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Rationale for Use of Systems' Design in Education with Reference to Kenya

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Abstract:

Systems' theory suggests that education be managed more like an organization where all stakeholders are accountable for the smooth running of the organization. Each program should be taken as a sub-system of the entire system in order to increase the effectiveness and efficiency of the total system. Applying systems' theory increases understanding of relationship between systems which increases cohesion, giving rise to better problem-solving skills. It can be used to analyze any particular component (programme) and determine the interrelationships between sub-systems in an organization. This paper discusses how this theory/design can be used to improve delivery of education programmes in the Kenyan context.

Keywords: Systems' Design, theory, system, education programmes

1. Introduction

The purpose of this paper is to discuss the reasons for the use of systems design in education and specifically the Kenyan context. It highlights the meaning of systems design and advances why it should be used at different stages in the school system.

A system is a group of interacting parts or bodies working together in a regular relation. It is also an ordered set of ideas, theories or principles put together. Ackoff (1971) defines a system as a set of elements that have an effect on the behavior of the whole. They are interconnected and can only be understood in relationship to each other and to the whole. Kaufman (1970) says a systems' approach is a process of identifying component parts and determining the relationships among these parts and the whole system. According to Mukwa (1979), a systems' approach is a process for effectively and efficiently achieving a required outcome based on documented needs. It is similar to the scientific method where needs are identified, solutions are selected from alternative methods, means are obtained and implemented, results are evaluated and revisions done to all or part of the system so that the needs are met. Further, Gagne (1987) defines a systems' approach as an empirical approach to the design and improvement of instruction. These definitions suggest that systems' approach is scientific in nature. It is an orderly procedure which has elements that are interrelated and has a purpose to fulfill.

Systems design is a study of how systems are working with the aim of making them work more efficiently and effectively. It is a mental picture, plan or arrangement of a system showing the chronological order of activities. It informs all the relevant people of what is expected of them e.g. the government, administrators, managers, teachers and learners. It has principles and practices that enable it to succeed. System design should be applied to education in full consideration of the features and operations in education. All activities should be based on the objectives set. Similarly, the content, layout, instructional programs and environment should be logically arranged. Education is a system that consists of many sub-systems that are interdependent. Each can work on its own, with another part but for the good of the entire system. For instance, education technology is a sub system that facilitates human learning resources. A school is also viewed as a social system with organizational, comprehensive and descriptive characteristics like any other organization. The school is an open system characterized by the ability to exchange energy, matter and information within the environment in order to improve, (Assey, Ayot 2009). The school system is hierarchically arranged. For example, the Kenyan school system has primary and secondary school for different ages of learners. The boundaries are clear as seen in when and how examinations should be administered. The Kenyan school system allows for selective exchange with the environment in the form of content relevant to the society, instructional resources from the environment and regular interaction with stakeholders like parents' teachers, school administrators, donors, religious sponsors and the government. As learners go through the school system the information they acquire in terms of knowledge and skills is expected to enable them fit in the society and sustain them. In this way, they become a product that is consistent with the goals of the education system. Below is a model showing the application of systems' approach in education.

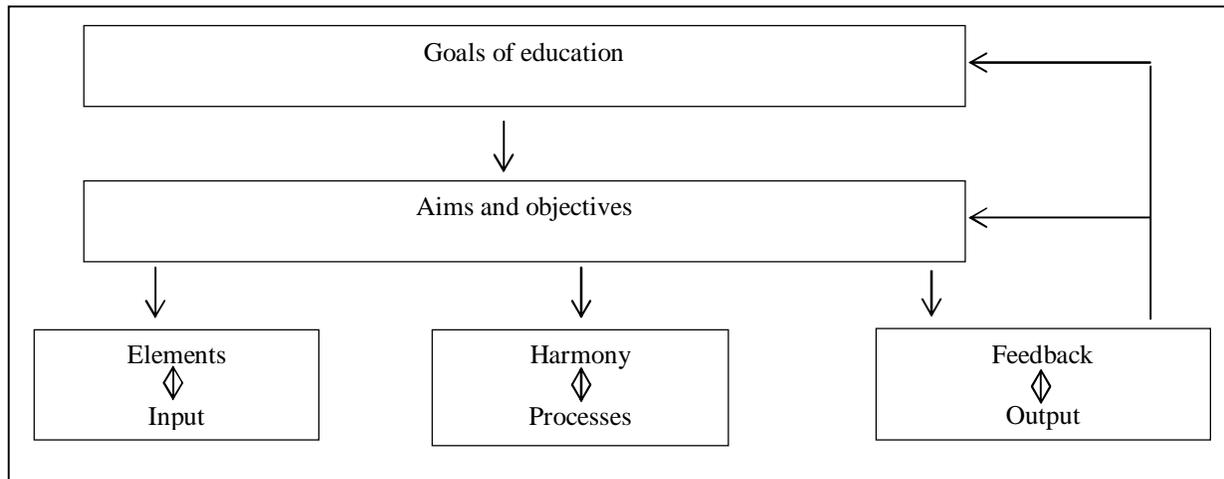


Figure 1: Model showing application of systems' approach in education
Source, Nasibi M.W. (2003)

Figure 1 shows how interrelated sub systems in education are. From the goals of education, aims and objectives are formulated. Content is carefully selected and administered to learners (input). Using varied methods (processes) learners are exposed to this content and finally evaluated at different levels. In the Kenyan situation, the Ministry of Education (MOE) has formulated the National Goals of Education. The Kenya Institute of Curriculum Development (KICD) in turn sets aims and objectives of teaching different subjects in the curriculum to help achieve the national goals of education. KICD proposes content, methodologies and resources for successful implementation of the curriculum. Kenya National Examinations Council carries out evaluation through Kenya Certificate of Primary Education (KCPE) and Kenya Certificate of Secondary Education (KCSE) to gauge the extent to which content has been mastered. These examinations pave way for further training of the graduates in preparation for the world of work. The knowledge and attitudes displayed by the graduates is an indicator of whether aims and objectives have been met and whether the national goals of education are relevant. Each of the sub systems in the Kenyan education system plays an important role in the successful implementation of education to learners at different stages.

2. Elements of a Sub-System

- Objectives – these are the reasons behind the launch of the system. They express the terminal behavior of the learners. A needs assessment is done to determine what you want learners to be able to do when they complete instruction. Objectives can be general or specific and reflect the needs and aspirations of that country. In Kenya, there are six goals of education. Different subjects in the curriculum have specific objectives geared towards achieving the national goals.
- In – puts– these are the components put into the system to make it functional. In the case of education, inputs include learners, teachers, the curriculum content, media resources, education policies etc. Inputs must go through designated procedures before they come out as finished products. It refers to the teaching/learning process that individual learners go through before coming out as graduates of a given stage.
- Outputs – these are products or results of what has been injected into the system e.g. the type of graduates from the education system at different levels. These end – products will be people possessing certain knowledge, skills, values and attitudes that will enable them fit in the society.
- Environment – this is the area of operation of the system e.g. the school, community. Richey (1986) says, an education system operates in a society from which it gets its inputs and in turn provides outputs. The efficiency of the system will depend on the ability of the society to equip the system with all the relevant inputs. In the case of Kenya, if the government does not provide adequate trained personnel (teachers), limited finances to acquire instructional resources, no relevant infrastructure, then the end - product of the education system will be of poor quality. Such will not meet the market demand.
- Evaluation tools – these are used to study the working of every component in the system. It is meant to make it possible for systems to maintain their expected outcome. It has to be accurate and decisive. In the context of education, there is need to evaluate adequacy of content taught, relevance of facilities, whether the environment was enabling, and methods of content delivery and final product who are learners. It is also important to evaluate the whole education system in relation to the national goals of education. An overall evaluation system will give information about the performance of the system, establish the suitability and efficiency and the impact of the system on the environment (society). Such information will help in revision of the system. The Kenyan Government has continuously evaluated the system of education with a view of making it more relevant to the Kenyan society. This evaluation has led to a proposed change in education system, content and methodologies. The new system is now at pilot stage.

3. Importance of Systems' Design in Education

3.1. To Introduce Order and Logical Conduct in Education

The goal of Instructional Systems Design (ISD) is to improve human performance. ISD is based on the premise that learning should be developed in accordance with orderly process, be specifically tailored to the target audience and have measurable outcomes. All the relevant people in education system are informed of what they are expected to do, the methodologies and the expected outcome. For instance, the government gives the outlines, the administrators and teachers implement and students receive the inputs. They are expected to acquire skills from the education system. All these are done to ensure the system is working in orderliness.

3.2. Revision of the System

Information from evaluation of the system helps in revision of the system to make it efficient and effective. When an education system is evaluated, the teaching methodologies, resources, curriculum content and learning environment can be improved, or corrected to make them work better. Strategies like improved methods of teaching using modern teaching technologies can be employed to improve performance. A lesson can be designed to use the computer and internet for wider knowledge acquisition.

3.3. Identification of Relevant Activities

For learning to occur, certain activities must take place. These have to be planned for. There are inputs at different levels, methodologies of teaching, evaluation, revision, objectives, organization of information and even control measures of the system. For instance, once the objectives have been defined the overall instructional strategy is developed to ensure mastery of the skills taught. Common instructional strategies include introduction, presentation of content, interaction, feedback, guided practice, review and summary of lesson. This is an example of a lesson presentation design.

3.4. Achievement of the Set Goals of Education

Systems design facilitates the achievement of the objectives or set goals of education. The learning objectives are developed. They make clear content to be taught and how learning will be measured. Objectives translate the tasks and content generated in the task and instructional analysis into specific descriptions of observable and measurable behavior. The objectives also explain the final outcome of the education system which is to produce graduates who have relevant skills to live in, work and develop their society.

3.5. Forward Planning

Systems design enables forward planning in a system. Review and evaluation of a system corrects and improves it. The data gathered from this evaluation is used to plan how to improve the system by availing the resources, changing methodologies and other inputs. In education, a conducive learning environment can be planned for like putting up computer laboratories. The media resources for teaching can be identified and sourced for, the implementers can be trained or retained e.g. teachers who will use computers during instruction. At the problem identification stage, the scope and requirements of the system are identified. More effective planning and decision making in the institution ensures an effective institution which provides quality services to the community in which it operates.

3.6. Makes Education Dynamic and Adaptive in Changing Times

Quality education is important in the development of any nation. It helps the nation to interact competitively with other nations around the globe. The systems' design ensures evaluation of all education sub systems with an aim to review and make them more relevant. The graduates of such a system will have the skills to adapt to changes and be a relevant workforce at the global level as envisioned in Vision 2030. Experts acknowledge that the high demand for higher education can only be met through technology-enhanced methods like ICT. Young Kenyans also seem to agree that ICT is a step towards building a technologically literate workforce to meet the changing needs of the information age. Such views call for changes in the education system.

3.7. Overall Evaluation of the Education System

The systems design at the evaluation stage provides data in managing, controlling and impact of the system. Information is gathered to make determinations about the course's effectiveness and continued use. Summative evaluation determines how the system has worked to meet the set objectives. This evaluation justifies the input from the output shown e.g., whether the students can use the skills they have been taught. It establishes the suitability of the system, the impact of the system on the environment, relationship of the components in the system and the individual performance of each of the components.

3.8. Training of Relevant Personnel

Capacity building is important to enable the system to work effectively. With trained, skilled and competent personnel, each part of the system will work according to their expertise. The systems' design in a school would comprise of different subjects which are taught by expert teachers trained to teach those subjects. Where need be these staff is in- serviced to improve their skills, or make them relevant in using new media technologies. The Ministry of Education in Kenya is now in-servicing teachers on the use of computer and internet as media resource in their teaching.

3.9. To Sustain the System

The systems design puts in place checks and balances or controls at every stage to ensure the system does not collapse. Dynamic leadership and effective management throughout the institution, the establishment of clearly defined vision and mission statements, strategic directions, goals, objectives and policies help to sustain the system. The 8-4-4 system of education in Kenya has been reviewed severally to ensure it survives so what is there now is not the original 8-4-4 system of education. The content has been revised, teaching methodologies and even the media resources. Assessments, evaluations and corrections have been made to make it more relevant to the global requirements.

3.10. Smooth Running of the Administrative System in an Institution

An institution can be analyzed in respect of its structures, functions and the interrelationships between them. In education, a school can be a system on its own. Therefore, a school should be managed like an organization where teachers are accountable for their students' results, the curriculum stresses critical thinking skills and learning is more learner-directed. The goal of systems design here is to realize the importance of each of these sub-systems to the whole school system in order to increase its effectiveness and efficiency. There is cohesion between the sub-systems because each knows that their role and contribution is key to the success of the entire system.

3.11. Interaction with the Environment

The systems design shows how the system interacts with other systems in its environment. A system is composed of sub systems that depend on one another for the success of the entire system. They also interact with the internal and external environment. Minaar, (1997) a consultant in Higher Education gives an example of an institution of Higher Learning as a system not functioning in isolation. It serves the community and functions within the community. It has a range of external stakeholders impacting on the institution. The institution is a sub-system of education system in a country. The interactions between the institution and other systems are shown in the following diagram.

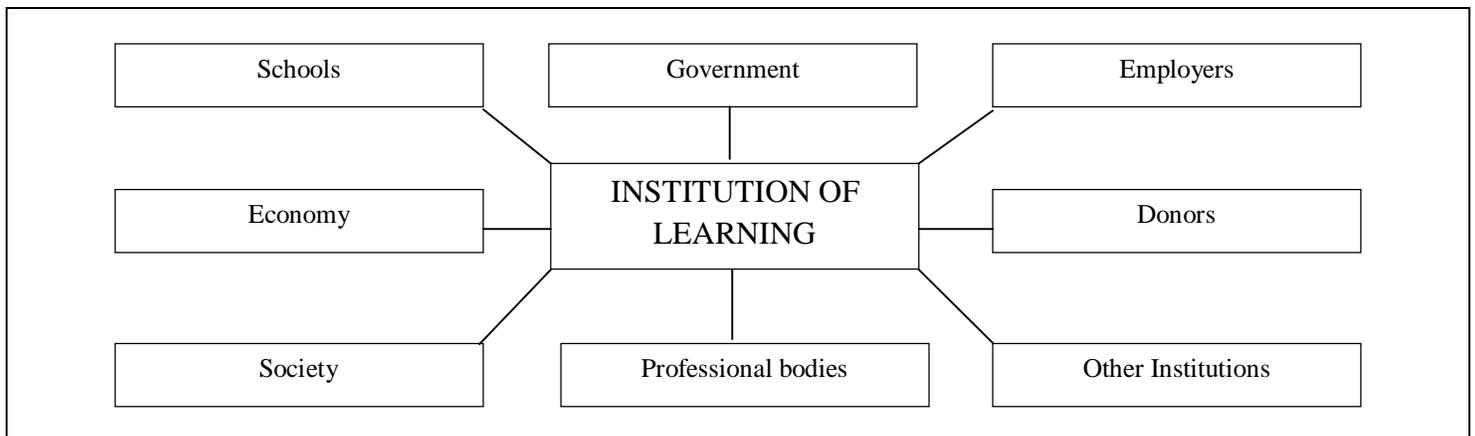


Figure 2: Interactions between an Institution of Higher learning and external systems
Source – Minaar 1997

Figure 2 shows how a system has many other sub-systems in it. These are smaller semi – autonomous systems but they are interrelated and work together for the good of the entire organization which is the institution of higher learning in this case.

4. Conclusion

This paper has explained the meaning of systems design. It has also advanced arguments for the use of systems design in education. From the discussion, the systems design can be used to organize education in order to achieve the set objectives. The graduates can acquire the skills that are taught as a result of proper organization of the education system. If the systems design is applied to the Kenyan education system, it would be improved to avoid some of the pitfalls that are evident in it. The systems' design is relevant to instructors, instructional designers and all stakeholders involved in education management process. It gives a roadmap of how education systems should be managed.

5. References

- i. Ackoff, R.L (1971) Towards a System of concepts, management sciences, Vol 7 no 11 pp 27.
- ii. Assey, A.A and Ayot, R.M (2009) Principles of Teaching and Communication. A handbook for Teachers and other Instructors. Nairobi: Kaswanga Press and Consultancy Ltd.
- iii. Blanchard, B.S and Fabrycky (1990). System Engineering and analysis. Prentice Hall Inc.
- iv. Gagne, Robert (1987) Instructional Technology Foundations London: Lawrence Tribaum Associate Publishers.
- v. Katz and Kalin (1966). The Social psychology of organizations in Hong N. retrieved from <http://www.edu.psu.edu/insys/ESD/systems/theory.html>.

- vi. Kaufman, R.A (1970) Systems' Approaches to Education Attempted Integration in social and Technological Change. Implications for Education. Eugene: University of Oregon.
- vii. Minaar, P.C. (1997) A knowledge based system for Quality Assurance in a university, PhD Thesis, University of Pretoria, South Africa.
- viii. Mukwa, C. (1979) Towards a systematic Approach to Educational Media use in secondary schools in Kenya. A field survey of Tools and Technologies for Learning. Michigan University PhD Thesis.
- ix. Nasibi, M.W (2003) Instructional Methods: General Methods for teaching across the curriculum. Nairobi Strong wall Africa.
- x. Richey, Rita (1986) Theoretical and conceptual Bases of Instructional Design. London: Kogan page.
- xi. Shirley, R.C (1987) Evaluating institutional planning, administrative services and programs. Jossey –Naba Bass Inc publishers.