

System Modelling of ITEM

Reengineering of Education processes

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Abstract

IT in education management is not merely a technical problem, but to a large extent a matter of understanding what effect IT has on organisations. IT has a great potential for making better schools, but at the same time IT introduces structural instabilities. System modelling may help leaders to get a holistic view of IT in schools.

Keywords

IT, Management, System theory, Structural instability

1 INTRODUCTION

IT in Education Management (ITEM) has grown over a period of at least twenty years. Initially ITEM was introduced to keep record of students and economy. During the last twenty years IT has been taken widely in use. Few questioned the importance of ITEM or studied what consequences this new technology has on organisations. To day ITEM seems to grow most rapidly as an information system on Internet.

If we stop for a moment and ask the basic question: Why are we using IT in education management ? The answer will depend whether you are a student, a teacher, a financial director or a principal. To day there is a new generations of fast growing IT technology. Neural network represents a paradigm shift in mathematics. Integration technologies such as CD-ROM, virtual reality and Internet will change the way we get and use information. As far as I know, there has not been much research on how this new generation of IT will effects schools.

System theory is a useful concept for better understanding fundamental aspects of organisations. We hope this may help school leaders of to choose an IT strategy more carefully before IT is implemented.

2 SYSTEM VIEWS OF SCHOOLS

2.1 General system theory

System theory is an organic view of understanding organisations (Bertalanffy). Systems are analysed with different perspectives in order to uncover different aspects of an organisation. Typical dual perspectives of systems are:

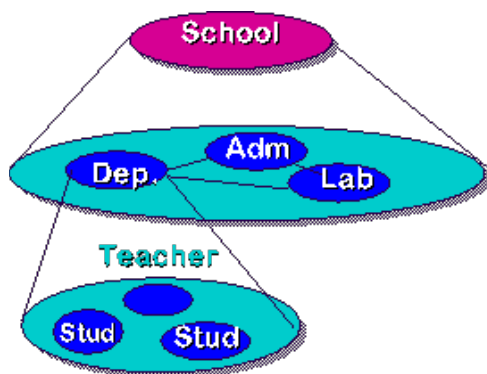
System = Ontology + Knowledge	Knowledge = Ethic + Learning
Ontology = Architecture + Dynamics	Dynamics = Structural + State
Architecture = Levels + Partners	Partners = Binding + Objects

Systems are analysed by dual elements and by levels of abstractions. Dynamics are studied by architecture and architecture by dynamics. Architecture is levels and partners. Partners is binding and objects. In system theory study of binding or relations between objects is of most importance. By analysing the binding, we may know more about objects, architecture and the dynamic of organisations. In an organisation such as a school, binding between partners or objects is usually information. System theory should than be a suitable tool to analyse how a new generation of IT will effect schools as an organisations.

2.1 System architecture

System architectures describes the relations between partners and levels of organisations. Level is an organisation that share a common purpose. Partners are two ore more organisations sharing a common purpose.

System partners in schools



Systems partners are partners because they are co-operating in sharing a common purpose. Sharing a common purpose needs some kind of binding between the partners. Typical internal binding in an organisation is communication, command, control and competence (C⁴). In a school the situation is essentially the same. There is a need of communication, command, control and competence at each level of the organisation. This may be between students, teacher, administration and the external society.

Figure 1 System internal partners

IT is a tool for faster communication between organisations, command in scheduling, control of economy, control of student records and so on. Faster binding is changing the

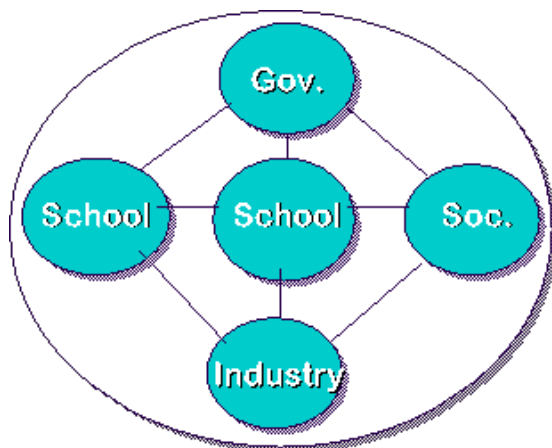
binding between partners. Changes in binding will introduce changes in the organisation knowledge and dynamics. Faster information between the management, library, laboratory and so on, has made schools more flexible and efficient. On the other hand, the school has changed in the way its organised and solve its problems. From the theory of systems dynamics we know that this may lead to instability problems in the organisation (Forrester).

System levels in schools

School usually have 3-5 organisational levels dependent on the type of school. We have the student level, the teaching level, the department level, the school and the governmental level. Since each organisation level has special purpose, they have different information needs. At a low organisation level the information focus on the product and at higher levels it focus more on running the business. This means that even if all information in a school are carried on a single network, information must be adapted to each level. The teacher must be responsible for how to manage information in teaching, leaders must responsible for the integration of information in his department and so on.

Introduction of new IT such as Internet will radically change how the information is organised and distributed. Changes in information speed, relations and openness is the same as less binding between partners. Less binding between partners will expand the partners purpose in the organisation. The effect of this is less specialised partners, a more decentralised organisation and fewer organisation levels. In schools we may expect the management of student will be decentralised from a specialised student administration to an educational department and even to the teacher. The same effect will occur in relation to other parts of the organisation. The library is bypassed by direct search for information directly world wide on the Internet. Integration of multimedia, simulation models, virtual reality and electronic instrumentation will open for a world wide laboratory testing. This is a structural change of education processes. Such changes of education will undermine mass production of education and open for specialisation of education.

External partners



A school is related to external partners. This may be an other school, the industry or other parts of the society. Together they are a system on a higher level sharing a common purpose. Fundamental aspects of systems is independent of system levels. Then changes in external binding, will have essentially the same effect as changing internal binding.

Figure 2 School and external partners

IT already is in use through the Internet for better communication between schools and the society. The government is using IT for better student records. Students already seek information world wide by Internet. Soon they will do this from their homes. This is an

fantastic world wide opportunity to get information online cheap and updated. But on the other hand: What is ITEM in a global campus ?

2.2 System Dynamics

If there are no dynamics in an organisation, management is an easy task. System dynamics has two perspectives. State dynamics and structural dynamics. Management is to control both of these perspectives at the same time. Thus, from a management point of view, ITEM is using IT for better control of dynamics of schools as an organisation.

State Dynamics

State dynamics is the dynamics of partners based on stable relations (Forrester). This is a well known paradigm from science and planning where the dynamics of organisation has a volume perspective. State dynamics is a perspective where IT easily may be used. We may use IT to get an optimal estimate of future needs of recruitment, costs, teachers, employment of educated students and so on. Most schools already is using IT for optimising resources and this is probably ITEM state of the art to day.

Structural dynamics

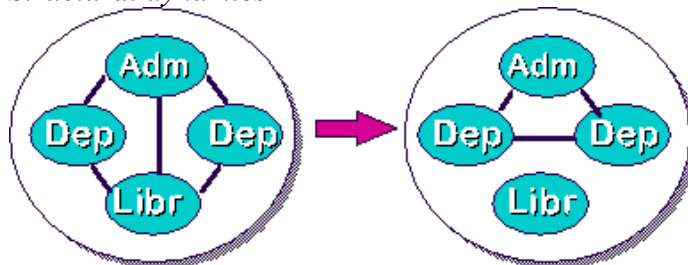


Figure 3 Structural dynamics

Structural dynamics is dynamic binding between partners. This is the same as changes in relations between partners. Structural dynamics has a relation perspective and thus we may discover the life cycle of objects. Examples of life cycles in schools are information, lectures, knowledge, staff and so on. ITEM is based on the ability of modulating the reality. There is no easy theory of understanding structural dynamics. The nearest is probably chaos theory and catastrophe theory (Zeeman). This type of dynamics is not controlled by IT but by management.

A value theory

The value of systems is judged by the strength of binding to its context. Structural dynamics thus is a critical problem leaders of schools should look up for.

Total Quality Management of schools

Schools need changes in a wanted direction like any other organisation. Understanding the importance of correct binding between partners is the key to influence the direction. Analysing the relation between partners is essentially the same as the essence in Total Quality Management. Following this doctrine, an important management task is adapting the right relations between internal and external partners. The question is: How may we use IT for better relations to partners ?

A simple advise here is to follow ISO 9004-2 standard for quality assurance of service organisations. In this standard schools are labelled as an service organisation. Following the guidelines in the standard, we have a functional specification on ITEM. The standard will help us to select where to introduce IT inside schools and where to use IT in relation to external partners.

2.3 System knowledge

System knowledge is something more than the sum of knowledge for each individual person. Knowledge reflects the organisation culture. It affects how the organisation behaves, solves its problems and how it survives. The behaviour of the organisation affect the paper flow in the organisation, where the decision is taken and what information is used for taken decisions. Knowledge based ITEM is therefore not an automatic decision system. It is the ability to select the right IT-system and predicting how the introduction of IT will affect the organisation.

System ethic

Systems as organisations have a tendency of striving for immortality (Heylighen). We know school lectures, courses, departments and even schools have a life cycle. The “genes” of schools are however in what they represent. Such “genes” materialise themselves in libraries, research papers, symbols and more. Today schools actively present their appearance and values on the Internet. This means that IT is the most important tool for accumulating historical information and to show the world its values. Thus the schools are moving their binding from local relation to a more international relation. When most schools in the world soon will be visible to each other on the Internet, this will have an dramatic effect of how these schools behave, how they define its identity and knowledge.

System learning in schools

System learning is the ability of prediction, control and adoption the dynamics of the organisation. The dynamics of organisations is influenced by binding to internal and external partners. Binding between partners has a level perspective and a relation perspective. Learning organisations is choosing the right levels and relations. Traditionally schools has stable partners. Stable partners has open for schools as an stable organisation. The planning horizon has been 3 to 10 years. This is a typical state dynamic situation where ITEM may be used for prediction and control of recourses.

New generation of IT changes the relation between internal and external partners. Learning in this perspective is choosing the right relation. This is the same as reengineering the organisation. In a such perspective IT is not a useful tool. IT may even make it more difficult to change the organisation.

Optimising resources

Systems tends to optimise its energy and resources. Schools are hardly a profitable business in a strict economic terms. Nevertheless there is a same need to optimising its resources. Optimising resources is not necessarily the same as doing things faster. Optimising resources may be doing the right thing, use the full potential of the organisation or adapting the organisation in new ways to its context. Introduction ITEM in organisations opens for a more flat and flexible organisation. Her schools are no exception. By introduction IT schools may be more open, flexible and decentralised. The schools may than be more adapted to the society where they are using the educated students.

2.4 Structural instability

There is no question about that most schools will pick up the opportunity of using IT to get better education and better schools. But is IT always something positive for a school ? Is there a dark side of IT ? If we go back to a basic doctrines of systems. It tells us that the value of systems is dependent on binding to its context. It is obvious that IT rapidly makes new relations. If new loose relations grow faster than robust stabile relation, the school may be isolated because it loses its binding to its context. In this case IT is not a tool to make stable partners on a higher system level. It will be a tool for fragmentation of organisations. In a rapid internationalisation process, this may be a price we have to pay.

2.4 Education processes reengineering

If new generations of IT leads to structural instability, than IT will be more a threat than new opportunities. A such threat may be solved by a reengineering of the organisation as an education process. Reengineering education processes is striving for a new kind of structural stability. This may be by a closer vertical integration of schools in the value chain of education and it may be a closer integration between schools and the society.

3 CONCLUSION

New generations of IT such as neural networks, CD-ROM, virtual reality and Internet will have a decisive influence on schools. Most school easily will pick up the opportunity of using these new tools for cheaper and better education. At the same time this new generation of IT will introduce structural instabilities in schools as organisations. System theory is a holistic concept of understanding complex organisations. By using system theory we may be better prepared to understand how IT will influence schools and than how to choose a right IT-strategy.

4 REFERENCES

1. Von Bertalanffy Ludvig: General systems theory. General Systems, Vol. 1, 1956
2. Forrester Jay W: Industrial Dynamics. Productivity System dynamics series. 1967
3. Forrester jay W: Beyond Case Studies. Computer Models in Management Education's. 1990.
4. Heylighen F. (1986): "Towards a General Framework for Modelling Representation Changes", in: Proc. 11th Int. Congress on Cybernetics
5. Heylighen F. (1991): "An Evolutionary System about Evolutionary Systems: Introducing the Principia Cybernetica Project", in: Workbook of the 1st Principia Cybernetica Workshop
6. Senge Peter M: The Fift Discipline. Productivity Press. 1990
7. Sterman D: Modelling for Learning organisations. Productivity press. 1994
8. Yndestad Harald: Generell Systemteori. HIA. 1995
9. Zeeman, E C: Chatestrophe Theory. Selected Papers 1972-77. Addison-Wesley. 1977