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EDITED BY
Miguel Baptista Nunes
and Maggie McPherson



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UNIVERSITY 2.0

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ABSTRACT

The article describes the basic components of the modern education models from Education 1.0 to Education 2.0, their pros and cons, tools and technologies used, the topology of communication networks and communication roles of involved actors. It suggests the basic approaches of the efficient organization of the learning process of a new type to improve the quality of education.

KEYWORDS

e-learning, university 2.0, education 2.0, web 2.0, pattern, network, hierarchy

1. INTRODUCTION

According to UNESCO the number of students in the world is growing. The demand for educational services now exceeds supply. Limiting the supply of education services is largely determined by the lack of qualified teachers. Among other problems of education is the adaptation of training support materials to the needs of learners and to the dynamic development of new technological areas of knowledge. Making the education system ready to accept challenges of the 21st century requires some system transformations based on the use of modern information technology. The main hopes in this direction rest upon the establishment and maintenance of learning management systems, open and distance learning, and the development of portals for electronic educational materials (UNESCO, 1998).

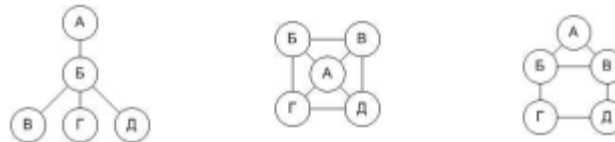
The pattern-based approach has worked well in other areas of rapid conceptual and practical evolution such as software development. In process sciences, patterns have been introduced with the hope that there is only a finite number of basic building blocks so that more complex processes can be understood in terms of simpler units (Coimbra and Rito-Silva, 2003). Our paper is based on the assumption that one can make conceptual progress with regard to future educational systems by using basic building blocks of multi-user communication. In the remainder of the paper, we present first ideas and some topological patterns related to educational systems.

2. TECHNOLOGY OF EDUCATION IS BASED ON COMMUNICATION

Communication is the process of formation, maintenance and implementation of interpersonal and inter-group contact at the university and the maintenance of joint activities of its employees. Communication can be divided in three aspects: communicative, interactive and perceptual. The communicative aspect of communication is manifested through the actions of the individual, consciously focused on their perception by other people and expressed in the exchange of information between the parties of communication. The interactive aspect of communication is the interaction of people with each other in the process of interpersonal relationships during the implementation of joint activities and development of overall plans and programs for both tactical and strategic interaction. An important role is played by a form of interaction (competition or cooperation), which leads to conflict, to emotionally rich interaction or to smooth "neutral" interaction. Perceptual aspect of communication is manifested through the perception and evaluation of social objects. Such social objects can be other people, communicators themselves, groups, and other social communities. Mechanisms are used: "identification - confrontation", causal attribution and reflection, i.e.

understanding how perceive each other the communication partner. Important factors that greatly increase the effectiveness of communication is its emotional side, the degree of empathic expressiveness.

In technology of education the communicative aspect of communication can be represented by different types of network structures. In practice, there are three types of structures: open, closed and combined. In open networks (Fig. 1 a) the information flow can be stopped, falling into a dead end, that is an element of the management structure, located at the end of the channel or bumping into the "mediator" ("Comptroller") - an intermediate in the network, which can not be bypassed (it has the ability to prevent the movement: to stop, to distort or to send to the other side). In closed networks (Fig. 1 b) dead-ends and supervisors are not available, or they can be circumvented. In such networks, information can circulate freely. Combined networks (Fig. 1 c) join the both principles of construction (Trofimov, 2010).



a) network of type "Star" b) network of type "All-Channel" c) network of type "House"

Figure. 1. Types of communication networks (Trofimov, 2010)

The configuration of communication channels defines the network topology; opportunities are the nodes that implement a variety of functions, described as roles. Communication channels are distinguished by their technical characteristics: bandwidth, the size of potential losses and failures etc. The important characteristic of the communication channels is the orientation of communication. Communication channels connect the elements of organizational structure, belonging to different levels. They can be vertical, horizontal, diagonal. Communication roles describe different sets of functions performed by network nodes. These roles include: "watchman", "contact man", "opinion leader", "cosmopolitan", etc.

The role of "watchman" takes a person occupying a place in the structure, which allows him to regulate the flow of messages that come on this channel. The function "watchman" analogous to the function of valve. For example, teachers and secretaries belong to the type "watchman". An important function of "watchman" is to reduce the information overload by filtering message flows.

The role of "contact man" ("connecting point") is an individual, linking on the interpersonal basis two or more groups in a system and does not belong to any of them, for example, the head of the group. "contact man" are placed at the intersections of information flows in the group (organization). "contact man" is the cement that binds the structural "building blocks" of the organization (with the removal of "contact man" system falls apart into isolated elements).

"Opinion leader" shall be a person that can provide a significant impact on the informal setting or behavior of other individuals in the desired direction, for example, the curator of the group.

"Cosmopolitan" is an individual who more than all the others interacts with the external environment of the system, such as the rector. Since every organization is an open system, it must have some "cosmopolitan". In most systems, "cosmopolitan" are located at the top and bottom of the hierarchy. 'cosmopolitans' can be described as a special type of "watchmen." "cosmopolitanism" of some individuals is a resource systems because they allow the organization to interact with the external environment.

2.1 Model of Education and Communication Networks

Model "Education 1.0" is a description of traditional methods of training, in which the teacher plays an active role while the student is relatively passive; this model is based on open network structures such as "Star" (Fig 1 a) with the teacher as central node "B". The introduction of modern information technologies in such a model leads to a slight change in the educational process: it increases the visibility of the material provided by the use of a projector, computer, electronic whiteboard and allows for access by placing a network of materials in electronic form. The tool can be used like a traditional intranet portal. It reflects the formal structure of the university and ignores informal communication, permitting to publish the study materials. Only "preferred" select content - the most relevant, moderated information is placed on it. The disadvantages

of such construction for the educational process may include a traditional, slow communication between teacher and students. Communication on the lower level between the students is not encouraged.

As a slightly evolved version, Model "Education 1.5" is a modernization of the previous technology and processes by establishing communication on the lower level between the students, for example by introducing a discussion forum. It is based on mixed network structures such as "House" (Fig 1 c) with the teacher in the roof position "A".

The introduction of modern information technology adds to the above mentioned advantages of the appearance of horizontal communication between students in the classroom (or forums): when training in a group based on mutual aid, the student masters the role of "teacher" to other students. There is a large number of free learning management system that support this mode of learning including the popular MOODLE and many others.

The disadvantages of such a learning management systems include: a centralized structure, slow-sanctioned "ride" the development, communication directed from the top down. A forum for students can serve as a non-trivial example for this topology: the lecturer creates a forum accessible to course participants and asks the students to discuss there all issues of non-confidential nature that might be relevant for the whole course. He discourages students from sending him emails (private communication). At the same time he stops himself from participating in the forum himself unless he is explicitly addressed and asked. What will happen and what has happened in those course where we have tried this is that the students will begin to answer each other's questions. They will increasingly manage without the lecturer who still reads the forum messages and steps in when absolutely necessary. In this way the students co-create course content. If the forum technology used allows it, the structure of the forum can be used to trigger additional sub-processes: the structure of the forum can be used to channel discussions (e.g. discussion on one topic only or only question and answer). Over time, the content developed by students under supervision can also be turned into a knowledge base, e.g. using discussions on administrative issues resulting in a FAQ.

Model "Education 2.0" represents a shift from a hierarchical to a flat network architecture communication and is based on a closed network structures such as the "All-Channel" (Fig 1 b). The distinctive features of the educational process of this model are as follows: collective processing of the data; gaining of new knowledge by the entire group; the teacher can act as a "student" (topologically he is only a node, albeit possibly a central one); Training 24x7x365; competition between teachers (struggle for students).

A corporate social network is an example of the organization created with this type of educational setup: it reflects the actual connection at the university; all participants of the learning process are involved and can publish; large amounts of content, which forms the real basis of knowledge, can be placed in the network; it provides a decentralized structure and a natural foundation for self development and bottom-up communication.. As a practical example for this topology, we would like to mention our use of blogs as a substitute for student essays in several courses at bachelor level at our school. In the course, students were asked to write weekly blog entries on self-selected topics and to comment on other students' blogs. Additionally groups of students teamed up and created group (multi-author) blogs on given topics. The blogs were located on the Internet (students were instructed on how to maintain their anonymity) and in many cases became part of larger communities of interest. An aggregator portal was used to display links to all the blogs of the students (like a table of contents). the lecturer also participated in the project by writing his own weekly blog. Hence, content was created by all course participants in a flat networked structure including the lecturer as a "student". while many students found this challenging initially, most of them grew to like it and many continued to write blogs afterwards. One could also imagine a similar procedure using mass social media tools such as facebook instead of blog software.

Outside of education, the architecture of Education 2.0 based on information technology is of course dubbed Web 2.0 with an emphasis on content co-creation by all process participants.

2.2 An Outlook: Education 3.0

For the sake of completeness, we will add a few thoughts on the next evolutionary step in educational technology, machine-learning based Education 3.0 corresponding to the semantic web (Antoniou and van Harmelen, 2008), Web 3.0 (though definitions of "Web 3.0" vary greatly, while there is agreement on the power and position of Web 2.0).

Web 1.0 is characterized by linked content without interactivity of the network participants. Web 2.0, as explained, rests upon the interactivity of participants who co-create content and make connections themselves. For Web 3.0, experts and expert systems will play a bigger role: the standardization of data formats permits a much improved automatic search for information, which will be much more meaningfully structured when it reaches the learner. The network topology of Education 3.0 is no different from Education 2.0. The main difference is the (pre-)structured content and the ability of the learners to mix and mash the content up according to their needs while the teacher acts as a coach and supervisor. In the Education 3.0 scenario, information is provided and pre-structured; the learner is still required to discern and evaluate according to relevance, form, suitability etc. If the learner can pick his own content from a sea of content, he will develop different competencies and he will act more responsibly both in his learning process and in the learning process of others. One could imagine learners turn into experts more quickly that way: this is essentially the process experienced by student and academic supervisor during the preparation of a longer paper or thesis - if a lot more knowledge was available to the student and if it was easier to make sense of this content, it is imaginable that this might happen much earlier in the course of studies. The didactic approach known as "Learning by Teaching" (German: "Lernen durch Lehren") is a methodical and practical framework for this type of process (Schroeder und Spannagel, 2006).

Another aspect of Education 3.0 concerns the increasing amount of virtual interaction replacing physical classroom hours, e.g. when teaching takes place in a 2D video conferencing environment or in a 3D virtual world. In such a situation, learners and teachers are like to experience sensory losses. The All-Channel network topology is also dominant here; the question of substituting for the incurred losses is important and have been investigated by one of us (Birkenkrahe and Gallo, 2011).

3. CONCLUSION

Drawing on the known differences between different phases of web development (up to Web 2.0), we have investigated the according evolution of educational network models and provided a few examples. We have argued that the technology employed at a modern educational institution "University 2.0" must satisfy certain technological requirements in order to live up to the promises of Education 2.0, a network topology structured like a "All-Channel" of equal participants. While we have also sketched an Education 3.0 scenario, it is too early to predict the impact on the classroom with certainty.

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