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Cover Page Footnote

I thank Ms Florah Asah for her initial work in collecting part of data that formed the basis of this article



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Research Paper

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ABSTRACT

This paper presents the results of a study to determine factors influencing perceptions and attitudes of nurses towards the use of ICT in 16 hospitals in KwaZulu-Natal (KZN) province, South Africa. Data were collected through a survey questionnaire and factor analysis performed to extract relevant variables. Overall, results revealed positive dispositions of nurses towards the use of ICT. Results further revealed self-efficacy, adoption of computers to improve nursing care, confidence in using computers, usefulness, interactability and knowledgeability were major factors influencing perceptions and attitudes of nurses towards use of ICT at the work place. Findings may inform institutional and provincial ICT infrastructure development decisions to improve nursing services in hospitals. Theoretically, the study provides an understanding of factors influencing attitudes and perceptions of nurses in the use of ICT at the workplace in a developing country context such as South Africa, and also in vast rural province such as KZN.

KEYWORDS: Nursing services, patient care, ICT, South Africa, eHealth

INTRODUCTION

The world of ICT is changing significantly the manner health professionals including nurses deliver patient care (Smedley, 2005). Governments are leveraging information and communication technologies (ICTs) to improve healthcare in response to the World Health Organization (WHO) call for ministries of health to integrate information technologies in the delivery and management of healthcare services (Commonwealth of Australia, 2007). In 2005, the World Summit on the Information Society (WSIS) affirmed commitments of nations to improving access to the world's health knowledge and telemedicine services to help improve quality of life (WSIS, 2005). WSIS also envisaged spreading the

benefits of technology to all in society by connecting health centers and hospitals with ICTs (WSIS, 2003). The summit further noted that the digital revolution, fired by the engines of ICTs, had fundamentally brought new ways of providing speedy delivery of healthcare. In a similar tone, the World Information Technology Forum (WITFOR) held in Gaborone Botswana in 2005 recommended prioritizing ICT to improve the provision of health services in developing countries.

The United Nations Millennium Declaration at the turn of the 21st century contained a series of goals for the improvement of human society by the year 2015. These goals included among others reversing major diseases and improving the quality of healthcare. Consequently, the term e-Health has evolved to refer to the delivery of clinical information, care and services using ICTs. Several initiatives have since emerged in different countries to support increased adoption of ICT by nurses in healthcare (Commonwealth of Australia, 2007). For example, many western national healthcare services have put in place extensive e-Health infrastructures and systems for the provision of safe, efficient, high quality, citizen-centred healthcare (Commonwealth of Australia, 2007). In South Africa government, through the National Health Insurance (NHI), is committed to providing free universal quality services for all citizens at the point of care.

In the context of this paper Information and Communication Technologies (ICTs) is used to describe all forms of technology both hardware and software, used to create, store, exchange information in various forms including, but not limited to telephone (fixed and mobile), computers, internet, intranets/extranets, TV, radio, and services such as social media, instant messaging, voice over IP, video conferencing, e-learning and more (Easingwood, 2000) to improve the delivery of health services including patient care.

STATEMENT OF THE PROBLEM

South Africa has nine provinces of which KwaZulu Natal (KZN) is one. KZN province is nicknamed the “epicenter of all things negative (Health MEC 2011). As compared to the other provinces, KZN has continuously experienced a high prevalence of HIV/AIDS, STIs, tuberculosis and extreme tuberculosis (Padayachi et al., 2010).

The healthcare services and the nurses working in the KZN province are therefore constantly under-pressure compared to other provinces (Health MEC, 2011). In addition, the population of the province is severely compromised by the lack of infrastructure and access to healthcare facilities, and also due to the vast rural nature of the province. Very often, health professionals lack services such as libraries and access to up-to-date journals and other health information (Asah 2011). Internet and Intranet services are not available (Herselman, 2003; Matodze et al 2007). Furthermore, it is difficult to recruit, train and retain health professionals, thus the healthcare facilities are experiencing high staff turnover. ICTs have the potential to substantially enhance the quality of services provided by nurses in the province since in KZN like in other provinces of South Africa, nurses represent a significant group of workforce. Consequently, their adoption of ICT is essential to the success of any healthcare service including patient care.

The implication of investing in ICTs in health especially patient care need not be over emphasized given the prevalence of HIV/AIDS in KZN province. Effective nursing support is important in various preventive and palliative interventions. While in developed countries such as UK, Australia and the United States of America, regular studies on ICTs integration in nursing at workplace are common (Commonwealth of Australia, 2007; Frantz, 2001; Timmons, 2003), this is not the case in South Africa.

Nurses' perceptions and attitudes towards the use of ICTs at the workplace play an important role in providing effective and efficient patient care. Perceived ease of use and usefulness of the ICT by nurses have been associated to attitude (Moody, Slocumb, Berg and Jackson, 2004). Moreover, nurses successfully adopting ICTs is generally affected by their attitudes and willingness to comply with use (Timmons, 2003; Kivuti-Bitok, 2009). The purpose of this study is to determine the perceptions and attitudes of nurses in KZN hospitals towards use of ICTs in the workplace. The two following objectives are addressed:

- to investigate the factors influencing attitude and perceptions of nurses towards use of ICTs at the workplace.
- to find out the challenges facing nurses in the use of ICTs at the work place.

METHODOLOGY

The study was underpinned by the technology acceptance model (TAM) (Chen, Yang, Tang, Huang and Yu, 2008). TAM is designed to explain ICTs usage behavioral intention (BI) and actual behavior. According to the TAM, ICTs usage is determined by the BI, a person's acceptance, which is determined by his or her intention to accept the technology (Chen et al 2008). A cross-sectional descriptive survey was used to explore the factors influencing the perceptions and attitudes of nurses towards the use of ICTs at the workplace. The sample population consisted of nurses working in healthcare facilities in the KZN province drawn from sixteen hospitals. All categories of nurses (n =226) including professional nurses, staff nurses, enrolled nurses and enrolled nurse assistants participated in the study. The official list of nursing hospitals provided at the KZN Department of Health website was used as the sampling frame. A self-administered questionnaire was used to collect data pertaining to the objectives identified above.

The data collected were subjected to factor analysis to extract variables or attributes influencing perceptions and attitudes of nurses towards the use of ICT. Factor analysis is a set of techniques for determining the extent to which variables that are related can be grouped together, so that they can be treated as one combined variable or factor rather than as a series of separate variables. Factor analysis is often used in empirical research in social sciences (Harman 1976; Kim and Mueller 1990; Hatcher 1994) to determine whether the responses to a set of items used to measure a particular concept can be grouped together to form an overall index of the concept (Duncan 2003). Political scientists, when comparing the attributes of nations in terms of a variety of political and socio-economic variables, have applied factor analysis in an attempt to determine the characteristics that are the most important in classifying nations (Rummel 1979). Alternatively, sociologists have determined friendship groups by examining which people associate most frequently with (Asher 1976). Psychologists, on their part, have used this statistical technique to study a given individual's intelligence dimensions (Thomson 1951), and to assess how people perceive different stimuli and categorize them into different response sets (Stukat 1958). Finally, economists have used factor analysis in the study of consumer behavior, namely in assessing the individual consumer living standards and individual consumer charity behavior (Schokkaert and Van Ootegem 1990). A brief theoretical review of factor analysis model is presented below to explain how factors can be extracted from a considerable number of latent variables.

FACTOR ANALYSIS MODEL

Factor analysis begins with a number of variables $X_1, X_2... X_p$

$$\begin{aligned}
 X_1 &= I_{11}\lambda_1 + I_{12}\lambda_2 + I_{1m}\lambda_m + t_1 \\
 X_2 &= I_{21}\lambda_1 + I_{22}\lambda_2 + I_{2m}\lambda_m + t_2 \\
 &\dots \\
 &\dots \\
 X_p &= I_{p1}\lambda_1 + I_{p2}\lambda_2 + I_{pm}\lambda_m + t_p
 \end{aligned}
 \tag{1}$$

Equation [1] can be defined in matrix form:

$$\begin{pmatrix} X_1 \\ X_2 \\ X_p \end{pmatrix} = \begin{pmatrix} I_{11} & I_{21} & I_{p1} \\ I_{21} & I_{22} & I_{2m} \\ I_{p1} & I_{p1} & I_{p1} \end{pmatrix} \begin{pmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_p \end{pmatrix} + \begin{pmatrix} t_1 \\ t_2 \\ t_p \end{pmatrix}
 \tag{2}$$

Where $X_1, X_2... X_p$ are known variables, t_{ij} is a constant represents loading for the i^{th} and j^{th} factor, λ_j is the j^{th} factor.

Similarly, the equation (2) can be expressed in the matrix notation:

$$X = \Lambda f + e
 \tag{3}$$

Where:

The common factors $f_1, f_2... f_k$ are common to all X variables and assumed to have mean=0 and variance=1. The unique factors are unique to X_i . The unique factors are also assumed to have mean=0 and uncorrelated to the common factors.

Equivalently, the covariance matrix Σ can be decomposed into a factor covariance matrix and an error covariance matrix:

$$\Sigma = \pi\pi' + \psi
 \tag{4}$$

Where:

$$\psi = \text{var}(u)$$

π' is the transpose of π

The diagonal of the factor covariance matrix is called vector of communalities h_i^2 where:

$$h_i^2 = \sum_{j=1}^n \lambda_{ij}^2$$

The factor loadings are the correlation coefficients between the variables and factors. Factor loadings are the basis for attributing a label to different factors. Analogous to Pearson's r , the squared factor loading is the percentage of variance in the variable, explained by a factor.

The sum of the squared factor loadings for all factors for a given variable is the variance in that variable accounted for by all the factors: this is called the communality. The factor analysis model does not extract all the variance, but instead it extracts only that proportion of variance of a particular item that is due to common factors (shared with other items) called communality. The proportion of variance that is unique to each item is then the respective item's total variance minus the communality.

The solution of Equation [4] is not unique (unless the number of factors=1), which means that the factor's loadings are inherently indeterminate. Any solution can be rotated arbitrary to obtain a new factor structure. The goal of these rotation strategies is to obtain a clear pattern of loadings, i.e., the factors are somehow clearly marked by high loadings for some variables and low loadings for other variables.

Rotation factors can be established as follows:

$$\begin{aligned} z_1 &= b_{11}x_1 + b_{12}x_2 + \dots + b_{1p}x_p \\ &\dots \\ &\dots \\ z_p &= b_{p1}x_1 + b_{p2}x_2 + \dots + b_{pp}x_p \end{aligned} \tag{5}$$

$\therefore b_{ij}$ is an element of eigen vector in correlation matrix.

Due to orthogonal transformation from X-score to Z-score, the Equation [5] becomes

$$\begin{aligned} X_1 &= b_{11}x_1 + b_{12}x_2 + \dots + b_{1p}x_p \\ &\dots \\ &\dots \\ X_p &= b_{p1}x_1 + b_{p2}x_2 + \dots + b_{pm}x_p \end{aligned} \tag{6}$$

With only extracting m principle components, Equation [6] yields:

$$\begin{aligned} X_1 &= b_{11}z_1 + b_{12}z_2 + \dots + b_{1p}z_p - e_1 \\ &\dots \\ &\dots \\ X_p &= b_{p1}z_1 + b_{p2}z_2 + \dots + b_{pm}z_p - e_p \end{aligned} \tag{7}$$

$\therefore e_i$ is a linear combination of principle components Z_{m+1} to Z_p .

$\therefore Z_i$ is new factor and b_{ij} is a new loading factor.

The eigenvalue for a given factor reflects the variance in all the variables, which is accounted for by that factor. A factor's eigenvalue may be computed as the sum of its squared factor loadings for all the

variables. The ratio of eigenvalues is the ratio of explanatory importance of the factors with respect to the variances in the variables and may be ignored.

In finding eigenvalue, consider Equation [8]:

$$\begin{aligned}
 A_1 &= b_{11}x_1 + b_{12}x_2 + \dots + b_{1p}x_n \\
 A_2 &= b_{21}x_1 + b_{22}x_2 + \dots + b_{2p}x_n \\
 &\dots \\
 &\dots \\
 A_p &= b_{p1}x_1 + b_{p2}x_2 + \dots + b_{pm}x_n = \lambda x_n
 \end{aligned} \tag{8}$$

Where,

$$(A - \lambda I)x = 0 \text{ or } A_p = \lambda x_n$$

$\therefore I$ is an identity matrix with $n \times n$ dimensions

$\therefore 0$ is a zero vector with $n \times 1$ dimension

By finding the determinant of matrix $(A - \lambda x_n) = 0$, then λ can be determined and it is an eigenvalue of A . An empirical example is presented to find an eigenvalue, loading factors and new factors.

EMPIRICAL STUDY

In this study, an application of factor analysis to nurse's perception with reference to utilization of ICT in the healthcare facilities is explored. In other words, understanding and listing of nurses' valuation for the utilization of ICT in healthcare is proposed. The survey instrument contained a list of twenty-two perception and attitude items given out to 226 nurses in sixteen healthcare facilities in KwaZulu Natal province in South Africa. Each item was represented by a sentence presented in the instrument survey. The respondents were expected to express their perception towards the use of an ICT product in healthcare by classifying each sentence using a three point Likert scale: disagree, neutral, agree. Formally, the factor analysis model that confined to the following steps that follow was used. In the second analysis, a loading factor for each common perception was provided. The Equation above 1-8 was used in the two analyses. Calculations were made using IBM SPSS version 20.0.

Extraction of the initial common perception and attitudinal factors

The first step in the empirical analysis involved the extraction of a latent perceptual construct with factors. Since the objective of the factor analysis is to reduce the number of variables that can be handled, this would not be achieved if all of them were used. Consequently, the next step was to decide how many factors should be kept. This really was a question of how many of the smaller factors should be retained, since the first few which explained most of the variance would be kept. The first factor will always explain the largest proportion of the overall variance, the second factor will explain the next largest proportion of variance that is not explained by the first factor and so on, with the last factor explaining the smallest proportion of the overall variance. Each variable is correlated with or loads on each factor. Because the first factor explains the largest proportion of the overall variance, the correlations or loadings of the variables will, on average, be highest for the first factor, next highest for

the second factor and so on. To calculate the proportion of the total variance explained by each factor, the loadings of the variables on that factor is squared, add the squared loadings to give the eigenvalue or latent root of that factor and divide the eigenvalue by the number of variables.

As there are as many components as variables, some criteria need to be applied to decide how many of the smaller factors should be ignored as these explain the least amount of the total variance. Before performing the factor analysis, the Kaiser-Meyer-Olkin Measure of sampling adequacy (KMO) test was used to check whether the 22 items were suitable for a factor analysis. The KMO test results for nurses' attitude to computer use (value=0.819, $\chi^2 = 1717.935$, $df=231$, $p<0.001$); and the nurses perception of computer use (value=0.917, $\chi^2 = 4567.947$, $df=325$, $p<0.001$) were significantly higher than the acceptable exploratory research norm of 0.5 established by Nunnally (Nunnally 1978).

Six factors were extracted from nurses' attitudes and three factors were extracted from perception of computer use in healthcare facilities using screen test. These factors accounted for 62.451% and 67.645% respectively of the total variance in the intention to adopt ICT as shown in the Table 1 .

Factors	Initial Eigenvalues of Attitude			Initial Eigenvalues of Perception		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.952	27.056	27.056	9.562	36.775	36.775
2	3.203	14.561	41.618	6.859	26.380	63.155
3	1.362	6.189	47.807	1.167	4.490	67.645
4	1.121	5.097	52.903	.992	3.814	71.459
5	1.088	4.947	57.850	.831	3.197	74.656
6	1.012	4.601	62.451	.683	2.629	77.285
7	.985	4.478	66.929	.627	2.413	79.698
8	.850	3.863	70.791	.524	2.015	81.713
9	.759	3.451	74.242	.474	1.822	83.535
10	.739	3.360	77.602	.427	1.642	85.178
11	.671	3.051	80.653	.423	1.627	86.804
12	.594	2.700	83.354	.375	1.442	88.246
13	.556	2.527	85.880	.371	1.427	89.673
14	.509	2.313	88.193	.339	1.305	90.978
15	.483	2.195	90.388	.332	1.276	92.254
16	.428	1.946	92.334	.304	1.169	93.423
17	.382	1.737	94.071	.281	1.082	94.505
18	.345	1.567	95.639	.252	.970	95.475
19	.290	1.317	96.956	.224	.861	96.335
20	.246	1.117	98.073	.194	.747	97.082
21	.215	.976	99.049	.173	.665	97.747
22	.209	.951	100.000	.152	.584	98.332
23				.133	.513	98.845
24				.131	.504	99.349
25				.102	.394	99.743
26				.067	.257	100.000

Table 1: Factor extraction for attitude and perception

Since the purpose of the factor analysis is to assess a number of reduced components (or factors), this cannot be effectively achieved if one retains factors that account for less variance than had been

contributed by individual variables. According to the estimation results, it is sufficient to retain six factors since factor 7 ($.985 < 1$) and factor 3 ($0.992 < 1$) for attitude and perception factors respectively as shown in Table 1.

The results of the factor analysis indicate that the first principal component explains 27.056% and 36.775% of the variation in the original variables and each subsequent component explains a decreasing proportion of variance.

Rotational of the attitude and perception factors

In the first step of factor analysis, the extraction (or identification) of the perceptual factors is presented. At this stage the number of factors to be rotated is not specified. Since the final objective is reproduction of the covariance's and correlations, the sample correlation matrix of rotated factor loadings as the primary data to be used in the analysis is accounted. Estimation results are presented in Table 2.

Printed results are multiplied by 100 and rounded to the nearest integer. The values of below 0.4 are omitted. This matrix represents the product moment correlation between the observable variable and the underlying factor. The factor loadings are analogous to the standardized regression coefficients as obtained in regression analysis. In other words, dropping an attitudinal item that does not score above 0.50 means that an exploratory rule based on the magnitude of the estimated regression coefficients, which is characterized by rejecting all the items indicating low correlations with the common factors are followed. The results were rotated by the EQUAMAX method.

, the results of the factor analysis clearly clustered the related items together. Factor 1 contains seven items: dehumanizing nursing care, creates more problems for the nurses, increasing cost of nursing/nurses workload, and causes nurses to pay less attention to patient care. These items are related to the implications of computers in healthcare. Therefore this factor was referred to as "implications factor".

Factor 2 includes violation of patients privacy, computers do not scare, aggressiveness and hostility towards computers, and a feeling of uneasiness and confusion with computers. These items are related to the self-efficacy in computers. Nurses are concerned with their patients' privacy, how scary computers are to them, a feeling of aggressiveness and hostility, and feeling of uneasiness and confusion caused by computers at the workplace. Thus this factor was designated as "Self-efficacy".

Factor 3 contains adoption of computers to nursing care, confidentiality of patient records, improvement of patients care, and making the nursing job easier. This factor reflects nurses' confidence in the use of computers in healthcare facilities. High scores in this factor were associated with comfort of use of computers in healthcare facilities, confidence in use of computers, storage of nursing data, fear and adaptability to nursing care. It seems appropriate to label this factor "adoption of computers to improve nursing care".

Factor 4 includes three items: comfortability with computer use, self-confidence, a feeling of being threatened, and the use of computers to keep patients data. This factor indicates the level of nurses'

confidence in using computers in healthcare. Thus factor 4 was labelled as “confidence in using computers”.

Factor 5 contains the items of implications of computer use to patients care, confidentiality of patients' records, and time and efforts of record keeping. Nurses may perceive that patients care can be improved by computerizing recording keeping. So this factor was named “Impact of computerization”.

Factor 6 contained only one item: effort needed to maintain patients' records. This item compares the effort it takes to maintain a patient record in the computer with manual record keeping. Therefore this factor was labelled as “computer self-efficacy”.

The reliabilities of these factors were assessed by Cronbach's alpha and the results showed that they were all above 0.5 and satisfied the exploratory research norm set by Nunnally (Nunnally 1978) except for factor 6: the Cronbach alpha could not be computed because it had only one question as shown in the Table 12.

Items	Factors						Communality estimates
	1	2	3	4	5	6	
QD7.	.778						0.73
QD9.	.761						0.667
QD6.	.749						0.646
QD8.	.728						0.740
QD20.	.438						0.529
QD18.		-.692					0.550
QD21.		.649					0.604
QD13.		.627					0.712
QD19.		.506					0.652
QD1.			.723				0.726
QD2.			.656				0.651
QD3.			.594				0.595
QD15.			.560				0.692
QD14			.550				0.460
QD5.				.723			0.374
QD22				.595			0.599
QD17.				.556			0.704
QD16.				.542			0.555
QD10.					.735		0.681
QD12					.466		0.583
QD11					.422		0.694
QD4						.801	0.596
Cronbach alpha	0.851	0.655	0.727	0.564	0.573	N/A	0.76

Extraction Method: Principal Component Analysis.

Rotation Method: Equamax with Kaiser Normalization.

a. Rotation converged in 9 iterations.

Table 2: Factor analysis of items influencing attitudes of Nurses use of ICT

Rotated perception factors

Factor 1 contained twelve items which measured how useful computers were in healthcare facilities – making the job easier, having control over the work, time saving, faster completion of the job, reducing time spent on an activity, increasing productivity, effectiveness and quality of work. Thus this factor was labelled “*usefulness*”

Factor 2 consisted of eight items: recovery, flexibility, workability, cumbersomeness, interaction, knowledge, and complexity of use. Nurses were concerned about how easy it was to use computers in healthcare, the difficulty of recovery from errors, and the complexity of using computers. So this factor was labelled as “*interactability*”. Factor 3 involved the frequency of being confused, frustrations in interacting with computers, the frequency of referring to the manual and involves a lot of mental work. This factor was labelled “*knowledgeability*”.

Item	Factor			Communalities estimates
	Factor 1	Factor 2	Factor 3	
QB10.	.898			0.809
QB3.	.879			0.780
QB9.	.878			0.773
QB11.	.871			0.769
QB4.	.856			0.734
QB5.	.844			0.742
QB8.	.843			0.713
QB7.	.828			0.691
QB2.	.822			0.708
QB1.	.802			0.669
QB12.	.789			0.659
QB6.	.746			0.600
QC8.		.842		0.776
QC9.		.801		0.685
QC12.		.763		0.710
QC10.		.754		0.652
QC11.		.683		0.637
QC7.		.675		0.599
QC14.		.654		0.573
QC6.		.603		0.662
QC13.		.474		0.259
QC1.			.786	0.695
QC2.			.785	0.744
QC3.			.758	0.695
QC5.			.686	0.594
QC4.			.654	0.660
Cronbach alpha	0.961	0.913	0.751	0.887
Extraction Method: Principal Component Analysis.				
Rotation Method: Equamax with Kaiser Normalization.				
a. Rotation converged in 5 iterations.				

Table 3: Factor analysis of items influencing perception of Nurses use of ICT

The reliabilities of these factors were assessed by Cronbach's alpha and the results showed that they were all above 0.5 and satisfied the exploratory research norm set by Nunnally (Nunnally 1978) as shown in the Table 1.

Overall, the factors which influenced attitudes and perceptions of nurses towards the use of computers at the workplace revealed positive dispositions. For example, the nurses agreed that information technology was very beneficial in the delivery of healthcare. They also agreed that computers were useful in healthcare facilities and contributed to effective service delivery. The positive perceptions and attitudes were also noted in such statements as,

- using computers makes my job easy to perform,
- using computers gives me more control over my work,
- using computers improves my job performance,
- using computers to do my work saves me time,
- computers enable me to accomplish tasks quickly,
- using computers reduces the time I spend on unproductive activities,
- using computer increases my productivity,
- using ICT allows me to accomplish more work than; would otherwise be possible,
- using ICT enhances the effectiveness of my job,
- using ICT improves the quality of the work I do,
- using ICT makes it easier to do my job, and overall, I find the use of ICT useful in my job.

The nurses disagreed with statements that using ICT created more problems than nurses could solve in practice, dehumanized nursing care, increased costs by increasing the nurses workload, increased healthcare cost, was time consuming, violated patients privacy, made nurses feel aggressive and hostile towards computers, caused nurses to give less time to quality patient care, and finally computers made nurses feel uneasy and confused.

The nurses also outlined some challenges in using ICT in the workplace that needed addressing such as:

- not enough time – because I have too many other work demands;
- ICT does not fit with other demands;
- not enough computers,
- lack of technical support,
- lack of ICT knowledge,
- lack of encouragement,
- location of computers,
- lack confidence in using computers,
- computer too slow,
- unreliable network,
- negative attitude of super users,
- discouraged by others,
- advanced age of nurse,
- lack of interest in computers and health and safety concerns about using computers.

CONCLUSION

This paper presented the results of a study that was carried out in 2012 to determine factors that influenced perceptions and attitudes of nurses towards the use of ICT in healthcare at the workplace. The study was motivated by the fact that in South Africa, KZN province has been hit by diseases such as HIV/AIDS, tuberculosis and extreme tuberculosis. Consequently, the nurses in the province were constantly under-pressure to deliver quality patient care services. It was assumed that ICTs if well integrated into healthcare services would substantially enhance the services provided by nurses. Besides, nurses in the South African health sector represented a significant group of the workforce; consequently, their adoption of ICT was essential to the success of any healthcare initiatives related to patient care and health service delivery.

The results revealed that there were several factors that influenced the attitudes of nurses towards the use of ICT at the workplace. These were aggregated as impact/implications of ICT for their work, self-efficacy, adaptability to computers to improve nursing care, confidence in using computers; usefulness; interactability and knowledgeability.

Overall, the factors which influenced attitudes and perceptions of nurses towards the use of computers at the workplace revealed positive dispositions. They disagreed with statements that using ICT created more problems than nurses could solve in practice, dehumanized nursing care, increased costs by increasing the nurses workload, increased healthcare cost, was time consuming, violated patients privacy, made nurses feel aggressive and hostile towards computers, caused nurses to give less time to quality patient care, and computers made nurses feel uneasy and confused.

The subject matter of this paper has policy, theoretical and practical implications for the nurses as well the institutions for which they work. The findings from this study provide an insight into the implementation of NHI in healthcare institutions in the KZN province. The findings may inform institutional and provincial ICT infrastructure developments to improve nursing services in hospitals. Theoretically, the study provides an understanding of the factors that influence attitudes and perceptions of nurses' use of ICT at work in a developing context such as South Africa on one hand, and a vast rural province such as KZN on the other.

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