and service-intensive departments; ii) categorising the personnel in the selected departments according to whether they represented top-, medium- or lower-level management; and iii) dividing the service areas into rural or urban-based centres. Using thematic categorisation and tabulation, the data collected were analysed and the findings were presented descriptively.

As for ethical considerations, informed consent was obtained from participants in the study in order to ensure that they understood what they were doing and to verify their willingness to participate. The respondents were assured of their rights, including the right of consent, protection from disclosure of information and respect for their privacy. All the research participants participated voluntarily. With regard to protection from harm, the researchers ensured that the participants were not at any risk and would not be exposed to embarrassment, unusual stress or any demeaning treatment. Anonymity and confidentiality were both promised and maintained. The information the participants provided was not made available to anyone who was not directly involved in the study and such information cannot be traced to and/or associated with the participants. The researchers also ensured that the participants would remain anonymous throughout the study. In terms of professional standards, the researchers ensured that the results were gathered in a professional fashion, without misrepresenting anyone and/or intentionally misleading the respondents about the nature of the study. The researchers ensured that all the findings were presented honestly, without fabricating any data to support any particular finding. The researchers also adhered to the institutional guidelines in this regard.

5. RESULTS

The results of the study reported below provide the demographics of the respondents, the types of ICTs used, why these were used, their benefits, and the types of ICTs that proved to be effective in improving work productivity and creativity. Recommendations for improving ICT usage in government departments are also made.

5.1 Demographic profile of the respondents

Background information sought from each respondent included age, occupation and the highest educational qualification obtained. The aim was to determine the relationships between the respondent's demographic characteristics and their use of ICTs. In terms of job titles, the respondents ranged from assistant managers to district managers and the majority (33; 22%) held the position of assistant manager. Most of the respondents (66; 43%) had a Bachelor's degree. A study by Ayoo (2001) established that in developing countries most professionals above the age of 40 years are often conservative and slow in keeping abreast of advances in ICT. Ayoo's study found a large number of respondents to be between the ages of 40 to 49 (47%), while a significant percentage of respondents fell in the 30-to-39 age group (28%).

Respondents in the 50 years and older age group and those aged 20–29 years ranked third and fourth respectively. It was also vital to assess gender proportionality in the study in that it is a widely held view that males dominate use and access to ICTs. Earlier studies have identified women and girls as disadvantaged in their uptake of ICTs (Kling, 2000). Ngenge (2003) found that gender disparities in the use of ICTs are much greater in Africa where women's involvement is as low as 5%. He further argues that gender disparity among professionals in Africa is attributable partly to the education system and partly to factors inherent in society at large. It has been empirically proven that women and men differ in their attitudes towards, comfort with, and anxiety in respect of using computer technology (Shaw &

Grant, 2002). The results of the study indicate that there was a distinct male dominance (89; 59%) in the sample population. In terms of the level of management, most of the respondents (68; 45 %) were top managers.

5.2 Types of ICTs currently in use

One of the objectives of the present study was to establish types of ICTs available in government departments. To realise this objective, the respondents were asked to indicate the level of accessibility of different types of ICTs in their respective departments. The main purpose of the study was to establish the extent to which the available ICTs were accessible to the civil servants in their respective departments. A Likert Scale of 1 (not accessible) through to 4 (very accessible) was used to rate the responses in this regard.

Table 1: Accessibility of ICTs in government departments (N=152)

ICT tools	Not accessible		Less accessible		Accessible		Very accessible	
	F	%	F	%	F	%	F	%
Television	141	93	11	7	-	-	-	-
Radio	145	95	7	5	-	-	-	-
Video camera	102	67	41	27	9	6	-	-
Video recorder	127	84	22	14	3	2	-	-
Tape recorder	112	74	34	22	6	4	-	-
Projector	43	28	41	27	45	30	23	15
Laptop	21	14	25	16	49	32	57	38
Fax machine	-	-	28	18	45	30	79	52
Videoconferencing	152	100	-	-	-	-	-	-
PC	-	-	-	-	-	--	152	100
Internet	-	-	-	-	10	7	142	93
Intranet	-	-	-	-	12	8	140	92
Mobile phone	-	-	-	-	7	5	145	95
Database	33	22	35	23	39	26	45	30
Telephone	-	-	-	-	-	-	152	100
Copy machine	-	-	-	-	-	-	152	100
Printer	-	-	-	-	7	5	145	95
Scanner	19	13	21	14	55	36	57	38
E-mail	-	-	-	-	-	-	152	100

**The table represents multiple responses*

The above table indicates that various ICT tools and services are available and have been adopted in government departments with a view to improving work productivity and creativity

in the sector. Several factors might account for the results of this study. For example, most of the respondents were based in urban or semi-urban areas and had physical access to ICTs. They moreover held management positions in their respective departments, a circumstance that normally guarantees ICT access and use. A study by Williams, Wilson, Richardson, Tuson and Coles (1998) conducted as far back as 1998, one supported by the later studies done by Ntetha (2010) and Mbatha (2012), also established the use of ICTs by some civil servants to be generally restricted to word processing and the use of specific applications. While Williams et al. (1998) noted that civil servants made more use of a range of generic computer applications – such as spreadsheets and PowerPoint – word processing still dominated their use of ICTs. Williams et al. (1998) further observed that other types of ICTs, such as the Internet, databases and videoconferencing were used relatively less often. Ntetha's study established that some ICT tools, such as videoconferencing, are still not available in the targeted departments. Furthermore, in Ntetha's study, civil servants identified a range of factors that they considered to be inhibitors to their effective use of ICTs, particularly a lack of access or of availability of hardware and software, and the lack of ICT education, ICT skills and knowledge regarding ICTs.

5.3 Reasons for using ICTs

People use technology for different reasons. The researchers therefore wanted to establish why specifically civil servants were using ICTs. The respondents were provided with possible options from which to choose and they were asked to rate each one on a scale of 1 to 4, depending on how applicable it was to their situation (1 = strongly disagree; 4 = strongly agree). The table below shows the number of responses for each rating and the corresponding percentages.

Table 2: Reasons for using ICTs (N=152)

ICT usage	Strongly agree		Agree		Disagree		Strongly disagree	
	F	%	F	%	F	%	F	%
To communicate with colleagues	152	100	-	-	-	-	-	-
To disseminate information	152	100	-	-	-	-	-	-
For research purposes	89	59	32	21	31	20	-	-
For information retrieval	34	22	44	29	33	22	41	27
For marketing purposes	34	22	41	27	54	36	23	15
For word processing	152	100	-	-	-	-	-	-
For Internet access	152	100	-	-	-	-	-	-
For spreadsheets	152	100	-	-	-	-	-	-
For managing records	122	80	30	20	-	-	-	-
For presentations	108	71	44	29	-	-	-	-
For database searching	12	8	34	22	65	43	41	27
For printing	152	100	-	-	-	-	-	-
Advertising	33	22	54	36	43	28	22	14
Purchasing	17	11	45	30	48	32	42	28
Information gathering	49	32	38	25	54	36	11	7

* The table above represents multiple responses

The survey revealed that all the respondents (152; 100%) were using ICTs to communicate with fellow colleagues, to access the Internet, for spreadsheet purposes, for printing, for word processing and to disseminate departmental information. By combining the positive phenomena in scales 1 and 2 under the umbrella term of *research purposes*, we were able conclusively to determine that the majority of the respondents were using ICTs for research purposes (levels 1 and 2: combined total 121 or 80%). An average number were using ICTs to retrieve information (i.e. levels 1 and 2: 78 or 51%). The survey results further revealed that a significant number used ICTs for records management (the combined positive phenomena in levels 1 and 2 translated to 152 ratings or 100%), while a total rating of 152 (100%) for the combined scales 1 and 2 served to illustrate that all the respondents were using ICTs for presentation purposes. The results also indicated that an average number of respondents were using ICTs for database searching (i.e. levels 1 and 2: 46 or 30%). This was also true of those who were using ICTs for advertising purposes. This is evident from a total rating of 87 (57%) at the combined levels 1 and 2 on the Likert Scale. Only an average number were found to be using ICTs for purchasing purposes (levels 1 and 2: combined total of 62 or 41%), while 87 (57%) of the respondents were using ICTs to gather information.

5.4 ICT benefits

One of the objectives of the study was to identify the benefits of using ICTs in government departments. An open-ended question was used to elicit responses from the civil servants. The respondents identified the following benefits of using ICTs in government departments. ICTs were found to

- improve government's level of efficiency.
- reduce the time spent in the performance of procedures within each department.
- take advantage of the best experiences in the performance of the business.
- promote accuracy in the completion of various functions.
- facilitate the electronic payment system.
- reduce the costs within government departments through improvement, development and the engineering of business processes.
- facilitate the flow of business.
- reduce the number of procedures and avoid duplicating information within business.
- promote coordination and cooperation between state institutions and establish the concept of integration.
- encourage the exchange of automated data.
- facilitate the use of government services.
- provide accurate data in a timely manner and as needed.
- facilitate transactions between the sectors of government and business sectors.
- reduce the costs of coordination and continuous monitoring.
- increase the profitability of the revenue transactions with government business sectors.
- encourage the building of infrastructure and the dissemination of technical information for high efficiency.
- provide new opportunities for private-sector investment information.
- achieve a high degree of integration between government and the private sector to serve the national economy.
- provide some services of interest to a large segment of the public and to investors on the Internet or via phone lines or mobile-phone networks.
- provide accurate and updated information to decision makers and investors.

The above results confirm that ICTs are capable of transforming the work productivity and creativity in the public sector. These results support Al-zhrani's (2010:93) observation that the effective use of ICTs enables people within and across organisations to communicate effectively and efficiently. According to Mbatha (2012), the South African government envisages that the inception of ICTs will promote and support electronic commerce applications, economic development and educational endeavours. ICTs are currently being used in government ministries to restructure the public sector by incorporating them (ICTs) in the everyday lives of civil servants. Further confirmation of the results of the study comes from Turban and King (2012) who note that ICTs are also encouraging civil servants to make effective use of existing and new ICTs to reduce drastically some of the communication restrictions in terms

of space and time. The latter authors further observe that it is common for many technology-centred accounts of new ICTs to emphasise the ways in which they enable new kinds of actions that previously were more costly, difficult or impossible (Turban & King, 2012).

In above results correlate with the observation by Almatarneh (2011) – one supported by Mbatha (2012) – that governments and non-governmental organisations worldwide have recognised the benefits of ICTs in improving business and public service, and in reducing poverty and encouraging governmental improvements. Almatarneh (2011) moreover believes that ICTs are capable of improving the provision of basic social services, of helping to disseminate valuable information on production and conservation, of improving the efficiency of governments and of enhancing the provision of education and health. Bussell (2011:267) concurs with the above views by pointing out that ICTs can provide governments with opportunities to deliver public services more effectively to their citizens, while Mbatha and Ocholla (2011) point out that across the world the waves of e-government are rising through public organisations and public administration. Bussell (2011:267) also notes that more and more governments are using ICTs, such as the Internet or a web-based network to provide services between government agencies and citizens, businesses, employees and other non-governmental agencies. According to Almatarneh (2011), ICTs can play a significant role in fighting fraud and making government institutions more transparent by reducing the opportunities and incentives for and increasing the costs of corruption. Many authors, including Borins (2007), Almatarneh (2011), Mbatha and Ocholla (2011), share similar sentiments regarding the pivotal role being played by ICTs in improving the lives of people. All of these authors believe that ICTs are effective in business, in the economy and in government. ICTs are also known to play a significant role in economic data transmission such as telecommunications, mobile phones and Internet communications globally.

5.5 ICTs that are effective for improving work creativity and productivity

The study sought to establish which ICT tools were effective in improving work creativity and productivity. Table 3 below indicates responses to the question: Which ICT tools do you consider to be effective in your work? Respondents were provided with a list of ICT tools and asked to rate these on a scale of 1 to 4, as applicable to their situation (1 = very effective; 2 = effective; 3 = less effective; and 4 = not effective). Using a close-ended questionnaire, appropriate multiple answers were selected.

Table 3: ICTs effective in promoting work creativity and productivity (N=152)

ICT tools	Very effective		Effective		Less effective		Not effective	
	F	%	F	%	F	%	F	%
Television					23	15	129	85
Radio	-	-	-	-	2	1	150	99
Video camera	-	-	-	-	18	12	134	88
Video recorder	-	-	14	9	35	23	103	68
Tape recorder	-	-	34	22	29	19	89	59
Projector	76	50	44	29	32	21	-	-
Laptop	152	100	-	-	-	-	-	-
Fax machine	152	100	-	-	-	-	-	-
Videoconferencing	13	9	35	23	81	53	23	15
PC	152	100	-	-	-	-	-	-
Internet	152	100	-	-	-	-	-	-
Intranet	152	100	-	-	-	-	-	-
Mobile phone	152	100	-	-	-	-	-	-
Database	31	20	87	57	32	21	2	1
Telephone	152	100	-	-	-	-	-	-
Copy machine	103	68	49	32	-	-	-	-
Printer	152	100	-	-	-	-	-	-
Scanner	99	65	43	28	10	7	-	-
E-mail	152	100	-	-	-	-	-	-

Scrutiny of the data reveals that all the respondents (152 or 100%) considered e-mails, printers, telephones, mobile phones, intranets, the Internet, personal computers, fax machines and laptops to be very effective in improving work creativity and productivity. They did not however consider ICTs, such as televisions, video cameras and radios to be effective in improving work creativity and productivity in the public sector. This is evident from a total rating of 100% at the combined levels 3 and 4. Therefore, it would be reasonable to assert that when it comes to work creativity and productivity, video cameras are not effective in government departments. A total rating of 78% at the combined levels 3 and 4 illustrates that tape recorders are less effective in promoting work creativity and productivity in government ministries. When combining levels 1 and 2, which translates to 79% of the ratings, it is clear that the civil servants consider projectors to be very effective. Videoconferencing is less effective in government ministries, as is evident from the above table, which indicates a rating of 68% at the combined levels 3 and 4.

5.6 Recommendations

The respondents were required to discuss and indicate contextual conditions that needed to be adapted in order to enhance the positive consequences of ICTs in government departments. The respondents generally recommended the following:

- All necessary resources should be provided to ensure that all equipment, including Internet access, functions properly and that administrative functions are performed effectively.
- All equipment and electronic resources should at all times be available and in working order.
- Money should be set aside for the purpose of increasing bandwidth to provide a speedy, reliable and consistent Internet connection.
- Network facilities and computers should be upgraded regularly.
- There must be sufficient and coherent government policies to regulate the training of staff in the utilisation of ICTs in the sector.
- ICT access should be provided to all staff.
- The budget for ICTs should be increased.
- More infrastructure should be provided for the effective use of ICTs.
- ICT professional competence within the departments should be increased.
- There must be both a clear focus and objectives regarding the use of ICTs.
- Adequate and well-structured planning should be done.
- ICT awareness should be created in the sector.

The above results reveal that the most frequently stated recommendations include the need for sufficient and coherent government policies regulating the training of staff in the utilisation of ICTs in the sector. Also, resources need to be provided to ensure that all equipment, including Internet access, functions properly and that administrative functions are performed effectively. The issue of planning is very important, since implementing innovations requires adequate planning.

6. DISCUSSION

It should be pointed out that for civil servants to be able to deliver services quickly and efficiently, they need to have access to ICTs. The study established that a variety of ICT tools and services are available and have been adopted in government departments with the intention of improving work productivity and creativity in the sector. These include computers, telephones, copy machines, printers, intranet utilities and the Internet. The ICT tools most frequently available in government departments include telephones, computers, e-mails, fax machines, mobile phones, the Internet, intranets, copy machines and printers – in that order. A large number of the respondents (95%) indicated a high reliance on mobile phones. This did not come as a surprise, as it is a well-known fact that South Africa is the fourth-fastest growing mobile communications market in the world (Popescu-Zeletin, Jonas, Rai, Glitho & Villafiorita, 2012:120). It is evident from the literature that South Africa's telecommunications and information technology sectors operate at an advanced level. For example, a study by DeRouen and Bellamy (2008:710) – supported by a recent study by Popescu-Zeletin et al. (2012:120) – established that two of the five main telephone lines in Africa,

comprising about 4.8 million units are situated in South Africa. Here, mobile phones outnumber fixed lines by eight to one (Popescu-Zeletin et al., 2012:120).

These results concur with similar studies conducted by Mutula and Mostert (2008) and Mbatha (2012), who indicate that in the last decade, the South African government has invested heavily in the provision of ICT tools to its ministries in order to elevate and improve the standard of service delivery to society. This can be seen in the number and variety of ICT tools made available to the respective departments. The availability of ICT tools in government departments suggests that improved service delivery can be expected. However, it should be noted that this availability does not necessarily mean that they (ICTs) are actually being used in that their use may be hampered by a lack of computer skills, low levels of confidence and negative perceptions in respect of ICTs – a fact indicated in the recommendations.

Everett Rogers (1995), in his now famous diffusion of innovations theory, argued that one of the greatest pains accorded to human nature is the pain of a new idea (see the theoretical framework). Some inventions, such as the cellphone, ‘take the world by storm’, while others (e.g. videoconferencing) seem to fail. Still others (e.g. the fax machine) may lie dormant for decades, but when their ‘time comes’, their use spreads rapidly, even explosively. Conversely, most new innovations (depending on their purpose, need and acceptance) often achieve slow penetration at first, but then grow quickly as their adoption and rate of use increases. Others may initially grow fast but slow down as their use is exceeded by newer, simpler and cheaper technology. A good example here is the use of broadband Internet access: its adoption and utilisation are directly related to its availability, speed and affordability, both to government departments and to the general public. Rogers’ diffusion of innovations theory states that innovations are more readily adopted when, compared with older ideas, they provide a relative advantage, and even more so if they are compatible with the existing value system of the adopter. Rogers (1995) further postulates that there are certain characteristics that determine the rate at which an innovation is adopted by a social system, and that these characteristics include relative advantage, compatibility, complexity, trialability and the observability of the innovation.

Tables 1 and 3 respectively indicate that some ICTs have proved to have a relative advantage over others, such as the Internet, mobile phones, computers and e-mail services, to name but a few. Other ICTs have no relative advantage, such as videoconferencing, televisions, video recorders, data projectors and tape recorders. Although some of the latter ICT tools are available in the surveyed government departments, they are used infrequently. Tables 1 and 2 further reveal that ICT tools, such as radios and cameras, were used relatively less frequently or not at all in the government departments surveyed. This is not surprising since these tools are probably irrelevant to the execution of the job.

With regard to the reasons for using ICTs, civil servants mainly used ICTs for communication through e-mails and to disseminate departmental information. Other than for communication purposes, civil servants mostly used ICTs for spreadsheets, word processing, and for printing – common uses in an organisational context. These ICT tools have been adopted in the public

sector because they are relevant to job execution and are thus advantageous to the civil servants (see the diffusion of innovations theory). Kenny (2002), looking closely at an ICT tool such as the telephone, asserts that telephones have accrued a long history of evidence as to their utility in government departments. This therefore justifies why all the civil servants (152 or 100%) were using telephones in their respective departments. ICTs can serve as catalysts in the functioning of all economic and social sectors. More specifically, they can speed up – even be an alternative to – the extension of services in areas such as health care, education, agriculture, business and government. In 1995, former President Thabo Mbeki (1995:183) expressed the following sentiments, which were later endorsed by the late Dr Ivy Matsepe-Casaburri, a former minister in the Department of Communications (1999):

We believe that the modern communication technology we are all talking about must help us educate our children, particularly in the rural and other underdeveloped areas of our country, teach our medical workers and parents how to care for babies, train our youth, and eliminate distance and infrastructure imbalances which act as a barrier in providing these social services.

Table 3 shows that all the respondents (152 or 100 %) considered ICT tools – such as e-mails, printers, telephones, mobile phones, the intranet, the Internet, desktop computers, fax machines and laptops – to be among the most effective ICT tools and services they used to improve work productivity and creativity. Table 3 further indicates that the less effective ICT tools include televisions, video cameras and the radio. The results indicate that most of the respondents believed that the use of ICTs had increased their work productivity and creativity. An earlier study by Kling (2000) on the use of ICTs in organisational and societal contexts established a correlation to exist between the use of ICTs and an increase in work productivity and creativity. A similar, more recent study by Mbatha (2012) concurs with the results of the present study by noting that ICTs enable people and organisations to extend their abilities in accessing data and in communicating, and that ICTs also enable them to overcome some of the communicative restrictions imposed by space and time. It is also true that ICTs have brought about a dramatic reduction in both the cost and the time involved in storing, processing and transmitting information, which has resulted in a fundamental reshaping of the public sector and of society as a whole. As such, ICTs are generating changes in markets, private and public sectors and economies in both the developed and the less developed world (Kling, 2000; Mbatha et al., 2011).

When asked to comment on contextual conditions that need to be adopted in order to improve the use of ICT tools and services in government departments, Theme 6.6 indicates that the most frequently stated recommendations offered by the respondents included the need for adequate and well-structured planning; the introduction of a good ICT policy that would provide sufficient frameworks for ICT development and/or use in the public sector and in South Africa as a whole; provision of proper and sufficient ICT infrastructure; the need to make funds available for the purchase of all the necessary ICT facilities and resources; and, lastly, that staff needed to be taught how to use ICTs, particularly the new or less-used services and technologies. Government initiatives targeting popular participation in the information society will also need to consider

launching vigorous campaigns to illustrate the benefits of using ICTs to improve work productivity and creativity. The issue of policy is also a serious one: if government is serious about improving work productivity and creativity in the public sector, an ICT policy is essential. Several studies have underscored the importance of ICT policies as an empowering instrument at both the micro and the macro levels of investment (Mandela, 1995; Mbatha, 2012).

The supply of ICT skills represents an integral component of the overall national development trajectory of countries in a globalised world (World Bank, 2006). The above results are corroborated by Akoojee and Arends (2009:189) who similarly point out that rudimentary intermediate-level ICT skills required to be able to function optimally in basic computer-related environments are crucial to national competitiveness in a developing context. In their study, Paterson, McGrath and Badroodien (2005) note that, in South Africa, considerable attention has been paid to intermediate-level ICT skills in light of the advantage of ensuring that the country develops a competitive edge with a view to attracting investment in response to national transformational prerogatives, which include growth and employment creation.

6.1 The relevance of the diffusion theory to the present study

This section examines the various elements of diffusion theory in the context of this study. Organisations are increasingly relying on the use of ICTs to support collaboration and/or communication among team members in different locations. The South African government has also made ICTs available in the public sector in the hope of improving work productivity and creativity. However, ICTs are not universally adopted by potential users. For example, Ntetha (2010) observes that the use of ICTs by some civil servants was generally restricted to word processing and the use of specific educational software packages. Ntetha's study further established that other forms of ICT, such as the Internet, electronic mail, computerconferencing, videoconferencing, digital scanners and digital cameras were used relatively less frequently. Surry (1997) explains that diffusion research in its simplest form investigates how the major elements of diffusion and a multitude of other factors interact to facilitate or impede the adoption of a specific product or practice among members of a particular adopter group. According to Surry and Farquhar (1997), professionals in a number of disciplines have used the theory of diffusion to increase the adoption of innovative products and practices. For example, while a variety of ICT tools and services are available in government departments, some of them are not being used (Ntetha, 2010).

In government departments, ICT tools and services such as computers, the Internet, telephones, intranet and e-mail are used frequently (Ntetha, 2010). However, some innovations seem either to fail or lie dormant for decades. For example, ICT tools and services such as videoconferencing, video cameras, radios, TV and digital cameras are used relatively less frequently (Ntetha, 2010). However, when the time is ripe, some of these inventions are used more and more frequently, even explosively. The fact that they are not being used does thus not necessarily mean that they will never be used. While most innovations at first achieve slow penetration, their adoption subsequently grows more rapidly, but this may later slow down again. As already mentioned, an

innovation can be an item, thought or a process that is new. Ideal examples of a present-day innovation would be sending a letter via email services instead of in the post, or using the intranet to communicate with employees in an organisation. Civil servants have access to the Internet, the intranet and to e-mail services. Government has adopted the use of these ICTs in order to facilitate the sharing of information and communication in the sector. Undeniably, e-mail is one of the most frequently used ICTs in the public sector.

Previously, government used conventional communication channels to disseminate information to civil servants and other stakeholders, e.g. community members. Although these channels have been used widely, they have been monologues and/or one-sided communications and have not allowed much interaction. At present, new ways of communicating are being adopted that use ICTs, such as the Internet and e-mail mobile phones. ICTs are therefore 'new' innovations that have been adopted by government to help it achieve its goals. The rate of adoption of an innovation is influenced more by an individual's perception of the newness of an innovation than by the actual time it has been around. 'Newness' can also refer to new knowledge of the innovation or a new decision to adopt it. For example, quite a number of ICT tools and services, such as computers and telephones, have been available to civil servants for many years; however, they are not fully used. These ICTs may be considered to be innovations even though they have for many years been available to civil servants whenever, that is, civil servants made a new decision to use them. To reiterate, Rogers (1995) notes that innovations are more readily adopted when they provide a relative advantage to old ideas. For example, civil servants now use e-mails instead of telegrams to communicate because e-mails are quick and cheap, and they provide a convenient form of communication. As indicated earlier, innovation theorists postulate that there are certain characteristics that determine the rate at which an innovation is adopted by a social system, and these characteristics include relative advantage, compatibility, complexity, trialability and the observability of the innovation as discussed below.

Relative advantage is brought about in different ways. Some innovations are not adopted because of the high cost associated with them. A variety of innovations have been adopted in government departments. However, not all the required or most useful innovations have been adopted. Some innovations, such as videoconferencing, are very expensive. Interestingly, Rogers (1995) explains that an individual may perceive an innovation to have a relative advantage if the price of a new and higher-quality product drops. This means that should it happen that the price of videoconferencing drops, government may decide to adopt the technology. Once it is adopted, civil servants will consider it to be an innovation. This would then render videoconferencing desirable and increase its relative advantage. As a result of its adoption, government officials' travelling costs would decrease.

Compatibility defines how closely an innovation fits in with existing values, past experiences, and the needs of potential adopters. It also decreases the uncertainty of adoption by helping the individual feel that the innovation is meaningful and applicable in his/her life. For example, government adopted different types of ICTs in the public sector in order to improve work productivity and creativity. ICT tools and services, for example computers, e-mail, the Internet

and the telephone – to name a few – are the most popular in the case of civil servants (Ntetha, 2010). This is because these ICTs tools and services are compatible with work that civil servants have to perform. These innovations thus improve work productivity and creativity in the sector.

Complexity refers to how difficult an innovation is to understand and use. Complexity has a negative impact on the adoption of an innovation. Some innovations are not adopted because they are either not user-friendly or difficult to operate. For example, not all ICTs are being used or adopted in the public sector because they are difficult to use. In essence, this refers to the degree to which an innovation may be experimented with and tried out prior to full adoption. This is why professional researchers constantly maintain that in order for a project to be successful, it has first to be piloted. ICT enthusiasts like Clark (1999) and Rogers (1995) note that innovations that can be tried out are adopted at an increased rate. Therefore, it is important for government to start by piloting its ICTs prior to their adoption. In this way, ICTs would make sense to the civil servants and would help decrease uncertainty about their use.

Observability largely refers to the degree to which the innovation offers visible results. The observability factor has a positive impact on the adoption of an innovation. The results of the adoption of some ICTs are glaringly obvious. Such ICTs tend to be adopted very quickly. For example, the rate of adoption of ICT tools and services such as e-mail, the Internet, intranet, computers, mobile phones, telephones and fax machines, to name a few, is intense in government departments. This is mainly because these tools and services offer visible results.

Information regarding the innovation has to be disseminated so as to introduce the innovation, form or change attitudes; influence decisions in respect of the innovation and support evaluation of the innovation. This means that if government wants to introduce an ICT tool or service, the civil servants have to be informed about that particular ICT tool or service. This would prevent a situation in which new ICTs are introduced and it is later found that they are not adopted because the civil servants are unaware of them. Communication and awareness are thus fundamental preconditions.

Many factors contribute to a decision to adopt or not adopt an innovation. Evidently, in order for civil servants to adopt ICTs they have, as noted above, to be aware of them and their benefits. A social system may consist of individuals, households, informal groups or social organisations. Some social systems and/or individuals do not use technology because of their norms and beliefs. The government should be aware of such unfavourable perceptions in order to be able to overcome them.

7. CONCLUSION

The aim of this study on which this article is based was to shed some light on the use of ICTs in selected government departments in KZN in the context of work productivity and creativity. Analysis of the results leads to several conclusions, namely that the adoption of ICTs in government departments is widespread and that a variety of ICTs have been adopted in the sector

for purposes of interaction and communication. This study reaffirms that ICTs are indeed catalysts for improving work productivity and creativity. These tools have definitely proved to be the solution to handling information and facilitating different forms of communication among human actors, between human beings and electronic systems, and between various electronic systems.

The emergence of ICTs has not only revolutionised how business is conducted, but has also transformed the delivery mechanism of governmental services. Rapid developments in telecommunications infrastructure in South Africa have created many possible ways for government agencies to collect, store, access and process large quantities of personal information about their citizens. Based on the results of this study, it can be concluded that computers and the Internet are some of the technologies that are most frequently used to improve work productivity and creativity. This paper has demonstrated the importance of ICTs in government ministries and has also identified various interventions that are needed to encourage civil servants to participate effectively in the emerging information economy. For this to be brought about, a number of measures need to be put in place, for example the enactment of an enabling policy and legislative framework to cater for skills development and the improvement of infrastructure (that is, telecommunications). Needless to say, ICTs play a crucial role in speeding up the flow of information and knowledge in the public sector and also in transforming the way in which government and citizens interact directly. ICTs have proved to be key catalysts in increasing work productivity and creativity in the public sector. They have also brought about a dramatic reduction in the cost and time involved in storing, processing and transmitting information – thus in fundamentally reshaping government ministries and society as a whole.

Interpreted in the light of the diffusion of innovations theory (Rogers, 1995:5), the results suggest that ICTs that were perceived to have a relative advantage and were moreover more compatible with the respondents' existing values, past experiences and needs were adopted more quickly. For example, the Internet and computers had a faster rate of diffusion among the respondents, this in spite of the high tariffs. The vital role being played by ICTs is already being felt in government departments. Think here particularly of the dramatic reductions in the cost and time involved in storing, processing and transmitting information, which, in turn, are therefore fundamentally reshaping the labour market and society as a whole. ICTs can therefore be seen to be generating change and progress in every area of economic, social and political activity – in both the private and the public sectors and in the developed and the developing world.

8. RECOMMENDATIONS FOR FURTHER RESEARCH

This study targeted only managers in the selected government departments. Future studies should focus on the perceptions, experiences and views of ordinary civil servants to complete the picture of social informatics in government departments in South Africa. Because of the diversity of the public sector in South Africa, and owing to financial and time constraints, the scope of this study was limited to four government departments in KZN. Further research should focus on the areas that have been excluded from this study. A more comprehensive future study of the status of the implementation of ICT innovation in government departments should be conducted

in order to monitor the development of transaction, integration and political participation and implementation barriers, and also to investigate the need for web-based services to assess actual demand. Finally, further studies should assess the impact of technological innovations and the relationship between ICT adoption and government performance so as to supplement the existing literature on modernisation in the public sector.

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