

CRITICAL SUCCESS FACTORS OF TEACHING INFORMATION SYSTEMS AND ACCOUNTING AS AN INTEGRATED PROGRAMME

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Abstract

This paper has been written as a part of an international educational development project deployed in Germany, Moldova and Austria. In this context we explored through two cases how students can be taught at university level for the use of Enterprise Resource Planning and accounting by using an integrated approach. We identified four success criteria to deploy such a program, and systematically analyzed them in a Hungarian and German setting. Our findings confirmed that the role of instructors, the educational background of students, robustness of technology (hardware and software) and the physical facilities all contribute to the efficiency of the learning experience.

1. Problems of decision making in Public Administration – the gap in ICT and accounting skills

Digital transformation – that is the ubiquitous penetration of information communication technologies (ICT) – has transformed several industries and disciplines. Public administration processes, central and government services are being redesigned and re-conceptualized thanks to several ICT innovations in service delivery, e-participation, e-cohesion and government e-platforms [4]. With the commercially available data analysis, artificial intelligence and user-friendly information systems, however, the issue of re-conceptualizing decision support is becoming also a relevant and feasible question. Particularly, the use of accounting data for evidence-based decisions seems to be finally feasible for a wide range of administrators and managers thanks to the overabundance of tools. According to several sources, the key challenge of ICT supported decision making – especially in the areas of costing and budgeting - has been transferred from the lack or inappropriateness of methods and tools to a new bottleneck; to the necessity of developing skills to combine ICT usage and accounting in a seamless and integrated manner for a wide variety of professionals.

In our paper we argue for the need of new concepts and methods to prepare the future generations to meet this challenge, basically by gradually breaking down the silos of classic disciplinary approaches to teaching information systems and cost accounting. While traditionally, both topics have been taught by separate departments and using different curricula enabling students to deepen their knowledge in both areas, the linkage and pragmatic skills to bridge these two field has been tremendously missing, and causing the widening of the cognitive gap between accounting information and managerial decisions.

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We compare two concrete cases in two different environments for introducing a university level course to teach the use of information systems and cost accounting in an integrated manner. The first course ran at the Budapest University of Technology and Economics (BME) and the second at the University of Public Administration and Finance in Ludwigsburg (HVF). The course has been developed by two experts who have rolled it out in different countries and different educational institutions based on *Integration management with SAP ECC: implementing ERP software in a manufacturing company* [1] and give a detailed account of their experiences in this conference volume.

Our research question in this paper focuses on identifying the critical success factors of deploying such a course, by exploring the role of instructors, students, the technological conditions, and organizational aspects, in order to formulate hypothesis for further testing. Using the two cases, our objective is to fund an action research strategy to systematically develop skills for evidence based decision making using ICT and accounting.

The next sections of the paper are structured for discussing the followings. In the second section we present the key areas of the two disciplines – information systems (especially the so called enterprise resource planning applications) and accounting – from the point of content and their educational challenge. In the third chapter we provide an initial list of success criteria for teaching the program, basically as we encountered them by observing the two separate cases. During the fourth section we discuss how these factors had been treated at BME and HVF. Finally, in the last part we summarise our conclusions and implications for further research.

2. The two foundations for effective financial decisions making: information systems and accounting

2.1. The concept of Information Systems and Enterprise Resource Planning

The concept of information systems and their use in supporting decision making is a fairly old concept and has been discussed in several disciplines from decision science, through process analysis, all the way to corporate management [5]. Especially, in this latter context, the notion of Enterprise Resource Planning (ERP) has gained wide practical recognition, covering the notion of organizing information management based on an integrated, robust database which not only connects separate functions and levels of the particular organization, but also contains best practices and a wide industrial know-how encoded into the actual systems. Therefore, organizations who deploy ERPs not only embark on a system implementation projects, but very often face the challenge of redesigning their process or business practices based on what ERPs have to offer. [2] Enterprise Resource Planning system is quite complex, but there are few of them which are extremely multiplex. For little firms, ERP can be excessive, or maybe a simple one is sufferable but for multi-corporations is evidential to use. They can have hundreds of vendors, distributors, consumers and other partners in the supply chain, and it would unimaginable to control them one by one. The bigger an enterprise is, the more complex ERP system they usually have. One of the biggest, and famous software in the ERP fields is the SAP and many corporates use it like Audi, Mercedes, Vodafone, Xerox, Airbus, Coca Cola along with other.

The basic motivation for the enterprises to use that system is to control and follow every step in the supply chain, reduce cost and maximize profit at all level. In the system all account events are recorded from purchasing to selling which is largely dependent on the integration of different components.

An effective part of an ERP is the so called Material Requirement Planning (MRP I) which is also an important element in our study. Its features are:

- a) MRP comes across with demand of end-products broken by periods (Production Scheduling),
- b) system notes down every part of each end-product (Bill of Materials/BOM),
- c) type and amount of inventory (Inventory Management)

This function has its developed version, a more detailed one which is called Material Resource Planning or MRP II in short which:

- a) contains every feature that the MRP I has
- b) completes it with financial and marketing information
- c) Demand Forecasting
- d) Scheduling of Machine Capacity

ERPs have other powerful modules such as Customer Relationship Management (CRM), Supply Chain Management (SCM) and from our course point of view Accounting and Reporting elements.

In our case study, we focused on what financial accounting information is needed before making an investment decision, and how we can effectively put it into the service of managerial accounting. All this requires the use of advanced integrated information systems capable of providing instant information and transferring information to the right decision-making location.

In order to explore the issue and to understand its relevance we conducted a pilot survey in one of Hungary's leading higher education institutions (BME), involving a heterogeneous group of students who came from different countries of the world with different IT and financial skills. Additional questions included:

- What IT parameters should be in possession for the introduction of a relatively simpler information system,
- What IT preparations are required to implement the system,
- What professional (IT, financial, accounting) skills they need to have.

2.2. Financial Accounting and Management Accounting in the light of Reporting and Controlling

In Figure 1 we summarized the interrelationship between the three key concepts of accountancy and reporting: how financial accounting, managerial accounting and controlling are connected. The main focus of financial accounting is the accountable reporting of profit-and-loss statements mainly for external stakeholders, while management accounting puts decision making in its center based on the principle of responsibility, on the appropriate cost and performance system, and on the design of investment calculations.

The task of controlling is to continuously compare the planned costs, revenues, performances with the actual data, analyze the differences, explore the causes, and suggest possible measures. The controller's work should pay particular attention to the reliability of data, the correct choice of the methods used, and the credibility of results ending up in correct conclusions.

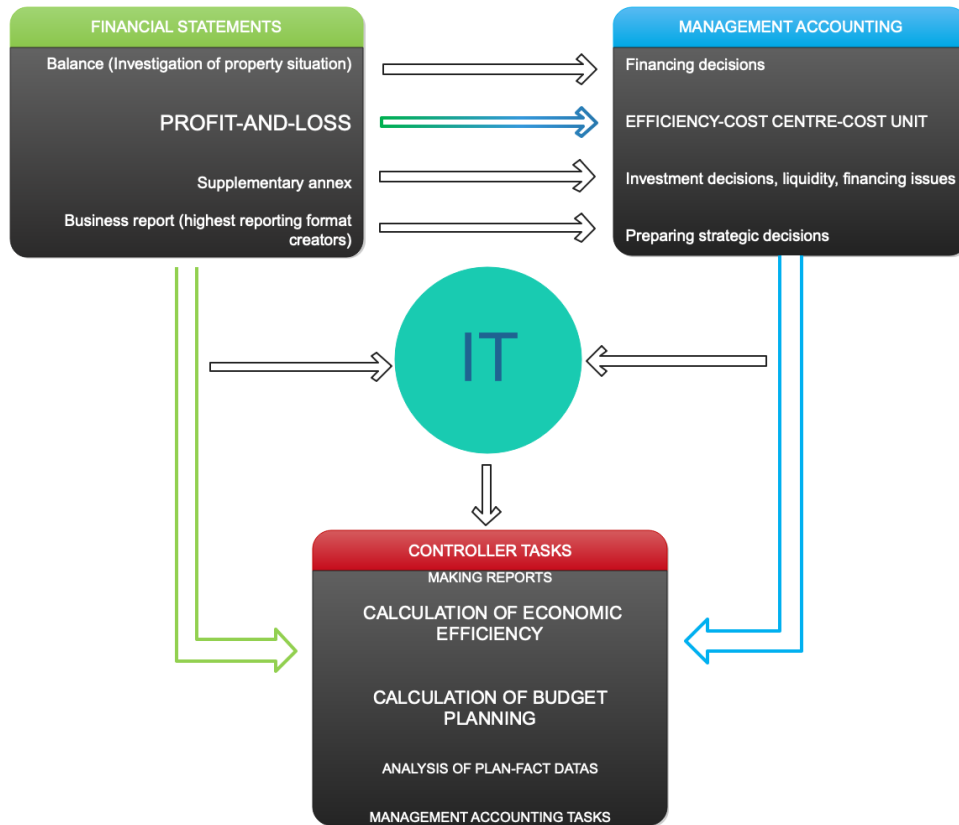


Figure 1. The relationship between financial accounting and management accounting in the light of controller tasks

Both in the education process and in the practical approach to accounting it is essential to draw the attention that revenue does not necessarily mean that the money has been received – cash on hand and revenues are two separate issues. Same applies to costs and expenses, since the outflow of money does not necessarily means that it appears as an expense immediately. From this point of view, in accounting, economists prepare their statements of revenue, expenses and investments according to the period in which they occurred, not taking into account whether the items are credited or charged.

For example, in the case of investing into a new service system management needs to pay out cash, but this only appears as an expense when it is put into operation, basically at the time of depreciation. The effectiveness of management decision in this case is assessed by developing cash flow models, therefore it is also important to quantify the factors influencing cash transfer. It does matter, indeed, whether an organization, is likely to pay for its obligations on time (coordination of timing of aligning its receivables and liabilities) or its investments are postponed, or facing liquidity problems irrespective of the investments – since these problems do not affect the economic value of the investment.

In order to assess cash situations managers need use the *cash flow statement which compares cash incomes and money outflows* for a particular period. It is not simply a reflection of the changes in the volume of funds, but it is also suitable for discovering the causes of change. Cash flow statements provide important information for management for two reasons. On one hand, management has a legitimate expectation that it wants to know how cash stock has developed and, on the other, the cash status is essential for the planning of expected cash incomes and outflows and keeping the money funds at an optimal level.

3. Preconditions of integrated SAP course

We identified four main success criteria for running an integrated ERP/Accounting course successfully based on the experience at BME: the pivotal and unique role of lecturers, the preparation of students, quality of technology and the physical infrastructure.

3.1. Lecturer(s)

When an institute considers organizing any a course the first major issue is who is delivering it, who is the lecturer. A lot of things depend on her/him like the mood of class, the amount of requirement and so on. Sometimes the students choose a course by examining who the instructor is. The more effective a lecturer is, the more popular the course is.

But what about the number of Lecturers or what about the field of expertise? These also need to be decided before an Institute intend to organize an SAP Course. The panel of Lecturer(s) should contain 1, 2 or maybe some of them. As we pointed out SAP is an ERP system, which requires both Information Technological and Accounting cognitions. For a person who will teach this type of course, both topics need to be familiar. In any case, for instance in software-configuration, in administration and in tasks related to the server side, it is good when the teacher knows what and how to do or repair. Let's suppose the client software lost connection or firewall blocks the system, an IT expert will be needed. On the other hand, maybe more important factor is the knowledge of accounting and controlling. Imagine what would happen if a teacher needs to explain the background of the bookkeeping or the cost centers without any accounting-related practice. These examples clearly show how important for the Lecturers to have both accounting and computer science experience.

At the best of times, the most practical version is when the lecturer has knowledge in both fields, if not, the course requires at least 2 people to teach: one IT and one accounting professional. As Brown and Atkins said, the lecturer's preparedness is the principle of quality:

"... clarity of presentation, structure, and expressiveness are key factors in effective lecturing." [3]

3.2. Participants and their educational background

Student who attend this type of class can be professionals or beginners. Professionals might be experts in computer technology or in accountancy, or even individuals who are willing to work with ERP systems. In the most of the cases the audience is non-professional and this presents the difficulty of lecture. Prior to the course, students had a few hours of basic controlling knowledge education. In the framework of the basic controlling knowledge education we focused on the conceptual definition of revenues and costs and cash flow.

Although the courses have been successfully completed by everybody, we assume that a more comprehensive financial and accounting knowledge would have contributed to a better understanding of the case study.

Control groups by education level	IT knowledge	Controlling knowledge	Accounting knowledge	Paper-based solution	MIS
Undergraduate	basic	basic	none	no	yes
Undergraduate	basic	basic	none	yes	yes
Economics	basic	basic	high level	no	yes
Economics	basic	basic	high level	yes	yes
Computer science economist	high level	basic	none	no	yes
Computer science economist	high level	basic	none	yes	yes
Computer science economist	high level	basic	high level	no	yes
Computer science economist	high level	basic	high level	yes	yes

Figure 2. Background knowledge summary of the participants

3.3. Technical background

Another impart element of a course is the ICT. A theoretic accounting lesson can be held only by its lecturer, but a lesson about SAP definitely not. The further subsections will reveal more details about this type of preconditions.

3.3.1. Hardware

It does not matter the computer is a PC or a Laptop, both can be proper to use. Few conditions are important to have for the organizer what they should check in advance.

SAP GUI (Graphical User Interface) requires optimally:

- a) 1 GB of Memory or more
- b) 1 GHz Processor or more
- c) At least 1 GB of Hard Disk, but it is closely linked to the components what he users want to install apart from the basic User Interface. A component is for instance Adobe LiveCycle Designer to implement automated forms.
- d) A display is necessary for the user to see what he/she is doing.
- e) A mouse with keyboard also beneficial to control the processes.
- f) A projector, what is very useful for the Lecturer to show and share her/his screen with the audience in order they see every step during the course.

The prerequisites mentioned before are easily feasible in the XXI. century. Maybe very few of the organizations have old technique whose devices are not enough up to date.

3.3.2. Software

When the hardware side is ready to use, the IT admin should install some software. Each of them is equally necessary, and the lecture makes sense if these software applications are set up.

- a) First of all, one thing is very important and should be ensured. This important factor is the operation system of the computer which must be Windows. From Windows 2000 to the newest is adequate, it is only up to the version of the next important software.
- b) The next software is the SAP GUI itself. It also has various versions, but for a course the students do not need the most recent one, for example the SAP GUI 730 services all the needs.
- c) Office package is recommended too, for example the GUI has a feature to export data to Excel or insert data to a formatted document in Word.
- d) Do not forget that scope is on the lecture and not only on the usage of SAP. We should think about the students and the Lecturers. One powerful tool is the desktop control wherewith the Lecturer can take over control of any computers in case of mistaking or lagging.

3.3.3. Other

Students often require notes or any other kind of curriculum. For those who attend an SAP Course for the first time, the Lecturer had better give them a support in need. However, it is almost impossible to hold a presentation, go to every person who left some steps and keep those interest who work fast:

- a) Before the users do anything with the computer, the Lecturers always give a quick insight to the theoretical side. For a better understanding, figures and tables could be very useful. This is called slides among these members.
- b) Experts' way of support during the usage of software is for example a guide book which contains all the arrangements, hopefully with a detailed explanation:
 - i. Printed version
 - ii. Digitized version, PDF for instance.
- c) The Lecturer must be aware of the whole curriculum but a failure can happen and for this case good to have the teachers' guide book. It should contain critical steps and their solutions.

3.3.4. Required knowledge areas in both fields

In the following Table we have summarized the minimum entry requirements/conditions of the course and also the expected outcome of students' knowledge improvement after the course.

Students had different backgrounds and educational experience – they come from different programs of BME. We think it is rather important in the future to create homogenous groups which in our opinion might influence the learning experience and obtained knowledge at the end of the course.

Field of study	Input	Output
ACCOUNTING	Revenues	<ul style="list-style-type: none"> • Net sales revenues • Contract revenues • Billing
	Expenses	<ul style="list-style-type: none"> • Cost allocation • Direct / Indirect expenses
	Materials, services	<ul style="list-style-type: none"> • Availability check • Price control • Gross / Net • Rebate • MRP • Semi-finished / finished products • Bill of Material • Depreciation
	Reports	<ul style="list-style-type: none"> • Invoices • Analyses • Interim reports
INFORMATION TECHNOLOGY	Minimal user experience	<ul style="list-style-type: none"> • Basic configuration of SAP software • Usage of SAP software • System Thinking • Master Data • Transaction Data • Data flow

Figure 3. Summarized input and output knowledge areas

3.4. Physical background

One factor during the organization of course is very critical and this is definitely the labor management.

Labor management appears where an Institute or its organizer Department does not have their own Computer Lab. In this case they must look for one, but it is harder than it seems for sure. Nowadays where the IT becomes one of the leading areas in the world, many people are interested in. That means the number of applicants is growing. Here comes the issue: the already installed Computer Labors has limited number of seats which ties their hands. The experiences show that they should see first where the course can be hold and check its limits. This limit is often about 15-20 people.

Another factor what should not be forget: the SAP GUI runs only on Windows operation system, so Linux, Ubuntu, Mac OS and so on is excluded. Programmers often use Linux system, designers and

modelers do often use Macintosh. If the organizer is about to hire a room from these areas of study, they need to fix every parameter before any preparation of the course.

4. Research: Case of BME & HVF

This section is about to compare two case studies of this research field. There were 2 SAP Courses in the near past with quite different circumstances. One course at the University of Technology and Economics in Budapest (BME) and the other one at the University of Public Administration and Finance in Ludwigsburg (HVF). Probably that based the whole research and caused the interesting results which can be seen in the table below.

Very important to mention that the BME is a technological University and its effect is obviously shown by the genders rate, 9 males and 2 females, summary 11 students. Mostly male Students choose to attend BME because of its profile and history, however it would be more desirable to increase the number of female students in order to popularize the idea to pursue a carrier in engineering. Well BME can be called a typical Technological University against HVF. In the course organized by HVF 33,3% of the participants was male and 66.6% was female, so 5 males and 10 females, 15 students at all. Here, another phenomenon can be observed: in the public administration sector traditionally more women choose to work, but according to the latest trends we see more men also in this field.

The participants presented above had a totally different educational background at the case of BME. They came from Mathematics, any kind of Engineering and Information Technology. Needless to say, these fields are a bit away from Finance, just a few of them had previously studied anything about Economy. On the other side, at HVF, the students were classmates, so they came from the same program. Their program is e-Government what means they had a deeper knowledge in economical fields.

Another area where the two courses varied is in the technological side. In Budapest the Labor was absolutely hi-tech with rather powerful PCs used for modelling, designing and programming. At HVF, there was a general PC rooms set up for normal users. The desks laid in parallel lines at BME and in "U" line at HVF. This factor has its effect on the ease of understanding. The Students who were not so familiar with the SAP system had a bit harder task, because they had not clear view to the Lecturer and to the screen due to the parallel lines and the PCs hid them. That caused a slower speed of learning and more questions about the handling of the software. The students, who stayed in "U" line and there was not any obstacle before them what could hide the screen and the Lecturer, had a quicker learning-tempo and quicker recognition. There was one more technological difference between these 2 studies and it was the state of software. In Budapest the SAP software was not installed before in the past, just set up for the duration of the course which caused a quite longer technical preparation. In Ludwigsburg the University has the SAP software installed in their PCs. This difference is caused by the course itself. At BME this course was the very first one about SAP, meanwhile in Ludwigsburg the SAP course is built in the program of the University and has been running for years.

The duration was the same of both cases. Twenty-four hours in 3 days, approximately 8 hours each. Beyond doubt this schedule is very intensive and hard to follow all around mentally, and it makes the participants work difficult. Couple of them with fewer financial background (BME) could not achieve successfully the SAP Course, exactly 8 had success in and 3 failed. The reason was following: at BME this course was optional and not built-in like at Ludwigsburg and another

Department arranged exams for some classes, few students were affected, needed to leave the course. At HVF all the students could pass the exam, 15 succeeded from 15.

Last difference of the 2 cases was in the number of Lecturers. At BME, there were 2 Lecturers at that period, but only one held the presentation simultaneously, so they changed each other systematically by the different parts. At HVF, there was only 1 Lecturer for the whole course. We can say, one person to hold the presentation is manageable, but it is tiring for sure to teach 8 hours a day almost in a row and 2 people could complement each other. This is why 2 Lecturers are preferred when a University consider to organize a course similar to this.

	BME	HVF
Students	11	15
Genders	M: 9 F: 2	M: 5 F: 10
Studies	Mathematics, Engineering, IT	Information Management, e-Government
Class room	Computer Lab with parallel lines	Computer Lab with "U" line
Technology	hi-tech PCs for designing, modelling	normal PCs for general Users
Software status	temporary	non-temporary
Organizations	not built-in	built-in
Duration	24 working hours	24 working hours
Successfully completed	8	15
Ideological approach of Students	technological, scientific	governmental
Number of Lecturer(s)	2	1

Figure 4. Comparison of Cases BME and HVF

In order to assess how much time does it take to prepare and run an integrated course, our research team have reviewed the time line and evaluated the entire project (Figure 4).

Without any doubt, the most time-consuming part of the Course organization was the searching of an appropriate Labor. It takes 5 weeks at all due to minor lack of information. This lack of information was come by the students, the participants who needed to consult with their other teachers about their program and we did not have any exact list of potential attendances. This results in 2 weeks of registration period within we also had to give some extra-basic information about accountancy in order to get any idea what it is. Prior to these 2 levels, we spent seven days with the agreement of the Lecturers about the course, the issue date, system requirements, etc. Right after we found an appropriate Computer room, a very important task had to be controlled: Software Installation. Of course, we set up one PC first and checked if it works or not, and after we getting aware of system's working ability. 19 PCs more continued (1 computer per Participants willing to join the course + 1 for Lecturers + few PC for safety reasons.) Last but not least, the next and last step was the course itself, 3 days as we mentioned before.

Project Timeline at BME

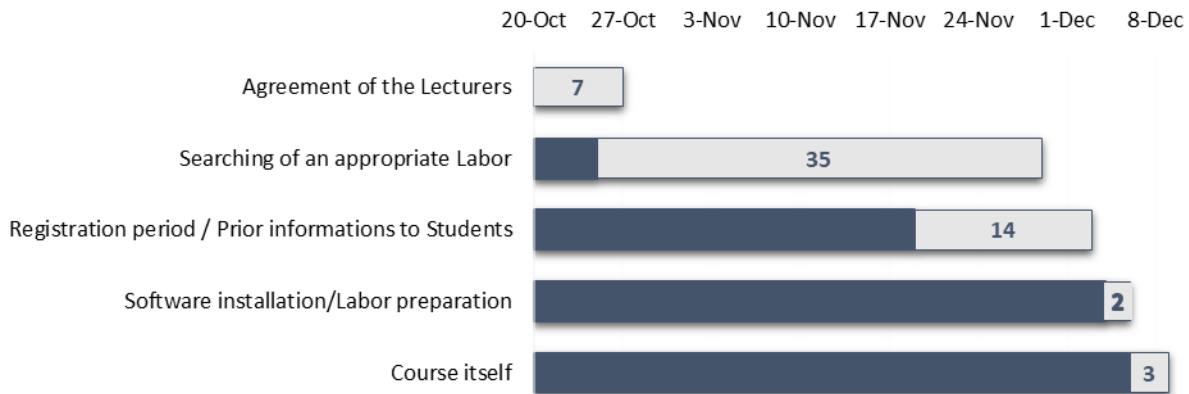


Figure 5. Project Timeline at BME

5. Conclusion

This paper has been written as a part of an international educational development project deployed in Germany, Moldova and Austria. In this context we explored through two cases how students can be taught at university level for the use of Enterprise Resource Planning and accounting by using an integrated approach.

We identified four success criteria to deploy such a program, and systematically analyzed them in a Hungarian and German setting. Our findings confirmed that the role of instructors, the educational background of students, robustness of technology (hardware and software) and the physical facilities all contribute to the efficiency of the learning experience.

Although, the original course has been developed for the purpose of public service education, we did find that the idea of integrating information systems into accounting education vastly improves the attention and interest of students in an engineering environment as well. The two cases serve as a convincing foundation for further developments and experiments for ICT and accountancy skill and knowledge building in order to improve evidence-based decision-making aptitude of future managers both in public and profit organizations.

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