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Responsabilités sociales et formation des acteurs de l'informatisation

Informaticiens, utilisateurs, décideurs

Key players in the introduction of information technology: their social responsibilities and professional training

Computer Professionals, Users, Decision Makers

Actes du colloque, *Proceedings*

NAMUR
Belgique

5-7 Juillet 1995, *July 5-7 1995*

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Responsabilités sociales et formation des acteurs de l'informatisation

Key players in the introduction of information technology: their social responsibilities and professional training

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Informatics and informaticians: Changing concepts and a realized example of teaching and understanding informatics beyond computer technology

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Abstract
Since its birth the notion of informatics has undergone basic changes of meaning. Its recent social and professional content can be deduced from questions "to where, what, how much, what kind of and why" rather than from "how and by what means". Education and professional training, however, do not follow this change of approach appropriately and training of "informaticians" is dominated by specialized fields of computer technology.

Department of Information Engineering of the Budapest Technical University, having recognized this gap, has launched the complex introduction of a new type education of informaticians. Its long-term goal is to establish an independent university programme to educate informaticians or knowledge engineers; its first working model is a comprehensive programme in banking informatics launched at graduate and postgraduate level.

Key Words: informatics, informatician, computer technology, education, banking informatics

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L'informatique et les informaticiens: conceptions variables et un exemple dans la pratique de l'enseignement et de l'interpretation de l'informatique dépassant la *"computer technology"*

Résumé
Le concept de l'informatique de sa naissance à nos jours a subi un transformation fondamental du sens. Aujourd'hui on ne peut plus deduire son signifié social et professionnel á partir de questions "comment, avec quel moyens" mais aussi de "ou, quoi, combien, quel, pourquoi". La formation des experts ne suit pas adéquatement les transformations de cet aspect et dans la formation des informaticiens, les domains professionnels de la "computer technology" domineront.

Le Département "Informatique et Société" de l'Université Technique de Budapest, constatant cette lacune, á decidé d'instaurer un enseignement des informaticiens complexe et d'un type nouveau. Notre projet est d'etablir un enseignement universitaire pour les informaticiens ou les ingenieurs du savoir independant. Le premier modèle fonctionnant est l'enseignement universitaire et post universitaire des informaticiens de la banque.

Mots-clés: informatique, informaticien, *computer technology,* enseignement, informatique de la banque

Informatika és informatikus: változó koncepciók és egy megvalósított példa a számítástechnikán túlmutató informatika tanításában és értelmezésében

Kivonat
Az informatika fogalma megszületésétől napjainkig alapvető jelentésváltozásokon ment keresztül. Mai társadalmi és szakmai tartalma nem elsősorban a "miként, milyen eszközökkel", hanem a "hova, mit, mennyit, milyent, miért" kérdésekből vezethető le. Az oktatás és szakemberképzés azonban nem követi megfelelően e szemléletváltozást, s az informatikus-képzésben a számítástechnika szakterületei dominálnak.

A Budapesti Műszaki Egyetem Társadalmi Informatika Osztálya e hiányt felismerve új típusú informatikus-képzés komplex meghonosítását indította el. Távlati terve egy önálló egyetemi informatikus- vagy tudásmérnök-képzés létrehozása, első működő modellje a graduális és posztgraduális szinten indított átfogó bankinformatikai képzés.

Kulcsszavak: informatika, informatikus, számítástechnika, oktatás, bankinformatika

1. Dilemmas in search for identity

When the notion of informatics was born, it simply meant *the discipline dealing with the scientific information system based on library network,* i.e. it concerned *processing and transmission of existing knowledge worlds in a definite way* (since 1965 in most European countries officially, too). In the sixties, it friendly coexisted with the new youngsters of science, with information theory (conforming to the mathematical theory of telecommunication) and with computer science (that has then just separated from the education in electrical engineering), however, its meaning went through a shocking change in the seventies. As the rapid development of computer technology called different scientific fields and corresponding university degree courses into being, the term informatics was more and more used as their *"collective category".* However, as computers left the closed circles of science and spread in the world of users, the *science of corporate computer systems,* top-rank in development, required the term informatics; in the French-speaking countries electronic data processing (l'informatique) was understood by it. In the eighties, instead of "information science", that was hopelessly tried to be naturalized, informatics has just merged *everything relating to the information phenomenon and techniques for handling information systems.* All this has led to the absurd situation that everybody engaged full-time in computer technology (or since the nineties, in telematics) was "informatician".

The era of this sort of "quasi-informaticians" came to end in the early nineties. In addition to jobless computer mechanics and programmers, that were made intellectual wage workers, everybody who was a little bit following the restructuring of the information market and its related knowledge worlds was able to recognize it. The information systems getting rid of the mystery of "technological miracle" parallel to the triumphant advancement of software producers have flooded the most different fields of application. According to a recent American survey, out of 1000 software specialists only one single is needed in theoretical research of programming and algorithms and ten in system programming: all the other 989 informaticians should act as programmers or system managers at any level on a unbelievably wide range of applications. When training informaticians in this new age, emphasis *has shifted toward practical techniques needed by design and construction of information systems,* and graduates should be able to utilize their professional knowledge in most various circles of users.

The direction of change well indicates that the rearrangement of the relation between objectives and tools completely confused due to the unbelievably rapid technological development has begun. *The role of the technological environment as tool, believed to be objective in the trance of development, becomes more and more obvious.* Earlier the most graspable level of all transformations was related to information tools with which we come into touch in the everyday routine: we work with, use, listen and watch (suffer) them. Among the related "knowledges", the computer and information science narrowed to mathematics and technology and their "applied" branches kept their stable position as disciplines. Meanwhile, the computerized nature of the reality with its unbelievably complex relations and relation systems to be disclosed being increasingly richer in information did not get the chance - with the exception of some approaches of sociological motivation - to gain its deserved place in public thinking, in halls of sciences and education as an essential field of changes. However, since the system change it becomes more and more clear that *the real social and professional content of handling information can be deduced from questions "to where, what, how much, what kind of and why" rather than from "how and by what means".* Indeed, what kind of specialists are needed by numerous fields of economy, politics, public life and culture? Specialists who *reach the necessary pieces of information and filter out the unnecessary ones*

and, after processing/systematizing them, reproduce/transmit the desired elements of knowledge. (And tools should remain in the competence of engineers.)

As nowadays electronic data processing is the elementary medium for informaticians, and the development of computer technology and telecommunications offers solutions usable and utilizable in almost all fields, informaticians, of course, have to have a good grasp of *computer technology and telecom.* This requires the ability of using or offering any tools and of adapting technological novelties if necessary. However, informatician is, first of all, not a computer technology expert! Knowledge of computer technology is only a *part* of the informatician's knowledge: the informatician has to both recognize *the objectives of the widest system and its connection to the environment* and include them in the task solution. Computer technology always means for them *tools* only!

Of course, there is no "general informatician", there are only basic informatical skills and knowledges that should be combined with further knowledge elements from other professional fields and then activated. At present, there are three scenarios for this combination:

1. *parallel acquisition of the necessary knowledge within institutional forms* (not commonplace yet)

2. *"opening" from a given profession* (mainly with higher educational qualification) *to the world of informatics,* most commonly within courses through "learning by doing"

3. *armed by the appropriate qualification as informatician* (possessing a diploma obtained at a computer technology oriented faculty) *"stepping over" to a particular professional field* where after the necessary period of orientation and learning, the knowledge "brought along with" will be applied and combined with the new knowledge.

2. What about the training?

The education system, that has become a bottleneck in this way, offers knowledge almost exclusively in computer technology and (somewhat less) telematics, at present, there is a shortage in high-level conveyance of abilities necessary for a "general" informatician. Even the institutional frames giving a second degree and allowing combination of both kinds of knowledge are missing.

Emancipation of informatics and computer science took place at university level in the early seventies when they stepped out of the incubator of electrical engineering from Austria up to the United States forever, organizing training within an independent faculty or institute of a technological or (rarely) a human university. Of course, a rapid differentiation has begun at once, and faculties of informatics have soon become centres and hosts for theoretical disciplines (information theory, computing theory) and practical ones (information technology, programming, etc.). By the eighties, a real avalanche of section and diploma splitting started: numerous sovereign fields have separated and identified themselves from artificial intelligence through software engineering up to man-machine interaction within institutions mostly in forms of departments or department groups.

In the nineties, *several education courses in "technical informatics", more or less competing with each other,* started in Hungary, while in conveyance of knowledge necessary for the various fields of application, professional periodicals played a greater role than education. In order to shape the culture of computer technology, all the higher educational

institutions, almost without exception, have set up their own infrastructure and competent staff (it was right and occurred through appropriately oriented supports). Usually, in spite of the scarce hardware park, high-level knowledge in computer technology is available, however, methods necessary for informatical approach of individual professional and scientific branches are not elaborated, and *real ideas concerning development of specific informatical abilities are nowhere available and lecturers are puzzled by facing the practical tasks originating from the need of integration of social and practical aspects into education cited as commonplace.*

In a particular sense, there is even nowadays no need for developing "general informatical abilities" at monster universities. All this leads to a specific situation not appropriately recognized yet: namely, the basic training is adequate for the knowledge necessary after graduation only in the case of persons belonging to the reflective circle of informatics (i.e. for those becoming engaged in technological development or scientific questions)! However, world rapidly appreciates the activity of users belonging to the social reproduction, and more and more reveals that the really important events should be searched now in the field of mass use penetrating the society everywhere and causing a change in way of life rather than in meticulous development of high-tech, improving it by small steps with enormous investments.

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As also the above mentioned facts suggest, except for the activity of some groups and researchers (mostly with sociological motivation), the Anglo-Saxon approach, i. e. mathematical and technological approach is dominant in the shpere of informatics in Hungarian scientific life, in state administration and education alike.

As it reveals also from Csákó's excellent organization-sociological and institution-historical work,[1] the heroic age of introducing computer science and technology produced numerous experts with outstanding abilities, and through concentrated state supports of the seventies (and serving then rather progressive purposes), monopolistic organizations came into being where many experts of this "great generation" raised to leading positions. With rapid development and diversification of the application of computer technology and, especially, with the political system change, these monopolies have ceased, and these experts have had various professional careers often based on self-teaching – sometimes filling high positions in state administration and scientific management – still, only a few of them widened their attitude toward informatics *beyond* computer science.

Although there have been some interesting (and mostly isolated) experiments in the field of training "new generations" in primary and secondary schools and in higher education, they are based on *individual* work of some enthusiastic and receptive instructors of wide horizons and with new ideas. However, the instructors, as well as employers and employees of the informatical profession, have already recognized the need for

(a) training in applied informatics – and not computer technology – (meeting requirements of particular fields of application through offering wide-range knowledge and shaping attitude);

(b) training in general informatics (which the applied informatics can be built on).

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1 Csákó, M.: *A successful institution in Hungary. The history of "KSH SZÁMOK".* (Manuscript in Hungarian)

3. A new educational unit

The educational unit, that we represent here, was set up 1991 at the only non-technical faculty of the Technical University of Budapest, at the Faculty of Natural and Social Sciences with the name *Department of Information Engineering* (in Hungarian it says "Department of Social Informatics") as the first university educational unit that, having recognized this gap, has set the complex introduction of training this new-type informaticians as objective.

It may be strange that widening of a technological field out of a non-technological direction is not initiated by a university excelling in other disciplines. However, a kind of regularity can be observed in establishment of this type departments at *technical universities* as we encountered almost the same objectives, ambitions and attitude at the Department *"Informatique, Communication, Société"* of the Paris VI University, and we found similar examples in programs and publications of CREIS. This suggests that our line of activity is somewhat congenial to the francophone attitude toward education and informatics.

Existence and attitude of this new educational unit have not been recognized without differences in opinion and clash of interests either among lecturers or students, at institutional or professional level.

In addition to the personal problems of lecturers' positions, even establishment of the organizational status, resources, lesson limits, etc. of a new educational unit, less matching the existing professional hierarchy, is not obvious. Then, we have to reckon with reluctance of experts called *technical informaticians* and with solicitude for achievements of their profession. Even the "right" of using particular *words* raises problems: computer technology experts do not allow to use officially the term *informatics "without adjective"* in the sense exceeding the limits of computer science and technology, just not in education. In the case of the denominations *information engineer* and *knowledge engineer*, they could be concerned about the erosion of the engineering nature, of the traditional engineering values. The same applies to the recognition of the right interpretation of the term "data protection": the technical intelligentsia does not want to renounce the monopolization of this notion for technological purposes, namely its interpretation as "data security".

Moreover, we had to convince the less innovative students that with these new subjects and knowledge of not exclusively technological nature, not only "easy and entertaining" lectures will be delivered that need not be taken so seriously (as the obligatory subjects in social sciences are often concerned at technical universities) but they concern topics essentially influencing their career, profession and attitude. Luckily enough, our department has usually formed its teaching activity in response to *students' real needs,* and, at the same time, this has contributed to our respect in the institutional hierarchy as well.

Of course, we do not aim at simply pushing the existing values and achievements into the background but at contribution with new values and knowledge, at establishment of convertibility of available knowledges, and through all this, we wish to indirectly promote the formation of a new order of values in informatics both in education and application and public opinion. Our long-term objective is to launch an independent graduate education at university level in *informatics "without adjective"*. Although this does not seem to be realizable for the time being, despite our elaborated concept (first of all, because of the understandable objection of the computer professionals), we are striving for realizing our comprehensive concept focusing on training of *knowledge engineers.*

We have always found important to launch – in addition to the common forms of university education and research (obligatory and optional courses in other programmes, diploma projects, etc.) – complex projects directed to the informatics of certain particular application fields. Such a complex educational project should comprise elements of the basic education we find the most important, mirror our informatical attitude, and summarize all the knowledge needed today by the profession concerned in an immediately applicable form, and consist not simply of a mixture of computer technology and knowledge of the given field but representing a higher quality.

4. The first working model: education in banking informatics

Out of several projects planned, the complex training has been realized at first in a field of application where, in addition to the presence of professional demands, we could obtain the appropriate external (professional and financial) support. This field is *banking informatics.* Training is carried out from September 1994 as a group of graduate subjects, and from February 1995 as an independent postgraduate programme in five semesters directed by our section.

This new training has been introduced on students' initiation as a sign of the appreciation of economy and finance. Students have needed a special education that enables them to utilize their knowledge in computer technology in banking. At the same time, there is an increasing demand for informaticians with up-to-date knowledge on the part of banking. After the change of the political system, the network of commercial banks has been built in Hungary, they are under privatization, even more, the first bankruptcies have occurred, which have been caused, among others, by improper information handling (e.g. risk analysis, decision support). However, most banks have spent huge sums to purchasing new computer systems, but, in the new systems, the informatical concept able to appropriately handle and distribute the special banking knowledge, and not only operating the existing hardware and software systems, is missing.

That is why the curriculum has been prepared in co-operation with leading and highly appreciated banking experts; of course, lecturers of other departments at our university and independent experts have been also involved in addition to our own colleagues. (Lectures are partially read by banking specialists and invited lecturers.) The postgraduate curriculum is separated in three subject groups.

1. Core modules: *Foundations of Banking, Introduction to Computing in Banks, Operation of Banking Information Systems, Bank Security and Information Privacy* (first year); *Technology of Banking Information Systems, Informatics of Financing, Investment and Project Monitoring, Knowledge Management and Communication in Banks, Methodology of Banking Information Systems Development* (second year).

2. "Elective A" modules (two thirds of them should be completed): *Decision Informatics, Banking Law, Ergonomics and Labour Safety Management, Database Management in Mainframes* (first year); *Management of Change, Marketing of Bank Services, Techniques of Argumentation and Negotiation, Telematic Systems and Services* (second year).

3. "Elective B" modules (half of them is obligatory): *Fundamentals of Computing, Sociology of Organisations, Information Society, Business Computer Networks, English for Banking I.* (first year); *Business Ethics, Specific Investment Solutions and Priorities (The "Green Bank"), Total Quality Management, English for Banking II.* (second year).

In the last semester, the students prepare a diploma work.

Students of the graduate training are homogeneous (students of electrical engineering), those of the postgraduate education are heterogeneous, most of them are bank employees and medium-level managers characteristically with diverse qualifications. Our first experience shows that in both forms, the "directly applicable" knowledge and subjects are most popular, and in the graduate training subjects with "exact" topics and knowledge assessment (this stands nearer to the logic of the technological subjects). However, we are pleased by the fact that there is a great interest for some subjects of social scientific nature – e. g. for the subject *"Information Society"* – knowledge of which cannot be utilized in practice in a direct way.

Of course, the new informatical attitude to be hopefully represented by our students in the future will not immediately spread in banking and squeeze out the traditional technological attitude. Expectably, the integration of this new knowledge will not occur without conflicts, first of all, for institution-sociological reasons. This process requires reinterpretation and reorganization of information techniques and technologies based on banking knowledge, on the other hand, this may cause personal problems for the persons armed with this new knowledge in adapting themselves. However, the rearrangement of banking positions, proficiencies and knowledges may start resulting in rapid restructuring where the new informatical knowledge is appreciated. (We have the opportunity to elaborate the concept of a special post-secondary education as well, meeting personnel demands of positions being lower however, having the same importance, in the banking hierarchy.)

The knowledge and attitude packet offered by us is not fully homogeneous, this originates from the diversified speciality and opinion of banking experts reading lectures as well as from the different existing approaches in banking. A graduate student wisely formulated his dilemma after a lecture in data protection: "What we have heard from the teacher about duties and interests of a bank concerning respecting private life of its clients is very good, but another lecturer had enthusiastically demonstrated before that due to the new information system at last all data of all debtors can be seen by all banks and how beneficial this is for banks." Our answer is: We cannot expect full harmony between points of view but students have to know all the relevant problems and conflicts of interests.

We think that our group has accomplished an initiation of great importance regarding both its endeavours and the first complex project realized, thus, on long-term run affecting the informatical profession and public opinion in Hungary. Our experience may be useful for others, at the same time, we appreciate experience of other workshops and their co-operation either in education or in research. We believe, this way we can contribute to a better understanding and clarification of the role of informatics and informaticians.

Les colloques du CREIS

Informatique et libertés, NANTES, 1979

Informatique et conditions de travail, TOULOUSE, 1981

Information et Informatique, LYON, 1982

Alternatives en Informatique, NANCY, 1983

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Informatique et libertés: nouvelles menaces, nouvelles solutions, NANTES, 1990

Chances et risques de l'informatisation dans l'Europe de demain, PARIS, 1992

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