

Information Systems Development in a Developing Country: Theoretical Analysis of Special Requirements in Nigeria and Africa

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Abstract

Research approaches on Information Systems Development (ISD) are characterized by diversity, focusing on a wide area of objectives and methods. Nevertheless, the understanding of ISD as a universal phenomenon is less commonly questioned. We can ask if systems development really is the same in Africa as in industrialized countries, because of several differences in contextual factors. We suggest that there are special requirements that should be taken into consideration in systems development methodology in Africa – like sustainability, affordability, socio-economic justification and community participation. We have founded a research programme to develop such a methodology. In this paper we present a research framework for studying ISD as a phenomenon in Africa, and particularly in Nigeria. In addition to a literature review and an empirical survey, the research programme consists of descriptive case studies and an action research part experimenting on adjusted methods in the setting of real-life projects. The first results from the initial phase of the study are presented in a hypothetical rather than conclusive way, suggesting the special requirements of ISD in Africa.

1. Introduction

Information system development (ISD) is an essential part of the diffusion and implementation of information technology (IT). It is broadly defined here as a process by which some collective work activity is facilitated by new information-technological means through analysis, design, implementation, introduction and sustained support [17]. It also includes activities like project management, quality assurance, and software process improvement.

ISD is an intentional change process, driven by certain more or less clear objectives. The resulting changes relate to a number of object systems or perspectives on computer-based information systems [24]. These include the technical perspective focusing on the technical platform, the symbolic perspective

focusing on the information contents, and the organizational perspective focusing on the use of the information system [24] [22]. However, it has been argued that ISD practices and methodologies are not universal as such, but need to be adjusted to any given socio-economic, cultural and organizational setting [3].

Systems development research is a wide area of objectives and methods. Mathiassen [24] gives a nice review of practice-related research approaches including action research (focusing on systems and processes), experiments (field, laboratory) and practice studies (direct or indirect). All these approaches, often in combination, contribute to the building of research-based knowledge in the form of theories and methods. Even if the research approaches are characterized by diversity focusing on different kinds of results, the idea of ISD as a universal phenomenon is less commonly questioned.

Is information system development really the same in Africa, e.g. in Nigeria, as in industrialized countries like Finland, Denmark or the USA? Does the very different socio-economic context in Africa result in different requirements for systems development? The question of how ISD is actually practiced in Africa is very little studied. In this paper we present a framework for studying the special requirements for ISD in Nigeria and Africa, and raise some initial conclusions based on the literature and empirical findings we obtained through a survey. By special requirements we mean issues that should be included in ISD methodologies and education. These hypotheses will be tested by conducting some case studies and by action research.

The rest of the paper is structured as follows. First we state our research problem and objectives and present Nigeria as a context. Then we discuss the applicability of various IS research methods to the problem at hand, and present our research design. A literature review about the special constraints for ISD in Africa is then presented, followed by empirical findings based on the survey. The theoretical and empirical analyses are drawn together into a preliminary list of the special requirements we regard to be important for ISD in Nigeria. Finally we discuss how this list of special

requirements can be validated, further developed, and turned into practice. In conclusion, the contribution of the paper is summarized.

2. ISD practice as a research problem

Information system research is a multi-disciplinary topic and very much a social, rather than an entirely technical science. Its foundations can be found in philosophy and in the organizational and behavioral sciences, as well as in mathematics and the natural sciences. [9]

Land [20] points out that information systems are essentially social systems, having information technology as one aspect. According to him information systems exist in a real world which consists of objects (some concrete, such as machines; some abstract, such as budgets), people, rules (like established procedures), norms (like ways of thinking and practice), and commands (such as computer programs). Information technology applications are just one part of the means or instruments required in a given work activity. Thus information system is not a synonym for a computer application, as it is often in day-to-day parlance.

What makes information technology ‘appropriate’ is the collective human activity within which it is utilized. Accordingly, we define *information system* as [17]:

the use of information technology (manual or computer-based) in a collective work activity, either as means of work or as means of co-ordination and communication.

Correspondingly we define *Information System Development (ISD)* as [17]:

the process by which some collective work activity is facilitated by new information-technological means through analysis, design, implementation, introduction and sustained support.

Traditionally ISD was seen as a project where software applications were developed and introduced, ie. it was always considered to include some programming or software engineering. However, today ISD deals increasingly with adjusting and integrating prefabricated pieces of software to fit the needs of a specific work activity [23]. The development process is composed of activities and relations of different groups of stakeholders such as IS users, IS professionals, management, IS academics, and IS users’ clients.

ISD is an intentional change process and in order to successfully carry out change actions, a development group needs some organized collection of concepts, beliefs, values and normative principles supported by material resources – that is, an information systems development *methodology* [22]. As Lyytinen [22] writes, methodologies must meet several conditions to achieve their change mission in ISD practice.

There is quite little in-depth, systematic empirical research reported on the **actual ISD practice** in any part of the world (as examples, see the MARS [2] and MUST [14] projects in Denmark). In addition, some

ISD methodologies like Soft Systems Methodology (SSM), ETHICS and Multiview are based on an empirical exposure with systems development [4]. Avison and Fitzgerald [5] provide a good overview of some of the major methodologies in ISD. However, none of these methodologies deal extensively with the requirements for ISD we consider important in Africa [17].

3. Research objectives and context

The overall objective of this study is to investigate if and how ISD in Sub-Saharan Africa in general, and in Nigeria in particular, is different from the industrialized countries. The specific objective of this paper is to present a **research framework** for studying such a phenomenon, together with **results from the initial phase** of the study. The results are considered hypothetical rather than conclusive in nature, i.e. a starting point for further empirical research. However, it is important to make the analysis of the first phase available to the international scientific community for potential critique, before proceeding to more detailed testing of them.

The study is part of a larger joint research project by the University of Kuopio, Finland, and the Obafemi Awolowo University, Ile-Ife, Nigeria. The objective of the project is to contribute to the practice of IS development and use by making them more sustainable in the severely constrained context of Nigeria and Sub-Saharan Africa. The project focuses on ISD as practiced in software companies in Nigeria, and aims at developing a ‘Made-in-Nigeria’ ISD methodology which is adjusted to the socio-economic and technological context of the country. The question is what requirements do systems developers in Nigeria have for methodologies and education that are expected to facilitate their work. As Lyytinen [22] notes, the choice of a development methodology should take into account its sensitivity to the cultural, social, political and moral aspects of systems design.

Nigeria is the most populous country in Africa, representing about 20 per cent of the entire Sub-Saharan African population. Nigeria achieved her independence in 1960 and received her national boundaries as a result of a colonial history. The country became a parliamentary democracy at independence but has been under military rule from 1966 to 1979 and from 1983 to 1999. From an economical point of view, a major feature since the 1970s has been Nigeria's dependence on crude oil (over 90 % of total exports). Table 1 shows some basic figures about the population and economy in Nigeria compared to Sub-Saharan Africa as a whole, low-income countries on average, and the USA as a point of reference.

Table 1. Basic World Development Report statistics for 1997 [39].

	Nigeria	Sub-Saharan Africa	Low-income countries	USA
Population in millions	118	614	2,048	268
Total GNP in \$billions	31	309	722	7,690
GNP/capita in \$	260	500	350	28,740

According to the World Bank Country Data [40], the overall economic growth in Nigeria has been very low in the past few years, despite economic stabilization policies that have reduced average inflation from over 70 per cent (1994) to under 10 per cent (1998). The main factors contributing to the poor economic performance have been political uncertainty, poor governance, corruption, and inefficient state-owned firms in the oil, electricity, and telecommunication sectors, leading for example to the erratic electric power supply and poor petrol availability in the country. The structure of the economy in 1997 was (in % of GDP) agriculture 32.7%, industry 46.9% and services 20.4%.

Table 2. World Development Report statistics on telecommunication and information technology for 1996 [39].

	Nigeria	Ghana	Tanzania	South Africa	USA
Telephone lines per 1,000 people	4	4	3	100	640
PCs per 1,000 people	4.1	1.2	..	37.7	362.4
Internet hosts per 10,000 people	0.00	0.15	0.02	30.67	442.1

The first computer in Nigeria was introduced in 1962. The bulk of computer installations are in the Lagos metropolis. The pioneer computer users were banks, the oil industry, government ministries and government-owned companies, and educational institutions [15]. In terms of information technology and telecommunication, table 2 shows some figures about Nigeria in comparison to some other African countries and the USA. The numbers depict a gap between the countries in the accessibility to the global information infrastructure. Eighty percent of the world’s population has no access to reliable telecommunications, and one third has no access to electricity [12] [31]. According to UNDP [34], more than half of the world population has never made a telephone call.

In 1988, besides in-house departments, more than 200 registered companies offered computer-related services in Nigeria [35]. In 1994 there were more than

500 registered computer companies and their activities centered mainly on computer sales and maintenance services, software development and information buildings, computer education and training, word processing and bureau services, marketing and economic research, amongst others [1].

4. The suitability of IS research methods to the study

In order to study ISD, researchers need to understand ‘the ill-structured, fuzzy world of complex organizations’ [4, p. 95]. According to Mathiassen [24], practice-related research approaches on IS development include action research (focusing on systems and processes), controlled experiments (field study, laboratory experiment) and practice studies (direct ones: field and case studies, or indirect ones: surveys and interviews). Most of the practice-related research within IS has been surveys [30].

In order to study the special conditions and requirements for ISD in a previously unstudied context, a **survey** is the easiest way to start with. It provides the researchers with the first contacts with companies and practitioners, and provides some first impressions about software industry in the country. It is an attempt to increase predictive understanding of the phenomena in question. However, a survey alone is insufficient in studying the phenomenon of ISD in any country.

For deeper understanding, the research methodology must be extended to include some **case studies**. Case studies are usually considered as descriptive studies. Our aim is to conduct case studies in a more interpretative manner. ‘Interpretative studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them’ [30, p. 5]. In this approach, the aim is not to create an objective or factual account of events, but a relativistic, shared understanding of phenomena. Instead of a generalization to a population, the aim is to understand the deeper structure of a phenomenon within cultural and contextual situations. The phenomenon of interest is examined in its natural setting and from the perspective of the participants, and the researchers do not impose their *a priori* understanding on the situation.

Surveys and case studies cover a wide variety of approaches to study systems development without an active involvement of the researchers [24]. The weakness with these methods is that they separate research from practice. The researchers observe and interpret the actions and beliefs of practitioners, and the practitioners do not take an active part in the research process.

Action research is a method where the researchers are in close collaboration with practitioners in practice situations. The strength of this approach is the strong integration of research and practice, so that research informs practice and practice informs research

synergistically [4]. The most important weakness is the limited support that action research provides to structuring the research process and findings. Thus the problem is how the rigor of the research can be confirmed. Relatively few sources document the application of action research to systems development. [24]

For the purposes of this study, action research in one or more software companies in Nigeria is the most relevant way to test the validity of the theoretical understanding produced through descriptive and interpretative methods, and to test the applicability of the results to real-life ISD practice in Nigeria. As a result of the feedback, the theory will be modified as well. Action research is possible only after a close relation has been developed with the software companies. That relation can be built during case studies, so that there is a smooth transition from a descriptive case study to action research. The aim is that the practitioners themselves start to influence their work by “improving” it through reflection, facilitated by the researchers. The research is an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning [4].

An ISD action research method called Reflective Systems Development was developed mainly in Scandinavia by Mathiassen and others, starting from the 1970s [24]. In that method, action research is the basic form of practice in research which is supplemented, whenever feasible and useful, with experiments and practice studies. The starting points in this model are the problems, challenges, and opportunities involved in system development practice. The objective is to first understand the phenomenon. The understanding is based on interpretation. Then, in order to support practice these interpretations are simplified and generalized, and engaged in the design of normative propositions or artifacts, like guidelines, methods or tools. Thirdly, the aim is to improve practices through different forms of intervention.

In our case the aim is not to tell systems developers in Nigeria how they should conduct their work, but to create a process in which Nigerian practitioners can reflect on their practices, identify problems and improve the practices by themselves. Mathiassen’s research approach can be applied to that end in the action research phase.

In conclusion, the study of ISD practice in a previously unstudied context must combine descriptive, interpretative and normative methods so that [24]:

- Action research brings relevance to the research process, while supplementary approaches improve the validity and reliability of the research results.

- Combining interpretations with interventions and normative propositions increases the relevance of the research.

Activity Theory provides a theoretical framework for analyzing information systems development as a work practice [7] [15]. For the purposes of this study, activity analysis can be used as an analytical framework in the descriptive case studies and as a work development methodology in the action research phase.

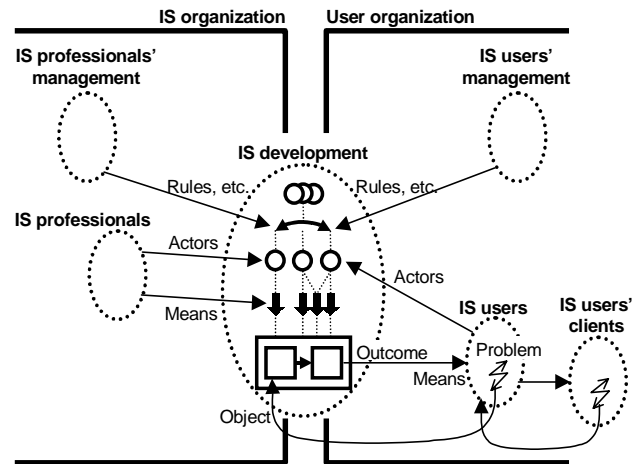


Figure 1: The composition of IS development as an activity.

As illustrated in Figure 1, for analyzing software companies and their relations with clients, the core of IS development can be seen as a temporary activity at the border of two departments, companies or other organizations [19]. Problems in the would-be users’ work activity constitute the object or starting point of ISD, and the outcome should be improved means for the users’ work. The actors come from both sides, thus including users and IS practitioners. The rules and norms of the participants also originate from different realms, and the means of ISD (methods of analysis and software technologies) may come entirely from the IS professionals.

5. The research design for studying ISD in Nigeria

The methodological discussion above leads to the following overall design of the research project (Figure 2). The study has three inputs: 1) literature review of relevant ISD methodologies globally; 2) theoretical analysis of the special requirements in Africa and Nigeria; 3) survey about existing practice and problems among Nigerian software companies, followed by in-

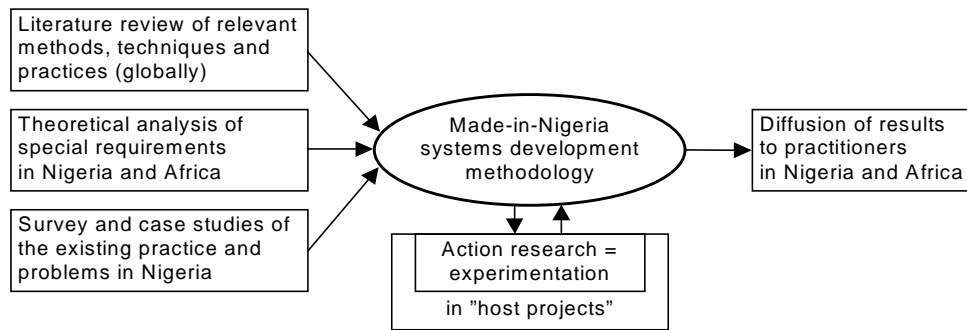


Figure 2: The overall research design.

depth case studies. The inputs are used for formulating adapted ISD methods, techniques and practices specifically for the Nigerian context, which are tested and further developed in an action research manner in one or two ‘host projects’.

The relevant ‘raw materials’ of methods, techniques and practices developed for other socio-economic contexts need to be identified through a literature review. In addition, the general requirements for ISD in the specific context of this study need to be specified through theoretical analysis. The first iteration of these two tasks has been done before [17]. In this paper we continue with the theoretical analysis by focusing on the research methods on ISD practice and the special requirements of ISD in Nigeria and Africa.

The survey is needed to get a ‘landscape view’ of the ISD practices and problems in software companies in Nigeria. The first round of interviews has been conducted [26].

The case studies will examine ISD practices and problems in Nigeria in relation to the theoretically induced requirements. The method will be purely qualitative. The unit of analysis will be a specific project and a developed application (in use). Three software companies have agreed to participate in the case studies: a major foreign-owned software company, a small indigenous software company, and an indigenous company with self-produced applications packages.

The ‘host projects’ provide a testing ground for the intermediate results. The first of these is a project by the Department of Computer Science and Engineering, Obafemi Awolowo University (OAU), aiming at producing and introducing a second-generation hospital and primary health care information system in the OAU Teaching Hospitals Complex. Another host project should be selected from one of the case study companies.

6. Literature review on Africa as a special context for ISD

When we try to identify aspects in which Africa as a context for ISD differs notably from Europe and North

America, we are not suggesting that African people or their cultures would be fundamentally different from people and cultures elsewhere. Rather, we regard that Sub-Saharan Africa’s present situation as the poorest and technologically least developed continent mainly has to do with her inheritance of insecurity and antidemocratic governance initiated by slave trade and colonial occupation [16]. Today the creation of a local software industry in developing countries, indeed in Africa also, is essential, because it is seen as a potential catalyst for socio-economic development [10] [11]. There is extensive literature on the problems within information technology projects in developing countries. Waema [36] provides a good summary of the main issues, which we have supplemented in the following:

1. Many problems relate to **inadequate infrastructure** [33] [6]. The most noticeable of these are poor power supply and telecommunications. In addition, **new technology** and **shortened product life cycles** [21] can cause complex situations. Rapid technological change requires resources to research, develop, manufacture and support technology. New technologies also demand managerial and organizational changes in order to receive maximum benefit from their application. Thus infrastructural development does not follow the rate of technological change. On the other hand, fast technological obsolescence can be a problem.

2. Another group of problems deals with the **shortage of skilled personnel** [28]. This problem relates to **poor maintenance** [25] and **lack of planning and inability to manage change**. IS professionals and managers are not educated in managing complex ISD processes. The education mostly emphasizes software engineering instead of information systems. Thus systems developers in Africa work under severe practical constraints but are less adequately trained to cope with them, compared to their colleagues in industrialized countries.

3. The third group of problems relates to **‘unsupportive public sector culture’** [36] as well as **‘colonially inherited administrative culture’** [16]. Ojo [29] names some ‘socio-cultural’ and organizational

issues influencing the development and outcome of IT applications for example in Nigeria. These issues comprise an over-politicized decision-making process, bureaucratic complexity, and preference for informality. Waema [36] also emphasizes **the lack of a national IT policy**. A national IT policy would give guidelines on how information technology would contribute to the social, economic and political conditions in a country.

4. Many African countries have grave economic and political problems which cause **insecurity of life and uncertainty of future**. This is a formidable hindrance to long-term initiatives like ISD.

Because of the magnitude of these constraints in Africa, the risk of failure in ISD is very high. This makes also the **sustainability** of would-be information systems a major issue. Sustainability usually implies maintaining something that already exists. The term is often equated with 'self-sustaining' and 'self-sufficient', which means that no outside support is needed [32]. In the case of IT, sustainability means the ability to identify and manage the risks threatening the long-term viability of the information system, or of the ISD activity [17].

The key message of the World Development Report 1998/99 for Africa [39] is that most countries on the continent need to do much more, much faster, to increase their knowledge base, to invest in educating their people, and take advantage of the new technologies for acquiring and disseminating knowledge.

We agree that it is particularly important for Africa to include broader organizational, social and political issues into systems development, and that educational and other 'empowering' strategies are particularly important [36] [37]. The technology of information systems is likely to be the same in industrialized and developing countries, but the uses and preconditions differ. Thus ISD in different countries needs to be adjusted to take the infrastructural, organizational, social and political differences into account. [17]

7. Empirical findings on ISD in Nigeria

We conducted 36 interviews in eleven software companies in Lagos in order to get an overview of the software industry. Experience suggests that maybe one out of five of the over 500 registered computer companies of 1994 [1] have software and information systems development activities. Although the sample is relatively small, it can be considered representative, particularly since it includes different kinds of companies. Thus the findings can be considered to provide a fairly representative picture of software development in Nigeria.

Our interview questionnaire addressed four research questions: What are the most serious risk factors in software projects in Nigeria? What kinds of methods, techniques and practices are used in ISD? What factors promote the sustainability of IT? When does IT have a

positive impact in society? The respondents were IT professionals with several years' experience in managing software development projects. The survey was conducted by interviews, instead of posted questionnaires. Interviews are more expensive, but by using interviews we ensure the commitment of the respondents and furthermore, the postal service in Nigeria is not reliable. The interviews were conducted by the researchers with the help of some students from the Obafemi Awolowo University. The language used was English.

Nine of the interviewed companies are Nigerian owned private companies, while two are foreign owned. All companies except one produce systems for outside companies, like banks or the oil industry, and they mostly produce business and management systems. One company produces its own packages. All the companies have e-mail addresses. On average, the companies have 117 employees (ranging from 5 to almost 900); the education of most interviewees is a Bachelor's degree; the average experience in the IT field is 6.5 years; the average number of projects headed by a respondent is six; and the duration of the projects varies from 11 weeks (the smallest project) to 67 weeks (the biggest project) on average. Eight of the interviewees (22 %) are women.

In the following we shortly summarize some findings which appear to make ISD in Nigeria different from industrialized countries. Some of the issues are familiar in industrialized countries as well, but the impact of the factors is significantly higher in Nigeria. The results are mainly based on the questions concerning risk factors and compared to similar studies in industrialized countries [13].

According to the respondents, the **infrastructural issues** like unreliable communication network and power supply are among the most serious risk factors in Nigeria. Private businesses use quite much money in order to guarantee the power supply: about 90 percent of firms in Nigeria had installed private generating capacity [38]. Poor communication network makes it difficult to keep contact between customers and suppliers. The hardware platform and development tools can be expected to be important in information system development. The lack of the tools and equipment is somewhat a problem in Nigeria – partly because of their high price. For sustainable use of IT, the appropriateness and availability of the technology to the application environment is essential.

The **political, social and economic environment** in Nigeria makes it much more difficult for software companies to make business. The risks in this area focus on the political climate, including the economic situation and IT awareness in the country. There is no national IT policy in Nigeria. Without a common IT policy, it can be difficult to create technology suitable to the current use of technology and industrial base in the country, as well as to the educational level of the personnel.

The **lack of educated and trained personnel** and the fast staff turnover are problems in ISD in Nigeria, as well as in many other countries. This insecurity in the project life cycle raises human relationship problems, in addition to a risk of project failure. Especially the technical know-how and design and management skills needed in today's projects are lacking. In Nigeria the emphasis in education is on computer science and engineering instead of information systems and information management. In addition, educational institutions do not have sufficient equipment. For example in the Obafemi Awolowo University, there are about 30 computers for 800 Computer Science students and lecturers have no personal computers in their offices.

Although the respondents regard the clients' role as important in ISD, the **relationship with customers** is one of the most important risks of the successful implementation of software projects. User involvement, client commitment, general phobia of computer by users and thus opposition from them, as well as insufficient training of users are common problems, among other things. For sustainable and beneficial use of IT in a user organization, it is important to develop the technological capacity within it. An in-house IT department or IT personnel in the client organization was regarded as important by the respondents.

Friedman [8] proposed that ISD in Europe and North America had by the late 1980s gone through three phases, each of which is characterized by a different main constraint – first hardware constraints, then software development constraints, then user relations constraints. Thus ISD has become increasingly more involved in issues of a social nature, which are subject to conflicting interests of different stakeholders. There can be seen a shift from technology towards its use and towards user participation. ISD in Nigeria seems peculiar in having all these constraints at the same time. The hardware or technical constraints are mostly due to poor infrastructure and power supply, in addition to the climate with humidity and dust damaging the equipment. The software development bottleneck arises from the educational deficiencies and the lack of tools. The user relations are mentioned by many respondents as the main factor to successful ISD. Analysis and design are also very much emphasized by them.

As Friedman predicted, ISD in the 1990s has been characterized by interorganizational issues, the most spectacular of them being the introduction of global networks. Applications are more integral parts of business strategies and enable collaboration across organisational and national boundaries [24]. In Nigeria as well, this is becoming a reality for the oil industry and the banking sector.

The questionnaire proved suitable for asking well-defined questions e.g. about the risk factors in software projects, but the rest of the questions need a more analytical research approach. Thus our findings so far concern mostly the software project risk factors.

8. Special requirements for ISD in Africa – preliminary conclusions

Based on the empirical findings and the literature, we have concluded on some issues which require particular consideration during the ISD process in a developing country like Nigeria, but which are not sufficiently dealt with by current ISD methodologies and curricula. Some of the requirements concern the resulting information systems themselves, while some requirements concern the development process only. Of course the first kind of requirements have implications on the development process also. These special requirements should be taken into account in ISD methodologies and education, if systems developers are to be facilitated with the kinds of skills and practices they will need in their everyday work. In the following we start from the requirements for the resulting information systems. The requirements cannot be separated from each other, but they are very much interconnected.

The first issue is the **sustainability** of IT in the user organization. Particularly in a less affluent country, the long-term viability of would-be information systems is essential but the required infrastructure and support activities are often lacking. The development process and the development methodology need to take into consideration the appropriateness of the technology to the application environment and the availability of local technological capacity to sustain its beneficial use, so that the resulting system would not be abandoned when the development project has ended. The factors that promote and threaten the sustainable use of information systems need to be further investigated.

The second issue is the **affordability** of the social information system and the new technology used within it. Information technology is still quite expensive in comparison with the resources available, so it is important to ensure that the investments are not wasted. The benefits must exceed the expenses and the resources used, and the user organization must afford to cover the running costs, maintenance and further development of the system in the long term also. In order to confirm the affordability of the systems, the technology must be suitable for both developers and users, and the application must be adapted to the actual conditions. For example it can be risky to follow new technology even if it can be tempting.

The third issue is the **ethics and socio-economic justification** of information technology. Particularly in a less affluent country, information systems cannot just make life easier for the immediate users. IT usually cannot directly address high-priority issues like health, education and agriculture – a computer will not cure the diseased or feed the hungry – but ultimately information systems should have a high indirect multiplier effect, e.g. by making healthcare delivery more efficient, more

accessible and more focused.

The following requirements deal with the ISD process and thus more directly with the ISD methodology. The fourth requirement has to do with **user participation**. The former three requirements seem to lead to this conclusion. For instance, the user organization and the people within it need to sustain the changes caused by the new technology in the long run. All the stakeholders in ISD – systems developers, IT users, management and the users' clients (the final beneficiaries or losers) – are needed to push the information system project through and to sustain the project and its outcome in a harsh environment, as well as to safeguard that it has a positive socio-economic impact [17].

The beginning of user participation in ISD, or *participatory design*, is in trade union participation in Norway in the design and introduction of new technologies in the industry [27]. Nowadays user participation is very much emphasized in industrialized countries. However, there have been doubts whether it is feasible in “traditional cultures” (cf. [18]). We regard that user participation is not only possible in Africa but even more important, since it alleviates problems like computer phobia and fears and thus increases the user organization's technological capacity to sustain the system and reach a positive socio-economic impact.

We have argued elsewhere that it is important to extend participation from the immediate users to their clients (e.g., from healthcare providers to patients) [18]. At least in the healthcare sector this ultimately leads to **community involvement in ISD**. With this we mean that local communities should be empowered to influence ISD. Regarding the socio-economic impact of ISD, management and local communities are the most important stakeholder groups [18].

The fifth requirement is that ISD methods and techniques must be highly **practicable** even when applied by systems developers with limited education, working under high financial, infrastructural, administrative and time constraints. This requirement is a direct consequence of the constraints discussed in section 6 above. To be practicable, the methods should be straightforward, rapid, informal and flexible.

The differences in the use of IS and in IS development between industrialized countries and developing countries are not based on the technology itself or on software engineering methods. The differences are mainly caused by the social preconditions which challenge the ISD methods and practices more severely. The latter need to be adjusted to take the infrastructural, organizational, social and political differences into account [17]. Also educational and other empowering strategies are particularly important [36]. The ISD process must be adjusted to the socio-economic and technological context so that all the stakeholders of the process – developers, users, management, and clients – can be winners.

9. Conclusion

Nigeria is moving from a legacy of military government to a new era with much hope for change. This brings about great challenges and opportunities for trade and industry, and especially for the people. The software industry is also challenged to provide the country with information systems that have a high socio-economic impact in comparison to the resources invested in them.

In this paper we presented what we consider to be the special requirements for ISD in Nigeria and Africa based on the first empirical results and the literature review. The special requirements are mainly based on the socio-economic as well as the wider socio-political context. Sustainability, affordability, socio-economic justification and community participation should be addressed by ISD methodologies, which must be highly practicable. We emphasize that these issues are relevant in industrialized countries also, but more critical in developing countries, and not sufficiently addressed by existing ISD methodologies.

We also presented how to locally develop a ‘Made-in-Nigeria’ systems development methodology. The process consists of a survey focusing on the practices and problems in ISD, a literature survey and descriptive case studies on the existing practices and methodologies, and theoretical analysis of the special requirements. It also includes an action research part experimenting with the results in “host project”. In the next phase of the study, we intend to elaborate on the requirements and the correspondingly adjusted ISD methods through the case studies and the action research.

The requirements we present here for ISD in Nigeria and Africa are not yet empirically proved end results of the study, but a theoretically and empirically conducted hypothesis. The purpose is to start an iterative process in which ISD researchers and practitioners in Nigeria, in other African countries and globally can contribute to the future development of ISD methodologies and curricula.

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