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Risks in the Collaborative Development of Management Information Systems (MIS) by Nigerian Universities

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ABSTRACT

This paper discusses the risks in the collaborative development of an MIS application by Nigerian universities. The study uses observation, interviews and Delphi study in presenting its findings. The viewpoints of the Directors of the project were solicited. The findings indicate that funding of the project, top administrators' commitment as well as the role of the external donors are among the topmost risks. The implication of the study is discussed and future research directions given.

INTRODUCTION

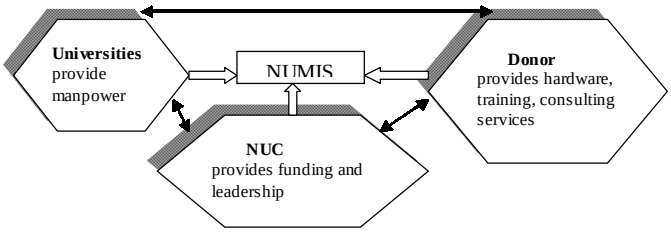
Realistically, universities across the globe generate voluminous amounts of data almost daily, due to the nature of their administrative and research activities. In order to make effective use of such generated data; the use of management information systems (MIS) have been utilised by many higher learning institutions in many parts of the globe (Simon, and Fielden, 1998; Walko, 1999; Stedman, 1999; Gordon et al., 2004). Realising the need to manage information effectively for all the stakeholders in the university system (NUC, 1989), the apex body responsible for higher education in Nigeria - The National Universities Commission of Nigeria (NUC) – came up with the plan to develop an MIS to handle students, staff and financial records in an integrated fashion, for Nigerian universities. The project is named NUMIS – Nigerian Universities Management Information Systems, and it is to be collaboratively developed.

Our definition of collaborative MIS development refers to the environment where groups from differing sources such as the local universities, NUC functionaries and external consultants participate in the development of an MIS project. NUC provides the funding, leadership and office space; the participating universities bring the manpower (staff) and the British Council (BC) through Overseas Development Administration (ODA) supplies training/consultancy services as well as the take-off hardware for the pilot universities. Though, the collaboration extends to 22 universities, only four (4) universities were selected as pilot universities for the project. At about the time the MIS project was planned, most of the universities were basically using different ad-hoc software, which were inadequate for handling the main functions in a university environment (NUC, 1994). The proposal to develop an integrated software system that will be largely funded by the NUC was therefore, an attractive option. Having produced the requirements specifications and the design report, the Technical Committee (TC) was faced with the task of deciding whether to develop the software in-house or acquire appropriate software from outside developers. A number of factors informed the decision to go for in-house development. Firstly, a survey of the application software market at that time – early 1990s - could not identify an integrated, scalable, multi-platform product that fits all the stakeholders' requirements. Moreover, none of the vendors approached showed willingness to part away with the source code. The project cost is approximately $250,000 and lasted for five years, between 1990 -1995.

Universities in Nigeria are not known for cooperating with themselves (Ojo, 1996); yet, in this instance they showed willingness to collaborate on this project because of its perceived benefits. Moreover, the burden of funding is borne by other parties. See Figure 1. for the NUMIS project composition. Additionally, the approach is appropriate considering the similarity regarding organisational and cultural values existing in Nigerian universities. Lund (1998) notes that one reason why universities collaborate is the similarities in the activities of such institutions. Importantly, similar collaborative approach in developing IS within universities is not a novelty; some universities around the globe have used such an approach (see, Lund, 1998; Fielden, 1998). Lund (1998) gave brief accounts of where African universities collaborated in developing computer-based MIS for their use. For example, "In South Africa, the universities of Stellenbosch and Pretoria are collaborating with Potchefstroom University for Christian Higher Education to develop integrated computerised administrative systems … and staff at the University of Natal are "working closely" with Mangosuthu Technikon to implement, develop and train staff in the use of a new Executive Information System (EIS)" (Ibid, 1998, p. 24). However, these studies do not focus solely on the risks associated with developing MIS collaboratively, which is the main objective of this paper. Furthermore, the nature of collaborative MIS development in Nigeria may be different from South Africa's; although, the benefits sought in the South African cases and this Nigerian case appear to be similar (NUC, 1989); namely, cost-effectiveness, increased standardisation of systems and procedures.

It goes without saying that as MIS projects are initiated and implemented; there are risks every step of the way. To this end, we will attempt to present the sorts of risk factors that surfaced as NUMIS is executed. This is important because the findings could elaborate on the nature of risk factors that may plague the development of an MIS project from the perspective of a developing country such as Nigeria. Further, it is worthwhile to comment that some UK researchers have come up with a framework for managing IS projects in higher education (Anonymous, 2002). In reality, such an effort might have been done in the context of that society – highly developed. One might argue that using such a framework for a region of the world whose MIS project risk factors - specifically those peculiar to higher-learning environments - have not been adequately studied may bring no good at all. Overall, very limited information exists with regard to risks that might arise in the course of developing IS projects within university set-ups in Africa with the exception of a few anecdotal accounts gleaned from the work of a few commentators (Lund, 1998; Fielden, 1998; Nwamarah, 2002; Uwadia et

Figure 1. NUMIS Project and Actors



al., 2002). That said, this paper aimed at shedding light on such risk factors in collaborative MIS development in the context of Nigerian universities, which may have implications for practice and research for universities in similar settings. Specifically, the paper aims to answer the following research question: What are the risk factors involved in collaboratively developing MIS for Nigerian Universities? The remaining part of the paper is organised as follows: Firstly, a review of IS project risk factors is discussed. Secondly, an overview of the collaborative MIS development in Nigerian universities is presented. Thirdly, research methodology is dealt with. Lastly, the implications and conclusion of the study are given.

LITERATURE REVIEW

Developing any IS, whether it is based in any commercial organisation or within a university environment, is an activity that is fraught with risks (Lucas, 1981; Karolak, 1996; Charette, 1989, 1996; McFarlan, 1981; Stedman, 1999). And, when such project risk factors are not properly or successfully managed (Boehm, 1991; Lyytinen, 1988; Charette, 1989, 1996; Flowers, 1996) failure is the inevitable outcome (Ewusi-Mensah and Przasnyski, 1994, 1995; Lyytinen, 1988; Lyytinen and Hirschheim, 1987). Risk in this paper refers to a particular aspect or property of a development task, process, or environment, which if ignored, will increase the likelihood of a project failure (Ropponen and Lyytinen, 2000). In a similar vein, our notion of a successful MIS project is one in which a particular MIS project meets its set objectives and goals, cost escalations is minimal and/or manageable, end-users' satisfaction and management support is gained, to mention but a few. Conversely, a failed MIS project refers to an initiative where the stakeholders experience significant undesirable outcomes (Heeks, 2002b; Lyytinen, 1988; Standish Group, 2001).

Interestingly, Al-Wohabi et al. (2002) has observed that most of the existing literature on risk factors affecting IS implementation, tend to focus more on commercial/business entities than on government or state – controlled concerns, of which some universities are a part. In Nigeria, government own and control up to 90% of all the universities in the country. Likewise, a majority of studies on risk factors also come from the developed world. This present study uses both a government-owned entity and the research setting is in a developing country. Recently, a few studies investigating risk factors in IS development and implementation in the developing countries have issues relating to social, cultural, technical and organisational factors predominating (see, Tettey, 2002; Mursu et al., 2002;2003). In general, several risk factors are associated with IS project development and implementation, a few of the widely discussed ones are presented in Table 1. See the work of Wallace and Keil (2004) and Schmidt et al (2001) for a more comprehensive list.

Table 1. Information Systems Developments Risk Factors

Risk Item/Factor	Reference sources
Project size	McFarlan, 1981; Barki et al., 1993
IT illiteracy among users	Ojo, 1996; Ododra et al., 1993; Mursu et al., 2000
Resistance to change	Tettey, 2002; Anderson and Narasimhan, 1979
No or inadequate planning	Standish Group, 2001, Lucas, 1981
Lack of required IS skills in team	Schmidt et al, 2001; Barki et al., 1993
Lack / insufficient of funding	Mursu et al. (2003), Barki et al., 1993
Lack of effective PM skills	Land and Somogyi, 1987, Standish Group, 2001
Lack of top management support	Beath (1983), Schmidt et al., (2001)
Inadequate users' training	McFarlan (1981), Jiang and Klein, 2001
Complexity of the project	Zmud, 1980, Beath, 1983
IT illiteracy among top management	Ojo, 1996; Mursu et al., 2000; 2003

Table 2. Participants' Demographic Profile

Size	6
Age	Mean: 52 years
Gender	Male: 100%
Job Title	Director(4): 66.7% Deputy Directors(2): 33.3%
Education	Bachelor's (1); Master's (4); Doctorate: (1)

Specifically, with respect to collaborative MIS development projects within university environments, other risk factors may also arise. Such include the size or number of the participating institutions and the organisational / cultural fit between the participants (Lund, 1998). Furthermore, the activities of external donors in the project may pose a problem as well (HMSO, 1997; Udo and Edoho, 2000).

METHODOLOGY

Firstly, this study is carried out using a combination of methods; observations, interviews and a variation of the Delphi study. The multiple methods were chosen for the purpose of data triangulation. The viewpoints of the projects' influential participants were sought. One of the co-authors was involved in NUMIS at that level. Also, NUC reports on NUMIS' risks and constraints (NUC, 1995, 2000) were consulted. Secondly, a variation of the Delphi study (Kendall, 1977; Schmidt, 1997) was used. The Delphi study started with interviews - akin to brainstorming - with the participants about what the project risk factors of NUMIS were; they were asked to list such. Furthermore, the items generated were compared with NUC's publications. Lastly, a final list of 13 factors got collated and was administered to the participants to rank. The relative ranking order of each item is shown below. Also, their demographic profile is shown in Table 2.

RESULTS AND DISCUSSIONS

The Kendall's *W* coefficient of concordance for our participants is **0.833**, which is an acceptable value for this kind of study (Schmidt, et al., 2000). Basically, the Kendall's *W* coefficient of concordance is anchored thus; 0 (no agreement) and 1 (total agreement).

- *Funding*: For the NUMIS project, the funds were available until 1995; thereafter, it became increasingly difficult to secure more funding from the project sponsors. This meant that the migration of the software to most of the non-pilot universities became stalled. According to one participant, "… [the] project became stifled with time because of the lack of money".
- *Top management commitment and support*: A national implementation committee controls and monitors the project development stages; the committee sets out policies for NUMIS. NUC (2000) report indicated that commitment of that body shifted elsewhere with a change in the top leadership of NUC. A new university-wide MIS project was conceived. NUMIS is about software on students/ administrative computing, whereas the new project focuses on network infrastructure within Nigerian universities.
- *Project team composition and stability*: For the Nigerian MIS project, all personnel involved in the project were full-time staff of either NUC or the participating universities. They worked part-time in the project basis and are released when required by their respective employers. Inadvertently, this impacts the project negatively as members leave the team and new hands are brought on.
- *Technical complexity and team expertise*: Several researchers have written about the risk factor associated with the technical complexity (McFarlan, 1981; Beath, 1983; Barki et al., 1993) of the project and the technical know how of team members (Standish Group,

Table 3. Relative Ranking of Risk Factors for Collaborative MIS Development in NUMIS

	Risk Factor	Min	Max	Mean	Std. Deviation
1	Funding	1	3	1.83	.75
2	Top Administrators commitment	1	5	2.17	1.60
2	Project team composition and stability	2	6	3.67	1.86
4	Technical complexity and team expertise	1	9	4.50	2.59
5	Role of external donors and consultants	4	7	5.33	1.03
6	Artificial Deadlines	4	8	6.00	1.41
7	Project management skills	3	8	6.00	2.37
8	Number of the collaborating institutions	7	9	7.83	.75
9	Users' commitment and support	6	10	8.67	1.37
10	Lack of IT literacy among users and top administrators	4	13	9.83	3.13
11	Organisational or cultural affinity	11	12	11.17	.41
12	Proximity of collaborating universities	10	12	11.50	.84
13	Intellectual property right ownership	10	13	12.50	1.22

2001; Anderson and Narasimhan, 1979; Wallace and Keil, 2004). In regard of NUMIS, the software architecture was jointly produced by the TC, whilst coding and testing were performed by the Programming Team (PT) under the supervision of the TC and external consultants from ODA. The TC and PT were selected from the universities and NUC. Though, the development was successfully carried out within schedule; there were risks associated with using a team with inadequate expertise. And, "Some had to be retrained while the development was on", according to one participant.

- *The role of external donors and consultants*: The level of expertise in IS project management and implementation in Nigeria, like any other developing country, is limited (Heeks, 1998, 1999; Odedra et al., 1993; Ojo, 1996; Woherem, 1996; Arunkumar, 1999; Ifinedo, 2004). This explains the option to enlist the services of external consultants and/or donor for such technical activities. In the case of NUMIS, there were schisms between the external consultants and the local TC members. For instance, the TC in its System Design Report (NUC, 1991) had recommended a multi-user/ network hardware, UNIX/NOVELL operating system, C++ programming environment and an ORACLE backend. For some inexplicable reasons, these recommendations were not adopted; rather ODA supplied stand-alone microcomputers, DOS and DBASE IV to each pilot site. This could be interpreted as the influence of power. As ODA wielded power in the project, there views hold sway. Consequently, the external consultants' action impacted the success of the project. One participant comments that, "For example, in the 1st generation [older] universities with about 20,000 students it would require months to input students records on a PC!; this would have been different in a multi-user platform". Thus, NUMIS' acceptance was diminished by such.
- *Project deadlines*: Delays are among the symptoms of failed projects (Standish Group, 2001). NUMIS was characterised by complaint of delays in deploying the software for the universities. A participant notes that "What was delivered in NUMIS 1.0, which is the first version, excluded financial computing capability as users were getting impatient; and something had to be delivered quickly to allay some fears". Originally, the project was to last for 2 years but delays and postponements took it to 5 years!
- *Project management skills*: Perhaps, the foregoing risk stems from the lack thereof of good management skills. For example, there were instances were scheduled meetings with group members could not hold, project team members drop off due to lack of motivation amongst other reasons. With the benefit of hindsight, the co-author (Uwadia) concurs that many of the problems encountered during the NUMIS project have their roots in poor project management.
- *The number (size) of the collaborating institutions*: Specifically, in the development of NUMIS, it became clear that drawing up requirement specifications with inputs from twenty two (22) universities was a cumbersome task. This inevitably led to longer waiting periods for such specifications to arrive and be incorporated into the design (NUC, 1991).
- *Users' support*: The lack of users' support and involvement is among the top factors contributing to failed projects (Standish Group, 2001). With regard to NUMIS, users' groups offered cooperation and support as much as possible at the early stages of development; however, reports (see, for example; NUC, 2000) later highlighted lack of cooperation in some aspects; namely, non-compliance with the rules/procedures of the software. Further, a participant remarks that "IT illiteracy exists among users, [which] … led to the inability to provide needed information and support and also the inability to appreciate the developed system".
- *Lack of IT literacy among users and top administrators*: This similar to the *users' support* item. Many top university administrators in Nigeria are not IT literates (Ojo, 1996). Upon realizing the impact that such a shortcoming could have on the success of the project, training programmes were organised in clusters for Vice Chancellors, Registrars, Bursars, and Directors of Academic Planning Units by the ODA consultants and the TC members (NUC, 1989; 91).
- *Organisational or cultural affinity*: Though the participating universities are located in differing regions of the country with diverse socio-cultural undertones, the way universities operate in Nigeria is somewhat similar. This is not to say that differences do not exist. For example, in Nigeria some of the universities have enrolment ranging from 20,000-30,000 students, and have programmes that cover the Arts, Sciences, and Humanities; others have enrolment of 10,000 students and focus solely on Technology. This study did not ask for peculiar cultural differences that might have impacted the success of NUMIS; however, NUC reports indicated that the collaborating institutions have "different needs" (NUC, 1991). For the South African universities collaborating in IS development, lack of confidence on the part of some IT staff vis-à-vis more experienced colleagues from other institutions in the partnership was noted (Lund, 1998).
- *Proximity of collaborating universities*: Nigeria is a large country and physical distance could be a constraint. At the outset of the project, only the (4) four pilot universities were involved. This meant that meetings and development activities were held at nearby NUC office spaces; thus, physical distance was not an issue. But later, with the inclusion of other universities from different parts of the country, in the project, logistical problems surfaced.
- *Intellectual property right ownership*: One obvious benefit of in-house development of the NUMIS software as against engaging the service of vendors is that the source code is in the custody of the project sponsors, notably NUC. As enthusiasm over the NUMIS waned in some universities because of the perceived inefficiency of NUC to properly manage the project, such universities resorted to extending the original delivered system on their own. The risk here is that though the MIS software was developed from one source; it has nonetheless undergone varying degrees of modification. The question is: Does the NUC own the IPR for the software? Suffice to say that the objective of this study is not to investigate or comment on such ensuing scenarios.

IMPLICATIONS AND CONCLUSION

This paper has deliberated the collaborative development of a computer-based MIS by some Nigerian universities. The risk factors encountered in the implementation of the project is highlighted. The main risks relate to the commitment of top administrators, funding, the project composition and the teams' technical abilities as well as the role of the external donors. The issue of IPR, proximity of the collaborating universities, their organisational and cultural similarity are among the least risk factors, and perhaps less of a risk and more of a constraint. Overall, the NUMIS project was a partial success in so far as it did not meet all its set objectives – not all the universities that are billed to have it, got the software. And, those that have it complain of some problems or the other; and have since carried out extensions on their own. More so, NUMIS went beyond its time schedule. The implication of this study is that for a collaborative MIS development to succeed, at least, from an African developing country context, some of the risk factors discussed in this paper may deserve a careful attention. For instance, the

commitment of administrators, project management skills (technical and organisational) and the role of external donors could impact on the success of such endeavours. Not to mention the need to motivate and train staff and users alike in order to engender success. In regard of NUMIS, these factors were found to be inimical to the project's success. In that regard, entities considering such collaborative approach may benefit from this case study in regard of the risks factors discussed. Finally, the limitations to this paper include the sample size used and also, the absence of views from other entities such as the users of NUMIS. Future studies may research comparable approach in IS development by universities and other government bodies in Africa, so as to complement the findings, herein.

REFERENCES

Available upon request.