

A STUDY OF COMPUTER USAGE BY NIGERIAN QUANTITY SURVEYORS

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SUMMARY: *Quantity Surveying (QS) appears to be one of the few professions that have not been profoundly transformed by the application of the technological advancement offered by digital revolution especially in a developing economy like Nigeria. The paper examines the extent to which the Nigerian quantity surveyors (NQS) have been moving with the times of information technology. The aim is to discover the challenges faced by the professionals by examining the factors affecting the use and adoption of computer in a dynamic world of explosive growth of the information and communication technology (ICT). The study adopted a survey design methodology. It was observed that there was increasing yearly rate of adoption of computer in QS services, particularly among those Qs in their mid-career years. About 89% of the quantity surveyors have been using computer for project cost management services (PCMS). Almost all the respondents are performing word processing functions using computers while the proficiency level is indicated to be high in Microsoft Excel and Microsoft Word. About 44% of the respondents carried out spread functions using computer while about 45% wished to perform spreadsheet functions with computer. Qs' attempt to computerize their services has been more of technology driven than process driven. Four elements of cost that were rated to be high with respect to income of the Qs are cost of original software, cost of branded hardware, cost of infrastructures to support computerization and cost of support services by computer professionals.*

KEYWORDS: *quantity surveyors, IT usage, computing proficiency, developing economy*

1. INTRODUCTION

The explosive growth of the information and communication technology (ICT) has had unquantifiable impact on business systems and processes. The global acceptance and widespread adoption of ICT has accelerated the dimensions of competition not only among organizations globally but among professions locally. The Qs ability to avail themselves with the emerging opportunities provided by the advent of ICT depends on the adoption of new technologies (Castle, 2002). Computer has promised to be a reliable tool in all spheres of human endeavour. Literature has documented the relevance of computer/computing to the industry (Shash and Al-Amir, 1997). Advances were made in various professions when such professions took advantage of technological tools available (Li, 1996 and Pollack-Johnson & Liberatore, 1998). There is quite a lot of development in all areas of computer application to the industry. Of note are the expert systems, artificial intelligence, knowledge-base systems (KBS), artificial neural networking (ANN), robotics and computer aided design (CAD). Wager (1988) examined at the implications of transferring quantities information from CAD systems directly to the quantity surveyor or contractor. Rivard, Froese, Waugh, El-Diraby, Mora, Torres, Gill and O'Reily (2004) predicted that the evolution of IT will have a profound impact on how organizations in the architectural, engineering and construction (AEC) industry operate. This is already coming to pass. For example, there are pockets of reduction in paper-based operation in quantity surveying offices while electronic led-processes are leading to less dependence on taking-off sheets and other ancillary stationery. Honey (1998) reported that a large proportion of Qs in the United Kingdom have been using computers. In an earlier baseline study, Oyediran and Odusami (2004) examined the state of the art of computing by Qs in Nigeria at the turn of the last century. Their study was limited to Lagos State of Nigeria and can at best be cautiously generalized.

Thus an update on the state of the art of computing by the professionals is necessary. The critical roles being played by the QSs in the procurement chain require that the professionals must not lag behind in the adoption of tools that promise to improve on their service delivery.

2. MOVING WITH THE COMPUTING REVOLUTION: PREVIOUS STUDIES

Studies have shown that the early 1980s is an era when CIPs were awakened to the reality of applying computer into the operations and processes in the industry. The professionals in the advanced economies have shown readiness and commitment to the adoption of computers in their operations than those in the developing economies like Nigeria. It was not until the late 1980s that researchers and practitioners in Nigeria began to draw attention of the industry to the advantages of the use of computers in the construction industry. (Ayeeni, 1989).

Early writers have indicated the software and hardware requirements CIPs (Sidwell and McIntosh, 1982a and 1982b). These requirements will continue to vary depending on the technological advancement, the client and/or market demand, the users' needs, among other factors. The 1980s witnessed the use of computers for functions such as cash flow forecasting, Computer Aided Taking off (CATO), project management, accounting and cost control (Geary, 1982, Heckford, 1982, Sidwell and Cole, 1988). There were few specialist computer programmes relevant to the needs of the CIPs (Eite, 1982). The fewness of specialist computer programmes, which he noted, is being overtaken by the rapid development in the IT world. Wilderspin (1988) observed that the implementation of IT in many businesses has been more of accident than design. This may be connected with the absence of industry-driven IT strategy. This accounts, partly, for the level of misunderstanding, confusion and uncertainty common in the industry. His observation is still true, to a great extent, in a developing economy like Nigeria, where the level of adoption has been found to be low (Oyediran and Odusami, 2004, Oni, 2003, Jagun, 2003).

Advances in the late 1980s and 1990s have shown the increasing awareness and adoption of computers by the CIPs. The work of Shash and Al-mir (1997) showed the limited utilization of computers to accounting, administration, estimating, planning and control duties by Saudi contractors. Honey (1998) reported that about 83% of the quantity surveyors in the UK use computer at work and that quite a large proportion of members use general-purpose Office software (database and spreadsheet applications). He reported, in addition, that the RICS members are aware of other applications being introduced to the market. Thus it can be speculated that the RICS member QSs, having been following the development in IT revolution, may not be caught unaware in the future. The conservativeness of the QSs has been cited as one of the reasons why their rate of IT adoption and diffusion (Cartlidge, 2002).

It is to be noted that computer use and adoption in the construction industry has been a subject of interest among the construction industry professionals in general. Rivard et al (2004) carried out case studies on the use of IT in the Canadian construction industry in the summer of 2002. The CIPs interviewed include architects, engineers, general contractors and owners. It was reported that many of them are at the cutting edge in their use of IT for construction operation and processes. Notably, QSs were not part of the sample of CIPs interviewed. Some of the issues related to IT adoption identified in their study are: efficiency and economy of electronic distribution of documents, difficulty in introducing new technologies on projects due to time lag and tight budgets. Others include: the industry-wide use of CAD system, cost of maintaining trained CAD and IT personnel and the loss of IT benefits to companies that lag behind in adopting IT. In all, the authors believed that the potential benefit in adoption of IT can spread round the industry.

Howard, Kiviniemi and Samuelson (1998) carried out a survey of the IT in the construction industry in Scandinavia. The study aimed at setting a baseline for comparison when measuring growth and success of IT adoption. The results are similar to what was obtained by Rivard et al (2004) in their study carried out in Canada. They indicated the dominance of CAD system in almost all design offices. A related study of the Finnish construction industry by Bäckblom, Ruohutala and Björk (2003) surveyed the use of electronic data management (EDM) systems. The study indicated that there exist barriers to the efficient use of the EDM systems. The nature of the barriers, they claimed, are psychological and training. The survey of Doherty (1997) on the use of computer in the New Zealand Building construction industry was industry general and not profession specific. The survey revealed that a large minority of businesses either does not use computers or it uses them casually. The report ended on a note of optimism that growth is expected in electronic information service. Expectedly, this position must have shifted in order to keep pace with the trend of development in developed economies.

Arif and Karam (2001) reported the use of IT in the West Cape Province of South Africa among architectural firms. The survey revealed the reliance of architectural practices on CAD systems. They also noted that the use of computer concentrated on three areas: administration, communication and construction drawing production. From the economic perspective they indicated that the use of IT showed no actual reduction in the running costs of professional practices.

The use of computer in the construction industry in Nigeria has been a subject of inquiry in Nigeria of late. Jagun (2003) noted that (CIPs) involved in project management services have been slow in adopting IT in their operations while Oni (2003) reported a low level of IT adoption in the construction industry. He also noted the lack of comprehensive IT strategy by practitioners and management. The foregoing review has discussed some elements of IT adoption and progress in IT in construction. While some of the studies examined the architectural, engineering and construction industry as a whole others focused on specific systems and / or profession.

This study sets to explore the extent to which the QSs in Nigeria have been moving and growing with the times through the adoption and use of computer in construction project systems cost management services (PCMS) delivery. It sought to understand the training modes prevalent among the adopters with the aim of determining the training strategy that will promote better rate of use of computer. It is to further discover the challenges faced by the professionals by examining the factors affecting the use and adoption of computer by the NQSs.

3. METHODOLOGY

The research is designed to obtain information from a broad spectrum of practicing QSs working in various career environments such as contracting, consulting, teaching/research and client organizations. The sampling technique employed is purposive in the first instance and then the collected questionnaires were randomly sampled. The data administration was carried out during a national computer demonstration workshop organized by a South African QS software producer and the Nigerian Institute of Quantity Surveyors during the second quarters of 2004. This was further supplemented by administering the same questionnaire on QSs in various organizations to obtain a nationally representative information. The data generated were analyzed using mean item scores to generate ranking of the variables of interest. The variables measured with the index are: the proficiency of the use of various computer packages, the dominance of training modes of computer education, the preferred modes of training recommended, the effects of factors affecting computer usage, the cost of computer systems in relation to their income.

4. RESULTS, ANALYSIS AND DISCUSSION

Table 1 shows the age distribution of the respondent. Majority of the respondents are in the 31-40 years of age group (average age is 38 years). Their average construction industry work experience (CIWE) is about 11 years (Table 2).

TABLE 1: Age Distribution of Respondent Quantity Surveyors.

Age Interval	No of Respondents	Percentage
21 – 30	12	16%
31 – 40	39	51%
41 – 50	26	34%
51 – 60	0	0%
61 – 70	0	0%
Total	77*	100%

Mean Age = 38 years. *Respondents whose age were not indicated = 5.

Majority of the respondents have university degree in quantity surveying (Table 3), while over 50% hold the professional qualification of the Nigerian Institute of Quantity Surveyors (NIQS) (the nation's quantity surveying regulatory body). Very few respondents indicated membership of the Royal Institution of Chartered Surveyors (RICS) - the foreign\international quantity surveying professional body (Table 4).

TABLE 2: Construction Industry Work Experience (CIWE) in years.

CIWE Interval (years)	No of Respondents	Percentage
1 – 5	20	27%
6 – 10	19	26%
11 – 15	11	15%
16 – 20	13	18%
21 – 25	9	12%
26 – 30	1	1%
31 – 35	0	0%
36 – 40	0	0%
41 – 45	0	0%
Total	73*	100%

Mean CIWE = 11 years * Number of respondents whose CIWE were not indicated = 9.

TABLE 3: Academic qualification of respondents

Highest Qualification	Number of Respondents	Percentage.
National Diploma	1	1.2%
Higher National Diploma	23	28.1%
Post Higher National Diploma	3	3.7%
Bachelor of Science	22	26.8%
Post Graduate Diploma	10	12.2%
Master of Science	21	25.6%
Doctor of Philosophy	2	2.4%
Total	82	100

TABLE 4: Membership of Professional Associations Respondents

Grade of Membership	NIQS	%	RICS	% of the total
Student	4	5.3	2	2.4
Graduate\Probationer	33	43.4	6	7.3
Professional Associate	35	46.1	3	3.7
Fellow	4	5.3	0	0
Total	76*	100%	11*	13.4

TABLE 5: Current Career/Job environment and the number of years spent

Career\Job environment	No of Respondents	Rank
Full Q. S. Consulting Firms	29	1
In contracting Organization	27	2
Civil Engineering Contracting only	4	
Building Contracting only	2	
Services Engineering only	4	
Building and Civil Engineering only	16	
Specialist Contracting only	1	
Client Organization	21	3
Government / Ministry\ Agency \Parastatals	11	
Banking and Financial Services companies	4	
Services Section of Educational Institution	3	
Manufacturing Organizations	2	
Teaching\Lecturing\Research	11	4
Freelance Q. S.	7	5
Unemployment\Job Seeking	5	6
Oil and Petrochemical companies	1	7
Total	100*	

*Some respondents are in more than one career\job environment.

From Table 5 most of the respondents work in full consultancy job environment .Almost one-third of the respondents work in contracting organization job environment (Building and Civil Engineering Contracting only attracting the largest number) and about one-fifth work in client organization (Government, Ministries, Agencies and Parastatals, while those in teaching/research environment constitutes about one-tenth of the respondents.

4.1 Computing skills among the Nigerian Quantity Surveyors

The computing skills among the NQSs are assessed using the following measures:(1) Time when the respondents began to use computer and when their organizations began to use IT (2) Hard ware and software owned by the quantity surveyors and the computing facilities they are using, (3) Type of computer and software being used for their works, (4) Adaptation strategies and their measures of currency of computing systems, and (5) Proficiency level of quantity surveyors in the use of IT tools.

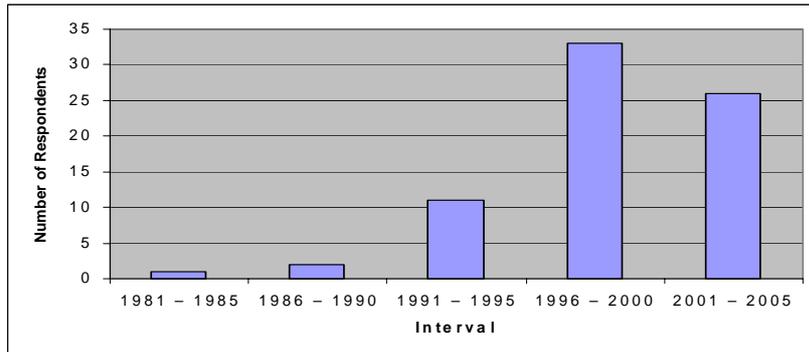


FIG. 1: Time when Quantity Surveyors began to use computers

Figures 1 indicates that as at 2004, about 89% of the quantity surveyors have been using computer for quantity surveying services. There has been some tremendous growth in the number of surveyors who have been using computers from 1996 to date. A similar trend is noticed in the personal and corporate use of computers for quantity surveying services. Figures 2a and b show that about 87% of the respondents cumulatively have been using computers personally. However, about 83% responded that their organizations have been using computers in the last ten years.

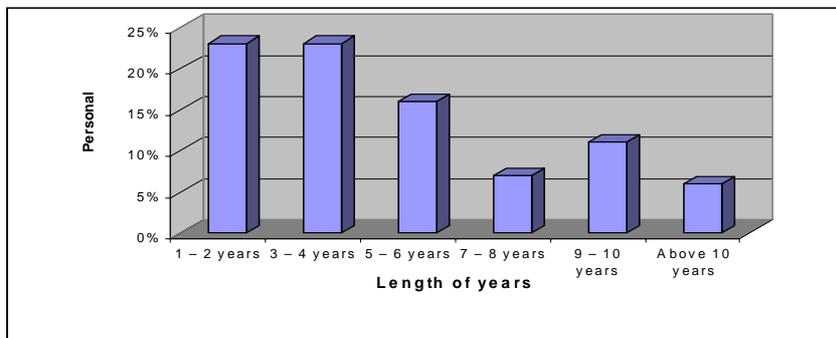


FIG. 2a: Length of time of use of computers personally

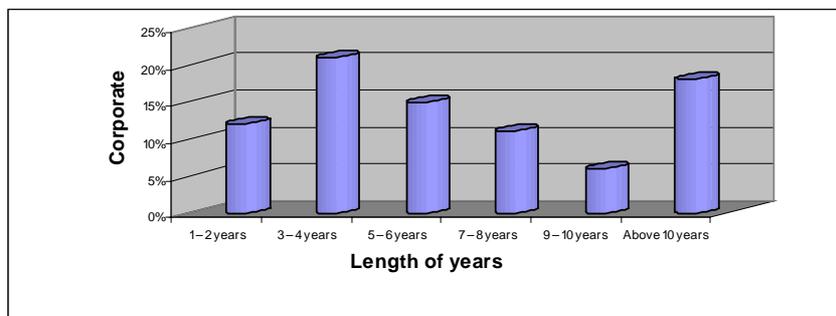


FIG. 2b: Length of time of use of computers corporately

From Figures 1 and 2a&b, it can be inferred that a great proportion of QSs (over 87%) have been using computers either personally or in organizations for quantity surveying services. The statistics also indicate increasing trend in the embrace of computers. Hardware collection is of interest in evaluating the state of the art. Computers vendors, in their response to the consumers' quest for possessing computer, often offer a variety of options to suit the financial ability of the users. The country is also a third world, which relies heavily on importation of computer hardware. A peculiar trend is the importation and sales of fairly used computer hardware. Table 6 shows that branded and clone (new ones) are the commonest computer hardware. It is expected that very many, if not all, of the computers will be branded and new.

TABLE 6: Computer Hardware

Type of Hardware Possess by Users	Mean quantity score (MQS)	Comments
Branded and New	2.67	Many
Clones and New	2.38	Many
Branded and fairly used	1.53	Not many
Clones and fairly used	1.70	Not many

It is generally known that branded computers are costlier than the locally assembled ones. Despite this situation, the result in Table 6 shows that many of the hardware systems are of the branded type. The average of the MQS for branded categories of computers (branded new and fairly used) is 2.10, while for clones categories (clones new and fairly used) is 2.04. The variety of options available in software possession were explored and categorized to original and copied versions as shown in Table 7

TABLE 7: Quantity and Quality of Software (Qsing and other packages)

Type of software by quality	Mean Quantity Score for;	
	Quantity surveying software	Other software
Original	1.90*	1.85*
Original with original manual	2.03	2.00
Registered ownership	1.72	-
Possession of license of package	2.08	1.71
Copied version	1.31*	1.74*
Original copy without original manual	1.29	-
Copied version without manual	1.25	1.96
Copied version with photocopied manual	1.39	1.52

1 = Not many, 2 = Many, 3 = Very many, 4 = All; * Average of the mean quantity score for the types of software

Table 7, shows that there is the existence of both original and copied versions of the various types of software in use by the responding QS. Quite many of the software available for quantity surveying services and other uses are original. Not many of the QS packages are copied versions. This is not unexpected since they are specialized software with limited market and adequate security systems to prevent duplication.

TABLE 8: Quantity surveying software in use

Using software	Mean regularity of use score	Rank	Remarks
Cat Pro	1.72	1	Used occasionally
Masterbill	1.52	2	Used occasionally
QS Bill	1.38	3	Close to "Not used at all"
In-house	1.35	4	Not used at all
Others	1.29	5	Not used at all
QS Elite	1.16	6	Not used at all
Snape (vector)	1.12	7	Not used at all
Win QS system	1.08	8	Not used at all
Average mean of regularity of use score	1.33		Close to "Not used at all"

CatPro, Masterbill and QS Bill are the three most used quantity surveying software. In-house software being used is of local origin, while the former three types are foreign, of British origin. Their cost is an important factor in their acquisition. The most recent system in the Nigerian market is the South African developed software –

Win QS system. The system was introduced in 2004 and there is evidence from this survey that it is being given some consideration by some NQs. The level of usage of these QS software is low.

TABLE 9: Software in use and regularity of use

Software group	Mean regularity of use score	Rank	Comments
Communication based software	2.18	1	Used occasionally
General purpose software	1.88	2	Used occasionally
Other industry related software	1.46	3	Not used at all
Quantity Surveying software	1.33	4	Not used at all
<i>Average mean of regularity of use score</i>	<i>1.71</i>		Used occasionally

It is to be noted that communication based software ranks the highest, followed by general-purpose software, then quantity surveying software and lastly by other industry related software. It is apparent that their use is still occasionally, and by implication, very low.

4.2 Functional demand of IT by NQs

Table 10 shows the functional demand of IT by NQs. The three groups of function are Word processing function, Database function and spreadsheet function. There are functions being performed using computers and there are those, which they hope can be performed by computers. This is to reflect the needs as well as indicate those who have not been performing those functions already.

TABLE 10: Functions which NQs perform using computer.

Functions	Functions being performed		Functions being desired to be performed	
	Respondents	Percentage	Respondents	Percentage
Word Processing Functions		85%		8%
External correspondence	71	87%	6	7%
Internal correspondence	68	83%	7	9%
Technical Reporting		52%		34%
Project information	47	57%	29	35%
Staff information	45	55%	23	28%
Equipment information	35	43%	33	40%
Spreadsheet Functions		44%		45%
Programme of works	46	56%	33	40%
Material schedule	43	52%	32	39%
Estimating	42	51%	34	39%
Cash flow requirement	38	40%	39	48%
Scheduling	37	45%	35	43%
Job costing	34	41%	39	48%
Resource leveling	16	20%	44	54%

Word processing functions are being performed virtually by all the respondents. About 15% indicated desire to perform word processing functions using computers. This is a reflection of those who probably have not been using computers at all. Spreadsheet functions are being carried out using computer by about 44% of the respondents while about 45% wish to perform spreadsheet functions with computer. By implication, a large proportion of the NQs are yet to perform works requiring spreadsheet applications on computer. The same observation goes for the categories of work under the database functions. Of the functions that the QS desires to computerize resource leveling, job costing and cash flow requirements appear to be the three most desirable functions. This may be as a result of the fact that a high proportion of the respondents are working in contracting environment.

Proficiency in computing adoption in PCMS offered by NQs can be used as a proxy for computer literacy level. There are indications of high level of proficiency in using Microsoft Excel and Microsoft Word. They appear to be moderately proficient in the computer based communication media – the E-mail and the Internet facilities. There is indication of fair proficiency in presentation packages such as Microsoft PowerPoint. The proficiency

level of NQs in quantity surveying packages calls for concern. Majority cannot programme at all. All these are pointer to the fact that the NQs still have a long way to go and ample challenges for growth, especially when it comes to adaptation of existing software to peculiar situations or individual office needs. Trainers in the use of these packages will be required. Opportunities for training at various institutions will need to be created.

TABLE 11: Proficiency in computing capacity of Qs

Packages	Mean level of proficiency score	Ranking	Comments
Word processing packages	4.28	1	Very proficient
Ms Excel	4.16	2	Very proficient
E- Mail	3.76	3	Proficient
Internet	3.72	4	Proficient
Presentation packages	2.80	5	Fairly Proficient
Intranet	2.66	6	Fairly Proficient
Ms Access	2.42	7	Not proficient
Qsing Software	2.30	8	Not proficient
Others, Ms Project etc	2.22	9	Not proficient
In-house packages	2.12	10	Not proficient
Design packages	2.07	11	Not proficient
Lotus 1-2-3	2.08	12	Not proficient
Programming language	1.75	13	Not proficient
Accounting packages	1.65	14	Not proficient

TABLE 12: Index of dominance of training modes

Training modes	Mean Index	Ranking	Comment
Personal self development	3.00	1	Highly Dominant training mode
Private computer training organization	2.87	2	Dominant training mode
In-service training by employers	2.74	3	Dominant training mode
Continuous professional development workshop/seminar	2.52	4	Dominant training mode
Taught curriculum while at school	2.20	5	Least dominant training mode

Table 12 shows that the leading mode of training in computer is through personal self-development. Training through private computer training organizations follows this. From the late 1980s till the turn of the millennium, there were large numbers of private computer training organizations in the country. They took advantage of the missing link in the tertiary educational training where graduates were not given training in computer before graduation. Abimbade (1999) informed that there has been a national policy on computer education as far back as 1988 but has suffered from implementation.

TABLE 13: Index for training and retraining

Training modes	Index for Training and Retraining	
	Index for training	Retraining of Q. S staff
1. Formal Training as part of Qs curriculum	2.72	2.03
2. Formal Training with other computer knowledge seeker	2.34	1.89
3. Out of school on- the- job training	2.41	2.70
4. Specialized computer training schools for Qs	2.23	2.85

1 = Not recommended, 2 = Recommended, 3 = Strongly recommended

Respondents are of the view that all the listed modes of training are recommended. Formal training in IT as part of curriculum in the training of Qs was highly recommended. Training in specialized computer schools for Qs alone was also highly recommended.

TABLE 14 Factors Driving the Computerization of QS Services

Driving Factors	Mean Influence score	Rank	Comment
1. General Technology demand	3.33	1	High influence
2. Corporate Technology strategy	3.24	2	High influence
3. Industry Competition among Professionals	3.23	3	High influence
4. Industry competition among Q. S	3.21	4	High influence
5. Client\Customer demand	3.11	5	High influence
6. General construction industry demand	3.00	6	High influence

Table 14 shows that all the drivers have high influence on the decision of the QSs to computerize their services. As it appears the QSs had to computerize their services because the driving force of technology is too compelling to ignore. Closely following this is another technology related factor: corporate technology strategy. Other factors are: competition (either in form of competition among construction industry professionals or among the QSs), client and customer demand and general construction industry demand.

Table 15 lists 16 factors grouped into five groups that affect the effort to computerize. Educational problems appear to be the leading factors group. These educational factors revolve around training at institutional and on-the job levels. Returns on investment factors also appear significant as inhibiting factors. Related to the return on investment is the relationship between the cost of systems and associated sustaining resources and the annual income either of the individual or the organization. Table 16 shows that respondents believe that four elements of cost are high with respect to their income. Some of the respondents holds the believe that computerization permits other professional to encroach on their service area, that it is for the next generation of QSs and that it will create unemployment problems for QSs. These are considered as myths and they indicate some elements of conservatism prevalent among the practitioners.

TABLE 15: Factors Affecting the Use of Computer by QSs

Group of Affecting Factors	Elements of the effect	Mean affecting score
Operational Inhibitors	Rate of virus attack leading to loss of data, and associated problems.	3.28
	Few QS software to choose from.	3.03
	The rate at which software becomes outdated and require up dating	2.84
	Durability of clones (locally assembled computers)	2.60
	Branded computers are not replaceable	2.41
Educational problems	QS training institutions are not equipped\positioned to give computer education to their students	3.89
	There is no tailor-made QS training by private computer school trainers	3.85
	Management of organizations rarely give in-service training to Q. S staff	3.64
	Software education is poor	3.59
	Capacity to Q. S educators are low	3.46
Return on investment	Inadequate job order to encourage investment in computer	3.60
	The cost engaging computer literate is high	3.29
	Fees are not paid to justify computerization of PCMS	3.09
Management attitude	Management is not willing to computerize PCMS	3.24
	Management does not see the need to computerize	2.95
Myth factors	It makes other professionals to encroach on QS jobs	2.28
	QS believes computer training and usage is for the coming generation	2.15
	It is capable of creating unemployment for QSs	2.15

1=No effect, 2=Minor effect, 3=Moderate effect, 4=Major effect, 5=Very major effect

TABLE 16: Cost of system in relation to annual income

	Element of Cost	Mean cost score	Comments
Cost factor	Cost of original software	3.55	Very high cost
	Cost of branded hardware	3.13	High cost
	Cost of infrastructures to support computerization (e. g. Electricity)	2.72	High cost
	Cost of support services by computer professionals	2.52	High cost
	Cost of ancillary such as UPS, stabilizers, scanners etc	2.48	High cost
	Cost of cloned hardware	2.36	Moderate cost

5. DISCUSSION OF FINDINGS

In an earlier baseline survey (Oyediran and Odusami, 2004) it was found out that about 83% of respondents QSSs have been using computers for quantity surveying services as at the year 2000. The yearly rate of adoption or use of computer has also been on the increase. There seems not to be a significant difference between the number of respondents, which started using computers between 1996 and 2000 (5 years) and between 2001 and 2004 (4 years). This yearly rate of growth of the use of computers in PCMS is a good indication that the coming generation of NQSSs will take advantage of the benefits of information technology. This, of course, will have positive implications in their ability not only to compete with other professionals but also to contribute to the ever-desirable efficiency in project management service delivery.

The predominant mode of training for the NQSSs is the informal training through private computer training organizations. On one hand, the predominant mode of IT training indicates individual motivation to acquire the knowledge that will enable them to be on the competitive edge. On the other, it creates training business opportunities for the entrepreneurs who are running the training schools. However, such schools provide general trainings rather than specialized training in software that is QS specific. Respondents' recommendation of specialized computer training schools for QSSs is therefore not unexpected. However, if formal training in IT as part of the QS curriculum had been adopted, there would little or no need for specialized computer training schools for QSSs. The merit of formal training is in both the economy and the quality assurance of the training being offered. Including computer training in a formal QS education at institutional level requires that the trainers be literate in computer also. This capacity at the construction industry level is yet to be explored. Honey (1998) has counseled that a vital part of any IT strategy is to have all the staff of an organization properly trained.

The content of training revolves around the function of the quantity surveyor in the project management chain. Two major job functions amenable to computer operations are those requiring technical reporting and spreadsheet calculations. Most quantity surveying programmes have spreadsheet programmes as the baseline operating programmes. Consequently, a good understanding of and proficiency in spreadsheet programmes is necessary for quantity surveyors to assert any reasonable computer literacy. Similarly training requiring understanding in database management, such as information storage, data mining and data retrieval will be necessary in the training of quantity surveyors.

The leading inhibiting factors in the study are the educational factors. All the factors were rated as having major effect on the ability of individuals or organizations in adopting IT in their operations. As earlier observed and discussed, personal development has been the predominant mode of acquiring the needed education in computer. In Oyediran and Odusami (2004) this situation was noted, however, the degree to which quantity surveyors see this as inhibiting their computer literacy and proficiency was not examined. They suggested that computer literacy courses be introduced into the curriculum of quantity surveying institutions in Nigeria. This study has not only shown the criticality of this, but has also exposed the more fundamental need of equipping the institution so that they will be properly positioned to give the requisite industry relevant computer education to their students. The low capacity of QS educators has also been rated as having a major effect on computerization efforts.

Apart from inhibitors related to training institutions, on-the-job training has also been seen as a major factor inhibiting computerization of QS services. Training provided by private operators has not been QS specific coupled with low QS software education. A disturbing factor is the failure of the management of organizations, which rarely give in-service training to their staff. In Oyediran and Odusami (2004), the support of management of the organizations where quantity surveyors work has been found to be very weak. Oni (2003) had noted the

weak IT strategy existing in the industry. Cartlidge (2002) had reported that management driven IT strategy had been a major impetus for IT adoption in the manufacturing and media world. Owners of quantity surveying firms, as in other enterprises, are bound to consider economic factors above all other factors before adopting IT strategy. It has also been observed in this study that all factors indicating return on investment were rated as having moderate effect on IT adoption. It is noteworthy that there are some pockets of belief about adopting IT for QS services. Even though the three beliefs were each ranked as of minor inhibiting effect on IT adoption, the respondents were aware that some members of the profession still hold such belief. This is an indication of the level of conservatism and awareness.

Cost as an inhibiting factor has been observed to take a prominent position in the computerization quest. A major cost variable is the cost of the original software, which is believed to be very high. As at the close of 2004, there has not been any locally made commercial QS software in the Nigerian market. The leading software has been the Masterbill and QSCAD software from Masterbill Micro System Ltd of the United Kingdom. The cost, which is about N500, 000.00 (about 3500 USD at 2004 exchange rate) is considered too high by many practicing firms and individual quantity surveyors. The newly introduced QS software of South African origin (Win. QS system) is about three quarter of the price of the Masterbill. The general response from firms and individuals is that except they are able to secure commission with substantial fee return, these systems are beyond what they can afford.

Other cost related variables, such as cost of branded software, cost of supporting infrastructure and cost of computer ancillaries were also rated as been high. Understandably, cost must be related to income and expected return on investment. Rivard, et al (2004) had observed that the drastic reduction in computer prices and popularity of computers over the few years have made IT more ubiquitous within the Canadian AEC industry. The reduction in prices is global and Nigeria seems not to be an exception. However, the imported hardware and software systems are still above the reach of many professionals and many small professional firms. Users therefore devise various strategies in order to have access to computing system. Such strategies as cloning of systems, purchasing fairly used imported systems, software piracy are commonplace. There are small offices, which operate without computer. Some rely on computer rentals (which are few in most cases) or business centers which offer general word processing services for fees.

6. CONCLUSIONS

About 89% of the quantity surveyors have been using computer for PCMS while, about 83% responded that their organizations have been using computers for their services. There has been some tremendous growth in the number of Qs and firms who are beginning to use computers from 1996 to date.

Branded and clones (new ones) are the commonest computer hardware. There is the existence of both original and copied versions of the various types of software in use. CatPro, MasterBill and QS Bill are the three most used software. As expected cost was found out to be the most important factor in the acquisition of the software. In terms of regularity of usage communication-based software ranks the highest, followed by general-purpose software, then quantity surveying software and lastly by other industry related software.

Almost all the respondents are performing word processing functions using computers. Spreadsheet functions consisting of estimating and job costing, cash flow preparation, scheduling, resource leveling, and material schedule and programme of works are being carried out using computer by about 44% of the respondents while about 45% wish to perform spreadsheet functions with computer.

The Qs indicated high level of proficiency in using Microsoft excel and Microsoft word. They appear to be moderately proficient in the computer based communication media – the E-mail and the Internet facilities. There is indication of fair proficiency in presentation packages such as Microsoft PowerPoint. The proficiency level of Qs in quantity surveying packages was found to be low.

The leading mode of training in computer is through personal self-development. Formal training in IT as part of curriculum in the training of Qs and on- the –job training is the highly recommended modes of training.

Educational problems appear to be the leading factor group that affects effort to adopt IT by the NQS. These factors revolve around training at institutional and on-the job levels. Returns on investment factors also appear significant as inhibiting factors. Cost of original software, cost of branded hardware, cost of infrastructures to

support computerization (e. g. Electricity) and cost of support services by computer professionals are the four cost –related elements that were found to be high in relation to the income of the NQSS

Evidences from this study have indicated the need to include computer training in the formal QS education curriculum. This study has not only shown the criticality of this, but has also exposed the more fundamental need of equipping the institution so that they will be properly positioned to give the requisite industry relevant computer education to their students This requires that the trainers be literate in computer also. This capacity at the construction industry level is yet to be explored. The training requirement should include understanding in database management, such as information storage, data mining, data retrieval and programming and in the use of QS packages .

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