A SERVICE APPROACH FOR INFORMATION SYSTEMS IMPLEMENTATION IN INSTITUTIONS OF HIGHER LEARNING - INTERIM LESSONS.

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Abstract

This paper presents an analysis of information systems (IS) implementation in institutions of higher learning, the key to success or failure of ICT projects aimed at improving performance of the core business processes. The author observes that universities in Africa have been key beneficiaries of funding for technology projects aimed at capacity building. It is also observed that because of the socio- technical constraints prevalent in the recipient universities, most ICT projects are yet to realize the intended performance gains for their mandate of research, academics and learning. Central of the realisation of improved performance are the information systems that support the core business of the universities.

The deployment of the administrative information systems in the university signals the most fundamental transformation in the university operations and the biggest challenge. Successful and timely implementation greatly depend on transcending socio–economic factors. The automated applications and supporting infrastructure can only facilitate a proactive human intervention. The indicators of institutional transformation will then be gauged through efficiency gains and the overall effectiveness of the university in improving institutional performance for both the academic and administrative sector.

The paper proposal and investigation of the IS service approach as a possible solution for mitigation is part of a research project that is yet to be concluded. However, there are some interim lessons drawn from the findings of preliminary case study based on three African universities that provide lessons for the current and future IS implementation for higher learning. The presentation of the academic hypothesis and the interim findings combine to give guidelines for current projects and strategies for future mitigation.

Keywords*: information systems, universities, implementation, service, socio-economic inhibitors.*

1. Introduction

Recent literature has shown a renewed interest in systems implementation research with current trends in the organizational deployment of IT motivating new studies of implementation efforts. The renewed interest is due to the complexities related to systems becoming larger, more distributed, interlinked and integrated across global and institutional boundaries. Much work has appeared addressing the disparity between high technical quality of systems and low success in their effective deployment, (Marble 2000).

The working definition adopted for this research comes from Swanson (1998), who restricted the implementation process, to the systems life cycle stages between design and use. Swanson defined implementation as: "*A decision-making activity that converts a design concept into an operating reality so as to provide value to the client.*"

1.1 University Context –Why universities?

The implementation stage in the systems development life cycle is identified as being critical to the eventual systems impact in improving effectiveness and efficiency of IS. To verify these assumptions, the author analyses case studies from African universities to showcase the risk associated with socio-economic constraints as the reason behind the low performance gains in business processes.

*Universities as unique organisations:*Universities face many problems common to most modern organisations like controlling costs, coordinating resources, stimulating enterprise among staff, Lockwood (1985, p29). However they have differences that make them unique:

- Different decision making process;
- Complexity of purpose;
- Limited measurability of outputs;
- Both autonomy and dependence from wider society;
- Diffused structure of authority and internal fragmentation; and,
- Internal client who is not primarily income generating.

Whereas organizations in general might possess one or more of these characteristics or components, it is the particular combination of the components within universities that make universities “unique”.

It is because of the attributes above that universities cannot successfully adapt their core business processes of research and learning to mainstream commercial IT solutions for improving organizational performance.

1.2 Research Context

In the research context, the socio-technical challenge refers to a deficiency of critical basic factors like skill base, infrastructure, flexible organisational culture and adequate funding, which undermine effective implementation. The majority of organizations with such characteristics are found in developing economies.

Perceived socio-technical challenges affecting IS implementation in the three universities selected for this study, are representative of the majority of African universities, It is worth noting that there are a few exceptions to this perception, where universities have constructed a coordinated ICT policy response and showcase a measure of effective implementation.

The objective of selecting universities based on their similarities is to study and underscore emerging patterns, apply and test cross cutting potential solutions and develop a replicable approach to support improved IS service implementation.

The research context uses two critical success factors defined as:

- *Efficiency:* - IS that work well in executing tasks, while reducing operational costs.
- *Effectiveness:* - Deals with information being relevant and pertinent to the business process as well as being delivered in a timely, correct, consistent and usable manner.

2. Challenge to be addressed

In developing countries, public universities are among the most significant recipients and users of the computer technologies. The study of three public universities for this case therefore, has

wider implications for IS implementation in other public institutions as forerunners in narrowing the digital divide.

It is imperative therefore that these pioneer universities overcome their socio- economic environment to showcase the business gains using ICT in building human capacity.

To support the research premise, the Association of African Universities (AAU) Technical experts meeting on the use of ICT in higher education report, (Sept 2000) cites the poor track record of IS implementation in African universities as a key factor in failure to realize IT supported performance gains in higher education.

The three case studies were undertaken in the universities of Makerere in Uganda, Dar es Salaam in Tanzania and Mondlane in Mozambique. The suitability of this selection for the case studies is explained as:

- Positions as leading, national universities; makes them trend setters in Higher Education. They are the oldest pioneers in ICT deployment in public universities in their respective countries.

  Oldest universities that have excelled in research.
- Currently have on going ISD projects to support policy and management, in collaboration with

  the same universities in Europe, hence the same generic names used to describe the systems.
- Age and size differences for comparison: Makerere started in 1922, current student population is 30,000 students; Dar es Salaam started in 1961, has 7,089 students; Eduardo Mondlane: started in 1962, has 7,368 students.
- Rapid increase in student enrolment.

The case studies aimed to verify the following assumptions as the IS implementation challenge in institutions of higher learning in transition/developing countries:

- Traditional IS implementation methodologies leading to proprietary IS cannot adequately support the implementation process to overcome the socio- technical challenges hindering effective IS implementation in the three universities.

- Current IS implementation is de-benchmarked. There is formalised performance measurement, assessment, review, design/reengineering for the current IS implementation to assess IS effectiveness and efficiency in supporting the core business processes of the universities.

- There is need for a Support environment for the development, application and assessment of service based IS required to find a suitable change alternative for improving efficiency, effectiveness and sustainability of IS implementation in the universities.

The above premise is the basis of the research questions:

How can African Universities support their implementation and adaptation of a service-based IS to:

- *Improve quality of the implementation process?*
- *Improve efficiency of the resulting IS services?*

3. Research Parameters

The priority issues from the case study based on the comprehensive framework of research variables and how they relate to the critical success factors; *Effectiveness, Efficiency,* are listed below:

3.1 Current situational factors

- Size, age
- Location,
- Technology environment,
- Culture, and,
- Communication infrastructure.

Situational factors also contribute to the Complexity and uncertainty of IS projects and the management and delivery of ICT services. The (Euromethod94) defines complexity as the difficulty encountered in managing the available knowledge or situation. Uncertainty is defined as lack of adequate knowledge to manage the problem situation or the gap between the amount of information required to perform the task and the amount of information possessed by the organisation (Galbraith77).

3.2 Preconditions

- Information policy and planning,
- Centralization and decentralisation of activities, hardware, software financial resources, personnel allocation, and,
- Standardization.

3.3 Users

- Categories
- Skill levels
- Location
- Values/expectations

3.4 Entity relationships

- Entities
- Relationships (i.e. support, exploit, manage, employ, respond)
- Influences- economic, managerial, technological, donor, cultural

3.5 Processes

- Establish whether current processes are:
  - -Recognised
  - -Cost effective and on schedule
  - -Planned and practiced
- Technical training availed, enforced and measured, related to SLAs
- Organised as a service, predictable with structured actions

3.6 System Components

ICT :

- Hardware –PCs, printers, scanners etc
- Software – System, application

- Network components
- Complexity factors –quantity, cohesion, distribution, ownership

3.7 Implementation strategy

- Activities- procurement, installation, training, management
- Cost

3.8 Maintenance

- Items
- Cost.

3.9 Impact

- Benchmarks
- Performance
- Assessment

4. Hypothesis

4.1 An approach to support service-based IS implementation can minimize the negative impact of socio-economic constraints to:

- Improve the quality of the implementation process, and,
- Improve efficiency and effectiveness of the resulting IS services.

4.2 A service based implementation would promote inter-organisational implementation of IS services thus optimize scarce resources and increase effective adaptation of IS for core business processes in universities.

4.3 A service based implementation would reduce/minimise user cognitive requirements and increase acceptance and use of systems.

The above assumptions are supported by the research premise*, which recognizes the management of IT/IS as a critical support function to the university but not the core business.* It is the contention of the author *that this additional responsibility can be regarded as of little strategic importance and further strain to scarce resources in African countries.*

5. Contribution to the body of Knowledge

- The research proposes service based implementation supported by combinations of core info rmation technology tools and development methods known as **Suites** for design and delivery. These suites are embedded in the support processes that Sol and Keen, [03] refer to as **"studios"**, focused on provision of experiential process methods, in an interactive enviroment. Their main purpose, to generate *the best product within the constraints of cost, time, program and topic*. The effectiveness of a studio rests on its processes, which fundamentally involve people and collaboration. The service approach supported by a studio enviroment is the appropriate solution to bypass the risk and minimise the impact of implementation inhibitors (long training cycles, customization and IRM management skills, human factors e.g. user mindset and economic resources).
- The research proposes a practical aid to the understanding of the development context risk in IS implementation and its mitigation in organisations, particularly universities.
- The application of a decision support environment for different IS development contexts through

the studio approach adds value to the current implementation studies through:

- Revolutionary method based on proof from tested organisational parameters against the proposed system; and,
- Bypasses traditional methodology boundaries so far proposed for the IS implementation domain by utilising a studio environment to support the decision making process.

6. Research benefits

The output of this research is a replicable support environment enabled through a combination of DSS and IS development tools that will enable universities to:

- Define and develop appropriate models for effective and efficient IS implementation by supporting the requirements elicitation process and mitigating risk areas within their particular developmentcontext;
- Identifying suitable methodologies for implementation and roll out;
- Optimise scarce resources by adopting a resource context business model; and,
- Monitor and evaluate IS implementation parameters on a continuous basis and proacproactively devise solutions for adaptation to the changes in the organisational environvironment.

7. Interim Lessons

Case study research from the three universities indicates:

7.1 Lack of Performance Measurement (PM)

- A lack of documented benchmarks for ICT performance used in these universities;
- No procedures and deficient tools for proactive routine assessment on IS performance; and,
- Lack of crisis review of efficiency of business process supported by ICT.

The lack of performance data for the current IS in the universities creates a gap for comprehensive evaluation that should be addressed by the research.

A key intermediate out put to the study is the identification of the parameters for the development of performance management criteria and development of PM applications to assess IS performance in the case study universities.

In performance measurement, comparison of the descriptive, prescriptive empirical model will require both qualitative and quantitative parameters to evaluate impact of the research intervention. E*mpirical evidence of ICT performance measurement based on measurable indicators in the universities should be presented to enable a scientific evaluation of IS efficiency in supporting the business processes. Such indicators should be based on objective but context relevant performance benchmarks applicable to each university.*

7.2 Preconditions -Policy formulation

The development of policy guidelines for the implementation and usage of ICT services and systems as the precursor to ICT deployment should be underscored. It is apprent from the preliminary case studies that unviersities that have taken this approach have met fewer constraints. They have mobilised user awareness and ownership of the new technologies through wide participation of users in a policy formulation process. Internal policy leaves owners not donors to define priorities and direct process.

7.3 Implementation process

Limited skills and facilities for in-house systems analysis and software development have led to higher implementation costs and longer training cycles for both user and managers. This is one area where the inter-university collaboration on standards and benchmarks would further support optimization and development of limited skills to sustainable support regional/inter-university IS applications. Inter-organisational sharing of scarce resources is gaining ground in commercial enterprises. Universities in Europe have successfully developed consortiums for development and maintenance of administrative IS. African universities should explore the strategies for an African consortium to optimize resources.

Observations of implementation constraints:

- In two of the case study universities, there is an operational ARIS limited to generating the nominal role and no student interaction in executing student data managementfunctions.Students are not aware these systems exist.
- Lack of a coordinated implementation strategy has led to redundant/premature projects that have preceded the dependencies. A case to illustrate this is Smart card project which preceded a central ARIS database for authentication.

7.4 Training

Emphasis has been put on infrastructure at the cost of services. Training of the IRM units in the universities would support this conclusion. Orientation IS training does not exist and it is not catered for in most IRM units. This includes training for application operators and users.

7.5 Sustainability

Most universities in Africa have been reluctant to charge student fee towards the sustainability of ICT services. It is regarded as a political issue. It is inevitable as the donor funding recedes, that this will become mandatory. A few shining examples include one where a 2% institutionalised fee from every unit is charged for bandwidth costs and maintenance of backbone resources. This plan to introduce a student fee as a required level of universal access to ICT is realized.

8. Conclusion

African universities still remain with a challenge to reflect substantial donor investment for ICT projects into high performance gains for operations that support both academics and administration. This challenge will be resolved through careful scrutiny and reengineering of the implementation process.

The approach to support service based IS implementation proposes a solution that will mitigate the socio-economic constraints that have led to the negligible efficiency gains in the deployment of automated IS**.**

The hypothesis for this research is yet to be proved or disproved and hence findings from this research are not yet concluded. The interim research lesson exhibited through case study research still provides African universities with strategies for improving their current IS implementation and implicit performance gains in supporting both academics and administration.

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