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A Generic Framework For Analyzing the Sustainability of Information Systems

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ABSTRACT

Globalization has brought about a new kind of a polarization development in the world recently. Information and communication technologies (ICT) are expected to promote development in marginalized countries too, but in order to achieve the anticipated impacts, ICT should encompass all the levels of society when its relevance will be evaluated – human, organizational, social, economical and cultural. In this paper we suggest a multi-level framework for analyzing the sustainability of information systems (IS). The framework is further elaborated into a more practicable method that would help practitioners to design and implement information systems that are sustainable. The study is based on empirical material on software industry in Nigeria as well as theoretical literature on work activities and sustainable technology. This paper is theoretical, but we test the model by analyzing some of our empirical material through the framework.

Keywords

Information systems, sustainable technology, appropriate technology, activity theory.

INTRODUCTION

Information and communication technologies (ICT) are claimed to provide possibilities for growth in the global economy more than any other technological innovation in history (e.g., Castells 1996). We agree that ICT is a powerful tool, and the expectations of applying ICT for development – both in economic and political terms – are reasonable. But we are also aware that the benefits of the ICT revolution are unevenly distributed, and there is an increasing divide between 'the haves' and 'the have-nots'.

In order to achieve the anticipated impacts, ICT should encompass all the levels of society when its relevance will be evaluated – human, organizational, social, economical and cultural. While ICT is becoming increasingly ubiquitous, it is one of the most important kinds of means in and between many information-laden activities. The need for new information-technological means is one of the most common drivers for change in work, and information systems projects one of the most common forms of change (Korpela et al., 2002).

ICTs are introduced in organizational settings, but organizational information systems (IS) comprise of more than just technology. An information system is a social system (Walsham et al. 1990), having some technical aspects as well as social, political, and communicative aspects involved in a work activity. It is the collective work activity where ICT is utilized that determines the appropriateness of an information system. Furthermore, information systems do not exist without IS development (ISD). ISD is an intentional change process which is driven by certain objectives.

Our results concerning ISD in Nigeria supported the idea of having all the levels of society involved in the introduction of ICT, in order to have sustainable information systems. But there are few methodological tools for analyzing the sustainability of IS in organizations; the focus of ISD methods is too often solely on technical questions.

In this paper we provide a method that would help project managers and system analysts to design and implement organizational information systems that are sustainable, and researchers to analyze the sustainability of information systems. The paper is theory-constructing, leaning on our empirical results from hard socio-economic conditions, but we believe the model would be adaptable to other contexts.

The first part of the paper introduces the theoretical underpinnings our method is based on – sustainable technology and work activities. We then combine the theoretical inputs into a suggested framework for sustainability analysis, and then further elaborate the framework into a more practicable method. The method is tested by analyzing some of our empirical data through the framework. Finally, we discuss the applicability of the framework and suggest further research to validate and elaborate on the method.

THEORETICAL BACKGROUNG

The objective of this paper is to provide a method that would help project managers and system analysts to design and implement information systems that are sustainable. ISs are created by the ISD process, and because we consider ISD to have a major impact on the organization and work activities, we consider work development to be an essential part of ISD. Thus work development together with sustainable technology creates the theoretical underpinnings to our framework. In the following we first clarify the definition of sustainable technology, and then present an activity-theoretical ActAD framework for activity analysis.

Sustainable and appropriate technology

The basic value of technology comes from the improvements achieved by technology and how these improvements are sustained and enjoyed over time. Technology can be defined as sustainable when it is appropriate, usable and useful, and when the possible changes in an organization or in environment caused by the technology are intended, manageable, far-reaching and humane, and further improvements can be conducted smoothly (Mursu et al. 2003).

We want to consider the sustainability of ICT in terms of the resilience and adaptability of a system to respond to both external and internal pressures. According to the internal view, we define the sustainability of a technology to be functionally dependent upon three variables: the level of demand for the technology, the availability of local technological capacity to sustain its beneficial use, and the appropriateness of the technology (Oyomno 1996).

Demand can be seen as a measure of the extent to which the use of a certain technology is required in an organization, so that the organization is able to provide the services it exists for. A technology that is in less demand is less likely to be sustained. The demand for a technology depends on the criticality of the service or activity that the technology is put into, the expected productivity resulting from using the technology, and the value of the outputs from the technology to the organization. (Oyomno 1996)

Local technological capacity is defined as the entrepreneurial, technical, managerial, intellectual, institutional, socio-political, cultural, and physical resources and infrastructure that exist in an organization and its immediate environment. It is related to the extent to which an organization is able to utilize effectively and maintain its new and existing technology. (Oyomno 1996)

According to Oyomno (1996), *appropriate technology* refers to how well the technology fits the requirements of the activity where it is used. The appropriateness of a technology refers to the cost-effectiveness, affordability (financial and human), and suitability of the technology, meaning operational simplicity, flexibility and so forth.

From the external perspective, sustainable technology should adapt to external forces so that the timing and size of an external perturbation matches the changes that the system can absorb (Sheats 2000). On the other hand, in all societies technology (any technology) has always been subjected to change. People have devised tools for improving health, raising productivity, and facilitating learning and communication. ICT is just another tool.

The desirable role of technology in development can be described as follows (Pellegrini 1980):

> *Technology should be considered 'appropriate' when its introduction into a community creates a self-reinforcing process internal to the same community, which supports the growth of the local activities and the development of indigenous capabilities as decided by the community itself.*

This ideology supports development that focuses on empowering local communities to be self-reliant, in contrast to purely economic growth. Accordingly, in every situation, the appropriateness of technological solutions and their embedded values should be assessed, whether the technology is Internet, PC, or paper and pencil. Thus appropriateness is determined by the

process, context and moment more than the static characteristics of a given technology. The main question is about the level of self-reliance, whether it is local, national, or regional, and the degree of self-reliance, e.g. what is meaningful cooperation (Hettne 1990).

Appropriateness in Pellegrini's sense is a critical precondition when introducing new technology to any community or organization. Information systems development should be based on social development which empowers user communities, thus giving people voice and choice.

Work activities and work development

Activity theory is a broad and long research tradition emphasizing that human activity is culturally and historically formed, mediated and defined by its object (Hedegaard et al., 1999). The activity-theoretical framework most commonly applied in work development was developed by Engeström (1999). Our activity analysis and development (ActAD) framework has been modified from Engeström's original model to be more suitable for Information Systems research and practice (Korpela et al., 2000; Korpela et al., 2002).

The model starts from presenting the elements of a *mediated action by an individual person* (Figure 1, broken line) – the subject or actor, the object of the action, the instruments or means (both mental and physical) needed for the action, as well as the goal (Vygotsky, 1978).

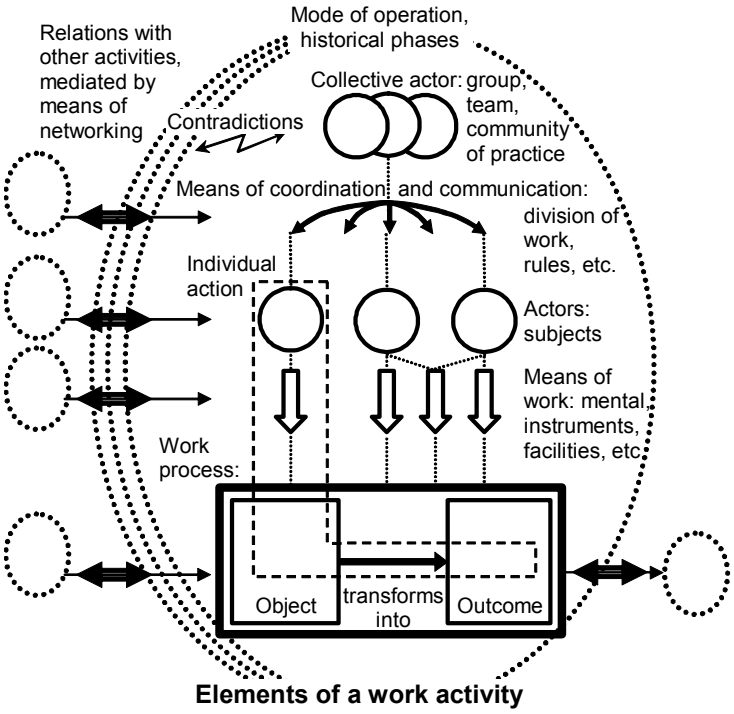

Figure 1. Three different kinds of means in activity networks

In practice it almost always takes several actions by several individuals to produce any useful service or product (Figure 1, lower half). In activity theory, such a set of mediated actions on a shared object by a number of actors, directed by a (more or less consciously) jointly aspired outcome, is called an *activity* (Leontiev, 1978). It is important to notice that individual human actions can only be understood through the collective activity which they are part of.

In addition to the instruments or means of the individual actions, other kinds of mediating instruments are needed as well within an activity. The actions need to be co-oriented by *means of coordination and communication* (Figure 1, upper half) – for instance a blueprint, division of labor, meetings, rules, etc.

We consider that work activity is a *systemic* entity, a system. Accordingly, there must be a relative fit between the elements of a work activity, a *mode of operation* (Figure 1, large oval). When an activity evolves over time, it moves from one relative fit to another, from one mode to another, in historical phases. *Contradictions*, imbalance within and between various elements and the mode, are the force driving the activity to transform. A trigger to change can come from the outside or inside of an activity.

Finally, activities do not stand alone. The elements of one activity are produced by other activities, and the outcome of one activity is usually needed in one or more other activities (Figure 1, smaller ovals). The relations between activities need to be mediated as well, by *means of networking* (Korpela et al., 2000).

According to the framework, ICT can be used as a means in three different ways – as a means of work in individual actions, as a means of coordination and communication between actions in an activity, and as a means of networking between activities.

When the viewpoint is in work development, networks of activities are to be analyzed first in their entirety, including all kinds of means that they subsume. It is only within such a holistic framework that the current or required new ways of using ICT as means in work practice should be analyzed.

The ActAD framework can be used as a checklist when analyzing work activities. The purpose is to find requirements for improvements. We applied ActAD when studying software companies and their system development projects in Nigeria. Table 1 gives an example of generic questions based on the ActAD framework that guide the researcher in studying an activity in an organization. They can be made more specific to fit the specific research object.

1. Brief description and history of the organization.
2. What is the activity to be analyzed? What is the outcome or service? Who is the client who uses the service and for what? What are the historical phases of the service or outcome? Define the object, goal and outcome.
3. Who are the people, actors, within the activity? What are they doing, where do they come from? What is the collective actor like (e.g., integrated team, loose grouping)? How is the activity organized within the company? Define the actors.
4. What kind of tools are needed? What kind of professional skills, methods, standards and so forth? Where do all the means of work come from? What information is needed, and where this information comes from? Define the means of work.
5. How do people within the activity communicate with each other, by which means? How is the work divided and distributed between actors? Define the means of coordination and communication within the activity.
6. Who and what are the people and other activities that are needed to be in contact with, why and how? How do people within the activity communicate with people or organizations outside the activity? Where are organizational boundaries and how are they related to the whole service chain? Define the means of networking that link the activities to each other.

Table 1. Example of questions based on ActAD

FRAMEWORK FOR SUSTAINABILITY ANALYSIS

Based on the theories above, when analyzing the sustainability of a technology in any organization, one must consider the context (network of activities and community), moment (ICT as a means at a given phase of the use activity), and process (IS development), besides the static characteristics of the technology. In the following we interpret Oyomno's three variables and Pellegrini's definition of appropriate technology in the light of activity theory.

Figure 2 presents a generic model for sustainability analysis (first introduced in Mursu et al. 2003). Each of Oyomno's and Pellegrini's criteria for sustainability (top line) are determined by a given part of an activity network. The question studied by means of the framework is: Is the use of ICT, i.e. the information system, in activity A sustainable or not?

The lowest level of sustainability is determined by the (static) *appropriateness of the technology to the application environment*; i.e., to the activity A where ICT is used as a means – either as means of individual actions or as means of coordination and communication among actors. The question is about usability, a static fit between new technology and other elements within the activity. We suggest that the ActAD framework (Figure 1) provides a suitable tool for such an analysis.

The level of *demand for the technology* is determined by the service that is provided by activity A to the client community or activity B. If the use of ICT improves the outcome of A, the possibilities for sustainability are better. The indirect socio-economic and human impact of the information system would be positive.

To be able to evaluate the real demand for the technology within the service, we must place the service into the context. The activity providing the service must be evaluated within the network of other activities, including its clients. The network of activities must be recognized, including the inputs and outputs, as well as the means of networking between activities. We suggest that the network of activities can be analyzed by using the ActAD framework.

The availability of local technological capacity to sustain the technology's beneficial use is dependent on the supporting activities C_i that produce the actors, means and objects of activity A. The needed level of local capabilities are evaluated and analyzed. This includes e.g. hardware maintenance, training, systems support, and even electricity supply in certain circumstances. The ActAD framework guides also to analyze the means of networking – social, legal, technological – that mediate the relations between the supporting activities and the served activity.

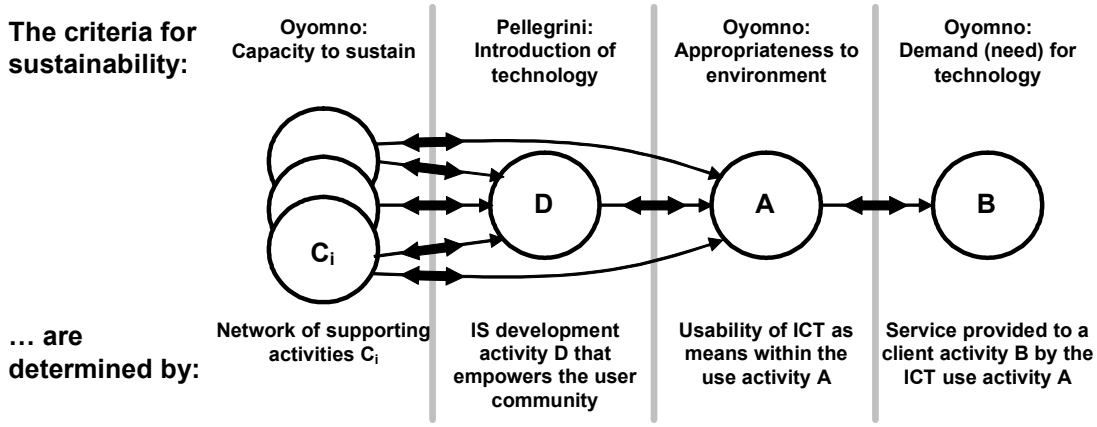

Figure 2. The generic framework for sustainability analysis of IS. Each circle represents one activity like in Figure 1.

When ICT is concerned, *the introduction of technology* to an organization equals to an information systems development activity (D). When introducing new technologies, developing information systems, there are always some impacts on the activity and work processes. In order to combine the development of an IS with the development of an entire work activity successfully, according to Pellegrini's definition, the empowerment and participation of the user community (A and B) in the ISD activity (D) is the key.

FROM FRAMEWORK TO METHOD

Abstract frameworks as in figure 2 should be modified to be more useable for practitioners and also for researchers in empirical studies. In the following we have formulated the generic framework into a checklist of questions, thus providing a first attempt to create a method for sustainability analysis.

Risk management is an essential part of project management, and it should be included in the process consciously. In risk management, possible risks can be divided into inside risks and outside risks. Inside risks are related to the task and project management skills, outside risks are related to the client and environment (Cule et al. 2000). Sustainability risks can also be divided into inside and outside risks, in relation to an activity. In general, there are risk lists in the literature concerning typical risk factors (e.g. Schmidt et al. 2001, Mursu et al. 2003), but in each project specific risks must be identified.

APPLYING THE METHOD

The framework has not been used in any practical or research efforts yet, but next we will apply it in analyzing a couple of ISD projects in Nigeria that we studied in a previous phase. The first case is about an insurance company and the other one about a manufacturing company. Comparing with the framework in Figure 2, the use activity (A) in both cases was an internal function of the company, the client activity (B) was the corporate management, and the ISD activity (D) was organized by a local software company. The supporting activities (C_i) varied.

Step I: Demand for technology: **- identify use activity** **- identify clients** **- define network of activities** **- specify the demand for technology**	To what extent are the applications or activities to which the technology is put, critical to the proper functioning of the organization? What is the expected productivity gain accrued to the organization as a result of using the technology? What is the value of the outputs from the technology to the organization, or to the activity or service? What is the value of the outputs from the technology to the client?
Step II: Usability of ICT to use activity **- define use activity** **- specify appropriateness of technology**	Cost-effectiveness of technology: what is the quality of information obtained by new technology, and the extent to which jobs are enriched by new technology? What are the human resource requirements for the new technology, and what are the needed changes in the activity or organization? How well does the new technology fit with neighboring activities? Suitability: is the operational simplicity, flexibility, maintainability, and robustness suitable in new technology?
Step III: Sustaining capacity **- define supporting activities (ActAD)** **- specify capabilities**	What is the local technological capacity build-up, physical and intellectual? What needed services can be obtained inside of the organization, what outside? What is the level of outside support – organizational, national, global? How do we institutionalize new practices? Where can we get needed training or education for employees? What about in organizational level? Does new technology have an impact on organizational culture?
Step IV: Introduction of technology **- perform information system development management** **- perform risk management**	How to organize and plan ISD project? What is the level of participation of users? How to organize user participation, or community participation? What are the software project risks? How to manage these risks? What are the risks for sustainable system? How to manage these risks?

Table 2. Draft check list for sustainability analysis of IS

A case of an insurance company

In this case a local software company developed a tailor-made human resources management system for a major insurance company.

Demand for technology. This insurance company is a modern international organization, which considers computerized services as a competitive edge for its business. Their clientele consists of other companies and individual people. The company advertises on its web site that for productivity and efficiency, they have computerized all their activities for better services. This includes also human resource management (HRM) and payroll, which are discussed here. The company considers the HRM system as critical within the business activities, since they have more than 300 employees. In addition, the bank that is taking care of the salaries, demands all the information in an electronic form. Thus there is a real demand for new technology, since the old system provided the information only in manual reports.

Appropriateness of technology. Because of the new system, there are less mistakes compared to the old system, the salaries are in time, and there are less misuse situations (intended or unintended). The HRM software has to be locally developed or adjusted, because for example the payroll system in Britain is different than in Nigeria. In addition, the company did not want to change their activities too much because of the new system. As a result, there are some parts of the new system that the company does not use, not yet. Maybe if the human resource management activity had been properly analyzed during the implementation process, they would have better possibilities to use the whole system efficiently. Now they do not know exactly how to utilize the rest of the system.

The company pays attention to the compatibility between their systems on a technical level. They have what they call a contingency plan, and they have trained people to take care of the whole system.

Local technological capacity. The company has agreed with local vendors for hardware and software support in problematic situations. They have their own IT department to run the system daily. The company stressed the local software vendor to adjust the system according to their needs, to provide implementation service and post-implementation service. The company feels quite confident in using the system. Because of the poor infrastructure in Nigeria, the company has its own electricity supply for power outages.

Employees are well trained for accounting and using computers, thus they were prepared for the new Windows-based system.

Introduction. Because the functional requirements for the new system were based on the old system, the implementation went quite smoothly and quickly. However, the new system is not fully used, which is a waste of resources, so there might have been a need for work analysis together with the company people. The software company admits that even if they want to emphasize user participation, in reality the participation is quite limited. They don't have proper 'ways' of planning and implementing user participation, the attention is usually on technical issues. Maybe the most serious reason for that is the customers' reluctance to admit the need for user participation. It is not cheap, and it requires careful planning, which companies do not understand to do. However, the computerization process seems to be systematic, so risks of failure are less.

In summary, the review of this case indicates that the insurance company has a good opportunity to create a sustainable organizational information system that provides information for efficient services. Because of its business clients, computerized services are feasible, even in Nigeria. But since the tendency is towards more ready-made systems, it might be useful for the company to consider also work development and adjustment according to new systems.

A case of a manufacturing company

In this case the local branch of an international manufacturing company purchased an accounting software package from a local software company who appointed a free-lance consultant to run the implementation project.

Demand for technology. This international manufacturing company started to computerize their local activities by purchasing an accounting system. The company does not consider the system critical for their business, but now they get information more quickly, there are less mistakes and less inventory losses. However, they consider the system to be a step towards a future where they see all their activities computerized for competitiveness reasons.

The benefits of the new system for the management are evident, they have information for decision making more efficiently, and the information is more reliable. The new system immediately highlights errors and they receive frequent reports, so they can more easily plan the production to meet the demand.

Appropriateness of technology. In the accounting department the work that used to take three days can now be done in a few hours. This caused some rearrangements in job descriptions, but nobody was sacked. The company had previously tried an accounting system they acquired from their parent company, but it was not suitable. So they returned to manual system. This new system was locally developed and adjusted to their needs. This company did not want to change their activities too much because of the new system, either. So the plan is to install computerized systems step by step, unit by unit. For technical solutions, they rely on the software company's advice. However, the manual system is still running in parallel.

Because of this early phase of the computerization, it would be useful for the company to conduct an activity analysis in its entirety, define requirements, and evaluate the appropriateness of the technical solutions in all activities.

Local technological capacity. The company relies totally on local vendors and experts in software and hardware problems and solutions. They have an IT department at the international level, but it is not much of help. They have started to train people for hardware maintenance, thus they want to increase their self-reliance. To support the use of the new system, they have an agreement with an external implementer.

This company too has its own electricity supply for power outages.

The employees' readiness for computer based systems varies a lot. The men working at the stores started to regard stock control as their 'own business', hence they now report the situation daily. The system inspired them to work better, so in best situations new technologies create new ways of thinking.

Introduction. The implementation of the system took more time than expected. The manufacturing company did not realize that they too have to participate in the process. There was no decent overall plan for ISD and implementation. The external implementer, who is supporting the use of the new system, is taking care of the whole introduction. The company admits that they should have hired some expert to manage the process. Risks of failure are high.

In summary, the manufacturing company has not paid sufficient attention to the sustainability issues of the new system. They are taking one application at a time, trying to arrange its technical fit with a specific activity. Conducting a sustainability analysis in time would save money and resources in the future. It would also help in strategic planning for future competitive markets.

DISCUSSION AND CONCLUSION

In this paper we presented a generic framework for the sustainability analysis of information systems and suggested a first version of a practical method for such an analysis. The method can be used by IS development practitioners in their work, or researchers in empirical or theoretical studies.

Practitioners working on IS and ISD, in Nigeria as well as in industrialized countries, seem to be too narrowly focused on the technical fit of ICT in their customers' organizations. However, the relationship and environmental risks have been observed to be the most critical ones for the successful completion of ISD processes (Mursu et al. 2003). In order to create long-term usability of information systems, we suggest practitioners to pay more attention to the service and value-added aspects, as well as to the supporting network. Our empirical results emphasize the value of a local software supplier in ICT introduction in organizations.

We understand that the full sustainability analysis suggested by our framework is not realistic in every project. For researchers the framework should be as comprehensive as possible. The framework presented in this paper does not yet sufficiently guide researchers in analyzing broader contextual factors of IS sustainability, e.g. the financial affordability. Our new INDEHELA-Context research project aims at studying the socio-economic impact, sustainability and affordability of ISD in and for Africa. Within the project the framework and method presented in this paper will be tested and further developed in practice. We believe that the results will be applicable to other contexts too.

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REFERENCES

1. Castells, M. (1996) The Rise of Network Society, Blackwell Publishers, Massachusetts.
2. Cule, P., Schmidt R., Lyytinen K. and Keil M. (2000) Strategies for heading off IS project failure, *Information System Management*, 17, 2, 65-73.
3. Engeström, Y. (1999) Activity theory and individual and social transformation, in *Perspectives on Activity Theory*, Y. Engeström, R. Miettinen and R. Punamäki (eds.), Cambridge University Press, Cambridge, 19-38.
4. Hedegaard, M., Chaiklin, S. and Jensen, U. J. (1999) Activity theory and social practice: An introduction, in *Activity Theory and Social Practice: Cultural-Historical Approaches*, S. Chaiklin, M. Hedegaard and U. J. Jensen (eds.), Aarhus University Press, Aarhus, 12–30.
5. Hettne, B. (1990) Development Theory and the Three Worlds, Longman Scientific & Technical, New York.
6. Korpela, M., Soriyan, H.A., and Olufokunbi, K.C. (2000) Activity analysis as a method for information systems development: General introduction and experiments from Nigeria and Finland, *Scandinavian Journal of Information Systems,* 12, 1, 191-210.
7. Korpela, M., Mursu, A., Soriyan, H.A., and Olufokunbi, K.C. (2002) Information systems development as an activity, *Computer Supported Cooperative Work*, 11, 1-2, 111-128.
8. Leontiev, A.N. (1978) Activity, Consciousness and Personality, Prentice Hall, Englewood Cliffs.
9. Mursu, A., Lyytinen K., Soriyan H.A. and Korpela M. (2003), Identifying software project risks in Nigeria: an international comparative study, *European Journal of Information Systems*, 12, 182-194.
10. Mursu A., Soriyan A. and Korpela M. (2003), ICT for development – sustainable systems for local needs, In *Organizational Information Systems in the Context of Globalization*, Proceedings of IFIP WG8.2&WG9.4 Conference, M. Korpela, R. Montealegre, A. Poulymenakou (eds.), CD-ROM, Athens University of Economics and Business, Athens.
11. Oyomno, G. (1996) Sustainability of governmental use of microcomputer-based information technology in Kenya, in *Global Information technology and Socio-economic Development*, M. Odedra -Straub (ed.), Ivy League, Nashua, 19-34.
12. Pellegrini, U. (1980) The problem of appropriate technology, in.*Criteria for Selecting Appropriate Technology under Different Cultural, Technical and Social Conditions*, De Giorgio, Roveda (eds.), Proceedings of the IFAC Symposium, Pergamon Press, 1-5.
13. Schmidt, R., Lyytinen K., Keil M. and Cule P. (2001) Identifying software project risks: an international Delphi study, *Journal of Management Information Systems*, 17, 4, 5-36.
14. Sheats, J.R. (2000) Information technology, sustainable development and developing nations, *Greener Management International*, Winter 32, 33-41.
15. Vygotsky, L.S. (1987) *Mind in Society: The Development of Higher Psychological Processes*, compiled from several sources and edited by Cole M, John-Steiner V. and Scribner S., Harvard University Press, Harvard.
16. Walsham, G., Symons V. and Waema T. (1990) Information systems as social systems: Implications for developing countries, In *Information Technology in Developing Countries*, Bhatnagar, Bjørn-Andersen (eds.), Elsevier Science Publishers, Amsterdam, 51-61.