Computerised School Information Systems Usage in an Emerging Country - Uganda

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Abstract: This paper describes an exploratory study on the usage of computerised school information systems (CISs) in the administration and management of the biggest secondary schools in Uganda. The field of information technology in educational management (ITEM) has been mostly confined to the developed countries that its potential in the developing countries in regard to its usage and implications on the schools that use it has not been studied (Bisaso, 2003). The literature reveals that developing countries are lagging behind in the use of CISs partly because of the resource constraints in skilled expertise, finance, and computer equipment (Visscher, 2001). But this magnitude of inferiority in school administrative computing has not been proven hence this study. The results of this exploratory study reveal that the CISs in Uganda are mainly used for clerical purposes while managerial usage by school managers is very limited. Relevant factors relating to the effective use of the CISs are identified. Users are generally positive on the effects of CISs use. It is concluded that wider and better CIS usage would be promoted by carefully designed user training grounded on a thorough analysis of the needs of the user group. Moreover, the support of the systems administrator is considered vital as a catalyst of CIS usage. A comparative summary with earlier studies in the developed countries is made.

Key words: Computerised school information systems (CISs), information technology in educational management (ITEM), school processes, management of schools.

1   INTRODUCTION

Information technology in educational administration and management (ITEM) of secondary schools in developing countries in general and Uganda

in particular is a relatively new field that not only needs in-depth study on system utilisation in schools but also on effects on the school processes and maybe outcomes. This is a concept that needs to be systematically embraced and studied in its genesis or initiation so as to come up with an advanced design of a CIS for schools in Uganda. Moreover, this can be a starting point for further research on ITEM in other developing countries providing a concrete generalisation. Uganda in the last 6 years has had a dramatic rise in the numbers of the primary school leavers, for instance in 2002 the candidates were over 0.45 million expected to rise to 1.6 million in 2004 (British council, 2003). The 2002 ministerial policy statement notes that there has been a pleasant effect of now attaining an enrolment of 7.2 million pupils in primary schools. Consequently, the pressure on secondary schools in Uganda has been mounting over the years and is likely to increase. This is an outcome of the ever-increasing numbers of primary school leavers joining secondary education that it is worthwhile to invest in CISs so that information handling that requires somewhat sophisticated means, and which can be provided by the computer, is more efficient. Through establishment of a central database time may be saved because there can be multiple usage of the same data by all the school staff, and prevention of errors which may have occurred as a result of repeated registration of data by various staff (Visscher, 2001). This improved efficiency can be manifested in school effectiveness with a likelihood of having a better attainment of the school goals. It is likely that the number of young school managers in Uganda will rise beyond what it is today. In the yesteryears most school managers were above 40 years, the trend is that most are now below 35 years. This is because of the mismatch between the available very experienced teachers and the numbers of schools being put up today. For instance, Ministry of Education and Sports (1999:5, in Aguti, 2002) reports that in 1999, Uganda had 625 secondary schools but by the year 2001, the number had almost tripled to 1850 secondary schools (Ministry of Education and Sports, 2001 a: 3, in Aguti, 2002). It is thus crucial for these increasing relatively novice schools managers to make informed decisions that can be based on the school information system, which in addition also provides guidance on management activities. Visscher (2001) notes that the information system can also help to signal that certain aspects of schooling require attention. For instance, if certain standards have been defined in advance, such as the percentage of low marks within a class is too high, and transcribed into software, the computer can provide a warning to school managers if the standards are not being met. This may improve process control, lead to more timely corrective actions, and to a more effective school.

1.1   Organisation of Education in Uganda

The existing structure of the Ugandan education system has been in force since the early 1960s. In 1989, a commission was appointed by the government to review the entire education system and made proposals and recommendations famously known as the Kajubi report. The government accepted the recommendations in 1992 culminating into the Government White paper- Education for National Integration and Development. Government then produced a master plan for the Education sector. The plan constitutes an action-based approach to the implementation of the education policies formulated in the 1992 white paper. (Odaet, 1995)

The Ministry of Education and Sports (MoES) has got the managerial and administrative mandate to centrally run the education system. The MoES has a Minister of Education and Sports as its political head assisted by the 3 Ministers of State; in charge of Primary Education, Higher Education, and Sports. There is a Permanent Secretary (PS) who is the overall accounting officer for the ministry. The Commissioner for Education Planning and an Undersecretary in charge of Finance & Administration assist the PS. The Director of Education oversees the activities of six out of the eight departments of the ministry, each headed by a Commissioner. The eight departments of the MoES include; Finance and Administration, Educational Planning, Pre-primary and Primary Education, Secondary Education, Higher Education, Teacher Education, Special Needs and Careers Guidance, and Business Technical and Vocational Education Training Department. In addition, there are semi-autonomous institutions that execute certain responsibilities on behalf of and in liaison with the MoES. These include the National Council of Sports (NCS), Uganda National Examinations Board (UNEB), National Council for Higher Education (NCHE), National Curriculum Development Centre (NCDC), Universities, and Uganda National Council for UNESCO and the Education Service Commission (ESC).

1.2   Structure of the Ministry and its Departments

In line with the overall government of Uganda decentralisation policy, education sector functions decentralised are recruitment, deployment of primary school teachers, implementation of UPE and the school construction program. The implementation of these decentralisation programs is however hampered because it has to fit in the general sector guidelines issued by the centre. The School Management Committee, with the head teacher as its secretary, oversees school policy formulation and implementation. Its

activities include supervising school budgets, reviewing education performance, overseeing student and staff discipline and making plans for school facilities expansion and repair. Head teachers draw up monthly reports to the District Chief Administrative Officers and forward a copy to the school management committee' chairperson (The Ugandan Experience of UPE, 1999).
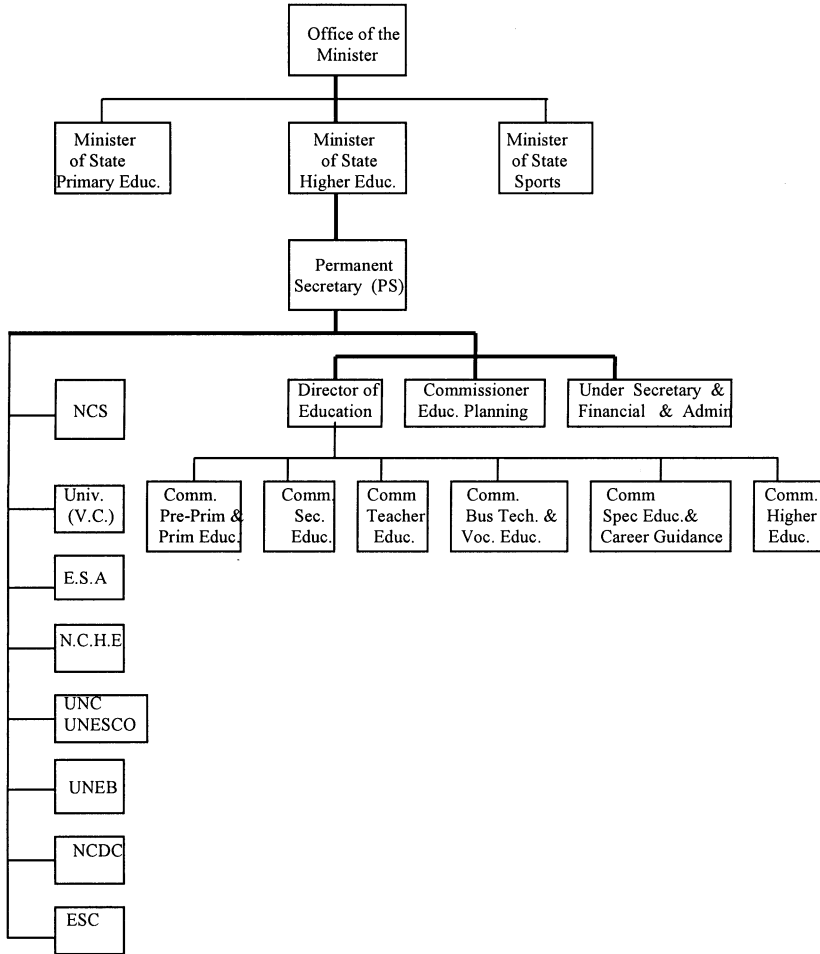

Figure 1:   *Source: Ministerial Policy Statement 2002*

2   RESEARCH QUESTIONS AND RESEARCH FRAMEWORK

The study is guided by the following specific research questions, which have been formulated with regard to the variable clusters in the Visscher model (1996; 2001).

1. What computerised school information systems (CISs) are used in secondary schools in Uganda?
2. To what extent and how are these CIS used in secondary schools in Uganda?
3. What is user opinion of the CIS quality?
4. How were the CISs implemented?
5. What were the relevant features of the schools into which they were introduced relatively successfully?
6. What are the positive and/or negative effects of CIS usage?
7. Which factors prove to have a relationship with degree of CIS usage?
8. How can computerised school information systems and/or their use in secondary schools in Uganda be improved?

The study in this paper explores the usage of CISs in administration and management of secondary schools in Uganda using selected variables in the Visscher model (1996; 2001) on the factors determining the usage and impact of CISs in developing countries. While the Visscher model has been used in developed countries (Visscher 1999; 2003), its feasibility in the developing countries is tested in this study. Visscher notes that four factors determine the level of use of CISs and their effect in schools namely the CIS design strategy, CIS quality, implementation process features, and school organisation features. Most developing countries have not evolved a uniform CIS used in all the schools. On CIS quality, each system is used and appreciated in accordance with the perception of its users towards its features. Hence the use of a particular system is dependent on its applications, some of which the school staff may or may not use (Fung and Visscher, 2001). Fung (1995) and Visscher and Fung (2001) point out that the initiation phase in an innovation process is essentially related to commitment among the innovation users and their perception of the added value accruing from embracing the change. Like in many other attempts at change, the time variable is needed for sufficient understanding of the reasons for the change otherwise it is rejected. Riggs (1964, in Kereteletswe and Selwood, 2003) notes that in a prismatic society, it is not easy for old practices to give way to new or modern practices emphasising the time variable. Moreover, there is not a replacement of old practices by new ones but a displacement. Fung (1991) and Bird (1991) cited in Visscher (1995)

argue that if the architect of the change process is supportive, that its successful implementation is guaranteed; and the same is just true if the school management does likewise. Moreover, with the wealth of expertise of CIS administrators, use of the system is expected to be impressive especially through their just-in-time assistance to the system users (Fung and Visscher, 2001). Visscher (1995) has presented user training as a factor that influences the implementation process of the CISs. Marx (1975, in Visscher, 1996b) points out that schools vary in their policy-making capacity, and that the areas in which schools develop their policies often differ in degree. It is this divergence in policy-making capacity that will strongly impact on the initiation of CISs in school policy making.

3   METHOD AND DATA ANALYSIS

The research is grounded on a sample survey. Uganda has fifty-six districts from which a selection of four neighbouring districts was made for conducting the sample survey. The researchers using a non-probability sampling technique identified 55 schools whose type and size, suggested that they could be using computers in school administration and management. It is evident that the majority of the biggest and well-developed schools in Uganda are located in the central districts of Kampala (the capital), Wakiso, Mukono and the neighbouring eastern district of Jinja; consequently qualifying as an area for drawing a sample for this study. Most importantly, innovations begin at the centre and spread to the periphery, hence the researchers thought that the field of ITEM being a recent innovation in developing countries to which Uganda belongs, it might not be spread over the whole country. Each participating school was sent one questionnaire, which was to be completed separately by one of the school management personnel namely the head teacher (principal), the deputy head or deputy principal, director of studies or any person knowledgeable about the CIS. The response rate was 100% after follow-up activities. Descriptive statistics were applied, namely frequencies and cross tabulations, corresponding to the selected variables studied in the Visscher model (1996; 2001). Moreover, a regression analysis was done on those variables considered to most predict CIS usage so as to confirm a linear relationship between the factors studied. The five selected variables cover aspects of the quality of CISs, features of the implementation process, and the characteristics of schools in which CISs have been implemented relatively successfully. Respondents' scores were transformed into normalised scores, allowing their mutual comparison, and thereafter variables assumed to meet the linear criteria on system usage were

entered into stepwise regression analyses on the use of CISs by school management personnel.

4   RESULTS

The survey mainly focused on fifty-five big and well-developed secondary schools in Uganda. It is astonishing that 38% of the selected schools (22% government-aided and 16% private schools) declared themselves non-users of CISs perpetuating the notion that developing countries like Uganda are advancing at snail-pace in regard to ITEM. Despite this relatively low turnout, optimism was restored by a total of thirty-four schools (a user response rate of 100%) responding to the survey of whom 56% were privately owned and 44% government-aided, all returning well-filled questionnaires acceptable to the researchers. Schools with 500-1000 students on roll were 54% and schools having over 1000 students on roll were 46%. Follow up from the researchers notwithstanding, it was impossible to increase the response rate because all responded. Due to time and financial constraints, the researchers decided to focus on responses of the CISs users from the thirty-four schools because the selected and therefore research schools represented the whole range of schools in the population using the CISs based on their size and type. Moreover, without obtaining results from and paying attention to these (part of) selected schools in Uganda, such a study, in all probability, would be unfeasible. We now adapt the results to the research questions in section 2.1 above.

4.1   Computerised School Information Systems Used

The findings reveal that there is a variety of CISs that are used in secondary schools in Uganda, which are both locally and externally developed. It is interesting to note that over 70% of the systems used are locally developed either by commercial software vendors (74%), or the school staff (18%), or individuals with knowledge in computer programming (8%). The locally developed systems are called ledger works, sysplus, school management information system, student information management system, school management system, accounting s/w, dehezi and the multi-user computer system. Some of the local systems developers include Kampala computer centre, and individuals with knowledge about computer programming. Software programmes reportedly used as CISs in some schools include Microsoft products like Access, Excel, Word, and Microsoft Money and Office automation systems, or End User computing system from

the U.S.A. Other externally developed CISs include Smart force training from India.

4.2   Degree of CIS Usage

Eight CIS-modules were identified which included student records, student assessment, student attendance, staff records, timetabling, programme schedule, financial monitoring and planning, and library management. Table 1 illustrates percentages of respondents reporting whether the modules are included or not included in the CISs used. The results portray that the most common modules on any CIS are financial monitoring and planning, student records and student assessment. The least available modules are library management and student attendance.

A further analysis of the extent of use shows a large percentage of use of the most common modules of CISs to support managerial decisions.

Table 1: Modules included in the Ugandan computerised school information systems

	yes	no
	%	%
Student records(personal data)	90%	10%
Student Assessment(test scores)	83%	17%
Student Attendance	46%	54%
Staff records	68%	32%
Timetabling	59%	41%
Programme schedule	67%	33%
Financial Monitoring and Planning	91%	9%
Library Management(records)	39%	61%

In Table 2, results on frequency of module usage to support managerial decisions portray that, 43% and 13% of the respondents use 'financial monitoring and planning' every week, and once a year respectively. 'Student assessment' is the most commonly used module every month with 31% respondents.

The 'programme schedule' is most used a few times a year by 40% and finally, the 'library management' module with 50% of respondents noting that they never used it at all for supporting managerial decisions. The financial monitoring and planning module is the most commonly used module, and student assessment is procedurally used every month to compute students' monthly test scores.

Table 3 shows the percentage of school management personnel using the CISs in hours per month. Of the 100% respondents in the sample, 60% indicated that they both directly and indirectly used CISs with variation in time of use. The questionnaire defined former as using the system oneself (school managers) and indirect use as use of information (mainly printouts)

Table 2: Managerial use of modules included in computerised
information systems

	never	every week	every month	few times a year	once a year
Managerial use of students' records	12%	27%	19%	31%	11%
Managerial use of student assessment	12%	15%	30%	31%	12%
Managerial use of student attendance	38%	29%	12%	21%	
Managerial use of staff records	24%	14%	24%	33%	5%
Managerial use of timetabling	33%	10%	18%	29%	10%
Managerial use of programme schedule	27%		27%	41%	5%
Managerial use of financial monitoring and planning	7%	43%	20%	17%	13%
Managerial use of library management	50%	18%		11%	21%

received from other staff using the system.

The data in Table 3 below illustrates that the time investment for the direct use of the CISs is highest ranging between 1-10 hours per month implying less time in indirect use. On the other hand, the levels of indirect use are significantly higher between 11-30 hours per month. Even for the category 'greater than 30 hours' it is reasonably higher than direct use. This is an illogical result for a school manager but it is offset by the fact that the respondents were mainly heads of the computer studies departments in schools (an average of 59%) implying that they were knowledgeable about the available CIS. The other respondents namely the head teachers or principals, the deputy heads, and the director of studies constituted of 12%, 14%, and 15% respectively. This indicated that perhaps the head teachers or principals rarely directly used the systems available in their schools but frequently depended on the printouts provided by other users.

Table 3: Percentage of Direct and Indirect
Users in Number of Hours per Month (n=33)

	Direct use	Indirect use
0 hour	3%	3%
<1 hour	6%	
1-4 hours	33%	12%
5-10 hours	27%	18%
11-20 hours	6%	21%
21-30 hours	12%	27%
>30 hours	12%	18%

4.3   Perceived CIS Quality

This research question concerns opinions of the school management personnel on quality of CISs. On the question of whether the system provides information they need 12% replied that it does a little, 50% to some degree, 27% much and only 11% said it very much provides this. About 70% of respondents expressed the opinion that their systems always worked. Of the remaining 30%, 64% had one to three system problems a month and 36% has between four and seven problems.

Users have the following opinion (Table 4) on several aspects of the quality of data retrieved from CISs. Over 75% of respondents consider the accuracy of the data to be (very) good and so do respondents between 50%

to slightly above 70% on other aspects such as up-to-date information, completeness of information, management support capacity, on-screen retrieval and print out speed. School managers ranging between 10-35% are neutral on all the attributes of CIS data quality, yet according to 5-25%; retrieved CISs data is (very) poor.

Table 4: Aspects of computerised information
systems data quality

	(very) poor	neutral	(very) good
Accuracy of information	9%	15%	76%
Up-to-date information	12%	26%	62%
Completeness of information	21%	29%	50%
Management support capacity	13%	33%	54%
On-screen retrieval speed	24%	9%	67%
print out speed	6%	21%	73%

4.4   Process of Implementation

Research question four refers to the features of the implementation process through which the CISs have been introduced into the selected secondary schools in Uganda. Of all the respondents, 12% did not receive any training to use the CISs, 41% were trained for 1-4 hours, 30% of the users received between 5-20 hours of training to use the CISs while only 17% were trained for more than 30 hours.

Pertaining to problems with the CISs, 21% of the respondents were (very) unhappy about the ease with which they get help from within the school in case of difficulties, and 41% reported that it was (very) hard to get help from outside school. Generally, 60% of the CISs users often to very frequently solicit help from the system administrator. Similarly, 30-50% use self-support (work on the problem themselves) or seek assistance from colleagues within the school. On the contrary, approximately 60% of the school managers very rarely used support from the external colleague and/or the user manual/guide as sources of help. Concerning the extent to which the goals for the introduction of the CISs are clear, 88% noted they were very

clear, In addition, 62% indicated that the means and activities by which these goals could be met are very clear, and 32% remaining neutral.

Table 5: Hours of training (%)

	Amount of training
0 hour	12%
1-4 hours	41%
5-10 hours	15%
11-20 hours	15%
>30 hours	17%

4.5 School Organisational Features

When the CISs were first introduced in schools, only 12% of the respondents did not expect the system to help them in their jobs. Over 80% of the schools used manual systems prior to the installation of the CIS and only about 15% of the schools had other CISs. An inquiry into the level of motivation to work with the system revealed that 62% were (very) motivated and 12% (very) unmotivated when the CIS was first introduced in their schools. Experience in using computers either at home or work is generally low.

4.6 Effects of CIS Usage

The use of the CISs has had several effects at school level. Table 6 presents some of the outcomes and it can be observed that higher percentages are registered on the positive side starting with 40%-60% of respondents indicating insight into how the school functions had improved. Over 80% of the respondents reported (much) better evaluation of school performance. Utilisation of school resources (over 60%), information for curriculum planning (53%), and between 20-50% on internal communication with colleagues was better. However, it is only internal communication with colleagues that registered a reasonable negative percentage of about 23%. Stress (66%) and workload (69%) have lowered through using the CISs
Note: the table does not contain the percentages for the 'same' response category. The difference between 100% and the sum of the percentages for

the positive and the negative answers concerns the percentages of respondents who neither observed an improvement nor deterioration.

Table 6: School Level Effects of the Use of computerised information systems

	worse (negative)	better (positive)	much better (positive)
Insight into how the school functions	3%	43%	13%
Evaluation of school performance		53%	28%
Utilisation of school resources	3%	61%	13%
Information for curriculum planning	9%	53%	16%
Internal communication with colleagues	23%	23%	32%
Workload	6%	41%	25%
Stress	9%	47%	22%

4.7   Factors Related to Extent of CIS Usage

This research question focuses on the factors that have a relationship with the magnitude of CISs usage in Uganda. On closer scrutiny of how far the degree of CIS usage is determined by (some of) the influential factors in the Visscher model (1996a; 2001); those that the researchers identified as the most potential predictors of CIS usage were entered into regression analyses on direct and indirect use. Five variables were selected that included start motivation, computer experience, training, information quality and support from the systems administrator. The first four variables were based on earlier studies done which reported that they are predictors of CISs (Visscher et. al., 1999; 2003). Support from the systems administrator is considered because Uganda being a developing country and ITEM being a new field, direct users need immediate help. Upon computation, three variables were considered non-predictors of CIS usage in Uganda and consequently excluded from the

model on both direct and indirect use. These variables are start motivation, information quality and computer experience. It is the implementation factors of amount of training and support from the systems administrator that present proof of explanation of variation in direct use by the school management personnel as illustrated in Table 7.

Table 7: Results of Regression Analysis on CISs usage

		Direct use
Variable	Coefficients	School managers
1. Amount of training	Beta*	0.38
	Bstand*	0.39
	Sign. *	0.02
2. Support from systems administrator	Beta*	0.75
	Bstand*	0.61
	Sign. *	0.00
	R square	0.35

*Beta = unstandardised Beta; Bstand = standardised Beta; Sign. = Level of significance

The results in Table 7 indicate that thirty-five percent of the differences in the extent of the school management personnel direct CIS usage are explained by the variances in the variables 'amount of training' and the 'support from the systems administrator'. Overall, the latter variable has proven to be the most powerful explanation of variation in CISs use as is almost twice as influential as the former (.39 versus .61).

5   CONCLUSION AND DISCUSSION

The findings in this exploratory study portray the fact that Computer Assisted School Administration (CASA) in secondary schools in Uganda is just approaching the initiation stage in CIS development (Visscher, 2001). This is well-illustrated by 38% of the selected schools that are non-users even in these districts with most of the well-developed schools in Uganda, which indicates that it would be even worse in the poorer districts. Moreover, the basic usage available is concentrated on clerical work.

Developing countries have lagged behind in school administrative computing (Visscher, 2001). However, 70% of the CISs in Uganda are locally developed and commercial software vendors comprise 74% of the developers. With this trend, one could suggest that the future of CISs in

Uganda is promising and that for the other developing countries, ad hoc CISs can be developed without multi-million investments.

The CIS quality is low; only one third note that CISs provide the information they need perhaps due to lack of a common design strategy. On the process of implementation of CISs, user training was limited, for example, about 12% of the users received no training and 41% were trained for 1-4 hours to use CISs. Respondents were (very) unhappy with the accessibility of internal and external help. Most of the respondents (60%) sought help from the systems administrator while some solved the problems themselves. Computer experience was quite low being a symptom of the less vigorous use of information technology in developing countries. The level of indirect use is higher than direct use (only 1-10 hours per month).

Respondents are (very) positive on effects of CISs. Evaluation of school performance and school management were reported (much) better. It remains to be verified if the findings hitherto highlighted can scientifically hold and whether other factors apart from mere CIS usage are important, if not equally important. Computers as tools that simplify work is indisputable but may not wholly be responsible for the school improvements noted above, otherwise all schools having CISs would be impeccably the best performers.

Support from the systems administrator and amount of training are factors that explain the observed variance in the direct usage of CISs in secondary schools in Uganda. It is therefore worthwhile that any investment in design and implementation of CISs considers increasing the amount of training for the intended CIS users, and hiring the services of systems administrators in schools where CISs are introduced.

Comparatively, studies on CIS usage in Hong Kong, Netherlands, and the United Kingdom (Visscher studies) have revealed that the degree of CIS usage is by large for clerical purposes. The direct and indirect use of the CISs in the Visscher studies varies with the system administrator and clerks scoring high on direct use while principals are more of indirect users. The results in the Ugandan study are not any different from these findings.

Moreover the Visscher studies returned training as a relevant variable, possibly because it can be used to motivate the target group to use the system and clarify the goals and methods of the innovation process (Fung et. al., 2002). Much as the study in Uganda notes that amount of training is an important factor determining direct use; it also echoes the support from the systems administrator as an extraordinary implementation factor. This latter variable has not been proven its significance in the Visscher studies but Haughey (2003) reports that Telem (1997) focussed his study on the new role of the school computer administrator. Haughey further notes that in comparably large high schools, a site technologist was often hired to deal

specifically with the network and its applications, marking unusual data and checking if these data were followed up. This partly presents a defensible ground for the Ugandan finding.

In the Visscher studies, the systems administrator is second to the users solving the problems themselves. In the Uganda study, the systems administrator is the leading source of help partly explained by the naivety of the school managers in computer operation. Indirect use in the Ugandan study has not been explained by any factor, unlike in the Visscher studies.

It is recommended that the critical factors (amount of training and support from the systems administrator) are cautiously nurtured especially the remarkably determinant factor of training which is reported to have been a prevalent issue in evaluation of information technology systems in industry and commerce (Visscher et. al., 1999; 2003). The system administrator in the school, for instance, is very knowledgeable about the system and its components, and able to provide basic training to the school managers on how to use the system. Training should cut across technical competencies and practical capabilities to managerially use the retrieved data. However, it may demand additional expenses for the already hard-earned CISs, the most appropriate solution being to design and develop robust or less faulty systems with packages of electronic performance support systems from which the users incrementally seek knowledge.

Design and development of a comprehensive school information system comprising numerous modules and/or reports/lists that will be to a large extent, uniform to all schools. But this requires commitment of colossal sums of money, which developing countries may not readily have. Alternatively, governments of developing countries like Uganda could opt for importation and adaptation of sophisticated CISs from the developed countries to specific features of their school contexts. This may save money and time required in evolving a formidable CIS.

Finally, this exploratory study projects that if these recommendations are met, the probability that CISs usage will increase is very high. It is speculated that the findings of this study will stimulate further research on a wider population and in other developing countries for more authentic generalisations. Moreover the study has shown that the variables in the Visscher model are relatively appropriate for testing CISs usage and its impact on secondary schools in developing countries as well.

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