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INFORMATICS

IN THE SCIENTIFIC KNOWLEDGE

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Krassimir Markov, Krassimira Ivanova, Natalia Ivanova, Ilia Mitov

Abstract: *The "Information Market" is a payable information exchange. The Knowledge Markets are special kind of Information Markets. The staple commodities of the knowledge markets are kind of information objects, called "knowledge information objects". The main theirs distinctive characteristic is that they contain any information models (knowledge). Nevertheless, at the (electronic) knowledge market one can buy only the knowledge information e-object, but not the knowledge itself. The need of specialized e-publishing rules and standards as well as the need of corresponded laws for authors' responsibility are pointed out in the paper.*

Keywords*: Electronic Publishing, Education, Information Market, Knowledge Market*

Introduction

In the beginning of the XX-th century the great Bulgarian poet Pencho Slaveikov wrote: "The speaker doesn't deliver his thought to the listener, but his sounds and performances provoke the thought of the listener. Between them performs a process like lighting the candle, where the flame of the first candle is not transmitted to another flame, but only cause it."

If one buys a candle what does he really buy – the "wax" or the "light" of the candle? The light is not for sale in the store... But one really may see the example how the candle works and how it may be used. Based on this he may decide whether to buy the candle or not.

The usual talk is that at the Knowledge Market one can buy knowledge. But, from our point of view, this is not so correct.

This paper continues the investigation of the Knowledge Markets discussed in [4], [5], [9], [10].

The Universe of Electronic Publications: What's Out There?

The short answer to "What's out there?" in the world of electronic publishing is "Everything". If something can be published in print, it's also being published online, somewhere. What's more, many kinds of publishing that aren't possible on paper or other types of physical media, such as animation, interactive applications and 3-dimensional games, are also happening concurrently.

A few of the many different kinds of online publishing that currently exist appear on the following diagram (Fig.1). There are many ways to conceptualize such a list; this diagram presents a grid that ranges from commercial to non-commercial forms on one axis, and from proprietary formats to standard formats along the other.

Outside of all four quadrants lies the realm of "Things we don't know about yet", which will probably remain the major category of electronic publications as long as the current rate of innovation continues [11].

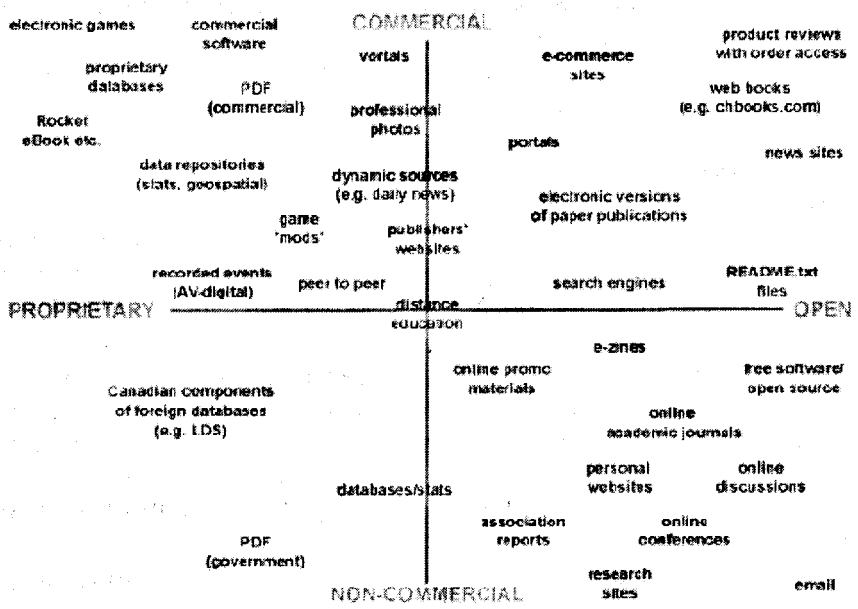

Figure 1. Online publishing

Pros and Cons of Electronic Publishing

Pros and Cons of Electronic Publishing are discussed many times. Let remember for instance [11].

Motivations for publishing online are varied and complex. Before 1994, the Internet was in essence a "free" medium, characterized by an open sharing of information, without regard to the commercial possibilities of digital publication. The development of the graphical Web browser, combined with the steady increase in access speed, produced a much wider interest in the medium, expanding the user base far beyond the original circle of academics and hobbyists. The first commercial web sites and "dot.com" companies appeared not long afterward, though many lacked (and still lack) viable business models for making money online. In

the late 1990s, the most common approach was "Let's just get online now and we'll figure the money stuff out later". Since the spring 2001 downturn in technology stocks, the level of interest among commercial enterprises for all things digital has become substantially cooler, and many companies have retreated to a more conservative position, either scaling back or canceling their online ventures entirely.

For many print publishers thinking about expanding into digital publishing, the current "wait and see" atmosphere comes as something of a relief. Selling books is a difficult business at the best of times; adding the expense of producing simultaneous digital editions without the presence of any clear solutions for the problems surrounding rights and licensing and secure distribution of digital publications is prohibitive for many publishers. On the other hand, some publishers have found that capitalizing on the general aura of excitement surrounding new technology by producing digital publications on a limited scale has boosted the sale of their print titles.

For other types of publishers, though, commercial success isn't an issue. Many individual writers, small magazines, specialized small presses, non-profit organizations and government departments have found the digital realm to be ideally suited for their purposes. Digital publications can be produced and circulated relatively inexpensively, and can reach a readership far wider than small-scale print publications. And beyond the selfish notion of "publicity", many publishers see the process of creating broader access to texts of all sorts as a public good.

Here are some of the serious arguments for why electronic publishing isn't such a great idea:

– ***Rights Management and Control***: it's virtually impossible to keep someone from copying an electronic publication if they have their mind set on doing so. Further, there are no effective national or international systems for managing rights and licensing issues around electronic publications, though some companies, such as ContentGuard, have made significant advances with XrML (Extensible Rights Markup Language).

– ***Startup Costs***: outlay for the training, hardware and software necessary to publish electronically can be considerable.

– ***Competing Standards***: There are currently a multitude of competing incompatible formats and delivery systems for electronic publications; some even require specialized (and expensive) hardware to access them.

– ***Vague Market***: it's unclear who will buy electronic publications, and how they will buy them. The current downturn in the fortunes of the technology marketplace has created an atmosphere of fear, uncertainty and doubt around electronic publications, and many companies have

decided to take a "wait and see" approach to the question of whether or not to expand online.

On the other hand, there are many good reasons for extending traditional publishing activities into the electronic universe:

– ***Portability***: once a document is in electronic form, it is easy to repurpose it for any imaginable format (Braille, print-on-demand, Web content, etc.)

– ***Renewal***: legacy material such as out-of-print books can take on a whole new life if recreated as electronic publications.

- ***Enhancement***: electronic documents have characteristics not found in print documents, such as animation and hyperlinking. It's also far cheaper to produce full-color electronic documents than it is to produce full-color print documents.

– ***Ubiquity***: if placed online, electronic documents have a potential audience far greater than any print document.

– ***Publicity***: because of the excitement surrounding electronic publishing, electronic documents make effective advertising for your company and your other products.

While each business has to make such decisions for them, it's clear that electronic publishing in some form is inevitability. There are definite benefits to be reaped from approaching electronic publishing with a pragmatic, carefully organized approach [11].

Education in the Global Information Society

The development of new training structures should take into account features of transition to a new stage of development of the society. Education in the global information society will be a direct successor of the already existing educational forms and structures, and at the same time, it dialectically will change the forms and contents of the working patterns of training [7].

In 1990 the US National Science Teachers Association (NSTA) published "Criteria for Applying Distance Learning to Science Education" as an NSTA Position Statement [13]. In this statement, the terms "distance learning" and "distance education" interchangeably apply to schemes where the learner and the source of instruction are in different locations.

Distance learning has considerable history in the education. For decades, correspondence courses have linked sources of instruction to remote individual learners through exchange of printed materials by mail. Also, radio and television have been used for a variety of distance learning schemes involving virtually all disciplines. Within science education, an early example of distance learning involved delivery of primary instruction for high school physics in the form of 16 mm films

which were mailed to be shown daily in classrooms. Later, but before communications satellites were highly developed, another distance learning project had televised science instruction beamed to classrooms from a high-flying aeroplane. Such early forms of distance learning were limited by a low degree of interaction between learners and sources of instruction.

Recently, a variety of distance learning schemes have arisen that use electronic ways of linking the learner and the source of instruction with increased interaction between them. For the purpose of this position statement - to ensure high quality when distance learning is applied to science education - the definition of distance learning rendered by the U.S. Department of Education is adopted:

"The application of telecommunications and electronic devices which enable students and learners to receive instruction that originates from some distant location. Typically, the learner is given the capacity to interact with the instructor or program directly and given the opportunity to meet with the instructor on a periodic basis."

Rapid advances in communications technology are causing a dramatic increase in applications of distance learning to all levels of science education. Today, students from elementary school through college have high probability of encountering some form of distance learning as a primary or supplementary mode of instruction in science sometime during their school years. Also, applications of distance learning to the continuing education of science teachers are increasing. It is likely that distance learning directed toward science education will continue to expand and evolve [13].

Schar and Krueger define computer aided learning (CAL) as "different forms of computer-mediated teaching methods in which the student is paired with a computer as virtual teacher". Students can benefit greatly from information presented through different types of media – this could increase their attention, and stimulate them to think about subject matter in different ways. On the other hand, CAL enables learning at home or at workplace, which saves time and efforts [12].

The global systems give an opportunity for each state to use information service for an effective utilisation of personnel potential of qualified teachers with the help of remote connection. Besides, it is quite possible in conditions of the global information society to fill up information resources in libraries and local centres of information service through remote access to global cultural and science centres [6].

The information society does not assume compulsion of usage by information services on the part of all inhabitants of the given territory. One very important feature thus is emphasised: for everyone will be necessary diverse and qualitative (from his point of view) information, but

also everyone can not receive all necessary information. The enterprising experts will accumulate the certain kinds of the information and will provide the existence through favourable to them information interchange with the members of the society [8].

The growth of the global information society shows that the knowledge becomes important and necessary article of trade. The open environment and the market attitudes of the society lead to arising of the knowledge customers and knowledge sellers, which step-by-step form the "Knowledge Markets". As the other markets the Knowledge Market is the organised aggregate of participants, which operates in the environment of common rules and principles.

Examination of the market demand for various types of courses and training modules is a key criterion for effectiveness and high efficiency. Market trends, industry requirements, and companies training needs have to be examined on a regular basis.

Basing on the analysis of the present approaches of collecting, processing, storing and transferring of the knowledge, and taking into account the open knowledge environment's basic characteristics, we can build a generalised scheme of the knowledge market, which reflects the information interactions and connections between the knowledge market's participants.

The first task in analysing the knowledge market is clarifying its basic components and the interactions between them. The knowledge market structure is formed by a combination of mutually-connected elements, which work in the simultaneously sharing joint resources.

The Information Market

The information society does not assume compulsory usage of the information services by the part or all inhabitants of given territory. One very important feature thus is emphasized: everyone will need diverse and qualitative (from his point of view) information, but also he will not be able to receive all of the necessary information. The enterprising experts will accumulate certain kinds of the information and will provide the existence through favorable to them information exchange with the members of the society. Thus, in one or other form, they will carry out *payable information service (granting of information services for some income)* [4]. This is the background of the Information Market.

The payable information exchange and services regulated by the corresponded laws and norms as well as by the government protection of the rights of the participants (members) of this kind of social interactions form the ***Information Market.***

So, at the centre of discussion, we have discovered a simple true: *in the information society the payable information exchange and services*

will dominate over all other market activities. In other words, the Information Market dominates over all other types of markets of the information society. Of course, the electronic publishing pays significant role at the scene of the Information Market.

Knowledge Information Objects

V.P. Gladun correctly remarks that the concept "knowledge" does not have common meaning, especially after beginning of it's using in the technical lexicon in 70-ies years of the last century. Usually, when we talk about the human knowledge we envisage all information one has in his mind. Another understanding sets the "knowledge" against the "data". We talk about data when we are solving any problem or are making logical inference. Usually the concrete values of the given quantities are used as data as well as the descriptions of the objects and interconnections between objects, situations, events, etc. During decision making or logical inference we operate with data involving some other information like descriptions of the solving methods, rules for inference of the corollaries, models of the actions from which the decision plan is formed, strategies for creating decision plans, and general characteristics of the objects, situations, and events. In accordance with this understanding, the "knowledge" is information about processes of decision making, logical inference, regularities, etc., which applying to the data creates any new information [1].

The usual understanding of the verb *"to know"* is: "to have in mind as the result of experience or of being informed, or because one has learned"; "to have personal experience of smt." etc. The concept *"knowledge"* commonly is connected to concepts "understanding" and "familiarity gained by experience; range of information" [3] or "organized body of information" [2].

From point of view of the General Information Theory, *the knowledge is a structured or organized body of information models, i.e. the knowledge is information model, which concerns a set of information models and interconnections between them* [10].

In accordance with this the information objects, which contain such information models are called ***"knowledge information objects"***.

The Knowledge Market

The growth of the societies shows that the knowledge information objects become important and necessary articles of trade. The open social environment and the market attitudes of the society lead to arising of the knowledge customers and knowledge sellers, which step-by-step form the **"Knowledge Markets"** [9].

As the other markets, the Knowledge Market is the organized aggregate of participants, who operate according to common rules and principles. The knowledge market structure is formed by a combination of mutually-connected elements with simultaneously shared joint resources.

The staple commodities of the knowledge market are the knowledge information objects.

The main components of the Knowledge Market (**KM**) and interactions between them are shown in figure 2.

The first question we have to answer in the analysis is: "Who needs the knowledge and can be determined as a real knowledge customer?". Obviously it is a man of enterprise, who owns and develops his own business. For the purposes of growing up his business, he hires and pays to the workers or employees, who need to have exact skills and knowledge to be transformed in real products or services during the work processes. This process is served by the Manpower Market.

In this interaction the businessman has the activity of the **Employer (Er)** and the hired workers are treated as **Employees (Ee)**. The whole process begins from the Employer – the very first component. The second component, of course, is the Employee – the man who possess the needed knowledge and who is able to turn them into the real products during the work process.

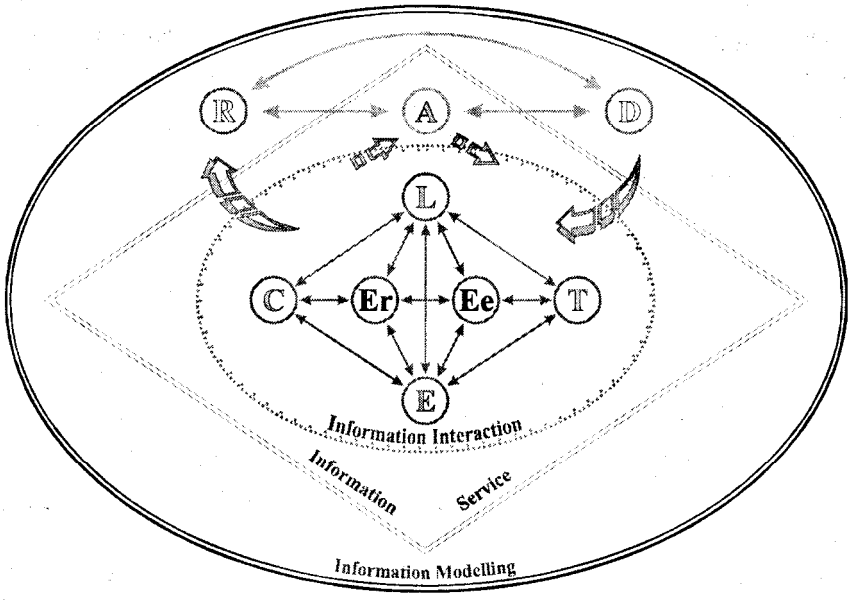

Figure 2. Structure of the Knowledge Market

If the people were born genetically all-knowing, the system could be closed to only these two components. However the Employees, even owning a high education level, need additional knowledge to solve the tasks assigned by the Employers. In this moment they became customers of new knowledge. Let remark that this is not the knowledge, received from the teachers and the lecturers in the school or the university. This is additional information which is necessary for carrying out the Employer's tasks.

The need of obtaining the new knowledge creates a new market – "The Knowledge Market", which should rapidly react to the customers' requests. In other words, the manpower's market causes the appearance of the knowledge marked. The final result of the Knowledge Market cycle is the educated and skilled Employees which can be engaged in the business of the Employer.

The technological and social status of the society is not a constant value. It changes over and over again – the new discovered knowledge became as a base for developing the new technologies. In order to reach to the production processes, these technologies have to be promoted to the Employers - they should be convinced to implement this technologies in theirs own business. In the same time, it is necessary to determine the educational methods for training the staff for using the new technologies.

So, a special type of knowledge market participants has been formed - the **Consultants (C).** The concept of Consultant means man or institution (scientific, business, public or state) who are specialised in the given practical domain and make research for discovering the present and future needs of the Employers to buy manpower for the purposes of theirs business.

The Consultants do not need to educate the Employees directly. They only determine what the Employees should learn. The education is carried out by the **Lecturers (L)** that transform the required by the Consultant scientific knowledge into the pedagogical grounded lessons and exercises.

The Lecturer has limited resources for the co-ordination of the processes of the knowledge transfer, for the interaction with every one knowledge customer, for the advertising of the services he offer, etc. These tasks the Lecturer solves in association with the **Tutor (T)** – an assistant who organises the educational process and supports the Employees during receiving the new knowledge and mastering theirs skills.

It is very important to point that the Employer is not able to control the knowledge and skills of his present or future Employees and to determine the level of their adequacy to his requirements and the

employment they are or are about to be hired. The theoretical principles of this control are given by the Consultant, but the real examination and attestation are carried out by another knowledge market participant – the **Examiner (E).**

This way, we have defined six Knowledge Market Components, which need to be connected via the global information network. They form the first level of the knowledge market called the level of the **"information interaction"**.

As far as these components are too much and are distributed in the world space, the organisation and co-ordination of theirs information interaction needs adequate **"information service"**. It is provided by a new component called **Administrator (A)**. Usually the Administrators are Internet and/or Intranet providers or organisations. The Administrator is characterised by the knowledge for carrying out and managing the information service of the processes of knowledge exchange between members of the given Knowledge Market.

The rising activity of the knowledge market creates the need of developing modern tools for the information service in the frame of the global information network. This causes the appearance of the high knowledge market level, which allows the observing the processes from every point of view, as well as developing and implementing new systems for information service. This is the **"information modelling"** level. It consists of two important components - the **Researchers (R)** and the **Developers (D)**.

As a rule, the Researchers perform large scale of scientific activities for inventing, establishing and growing the tools for information service for given practical domain and the Developers perform large scale of activities for projecting and realisation of the tools for information service for given practical domain.

Conclusion

Let consider an example of the correspondence between concepts "information object" and "knowledge information object". When an architect develops any constructive plan for future building, he creates a concrete "information object". Of course, he will sell this plan. This is a transaction in the area of the Information Market. Another question is from where the architect has received the skills to prepare such plans. It is easy to answer – he has studied hardly for many years and received knowledge is the base for his business. So, we see that the textbooks are not concrete information for building concrete house, but they contain the information needed for creating such plans. The textbooks written by the lecturer in the architectural academy are special kind of "information

objects", which contain special generalized information models. They are "knowledge information objects" and these textbooks have been sold to the students. It is clear; here we have a kind of transactions at the Knowledge Market.

At the end, we need to take into consideration the difference between responsibility of the architect and the lecturer. If the building collapses the first who will be responsible is the architect, but never the lecturer!

So, we came to the main problem we need to point – *the electronic authors and publishers are not responsible for what they sold to the customers.*

From customers' point of view, it is difficult to discover what really we will receive if we will buy an electronic knowledge publication. Many times, the title and announcement of the publications are not equivalent to theirs content, but the customers could not claim the damages.

To regulate this process we need specialized e-publishing rules and standards for knowledge markets' e-publications as well as corresponded laws for authors' and (maybe) publishers' responsibility.

Let point that the main goal of the Knowledge Markets is to serve corresponded forms of long live and as a rule – distance education using e-publishing products. It is very important for the society to support and control the correctness of knowledge which is aimed to be sold at the Knowledge Markets. The "freedom of information" may be dangerous in this case.

The interconnections between e-Publishing, Education and Knowledge Markets need to be regulated both by specialized international lows and rules and by social activity co-ordinated by government and non-government organisations.

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References

1. **Гладун, В. П.** Процессы формирования новых знаний. София, Педагог 6, 1994. ISBN: 954-8249-06-5.
2. **Hawkins, J. M.** The Oxford Paperback Dictionary. Oxford University Press, 1982, ISBN: 0-19-281209-2.
3. **Hornby, A. S., A.P. Cowie, A. C. Gimson.** Oxford Advanced Learner's Dictionary. Oxford University Press, 1987, ISBN:0-19-431106-6.

4. **Ivanova, N., K. Ivanova, K. Markov, A. Danilov, K. Boikatchev**. The Open Education Environment on the Threshold of the Global Information Society. IJ ITA, 2001, Vol.8, No.1 pp.3-12. ISSN: 1310-0513.
5. **Ivanova, Kr., N. Ivanova, A. Danilov, I. Mitov, Kr. Markov.** Basic Interactions between Members of the Knowledge Market. Proc. of the International Conference "Knowledge-Dialogue-Solution", 2005, Varna, Bulgaria, Vol.2, pp. 638-648.FOI-Commerce, Sofia, 2005, ISBN: 954-16-0033-6.
6. **Markov, Kr., Kr. Ivanova, I. Mitov.** An approach to the information service of the education. NITE-98, AGTU, Astrakhan, 1998, pp. 51-56. (In Russian).
7. **Markov, Kr., Kr. Ivanova, I. Mitov.** The Information Society. ITA-2000, Bulgaria, Varna, 2000
8. **Markov, Kr., Kr. Ivanova, I. Mitov.** The requirements to the automation of the education on the threshold of the Information Society. NITE-2000, AGTU and CNTEP, Astrakhan, 2000, pp. 23-31. (In Russian).
9. **Markov, Kr., Kr. Ivanova, I. Mitov, N. Ivanova, A. Danilov, K. Boikatchev.** Basic Structure of the Knowledge Market. IJ ITA, 2002, Vol.9, No.4, pp.123-134. ISSN: 1310-0513.
10. **Markov, Kr., Kr. Ivanova, I. Mitov.** The Staple Commodities of the Knowledge Market. IJ ITA, 2006, Vol.13, No.1, pp.11-18. ISSN: 1310-0513.
11. National Library of Canada. Electronic Publishing: Guide to Best Practices for Canadian Publishers. National Library of Canada, Ottawa, Created: 2001-10-03. Updated: 2004-03-03.
http://www.nlc-bnc.ca/9/13/index-e.html
http://www.collectionscanada.ca/obj/p13/f2/01-e.pdf
12. **Schar, S., H. Krueger.** Using New Learning Technologies with Multimedia. IEEE MultiMedia, July-September, 2000. pp 40-51.
13. US National Science Teachers Association. Criteria for Applying Distance Learning to Science Education. An NSTA Position Statement. *1990.*

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