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# INTEGRATIVE TEACHING ASPECTS FOR THE IS PROFESSION: DEVELOPMENT AND APPLICATION OF A TEACHING FRAMEWORK

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## Abstract

*The emergence of new organisational, informational and technological innovations has significant influences on the role of Information Technology (IT) within organisations. Over many years IT departments merely focused on the efficient realisation and support of non-integrated functions of determined areas. Today, IT is often perceived as the enabler for enhanced organisational and informational concepts (such as Supply Chain Management, Customer Relationship Management, Enterprise Resource Planning) and therefore should rather belong to the main processes of organisations. Thus, future IT professionals will need to be positioned on the interface of information systems and business. As a result, future IT experts have not only to be able to implement business processes within information systems (IS). They also need to be able to accomplish the holistic process of software engineering projects, which includes the phases requirement engineering, design, implementation, testing and maintenance. In order to ensure a reasonable education this has to be taken into account in today's IS curriculum, not only from a theoretical but also from a practical perspective. In this paper we introduce an integrated teaching framework that facilitates students to train their technological, organisational and social skills within realistic business scenarios in every phase of the software engineering process. The strong integration of teaching content into a specific teaching context enables a comprehensive learning experience for students taking all aspects of the IS Profession into consideration. This framework has been evaluated in an international teaching collaboration against the background of a supply chain management scenario.*

*Keywords: IS Profession, IS Curriculum, Integrated Teaching, Teaching Context, University Collaboration, Supply Chain Management*

# 1 INTRODUCTION

The continuous increasing competition, globalisation (Barret, et al. 2003, Yang 2003, pp. 270), internationalisation (Teichler 1999) and the pressure to decrease transaction costs since the early 90's have led to new paradigms in the fields of business management and information systems (IS) (Becker & Kahn 2003, p. 4, Kurbel 2003, p. 18, Scheer 2002). This development promoted on the one hand the emergence of new organisational concepts such as process orientation, outsourcing, supplier and customer relationship management, and on the other hand the arise of new IS, e. g. Enterprise Resource Planning (ERP) (Klaus & Rosemann & Gable 2000, Robey & Ross & Boudreau 2002) and Advanced Planning Systems (Fleischmann & Meyr & Wagner 2002, Krüger & Steven 2002, Rohde & Meyr & Wagner 2000).

As Information Technology (IT) is widely perceived as the enabler of new paradigms and concepts (Bechtel & Jayaram 1997, Bradford & Vijayaraman & Chandra 2003, p. 439, Hewitt 1994), the role of the IT department has been shifted (Barret, et al. 2003, Gutierrez & Boisvert 2003, p. 217). Over many years the traditional role of efficiently realising and supporting non-integrated functions of determined areas in organisations have been side-lined to the main processes (Becker & Kahn 2003, p. 2). In the last decade, ERP systems became increasingly important providing integrated system support for management functions, logistics, production and accounting within the organisation. Additionally, business concepts such as Supply Chain Management (SCM) and Customer Relationship Management are important elements of today's continuous integration efforts of most organisations (Bradford & Vijayaraman & Chandra 2003, p. 439). Those concepts require a much broader and complex employment and strategic considerations in IT and business. Therefore, IT should be part of the mainstream of organisations. Software design is no longer only an issue of technical expertise, such as applying formal methods or object-orientated programming paradigms. Matters of communication, social and business aspects, as well as implications for the end user have to be taken into account (Smith & McKeen 2003, p. 322). Accordingly, future IT professionals will need to be positioned on the interface of IS and business. They have not only to be able to implement business processes within IS, but also be able to accomplish the holistic software engineering process (including requirement engineering, design, implementation, testing and maintenance) in a suitable way. Therefore, organisations seek universal IT professionals, which are qualified, multi skilled and knowledgeable in all business areas.

Consequently, this new IS role has to be regarded in today's IS curriculum (Gutierrez & Boisvert 2003). In order to ensure a reasonable education, students should deal with these concepts not only in theory, but also in practice (Tynjälä & Jussi & Anneli 2003). However, teaching methods can only be insufficiently correspond to teaching of complex concepts such as ERP and SCM in practice against the background of real world scenarios (Bradford & Vijayaraman & Chandra 2003). Those methods are mainly lectures and corresponding tutorials or exercises. Learning experiences based on these conventional methods are hardly integrated and experiential; more often they lack in embedment of teaching content in a specific context. Lectures focus on teaching theoretical and conceptual knowledge in weekly courses towards a broad number of students. The corresponding exercises pinpoint selected problems from a rather specific perspective. The facilitation of student projects, where students are made highly accountable for their work in small-sized teams are only rarely part of the IS curriculum. Such projects highly engage students in their own learning process and thus enable students to improve their IT professionalism to match the current professional requirements (Smith & McKeen 2003).

This paper presents an integrative teaching framework in order to enhance conventional teaching methods with regard to the IS curriculum. The teaching framework has been applied in an international teaching project. International collaborations between universities allow realising the above concepts to stage real world scenario based education. Based on the teaching framework the derived unit design and the experiences of the international collaboration between two universities

from Australia and Germany are discussed. Against the background of a SCM scenario the two universities act in the role of a real world Hard- and Software supplier and an Online retailer. The first main objective was the implementation of an ERP system in alignment to the defined business scenario based on Third-Order Party Processing (Becker & Vering & Uhr 2003, p. 56). The second objective was the external process integration on organisational and technological level in order to allow the application of SCM concepts.

The structure of this paper is as follows. Section two gives a brief overview about current issues in IS curriculum and defines proper teaching requirements. Based on shortcomings of conventional teaching methods presented in section three, an integrated teaching framework for information system issues that facilitates innovative educational concepts is developed in section four. Section five presents the unit design and the order of activities of the university cooperation project that emphasises the utilisation of this framework in practise. Section six concludes this paper and provides key success factors for similar teaching projects.

## 2 CURRENT ISSUES IN THE IS CURRICULUM

IT has changed business processes within and between enterprises. Work processes are being executed under the supervision of IS that are often driven by process models, e. g. Workflow Management or ERP Systems (van der Aalst 2002). ERP software packages have become popular means for both, large and medium-sized organisations to overcome the limitations of fragmented and incompatible legacy systems (Robey & Ross & Boudreau 2002, p. 18). ERP systems are designed as integrated sets of software modules linked to a common database, handling basic corporate functions such as accounting, human resources, sales, and distribution (Davenport 1998). Basically, ERP can bee seen as a development of mapping all processes and data of an organisation into a comprehensive integrative structure (Klaus & Rosemann & Gable 2000) and thus provide an appropriate foundation for the promoted business process managed organisation. (Davenport 1993, Hammer & Champy 1993)

However, value-adding processes do not start and end at the boundaries of organisations (Kugeler 2003, p. 469). Organisations can no longer effectively compete in isolation of their suppliers, customers and other entities in the supply chain (Lummus & Vokurka 1999, p. 11). This external, inter-organisational perspective promotes the development of concepts such as Supplier and Customer Relationship Management, Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI), and Collaborative Forecasting Planning and Replenishment (CPFR), that can be summarised as SCM concepts (Bechtel & Jayaram 1997, p. 16, Stadtler & Kilger 2002, p. 7). As a result, organisations face two main challenges. On the one hand, business processes have to be integrated on an organisational level between supply chain partners; on the other hand, new organisational developments have to be embedded and reflected in IS to support the integrated business processes (Scheer 2002, p .9). Hence, an inter-organisational integration of the affected IS is inevitable. The integration of supply chain partners is primarily enabled through Electronic Data Interchange (EDI) technology, that uses protocols and document standards such as XML or EDIFACT; but also through the increasing popularity of web services (Alonso, et al. 2004, Ferris 2003, Kreger 2003).

The dynamic nature and the manifold applications of the IT industry have created the necessity of new teaching concepts and methods (Gutierrez & Boisvert 2003). The diversity of the above-sketched IS concepts ranges from business process management issues to technical matters of data exchange formats and are only exemplary for organisational and technical complexity. As today's organisations are faced with these numerous concepts, which are strongly interrelated, and show herewith a high complexity and impact on business results, today's IT professional must have a integrated understanding of all of these concepts. Due to the dynamic nature prospective IT experts will hold different jobs in diverse working fields throughout their career (Gutierrez & Boisvert 2003). Therefore, future IT experts have to become lifelong learners with the ability to renew their skills (Gorgone & Gray 2000).

In order to ensure a reasonable education a sophisticated IS curriculum should distinguish between teaching content, teaching method, and teaching context:

- The teaching content (the what) refers to what is actually learned (McFarland 2003), e. g. knowledge of certain domains such as ERP, SCM or Business Process Management or technical issues such as the object-orientated programming paradigm. Students not only need to understand those underlying theoretical concepts but need to be able to apply them in practice (Tynjälä & Jussi & Anneli 2003). Students for example need to be able to configure ERP systems accordingly to obtain the requested benefits of collaborations between supply chain partners. Furthermore strategic issues such as trust and reliability between supply chain partners need to be considered.
- Teaching methods are the mean in which a specific teaching content is transferred to the student and enable the student to learn. Therefore teaching methods (the how) need to be tailored to the learning needs of students and equip students with the skills and knowledge required as an IT professional (McFarland 2003). In order to fulfil the above-mentioned lifelong learning requirements, prospective IT experts need to be equipped with the fundamental abilities that will allow them to know how and to monitor the way they specifically and uniquely learn (Hsiao 1997).
- The teaching context describes the environment in which the content is mastered, such as a specific industry. The IS teaching content is due to its complex nature often taught in isolation at universities (Bradford & Vijayaraman & Chandra 2003, pp. 440, Hershey 2002, p. 480). However, the correct application of a specific concept within a given environment is one of the key factors students need to be aware of in future working placements. Therefore, students need not only to be able to select the most suitable concepts with regard to the given business problem, but also to apply these effectively, and even more important to implement them in a highly integrative manner.

Overall, it can be concluded that universities have to respond to the increasing demand by organisations for IT professionals focusing on strong business and IT alignment. A framework that allows imparting complex teaching content seems to be necessary when several interrelated concepts comprise the teaching content.

## 3 IS TEACHING CHALLENGES

The most common methods of teaching instructions range from lectures, readings, group discussions, practical exercises, tutorials to case studies. Traditionally lectures and readings as teaching methods are most widely applied in the IS curriculum. These provide theoretical backgrounds based on textbooks, but also can include discussion rounds. Main focus of these teaching methods is to provide the student with purely cognitive skills (McFarland 2003). Corresponding exercises allow students to gain experiences from a practical point of view. The following examples demonstrate the complementary nature of lectures and practical exercises in today's IS curriculum. However, these teaching methods have a strong focus on content.

Students obtain knowledge within Business Process Management lectures modelling methods such as the Architecture of Integrated Information Systems (ARIS) approach[1] (Scheer 2000a, Scheer 2000b), Petri-Nets (Petri 1962, van der Aalst 2002), or the Semantic Object Model (SOM) approach (Ferstl & Sinz 2001). Additional practical exercises complement the lecture content by applying these methods in practice. As such students can be faced with small-sized and tailored scenario descriptions that have to be transferred in business process models by using modelling tools.

[1] The Architecture of Integrated Information Systems (ARIS) approach creates a guideline for developing, optimizing and implementing integrated information systems (Scheer 2000b, p. 6).

Teaching content concerning ERP systems usually focuses on advantages and disadvantages of standard software packages, software-specific reference models, customising procedure models and on information system architectures of selected ERP systems. Practical exercises provide students with the opportunity of executing standard business processes in already configured ERP systems. ERP vendors even supply ERP solutions for educational purposes, which depict and support a selection of common business scenarios. An example for such an educational ERP system is the Internet Demo and Evaluation System (IDES) provided by SAP, which allows simulating core business transactions of a virtual multinational company (SAP 2003). As a result, students are able to execute or rather duplicate standardised business transactions. These practical exercises provide the student with a one sided application user view, which is essential, but not sufficient for an IT professional. As stated before, future IT-professionals will need to be positioned on the interface of IS and business. Therefore, students rather need practical experiences regarding the configuration of an ERP system, so that they are able to design and implement individual business processes for the requirements of a specific organisation. Today's IS curriculum should provide a learning experience for students from a point of view of the entire ERP lifecycle, including the system implementation and maintenance.

Teaching concepts and issues in SCM from a practical point seems to be even more difficult to achieve. Exercises in SCM lectures mainly focus on the solution of mathematical problems, such as ABC-analysis, Linear Programming, or complex forecasting methods. Learning objectives like designing a supply chain or the application of special SCM concepts from an operational point of view are difficult to integrate into IS curricula. Increasing issues for teaching occurs when trying to adopt the use of special SCM software solutions, such as i2 Rhythum, Manugistics, Numetrics/3, or SAP APO. An overview about the functionality of these software solutions can be found in (Rohde & Meyr & Wagner 2000).

Overall, the realisation of modern organisational requirements supported by comprehensive IS (such as ERP systems) seems to be a challenge in teaching that many universities face nowadays with traditional teaching methods. It has to be considered that the teaching corresponds to the complexity of such solutions and is based on realistic business scenarios. Thus, it is proposed to enrich the teaching content with a specific context and transform the inductive teaching approach to a deductive approach. The student will be exposed to a specific cognitive problem and apprehend to more general concepts through the application of these concepts in practice. The complex theoretical concepts have to be made relevant through reflection and allow the student to gain meta cognitive skills. By teaching students a specific set of IS problems the student can easier progress from a simple to complex and comprehensive knowledge (Omrod 1999).

## 4 DEVELOPMENT OF A TEACHING FRAMEWORK

As future IT-professionals not only require knowledge from a conceptional and theoretical perspective, conventional teaching methods often lack in practice orientation. Teaching methods are increasingly based on Problem Based Learning (PBL) that is defined as a student-centred and learning-centred approach (Boud & Feletti 1997, Glasgow 1997) to education, based on real world problems. As defined by Barrows and Kelson, problems can be a variety of things such as "How to find a better or best way to do or to build something". They state that a problem can best be thought of as a goal where the correct path to its solution is not known (Barrows & Kelson 2003). Therefore, PBL can be interpreted as an approach of deductive learning based on specific problems allowing the student to acquire conceptual knowledge. Oppositely to lectures, PBL is characterised by giving students more and more responsibility for their own education and becoming increasingly independent of the teacher for their education. Instead of weekly, disconnected lectures, students learn within the context of a problem, which makes learning more relevant and realistic to the students.

Figure 1 depicts an integrative teaching framework in order to improve IS education issues by the means of the PBL approach, which overcomes the issue of complexity and reality in teaching. A business scenario, or a real world problem presented to the student, is the starting point for the

development of a suitable task definition. By specifying and structuring the problem the students define under guidance of the teacher tasks which pursue specific learning objectives. Some examples of learning objectives the teacher intends can be found on the right hand side in figure 1. The definition of tasks may not only vary in the level of difficulty, but also in terms of detail in dependence of the business scenario. In order to support efficient and effective system development, the creation of conceptional models is necessary. Thus, on the one hand students should be able to accomplish a requirements engineering phase that is based on the prior scenario specification and task definition. On the other hand students have to be qualified in designing and implementing specific information system solutions, such as Data Warehouse, ERP systems, or even individually programmed, non-standard software. A final documentation and evaluation phase facilitates a reflection of the lessons learned for the students. Additionally, a capable project management in every phase is inevitable.

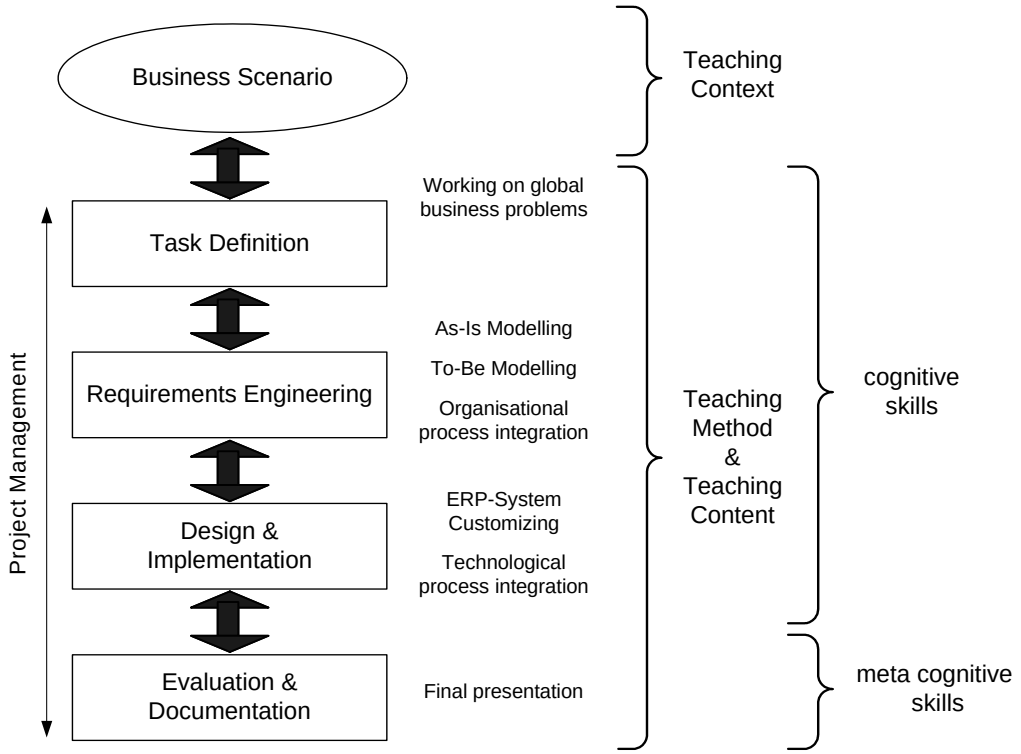


*Figure 1 Integrative teaching framework*

The teaching framework allows deriving practical-orientated unit designs, which facilitate students to apply their gained conceptual knowledge from an operational perspective. Depending on the business scenario specification, the focal point of derived units, and thus the context and content of teaching, is determined. The content refers to what is actually learned, e. g. knowledge of certain domains such as ERP or Business Process Management. The teaching context describes the environment in which the content is mastered, such a specific industry. Hence, the teaching content is constructed within a context that is situated in authentic tasks found in industry. Both, teaching context and teaching content can vary and be determined by any business problem in the real world, as simple as Online Recruitment or as complex as an integrated SCM.

Units are often designed around a particular phase of the teaching framework; units may focus solely on requirements engineering or implementation. With the teaching framework an integrated unit design is enabled exposing the student to solve a specific problem from conceptual design to implementation. Students produce in a project environment usable system designs as products of this unit. Herewith, the teaching framework facilitates a strong linkage between teaching content and teaching context and focuses primarily on the learning output.

# 5 CASE STUDY: THE RUN SCM PROJECT

In order to realise a unit design which is based on the presented teaching framework, an international university cooperation between the Queensland University of Technology (QUT), Brisbane (Australia) and the University of Münster (Germany) has been established. Based on this teaching cooperation, the InteR University Supply Chain Model (RUN SCM) project was founded. The challenge of the RUN SCM project is to configure SAP R/3 systems with selected components suitable to the supply chain of the RUN SCM business scenario and to demonstrate real life business interactions.

## 5.1 Collaborative unit design – business scenario description and task definition

According to the teaching framework from section 4, following business scenario structures the roles and business objectives taken by the universities as supply chain partner (see figure 2). This scenario sets the general conditions of any experiments and projects undertaken based on different teaching content.

The teaching context of the RUN SCM project is provided by the complex scope on the supply chain of the PC industry and contains all value adding levels from component manufactures to assemblers, retailers and service providers. University 1 acts in the role of MacPC, an assembler of PC components (e. g. motherboards, monitors, hard drives, CPUs, etc.), who receives these from various suppliers. These components are assembled to a complete PC based on explicit customer orders acquired by an Online IT Service Provider. Customers are able to configure their PC based on their specific requirements. University 2 acts in the role of ACTIS, the Online IT Service Provider, who focuses on retail and wholesales of PC's. In order to fulfil global business developments towards internationalisation the two above-mentioned companies agreed to establish an international cooperation based on the scenario of Third Party Order Processing enabled by integrated ERP systems, specifically SAP R/3. Both supply chain partners seek proof in decreasing transaction and coordination costs through this scenario. In particular, they focus on a low fixed cost structure, while on the other hand delivering high quality products on time to their customers. As a first step, an EDI between the companies should be realised to accelerate the information exchange. Afterwards, the feasibility of additional SCM concepts, such as CPFR and ECR should be evaluated and possibly implemented. The facets of SCM based on the capabilities of ERP systems describe the teaching content of this university collaboration.

This business scenario allows at any time vertical and horizontal extension of the supply chain towards additional suppliers and logistic service provider, but also new products and services. The set business scenario is herewith scalable for any future developments and has a long-term application focus in order to support numerous units. In a first unit conducted as project this business scenario was refined into following integrated business processes, which allowed a specific task definition to achieve the implementation of these processes.

As can be seen in figure 2 the order of a (total) end customer is the starting point of the business scenario. Customers are able to order PCs or PC Components from ACTIS using an online shop or a call center. These sales orders are straight away transformed by ACTIS into purchase orders which are transferred to MacPC via EDI. Based on a bill-of-materials explosion a stock availability check is performed by MacPC. Components which are not available on stock have to be ordered from specific component suppliers. Having received the manufactured parts the assembly of the PC is undertaken. The PC or PC Components are directly delivered to the end customers of ACTIS by a logistic service provider. Meanwhile, a copy of the delivery note and the according invoice is send to ACITS via EDI. After the reception of an acceptance acknowledgement from the end customer, ACTIS creates a corresponding invoice. Invoices from MacPC are periodically paid by ACTIS following the Evaluated Receipt Settlements concept (SAP 2003).

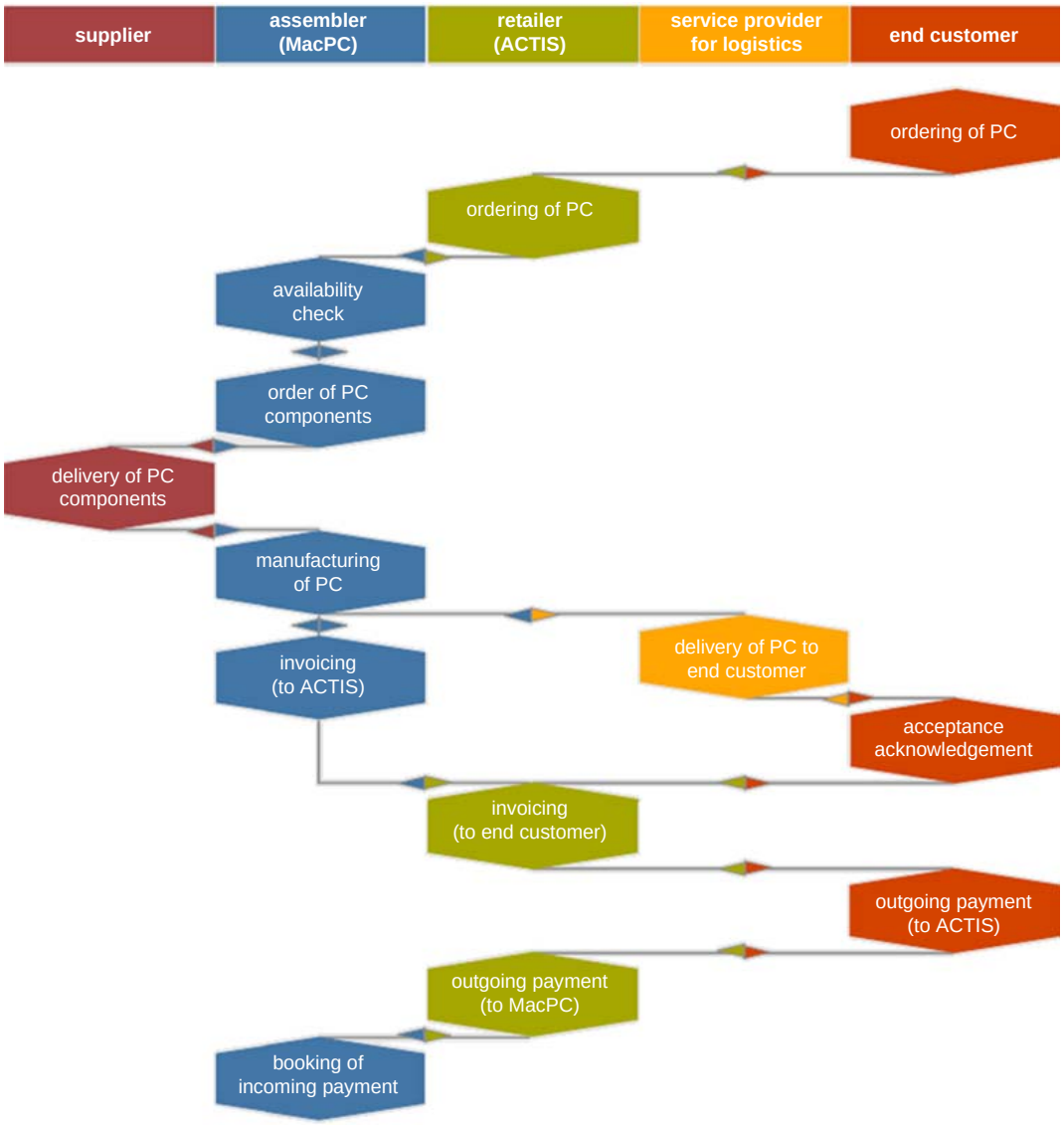


*Figure 2 RUN SCM Business Scenario*

Based on the scenario specification, the following tasks were defined with the student teams. Figure 3 illustrates these tasks in form of a phase model. Following the teaching framework the requirements specification phase can be found in the phases 2 and 3 (contract negotiation and inter-organisational Business Process Management). The contract negotiation phase is also included in the requirements engineering part, as the legal environments of the enterprise cooperation, negotiated between the two universities, have an immediate influence on the design of the business processes. The phases 4 and 5 (customizing and integration of SAP R/3) belong to the design & implementation phase of the integrative teaching framework. By means of a final presentation and documentation, the evaluation of the results and lessoned-learned is guaranteed. Thus, students have been facilitated to develop their meta cognitive skills. It has to be noted that the defined phases in reality often have an iterative character than rather being sequential. This can be led back to both universities working in parallel on this project with many interdependent activities.

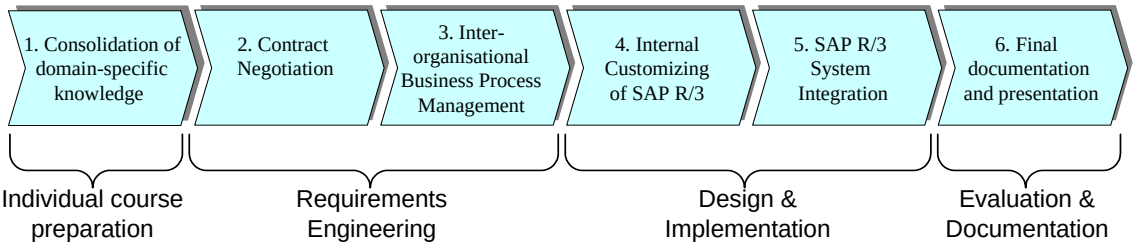


*Figure 3 RUN SCM Task Definition*

## 5.2 Collaborative project progress – teaching content

The collaborative project was commenced of by a video conference enabling both project teams to communicate and specify a common project plan. To ensure that students possess the required conceptual knowledge of SCM, Business Process Management and ERP systems students had to prepare and present individual reports as assessment item (see phase 1). The explored topics varied from modelling aspects (e. g. the ARIS approach, or the SCOR Reference Model), SAP Customising matters (e. g. ABAP/4, or the SAP R/3 Reference Model) to EDI concepts (e. g. SAP IDocs and ALE, Microsoft BizTalk). The presentation of this reports guaranteed an equally broad and project-specific theoretical background for all participants.

The legal considerations of the business partnership between the two organisations ACTIS and MacPC were specified in form of a contract in phase 2. The contract focuses particularly on conditions of inter organisational transactions, such as payment and delivery determined by the given business scenario. In order to negotiate the details of the contract, a representative of each student team was selected. The negotiation occurred by means of two internet discussion forums and via telephone conversations.

The third phase dealt with internal and external business process analysis and documentation. At first, each party created intra-organisational business process models based on the given scenario. For that reason, the business process had been modelled in detail in EPC notation by usage of the ARIS toolset. The core processes each party modelled are illustrated in figure 2. More detailed process models depicted in the swim lane notation helped to specify points for process and data integration. Thus, organisational interfaces to other entities of the supply chain were easily and precisely to identify. Based on the two internal process models of ACTIS and MacPC, an inter-organisational business process model was derived.

The intra- and inter-organisational process models acted as the starting point for the customising of the SAP R/3 systems in phase 4. At first, each project team had to implement their internal business processes. In order to guarantee a successful project completion on time, the implementation on each side took place in the preconfigured SAP R/3 IDES system. Thus, the students were able to copy original customising settings and standardised processes from the IDES system. Subsequently, these business processes and data were modified corresponding to the specific needs of ACTIS and MacPC. The student teams followed in this phase implementation methodologies of SAP, especially the ValueSAP (respectively ASAP) methodology (Appelrath & Richter 1999). As a result of this phase two R/3 systems were appropriately configured and with data populated.

In the fifth phase the two ERP systems were integrated. Consequently, negotiations, this time on a technological level, between the two teams had become necessary. Based on the knowledge gained from the consolidation of domain-specific knowledge in the first phase (see the RUN SCM phase model) and, additionally, the experiences gained concerning the operational usage of the SAP R/3 systems, the students were able to evaluate several solutions for the integration and data exchange of SAP R/3 systems (e. g. Intermediate Documents and Application Link Enabling, Remote Procedure Calls, or Microsoft BizTalk). The teams made the business case for the utilisation of Intermediate

Documents (IDocs) for the data exchange between ACTIS and MacPC. IDoc is a standard SAP format for EDI between R/3, R/2 and non-SAP systems (SAP 2003). IDocs had been selected, as both universities implemented their business processes within SAP R/3. Thus, the system integration had been realisable, in contrast to additional solutions, with rather little small costs.

In the final phase the implemented and integrated processes had been collaboratively tested. A final video conference was held facilitating the exchange of student's experiences and the discussion of possible future directions of the RUN SCM project. Concluding, the student teams documented their project progress and lessons learned within a final documentation. Moreover, each party presented their final results in a university-wide presentation.

## 6 CONCLUSIONS / LESSONS LEARNED

The collaborative teaching project enabled the setting of a complex, real world business scenario based on the acting roles of the involved universities. The established teaching framework for this unit provides a generic guideline for the design of such projects as part of an enhanced IS curriculum. Students are challenged to explore conceptual foundations by themselves and to immediately apply them in a given context. Teaching content and context are highly integrated in this teaching method, which overcomes shortcomings of traditional methods such as lectures. Content, method and context are not isolated anymore by a separation of several lectures and additional exercises. In comparison collaborative projects as teaching method allow to simulate complexity, to provide realistic teaching context and to push the student into the centre of teaching. Rather than being a reactive learner students are challenged to be proactive about and accountable for their learning.

In order to apply the presented teaching framework in the given context of a supply chain business scenario following criteria and learning objectives should be considered during the unit design of similar teaching projects:

- *Scenario definition:* As SCM problems are usually placed in a global, international environment, the scenario should be built by at least two or more enterprises that operate in different countries or even in different continents. The scenario specification should be given in industry based documentation, such as business plans. Thus, students for example are confronted with realistic difficulties such as communication problems or working in different time zones. Moreover, the selected scenario domain should be widely-known, so that students are easily able to imagine business problems that may occur. This scenario definition sets the teaching context and thereby affects the potential teaching content.
- *Task Definition:* The task definition should deal with an entire IS implementation project (such as an ERP system customizing). Projects, which are comprehensive and fact-related might prepare students more adequately to match the industry demand of the IS Profession. Teaching content within a reality context provides students with an important environmental benefit. In order to provide not only Business Process Management and IS implementation issues but also SCM aspects, the project should additionally include inter-organisational collaboration issues. Moreover, project goals derived from a global environment foster the training of soft skills, e. g. the negotiation of service level agreements. The students particularly deal in this phase with the refined teaching content.
- *Requirements Engineering:* Against the background of the given teaching context students are able to enhance their skills in conceptual modelling designing a business blueprint based on business process models. Through the environment of SCM the necessity of an inter-organisational integration of business process arises. Moreover, the conceptional specification of several SCM concepts, e. g. Efficient Customer Response, Third Party Order Processing or EDI becomes necessary. Thus, in this phase students define the requirements of the teaching content in a given context.
- *Design & Implementation:* The conceptual models are the starting point for the implementation of the IS. The students put the conceptual blueprint into practice and undertake the actual IS

implementation (or configuration). Learning objectives of this phase are not only the system implementation and integration but also the application of procedure models (see e. g. Appelrath & Richter 1999) and configuration methodologies (e. g. ValueSAP). In order to guarantee a successful project, our experiences show, that it is reasonable to configure SAP R/3 within the IDES-System. Thus, students are able to copy exiting process and properties against the background of their specific demands.

- *Project Management:* Complementary to technical skills, students should be able to train their soft skills with regard to the work in project teams. Following the PBL approach, students are fully responsible for the project status and management while determining the project progress on their own. That means that student teams are mainly self-organised. However, weekly project meetings between the project (sub-)teams and the lecture assure a long-term and target-orientated project progress. The lecturer primarily acts as in a mentoring and coordinating role rather than a lecturing and conducting role as in conventional teaching methods.

Due to the multiple skills required to master such a project the learning experiences built a meaningful IT skill portfolio for the student. Overall, the delivery of the teaching content is highly interactive between teacher and student. The unit assessments are due to the realistic teaching context purely output oriented and authentic. The student gains a learning experience that is integrated (content) and experiential (context). The learning environment enhances knowledge exchange and sharing among students, which led in the case study to more effective learn results.

In future work, the international teaching cooperation is going to be continued. The given business processes have been implemented and the two SAP-Systems have been integrated. Thus, a foundation for the implementation of enhanced SCM concepts has been created. Future projects are already conceptualised considering new teaching content such as the CPFR concept. Hence, the designed real world teaching context can continually be used to impart further teaching content. Moreover, the application of the teaching framework should be evaluated in additional projects, such as Data Warehouse, Content Management or individual programming projects. As the presented business scenario as teaching context is scalable for additional partners, the configuration and implementation of a more realistic hierarchical supply chain with three or more partners (e. g. supplier, manufacturer, retailer, customer) is considered. This will continuously allow an extension of the teaching context. Conclusively, the integration of complex teaching content into a teaching context is beneficial to the extension of both.

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