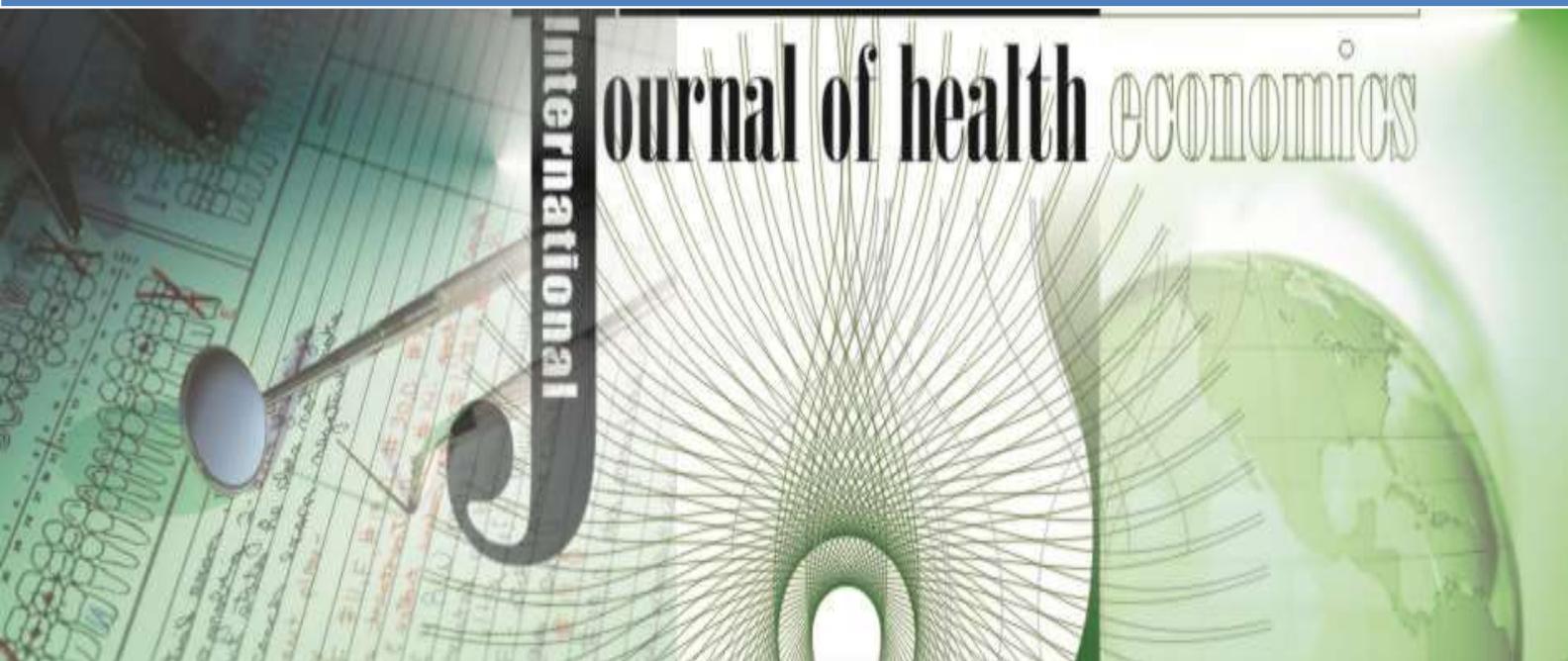


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**DEMOGRAPHIC DETERMINANTS OF COMMUNICATION AND INFORMATION
TECHNOLOGY APPRECIATION AND USAGE AMONG HEALTH CARE
PROFESSIONALS**

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Abstract

This study examines the link between demographic variables and communication and information technology appreciations and use among health care professionals. The research instrument utilized for the study was completed by 187 respondents who are currently engaged in either clinical or diagnostic health care services in government-owned hospitals. Results of data analysis indicate that e-mails remain most used internet facilities and a reasonable proportion of the respondents hardly use or never use information technology tools for work related applications. In addition, while age was found to be positive, prior computer experience and professional status were found to negatively affect on computer use. Similarly, professional status was also found to negatively impact on internet use among health professionals. It is suggested that an attitudinal change and policy framework that enhance the use of communication and information technology in the health system may be required to realize the potential benefits of the computerization of the health system

Key words: *Information Technology, Healthcare, Healthcare professionals, Computer, Internet*

Introduction

Communication and information technology has altered world economic landscape and created a new economic structure in form of knowledge based economy. Indeed, it has also significantly influenced the political, social, and cultural lives of nations. The use of information technology and the internet has revolutionized access to information by providing shared global resources of knowledge and made cooperation and collaborations among geographically dispersed persons possible. Advances in communication and information technology has been of immense benefit to the medical domain both in terms of delivery of educational materials, collaborations and cooperation among medical personnel, improved ability to diagnose diseases and conduct of medical examinations (Ajuwon, 2003). Besides, information technologies have potentials to provide both health care providers and patients' ready access to health information.

Notwithstanding the benefits derivable from communication and information technology (CIT) its appreciation and use among health professionals in most transition economy has been less than impressive. In most African countries, supporting infrastructures are lacking with the economy hardly in a state of providing these infrastructures. Consequently, information resource sharing is hindered and health professionals are more reliant on the traditional approach to care delivery. This constitutes damage to national health and a drain on critical resource that are required for economic development. It is evident that health is an important resource in the process of national economic development because a healthy population is, all things being equal, a more productive population. Investments in health are considered as productive investment and of central concern to governments, health professionals and those who shape and manage health care institutions through strategic and operations management. It is evident the performance of health institutions and facilities have implication for economic development.

However, health care professionals are one critical determinant of the performance of institutions that supports or enhance good health. According to Kabene et al (2006) the benefits and outputs the populace derive from healthcare institution is related to the knowledge, skills and motivations of health professionals and workers. The crux is that what enhances the knowledge and skills of health professionals directly improve their ability to practice effectively and efficiently; and enhances the benefits derivable from the health system. In examining the performance, skills and knowledge enhancing tools of health professional it is important to

explore the role of performance enhancing tools like communication and information technology.

The revolutionary impact of communication and information technology on the corporate sector conveys a motivation for its applications in the health sector in most transition economy. However, given the seeming difficult economic conditions prevalent in most transition economies of Africa and the infrastructural inadequacies it seem intuitively attractive to seek to understand the consciousness, degree of use, willingness and performance impact of computers and information technology tools among health professionals.

Admittedly, computers and information technology have potentials of enhancing better coordination and ability to enhance multi-disciplinary response to health situations, however, these advantages may be lost if health professionals have no motivations to use, resist or restrict the adoption. Barriers to communication and information technology diffusion and implementation are somewhat substantial in terms of cost, complexity and the work process and cultural changes required. Besides, there is evident problem of dearth of communication and information technology tools, mass internet connectivity and information technology skills competency in productive or health related use of communication and information technology. Therefore, there is the need to explore the demographic variables that affect the appreciation of communication and information technology among health professionals. The outcome of this effort is expected to have both practical and theoretical benefit for academic, government and health policy makers who are concerned with improving the performance of health professionals in transition economy. An insight to the demographic determinants of communication and information technology appreciation seem promising as tools for maximizing the existing resources and assuring future increased use. Beside, such effort hold promise of unveiling the drivers of computers and information technology diffusion in health care and provide guide to policy makers on what actions might be taken to spur physicians, nurses, clinical technicians, and others to readily adopt communication and information technology. The cost and complexity of investments in information technology in resource poor economy could weigh on the available resources and capacity to meet other social needs. Thus a focus on the determinants of use of existing communication and information technology resource by health professionals could serve as basis for justification of demand for increased investments giving prevalent resources constraints and the growing burden of disease.

Literature Review

Communication and information technology (CIT) facilitate communication, transmission, processing of information and knowledge. Consequently, the advent and increasing innovations and development in information and communication technology has significantly revolutionized economic relationship across the globe. Its impact has been globally pervasive in virtually all spheres of human endeavours: education, health, communication, access to information and knowledge, handling of social problems, governance, among others. The applications of Communication and information technology to business and studies focused on examining the outcome of such application have been impressive (For example Stone, Good and Baker-eleleth, 2007; Osuagwu, 2003; Anandarajan, Igbaria and Anakwe, 2000). Investments and empirical studies on the performance impact of information technology in the corporate sector are expected giving that it is seen as providing a key source of competitive advantages to users (Sriram and Krishnan, 2003). In addition, extant health care literatures indicate that physician had long recognized the potentials of computer to improve patients care (Anderson, Jay and Anderson, 1986). According to Burney, Mahmood and Abbas (2010) the definition of health care system has changed due to advances in ICT. The argument for information technology adoption in health care are hinged on such views as improved quality, cost reduction and enhanced productivity. Indeed, the United Nations Economic Commission for Africa (1999) observed that ICT have important role in the health sector through enhancing the use of scarce knowledge and health resources. Evidences indicate that information and communication technology have positive effect on access to health information, training, promotion of better health behavior, effectiveness of health institutions and research with beneficial effect on policy making (UNECA, 1999; Dzenowagis, 2009).

Scientific breakthroughs in communication and information technology make possible networking of computers with enhanced ability to communicate and share resource. Traditional barriers to communications and knowledge have been broken down, individuals, organizations and nations can leverage on the opportunity offered by advances in communication and information technology to overcome limitations imposed by geography and improves on growth and development. Internet, a main outcome of computer networking, due to its capabilities has had pervasive influence on most fields of human endeavours including the medical domain. Internet has potential applications in medical educations: teaching, medical examinations and conduct of diagnosis (Ajuwon, 2003, Nguyen, Zierler, Nguyen, 2011).

However, it must be observed that participation in communication and information technology adoption across nations, field of endeavor have not been even. For example, Mohammed, Andargie, Meseret & Girma (2013) found computer knowledge and utilization to be low among

health workers in Ethiopia. Similarly, Osuagwu (2003) noted the low level of internet awareness in developing economy like Nigeria; there is, therefore, the possibility of most developing economy not deriving the benefit accruable in both business and social issues.

However, Wong, et al, (2003) posit that information technology can ultimately produce better outcome by improving various aspects of care delivery such as decreased time spent on administrative duties. Although, adoption of communication and information technology in health have been slow due to uncertainty as to its effect on the traditional professional role of physician and organization of practice (Anderson, et al, 1986). However, there have been increased adoption and use of information technology in medical education as well as integration of computer technology into practice in most of the medical fields. Vernic (2012) argued for the inclusion of computer technology in clinical practice in future basic nurse training curricula. The argument rests on the submission that information technology has capacity to enhance faster production and dissemination of new knowledge in the nursing domain. The emergence of such areas as telemedicine, tele-nursing, nursing informatics, among others are products of advances and applications of information technology to health care. Studies have examined some dimensions of the impact of communication and information technology in health care. Ajuwon, 2003 study which assessed computer and internet use among fresher's clinical and nursing students found medical students to be more computer literate than the nursing students with e-mail being the most utilized internet resource. In addition, Menachem, et al, 2007 explored the interconnection of information technology adoption and patients' safety performance across hospitals in US. However, Deraraji and Kohli, (2003) study which examined technology usage and its impact on performance for eight hospitals found technology usage to be positively and significantly associated with measures of hospital revenue and quality. His basic submission was that "actual usage" of technology may be a key variable in explaining the impact of technology on performance. Other studies, however, have not completely supported the performance impact of technology.

Materials and Methods

The survey research design was utilized for this study. The preference for this approach was anchored on its feasibility in addressing the research problem and the need to collect samples in order to examine the description, occurrence and interactions of the variables focused in the study. The focus of this study is on communication and information technology appreciation among health professionals; therefore, the choice of study areas where these facilities are present

is quite pertinent. Most developing nations still grapple with epileptic power supply and inadequate basic modern health equipment in the health care system especially in the rural areas. These constitute impediment in use of CIT since these facilities are highly dependent on functional and stable power supply.

Indeed, the Nigerian government had recognized and pursued the option of incorporating traditional medicine into the national health programme, at least, to meet the primary health care need of those in the rural areas. Therefore, our choice of study area is limited to Lagos, the commercial hub of Nigeria; which seem to have been more favoured in terms of investments in facilities and existence of both private and public health care facilities to meet the health needs of the increasing population. However, the focus is on the existing general hospital in the metropolis which are owned and funded by the government. These health facilities have computers and information technology facilities, even if not in sophisticated form; besides, working in such environment often demands a reasonable knowledge of communication and information technology tools. Indeed, most of the respondents in this study have access to the use on computer and information systems, in addition, their education and professional qualifications placed them to understand and reasonably respond to the demand of the research instruments.

The design of the research instrument benefitted from earlier works. Specifically, it benefitted from the works of Osuagwu, 2003; Stone, Good and Baker-Eveleth, 2007 with items adapted and re-worked to fit in to the context of the present study. The research questionnaire is segmented into sections focused on key variables of interest in the study. Respondents are required to respond to items in each of the sections to reveal the extent of use or to which those items apply in their use and appreciations of aspects of communication and information technology. The design of the instrument was made quite simple and respondents' friendly to hedge against misinterpretations and the fact that respondents may be under the pressure of time, besides, health professionals are apt to consider most inquiry or probing questions as confidential.

The first section of the research instruments is focused on the demographic characteristics of the respondents including informations on such variables as age, gender, marital status. In addition work characteristics variables such as professions, experience in practice and professional status, were also included in the research instrument. Other aspects of the research instruments require respondents' evaluations of the degree of familiarity with and use of computer and internet facilities. Data on frequency of computer usage was collected using a three point evaluation of always (1), seldom or hardly use (2) and never use(3) while internet

service frequently utilized was measured from e-mails, using search engines to seek professional information, and news items. We did assume that existence of training on communication and information technology tools constitute an inducement to use ICT tools, besides training is required to prepare novice to adopt ICT tool. In addition, perceived relevance of communication and information technology tools as well as impact on job performance has higher tendencies to sustain continual usage. Therefore sections of the research instruments was focused on extent to which training facilities has been provided, perceived adequacy of information derived from computer, perceived impact on job performance and evaluation of availability and usefulness of various aspect of internet on job and professional development. The pieces of data required in most of the sections were collected using a five-point scale ranging from strong agreement (1) to strong disagreement (5).

Descriptive statistics of mean, standard deviation, skewness and kurtosis were computed for each questionnaire item. This was used to summarize the multi-items in each section to indicate the extent of utilization on each dimension of the key variables. In addition, a multivariate regression was used to examine the impact of demographic variables on computer and internet usage.

Results and Discussions

A total of 250 health workers were involved in the study, however, the effective sample for the study consisted of only 187 respondents who responded to the research instrument. The response rate of 74.8% is made up of 84 males (44.9%) and 103 females (55.1%) with 126 respondents (67.4%) being married and 32.2% (61) of the respondents in the unmarried or singles category. A significant number of the respondents are in the active working age group of less than 50 years: 89.8% of the respondents fall within 50 or less than age classifications while 19 (10.2%) lies in the 51 plus age groupings. With reference to professional groups 33.6% of the respondents are Doctors, 37.4% nurses: 14.4% of the nurses are Chief Nursing Officers; and 54 or 28.9% of the respondents are in diagnostic services and other health functions. Typically, chief nursing officers have, in addition to their technical health responsibilities, administrative oversight over their units. Consequently, they are more likely to appreciate the use of computers and information technology in their role performances; the pool of respondents involved in both clinical, diagnostic services as well other key hospital health functions provide the study a fairly rich data set for analysis

Table 1: Sample Characteristics

<i>Variable</i>	<i>Category</i>	<i>Frequency</i>	<i>Percentage%</i>
Gender	Males	84	44.9%
	Females	103	55.1%
Marital Status	Unmarried(singles)	61	32.6%
	Married	126	67.4%
Age	≤ 30years	95	50.8%
	31-50 years	73	39%
	51+	19	10.2%
Professions	Doctors	63	33.7%
	Nurses	70	37.4%
	Others	54	28.9%

The use of computers could be described as above average among these health professionals with 117 or 62.6% of the respondents indicating a frequent use of computers for task related to their assignments; however, 57 (30.5%) hardly use computer in work related assignments while 12 (6.4%) indicate they never use computer. These percentage within the hardly use and never use bracket appeared quite significant when compared to the sample size and the extensive use of computers in the education, corporate sector. Indeed, there is additional dimension of concern over these percentages giving the potential improvement that adoption and use communication and information technology could gender. Besides, with health manpower resource constraints and the migration of health professional to developed economies for greener pastures intensive use of computer should hold a promise of ensuring efficient use of available manpower, at least in critical health areas.

Table 2 shows the evaluations of different aspect of computer usage among the health workers. Generally, availability of computer training programme in the health system received a medium rating (C1, mean=2.70) with evaluations of the training programme being considered as below average (C2, mean=2.43). The seemingly low rating of the existing computer training programme for health professionals might be considered as the outcome of the wide applications of computers systems and technology in the training and educational programmes in health institutions in Nigeria. Possession of basic computer skills from these health training institutions may have predispose trainees to demand advanced or higher computer training beyond the basic being offered. Advanced trainings may require additional investment overlay such that health policy makers and those who manage available health facilities may quite reckon possession of

reasonable computer skills and knowledge as to hedge against additional investments in training programmes. However, the evaluations of training programmes seem to suggest that the existing programmes have not improved existing computer skills and proficiencies among trainees as indicated by the below average estimations of the training programmes (C2, mean 2.43)

Table 2: Descriptive Statistics of computer usefulness

<i>Variables</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>	<i>Skewness</i>
CI	2.7043	1.65503	2.739	.243
C2	2.4301	1.49881	2.246	.453
C3	2.6398	1.51544	2.297	.149
C4	2.4839	1.43027	2.046	.190
C5	2.7204	1.54126	2.375	.076
C6	3.1613	1.53370	2.352	-.402
C7	2.8333	1.62719	2.648	.029
C8	2.6183	1.53851	2.367	.247
C9	2.9194	1.58675	2.518	-.129
C10	2.5376	1.59770	2.553	.393
C11	2.4839	1.51827	2.305	.359

Table 2 also indicate that the evaluation of the information quality of computer was judged better than the existing computer training programme for health professionals (C3, mean = 2.64, variance =2.30). However, the perceived adequacy of the information obtained from computer for addressing health professional work related need was rated below average (C4 = 2.48) while for some other professional information need computer was considered as providing sufficient information (C5, mean =2.72). Perhaps, internet was viewed as an extension of computer given the wide availability of non-hospital internet facilities offered by telecommunications providers across the country. The findings on the perceived poor information quality of computer is worrisome as it seems to align with earlier opinion that the potentials of computerization of health system for improving data quality may not be realized giving the untimely, incomplete and inaccurate data that plagued the health system of most developing countries (Simba, 2004). Or, health care professionals' tendency of poor disposition to devices that infringe or threatened their professional roles as decision makers may have weigh significantly on their judgment on

the quality of information derived from computer. However, poor data base are common feature in the health system of most developing countries of Africa.

Expectedly, the descriptive statistics in table 2 show positive evaluation of the skills or proficiency of these health professionals in computer usage (C6, mean 3.16) with an indications of reasonable familiarity with computer use for both health and non-health related tasks for a reasonable span of time (C9 = 2.92). However, health related use is somewhat low (C8 =2.62) which suggests loss of benefit of computer skills and knowledge for improving the health system and a waste of resources utilized in acquisition of computers in health training school. This is because computer skills acquired are not effectively deployed to enhance medical practice and to free the scarce health professionals from tasks that computer can handle for societal benefits. this findings seem to agree with Mohammed et (2013). The policy implications are that health professionals possession of knowledge and skills in computer use seem not to be a guarantee for the use of that knowledge or that the health state of the society will be improve through use of such knowledge by those who deliver health care and those who shape them through operations management. Consequently, increased government and hospitals investments in computerization and policies designed to achieve these might be wasted if physicians, nurses and other health professionals limitedly apply these devices in patient management and care; and the hospital information management records are considered not responsive to health professionals needs.

Table 3 shows the descriptive statistics of perceived task performance benefits of computer. Computer was considered as having moderate impact in improving the health professionals quality of work (P1 mean 2.56) as well as good assistance for doing a better job than without it (P2 mean 2.82). In addition, also receive a more favourable overall evaluation in terms of effects on hospitals service performance both term of volume of services and speed (P3 mean 3.02). It can also be seen from the table 3 that computers are evaluated above average in the management of hospital-patients interaction (P4 mean 3.08). Traditionally, hospital-patients interactions are more administrative in nature in form of management of patients than infringing on the traditional professional roles (decision making, medical history-taking) of health professionals

Table 3 Evaluations of Work Performance Effect of Computers utilization

<i>Variables</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>	<i>Skewness</i>
P1	2.5591	1.53843	2.367	.257

P2	2.8226	1.56507	2.449	-.044
P3	3.0215	1.55253	2.410	-.246
P4	3.0753	1.42743	2.038	-.337
P5	3.0753	1.51915	2.308	-.269

Table 4 show that availability and broadband access to internet was considered above average (N1 mean 3.26). The advent of GSM telecommunications providers, lower access cost, government and organizational increased investments have ameliorated access to internet significantly, especially in the urban centres and commercial hubs in the Nigeria. Therefore, there was above average indication of increased utilizations of internet services among health professionals (N2 mean 3.44); and an improved communication within the hospital and colleagues (N3 mean 3.10). However, e-mail is the most frequently utilized of the internet resource with 70.65% of respondents indicating its use, 25.13% use the search engines to seek information related to their professions and 3.93% frequently use the internet for news. Internet has an above average usage for learning new medical techniques and methodologies (N4=3.31).

Table 4 Internet Utilization

<i>Variables</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>	<i>Skewness</i>
N1	3.2634	1.39902	1.957	-.540
N2	3.4409	1.42535	2.032	-.779
N3	3.1075	1.49928	2.248	-.351
N4	3.3118	1.47761	2.183	-.541
N5	3.1398	1.53582	2.359	-.328

Relationship between Demographic Variables, Computer and Internet Usage

The socio-demographic variables were regressed with the index of computer and internet use among health professionals. Generally, the variables used in the model accounted for 32% of variance in Computer use among health professionals while indicating lower explanatory power for variance in Internet usage (6%). Age, status, that is, respondent’s professional status, for example, resident doctor, nurses, chief nursing officer, among others; and prior computer experience reasonably covary with computer use. However, while age positively impact on computer usage ($\beta = .34, t = 4.24, p = 0.00$); prior computer use experience and professional status

negatively covary with computer use. This finding is worrisome and contrary with expectations given the acquisition, deployment and increased use of computer in the health training institutions in Nigeria

Table 5: Multivariate regression results of the demographic, computers and internet variables

<i>Variables</i>	<i>Std Coefficients(β)</i>	<i>Std Error</i>		<i>t</i>		<i>Sig</i>	
<i>Constant</i>	1.66 (<i>3.36</i>)	.29	.51	5.78	6.63	.00	(.00)
<i>Gender</i>	-.04 (<i>-.10</i>)	.08	.14	-.59	-1.40	.55	.16
<i>Age</i>	.34 (<i>.01</i>)	.06	.10	4.24	.10	.00	.92
<i>Status</i>	-.18 (<i>-.11</i>)	.10	.18	-2.38	-1.21	.02	.23
<i>Profession</i>	.07 (<i>-.28</i>)	.06	.11	.92	-3.14	.36	.00
<i>Position</i>	.02 (<i>.069</i>)	.04	.07	.31	.78	.76	.44
<i>Perc perf</i>	-.14 (<i>-.05</i>)	.04	.066	-1.56	-.47	.12	.64
<i>Experience</i>	-.30 (<i>-.18</i>)	.03	.07	-3.27	-1.64	.00	.10

R Square 0.32 (0.10) Adjusted R 0.30(0.06) F 12.13(2.78) Sig. 0.00(0.00)

Figures in italics in table 5 relate to Internet use

However, a plausible explanations may be found in possible unpleasant past experiences with computer use or unwillingness to adapt or accept computer application in some traditional roles in health provision. In addition, the poor and inaccurate database which has become a problematic issue in the hospital system of most developing countries in Africa may have accounted for these negative tendencies especially, if the data output quality is considered unreliable and the risk of dissemination of inaccurate data is high. Furthermore, the rise in professional status seem to be accompanied by less use of computers for task-related as indicated by the negative values of the beta coefficients ($\beta = -.18$, $t = -2.38$, $p < 0.05$). Perhaps, status is accompanied with devolving of computer related tasks to administrative assistants or loss of computer skills over time due to lack of use or adaptation to profession. This thought will hold sway if health related adaption of computers involve reasonable efforts such as re-training or trainees are required to incur out-of-pocket financial costs or time. The difficult economic conditions across the nations in African and the peculiar culture that interlock nuclear and extended family as one often make training and re-training of employees a perplexing issues as other social roles and responsibilities often contend with training and work hours(Abiodun, Osibanjo, Adeniji and Iyere-Okojie, 2014).

Professional status is the only statistical significant variable that seem to affect internet use among these health professionals (β -.28, t -3.14, p = .00). However, the effect is negative which seem to be an outgrow of their attitude to computer use and a reflection of the fact that a reasonable degree of trainings in health care, health care management and administration are still substantially physical in nature. Indeed, the use of internet among these groups appear more restricted to e-mail communications with 70.6% of the respondents (132) indicating using internet more to this end. While 25.1% or 47 respondents utilized internet search engine to seek information related to profession or learn new skills other utilize internet for news items and such like. Lack of internet education may not be considered as a restrain factor giving the existing non-hospital internet facilities, perhaps, lack of trust in internet facilities or extant opinion on concern for potential loss of autonomy and privacy may better explain these attitudes to internet use (Anderson, et al, 1986). This findings suggest some concern as it indicate a potential loss of benefits derivable from sharing, comparing of health information and a bar to telemedicine in communities that are poorly endowed with health manpower. This raises a question of concern: what benefits are been derived from the increased investments in the computerizations of the health systems and access to CIT in developing countries? Of what use if those who deliver care, manage and shape the health system through operations and strategic decisions are not able to exploit these for better health services and are entrenched in the 'old' way of health care delivery and administrations? Of the demographic variables only age showed a positively covary with internet use though not statistically significant while gender, status and experience are negatively, though not significant, correlated with internet use.

Conclusions and Recommendations

The increasing demand for health care by the growing population in the developing countries, the burden of disease and the need to constrain wastages in the health system demand a policy framework that enhance the use of communication and information technology in the health system. It is of advantage to secure attitudinal change among health professionals to make communication and information technology an effective decision support systems that enhance or facilitate their decision making. It is evident that computerization of the health system may amount to resource waste unless accompanied with data accuracy and timeliness that enhance quality of data and responsive to the needs of health professionals, Efforts may be required to secure a productive link between IT and health professionals to enhance security and privacy issue which are plausible reasons for the current attitude. Admittedly, energy is an important variable in communication and information technology use especially in life-saving industry as

the health increased and sustained investment in provision of energy is needed while appropriate policy framework is required to enhance the efforts of the telecommunications providers in provision of wider internet access. However, envisaged benefits of internet may be lost in the health sector if health professional are apt to use e-mails for non-health or skills upgrade communications and less use of the electronic resources offered through internet for enhancement of skills and learning of new methodologies.

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