ERP SYSTEMS IN HIGHER EDUCATION

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Abstract: In the past few decades data processing and in-company communication has changed significantly. First there were only a few computers purchased at companies, therefore departments developed applications that covered corporate administration which lead to so called isolated solutions.
These days with the spread of electronic data processing the greatest problem for companies is not gaining information – since they can be found in all sorts of databases and data warehouses as internal or external information – rather producing information that is necessary in a given situation. What can help to solve this situation? It is informatics, more precisely ERP systems which have substituted software that provided isolated solutions at companies for decades. System based thinking is important in their application beside the fact that only data absolutely necessary for managerial decisions must be produced.
This paper points out why we consider practice oriented teaching of ERP systems in higher education important.

Key words: Information technology, higher education, EPR system

Introduction

Highly responsible economic decisions required data and information in the past just like these days. The challenge for companies is not data collection it is rather data selection from a huge information set and to produce them in the required form and content. In the case of a large company, and even with medium sized companies it can be advantageous to invest in an integrated corporate information system that can safely store data connected to corporate processes and when needed it can present them in the required form for the users. Naturally, the investment costs of such systems present a heavy financial burden for companies; however, these expenses can be reduced as it is possible again in 2011 to apply for funds.

Literature review

Data, **information**, and **knowledge** are inseparable notions. In compliance with this WORMELL (1998) writes about data – information – knowledge spectrum, while SÁNDORI (2001) calls it data – information – knowledge ladder. In our opinion these three notions make their influence felt – defining it in the latter order – when a manager has to make a decision in an economic situation. In order to make a decision one needs **data** that appear in an interpretable form – **as information** – and together with the already accumulated experience they become **knowledge** and trigger action. Some authors deduce a definition from other definitions: "data is interpretable knowledge. Information is data interpreted as knew knowledge, and after the interpretation of new cognitions knowledge represents a reflection in the human mind of the real world, and the objects, facts, events, occurrences in it, as well as the connections and the relations of cause and effects amongst them" (RAFFAI, 2003/b).

Companies are sets of systems and resources that become existent after individuals and teams contribute part of their resources to an independent organising principle (FUCHS, 1979; KIESER, 1995).

Information is the basis of economic decisions. It informs managers about processes within the company, about the relations between the external environment and the enterprise, and also about the efficiency of the enterprise. Furthermore, information must also refer to opportunities, and protect the company from risks, i.e. it must support planning, controlling, and not least internal controlling by means of creating an internal control system (FICZERÉNÉ et al. 2009).

The most difficult question of the assessment of requirements at the managerial level of information-system planning is what information does a manager need? By no means is it certain that the higher we go up in the hierarchy the more a manager has to "see" (DOBAY, 1997). Therefore the question may arise why information systems give vent to unrequested information. BARACSKAI (1997) answers this question in two different ways:

on the one hand, it is because owing to the badly structured problems that surface at top managerial levels managers say that they cannot tell in advance what information might be needed,

and on the other hand, managers might list anything that comes to their mind. This will consequently become part of the system which will provide data that might not be necessary and therefore be disturbing.

Table 1. The order of managerial skills in 1996, 1999, and 2004

1996.		1999.		2004.	
Managerial skills N= 325	**Value**	**Managerial skills N = 321**	**Value**	**Managerial skills N = 301**	**Value**
Practicality	4,15	Practicality	4,16	Practicality	4,10
Professional knowledge	3,99	Professional knowledge	4,06	Professional knowledge	4,09
Problem solving	3,78	Problem solving	3,91	Problem solving	3,97
Business sense	3,71	Business sense	3,83	Business sense	3,87
Communicational skills	3,61	Organisational skills	3,76	Organisational skills	3,78
Organisational skills	3,61	Managerial skills	3,74	Managerial skills	3,78
Idea representation	3,60	Communicational skills	3,73	Communicational skills	3,74
Managerial skills	3,54	Idea representation	3,69	Idea representation	3,69
Risk taking	3,47	Analytical skills	3,57	Analytical skills	3,64
Analytical skills	3,46	Risk taking	3,53	Risk taking	3,46
IT knowledge	2,93	IT knowledge	3,04	IT knowledge	3,17

Source: WIMMER, Á. – ZOLTAYNÉ, P. Z. (2006)

We also believe that **the manager is not properly familiar with the information system of the company**. **Consequently they are not able to produce reports and accounts on the basis of which decisions could be made.** The research of WIMMER- ZOLTAYNÉ, (2006) supports this thought since they pointed out that the weakest point of managers is information technology (table 1).

Albeit even the most recent data in this particular research originate from seven years ago we have to consider that during the eight years between 1996 and 2004 IT skills did not improve significantly. It is highly likely that IT skills have not been able to make their way into the first half of this list during the last seven years.

CHIKÁN (2003) states that corporate operations are interlaced by information systems, which have been revolutionised but their more traditional elements have retained their importance from interpersonal communication to strictly compulsory accountancy rules.

MICHELBERGER (2002) approaches the notion of information systems not only from the aspect of technology. According to him "the main components of an information system are people – as decision initiator and decision maker, external and internal information, as well as external and internal hardware and software elements and corporate solutions".

On the basis of the reviewed literature we can state that **data evolving during the operation of a company have an ever increasing role**. These data are turned into information and subsequently knowledge after careful interpretation. Since an increasing amount of date are produced during the operation of a company in an electronic or other forms, **the use of new technological achievements – computers, ERP systems – is indispensable**. In order for these devices to supply the necessary data for decision making in the required form, structure, and content, **a properly practice oriented training on their applications is necessary**. This way not only the IT knowledge of career-starters would be further developed but also there would be a shift towards labour market expectations.

Connections between companies and higher education institutions and expectations on the familiarity of undergraduates with integrated systems

The information for the analysis stated in the title was gathered in field research by means of questionnaires. Altogether **181 questionnaires were returned** of which 155 were electronic and 26 paper based. 58**% (105) of the returned questionnaires were fully completed**, in the case of the remaining ones respondents did not give answers to the last set of questions, nevertheless their answers were recorded.

159 companies declared cooperation with an educational institution, 38 of them have connections with a higher education institution and 8 of them have a cooperation agreement. The importance of the connection reached the value of 4.1 on a 5-degree scale. Figure 1 shows the ratio of the different forms of connections.

It can be considered advantageous that 42% of the respondent companies provide internship opportunities especially as practice oriented training is becoming more and more important. Were internship opportunities continuous rather than offered to a very limited number of undergraduates, it would have a greatly beneficial effect on the employment statistics of graduates.

The chart shows that companies significantly contribute towards the financing of higher education since 30% of the respondents claimed that they support it financially. **Unfortunately none of the companies participate in mutual projects** with a higher education institution, which does not necessarily depend solely on the companies as higher education institutions should be able to provide research topics that are connected to the business activity of a company.

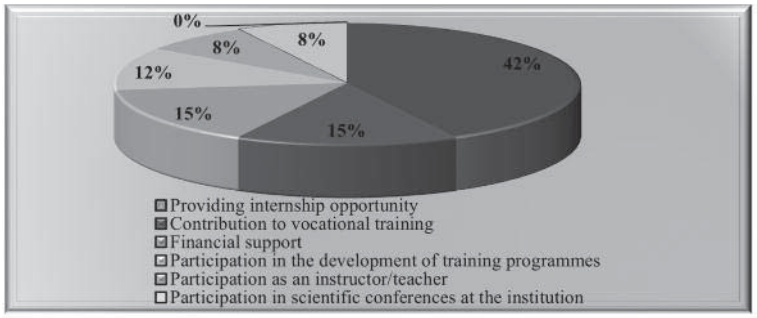

Figure 1. Cooperation forms between companies and higher education institutions
Source: own edition

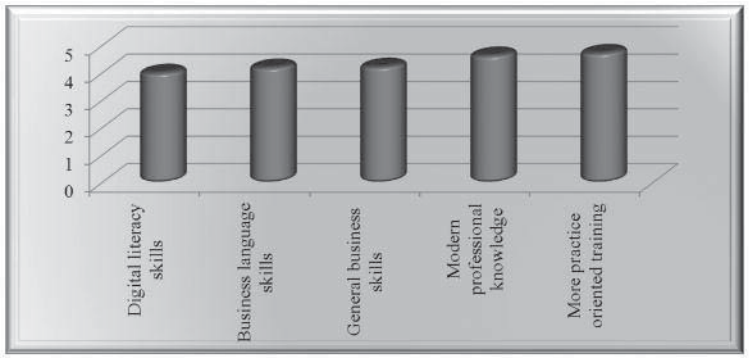

Figure 2. Areas that should be strengthened according to companies
Source: own edition

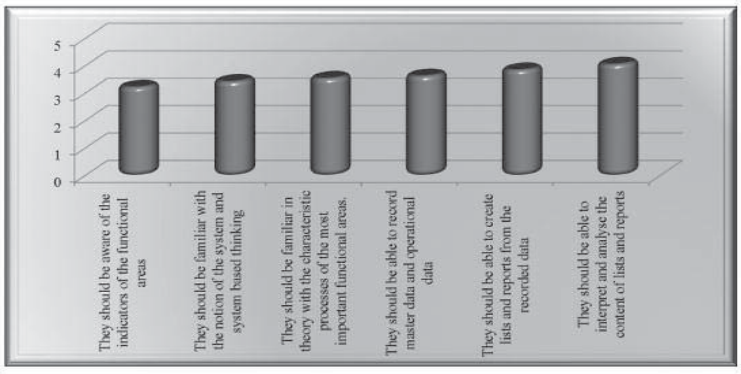

Figure 3 Company expectations about the use of corporate information systems
Source: own edition

Respondents indicated their opinion on a 5-degree scale about the areas higher education institutions should focus and the importance of the areas. The results are summarised in figure 2.

The value falls between 4,0–4,8. **IT knowledge and skills are important factors in the labour market.** In order to get into a good position one needs sound professional knowledge, must be able to communicate in at least one foreign language, and IT skills are also indispensable. Respondents expect to a lesser extent that higher educational institutions to focus significantly on two of these areas– on the basis of simple average. In another respect they place the greatest emphasis on the implementation of practice oriented training which, according to the above mentioned facts, could be solved by providing internship placements and by organising practical trainings.

The possible links between the variables of pictures 1 and 2 – do expectations about graduates depend on the existence of a partnership with a higher education institution – was examined by Mann-Whitney test (table 2).

Cooperation can be an important and determining aspect at the selection of educational areas. Respondent who had connections with higher education institutions emphasized the conveyance of modern professional knowledge. On the other hand **the reinforcement of digital literacy and business foreign language teaching were deemed important by those who had no connections with educational institutions.** This estimation validates the thought that some firms do not even want to cooperate directly with higher education institutions; they expect to have graduates with up-to date knowledge (digital literacy, foreign language skills) so that after being employed these employees could be trained according to the own specifications of the firm.

Figure 3 shows the expectations concerning the use of corporate information systems.

The values in this graph vary between 3,2–4,1, which indicates that expectations are quite identical

Table 2. Expectations concerning undergraduates in relation to cooperation with a higher education institute

Test Statistics[a]

	Mann-Whitney U	**Wilcoxon W**	**Z**	**Asymp. Sig. (2-tailed)**	**Exact Sig. [2*(1-tailed Sig.)]**
Modern professional knowledge conveyance	884	2837	–1,78	0,075	
Business foreign language teaching	**658**	**1324**	**–3,426**	**0,001**	
Reinforcement of digital literacy	**612**	**1207**	**–3,605**	**0**	
Development of general business skills	1018	2971	–0,8	0,424	
More practice oriented training	1072	1738	–0,463	0,643	

[a]Grouping Variable: Does the company have connections with a higher education institute?
Source: own edition

about the use of corporate information systems. It is expected to a lesser extent that a fresh graduate could record economic events in an unfamiliar system. **What they consider important is that the candidate should be able to interpret and analyse the content of lists and reports and also that the candidate should be able to produce such lists and reports.**

Considering that the expectations about how a fresh graduate can use ERP systems can be properly described, **the efficiency of teaching could be enhanced if the training areas of these systems were determined and the study focussed mainly on them**. To verify this notion we examined whether there are any connections between the different teaching possibilities and the ability to use information systems. The results of the Kruskal – Wallis test is presented in table 3.

institutions. We thought it important to examine whether expectations about different skills depended on work experience (table 4).

It is distinctly visible that with a 5% limit of error it can be proved **that expectations are mainly raised by employees who have been working for the company for 9-15 years about the creation of lists and reports**.

In the following parts we attempt to answer **what software application should be taught** since this question is not relevant in the case of a word processing or spreadsheet program since overwhelmingly one type of program is used by companies. However, the market of ERP systems is quite diverse. Both Hungarian and foreign software can be found in the market. At the beginning of the practical teaching of information systems it might cause some dilemma to decide which system to teach. Companies naturally expect the

Table 3. The analysis of the connections between applied teaching opportunities and the ability to use information systems

Test Statistics [a,b]

	Chi-Square	**df**	**Asymp. Sig.**
We do not need any support as we are fully familiar with the system we use	1,65	4	0,799
I and my colleagues maintain our knowledge by self-teaching and and helping each other	5,74	4	0,219
By means of organised courses	3,73	4	0,444
By supporting efforts to gain a degree (programmer, information system manager, etc.) that is necessary to operate the system	1,61	4	0,806

[a]Kruskal-Wallis Test
[b]Grouping Variable: Value your knowledge on a 1-5 degree scale about the use of corporate information systems!
Source: own edition

Table 4. Expectations about career-starters in relation to work experience

Test Statistics [a,b]

	Chi-Square	df	Asymp. Sig.
They should be familiar with the notion of the system and system based thinking	6,11	3	0,106
They should be familiar in theory with the characteristic processes of the most important functional areas.	2,21	3	0,529
They should be aware of the indicators of the functional areas	4,61	3	0,203
They should be able to record master data and operational data	3,65	3	0,302
They should be able to create lists and reports from the recorded data	**15,45**	**3**	**0,001**
They should be able to interpret and analyse the content of lists and reports	4,36	3	0,225

[a]Kruskal Wallis Test
Grouping Variable: How long have you been working at the company?
Source: own edition

Since the null hypothesis is valid in 21,9–80,6% we can state that **the ability to use corporate information systems does not depend on the form of teaching**. It follows from this that the necessary skills to use corporate information systems can be gained even individually after the basic skills to use integrated systems – which are adjusted to the expectations of employers – are mastered in higher education

teaching of systems that they themselves use. We wanted to find out if it was not necessary to name a corporate information system what the opinion of company representatives' would be. The results are shown in figure 4.

On the basis of this data it can be stated that only 17% of the respondents expect the teaching of the information system that they use. They believe it is much more important

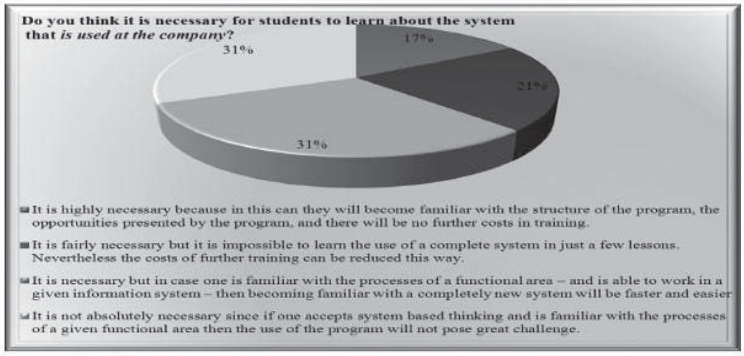

Figure 4. The expectations of the company about the use of corporate information systems
Source: own edition

to be familiar with internal economic processes and their interconnections. There are almost as many people who prefer system based thinking.

Other surveys prove that no corporate information systems work for years without alterations therefore the knowledge of the employees must also be developed continuously. On the basis of an overseas survey a mere 2.8% of the responding companies did not change their original system (INTERNET1). 56% of the companies we surveyed updated their system annually. Therefore the teaching of a given system might represent up-to-date knowledge for a short time. It seems to be more useful to develop skills and this was student will be able to follow changes and remain conversant.

Teaching the use of ERP systems in higher educational

We supposed that out of the 81 Hungarian colleges and universities 2**6 higher education institutions teach corporate information systems** mainly the ones that are involved in economics, business, technical and IT sciences. On the basis of the information presented on the websites of the institutions there are 17 colleges and universities. According to the trends of teaching information system there are three clearly distinguishable subject groups:

- mainly management subjects,
- mainly agricultural subjects,
- mainly technical and IT subjects.

Subjects are mainly taught at bachelor level but they can be taught at master level in certain institutions. **The number of subjects in connection with information systems changes at different institutions**. There is an institution where it is taught in one major in only one subject, at other institutions it is included in the syllabus of more than one major with different number of lessons and credit numbers. Course descriptions reveal that there are certain overlaps and **the most varied areas are mentioned in different institutions even in case of subjects with similar titles taught at identical majors**. Almost all institutions provide theoretical and practical training. The number of lessons taught varies greatly. Considering the total number of lessons taught the theoretical and practical lessons are almost identical. This might indicated that practice oriented teaching has been established.

Beside all this differences might be noticed among the courses offered by institutions according to the above mentioned guidelines. In the case of IT majors there is a difference not only in the number of the subjects taught but also in keeping track of practical aspects. It can be understood as it will be the task of the graduates of different majors to develop information systems as programmers, to communicate expectations about the system in the language of informatics as information specialists in economics or engineering, and to be able to carry out simple developments. In the case of **economics and agricultural specialisations** student become familiar with the functions, structure, and roles of information systems. In most cases students observe the operation of certain systems in seminars. We believe that **if we categorise information as a resource factor then the hands-on training of practical tasks should be emphasized just as in the case of financial management and HR majors**.

During our secondary research we gained a limited amount of information on how different institutions teach information systems. Nevertheless it provided good basis for the commencement of primary research during which we attempted to answer the following questions:

- What are the exact subjects during which information systems are taught, primarily in majors connected to the disciplines of economics and agriculture?
- To what extent do institutions satisfy labour market expectations in educational standards? Are there subjects in which student create and perhaps analyse lists individually?

Of the 26 higher education institutions that offer majors in the disciplines of economics and agriculture 21 responded. Table 5 shows how many institutions teach corporate information systems in certain majors.

On the basis of table 6 it can be stated that in the case of the two academic specialisations which are often offered by higher education institutions and are tightly connected to two economic areas of science (economics and management; finance and accountancy) institutions lay great emphasis on the introduction of how to manage information by means of information systems.

In the case of informatics disciplines a complete educational ratio can be observed in management areas. In the case of agricultural sciences very few institutions actually teach ERP systems. Besides, it is important to note that higher education institutions have recognized that information systems are coming into general use at logistic companies and they have adjusted their training programmes accordingly. In our opinion **the syllabus should be revised in the case of the commerce and marketing and the management and organisation academic specialisations**.

Table 5. The number of higher education institutions teaching information systems by academic specialisations

Academic specialisation	The number of institutions with the academic specialisation:	The number of institutions teaching information systems	%
Human resource management	7	4	57
Economics and management	16	13	81
Economics and rural development agricultural engineer	9	3	33
Business informatics	8	8	100
Informatics and managerial agricultural engineer	6	3	50
Commerce and marketing	**14**	**5**	**36**
Environmental engineering	7	1	14
Public services	6	2	33
Logistics	**6**	**6**	**100**
Marketing	1	1	100
Information specialist engineer	5	5	100
Technical manager	1	1	100
International management	7	1	14
International economics and management	1	1	100
Finance and accountancy	11	10	91
Tourism and catering	11	6	55
Business development	6	6	100
Management and organisation	**9**	**1**	**11**
Rural development agricultural engineer	7	0	0

Source: own edition

In the case of the former this statement is supported by the fact that according to our earlier survey a large proportion of trading companies apply corporate information systems and these companies – compared to other sectors – employ a larger proportion of degree holders. In the case of the major of management and organisation it is indispensable to further develop and master IT knowledge.

Conclusions, suggestions

ERP systems will provide the required information only if there are **properly trained professionals**. We are convinced that higher education institutions active in business and management sciences cannot avoid teaching how these systems are structured, work, and applied. It can be established that **most higher education institutions focus on theoretical knowledge laying a less significant emphasis on the application and practice oriented teaching of these systems.** Unfortunately it holds true in specialisations where professionals are trained for national economy sectors in which according to our survey the ratio of companies using corporate information systems is fairly large. Furthermore, on the basis of our career tracking examination a large number of graduates are employed by companies operating in these sectors.

What labour market players primarily expect from the teaching of ERP systems is that **graduates should be able to produce –** and perhaps analyse **– lists and reports that are vital for decision making**, and should be familiar theoretically with the processes of the most important functional areas. If they can follow all this in a corporate information system, they will have a better position in the labour market. We believe that in order to achieve this **corporate information systems should be taught not only within the framework of the classical IT subjects in economics and agricultural majors but also in subjects that are not directly connected to information management** – corporate economics, logistics, accountancy, e-business, etc. – by means of discussing different economic problems and situations. As a result of this **the improvement of managerial IT skill results** presented in this paper could also be achieved. Furthermore, **by using corporate information systems student will become familiar with internal processes**, their stages, relations, and not least with the benefits and use of integrated systems.

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