Information systems freshmen teaching: case experience from day one

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Abstract: Teaching information systems has been an international challenge for many years now, due to a number of reasons: changing technology, increasing number of applications, addition and modification of pertinent methodologies, to name just a few. Beyond this, the interest from students has been moving up and down over the years, with a recent new high caused by many Gen Y students. This report derives from 20+ years of experience in teaching information systems and summarises our findings as well as our current approach. The latter is characterised by two fundamental decisions: to provide novices with hands-on experience in dealing with information system concepts from day one, and to deliver a reality check on whether someone has chosen the right study subject and, if so, what to expect in study terms and courses to come.

Keywords: information systems; introductory course; case-based experience; modelling; case study; group work.

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1 Introduction

University-level teaching of subjects such as computer science (CS) or information systems (ISs) is confronted with a variety of challenges today, among them the ever changing content, the evolving demands of future employers, or the changing attitude and expectations of young students. Over the years, numerous attempts have been made to meet these challenges, to balance them against academic standards, and to develop a teaching approach that is sustainable in various respects. The present paper reports on one such attempt and is based on our experience of teaching a first-year ISs course at the University of Münster in Germany.

Like many courses in CS, introductory ISs courses face specific requirements not present in other disciplines: First, for many years it was vastly unclear exactly what material to include. Second, many students entering a CS or an IS program are not entirely sure that this will be their 'final destination' study-wise. While the first problem has essentially been solved over time, thanks to the availability of comprehensive textbooks such as Laudon and Laudon (2014), Rainer and Cegielski (2011), or Hasenkamp and Stahlknecht (2011) with wide acceptance, a solution to the second

problem is less obvious. Indeed, in particular in Germany, but most likely in other countries as well, high-school students are hardly advised professionally as to which direction they should follow once they graduate. Consequently, the decision to enter a particular program is often based on external factors such as career opportunities, finding areas that are considered attractive at the time or for which the student has some form of prior knowledge already. As many statistics show, this often results in frustration already in an early stage of higher education or even in dropout from a program after a 'trial and error' period.

In this paper, we report on the design, development, and implementation of a new approach to IS freshmen teaching, led by the following guiding question:

> "How can traditional lecturer-oriented IS freshmen teaching be adapted to the changing needs of practice and the changing expectations of students?"

The approach to ISs freshmen teaching that we report on in this paper is based on two fundamental design decisions: First, we want to provide our incoming students as early as possible with a realistic, though admittedly incomplete picture of a typical project someone may be confronted with when working professionally in ISs. Our intention here is to answer the question about what a graduate of our IS program might actually be doing in his or her future job even before anybody has asked it. Second, we want to enable our students to verify whether they have entered the right program as early as possible, so that not too much time has been lost when someone decides that another subject might be more appropriate for her or him. The solution to both aspects we propose in this paper is to provide 'case experience from day one', and to do so by outlining the many facets of IS design and development over the course of an entire semester in a practical and engaging fashion.

The introductory IS course that we discuss in this paper has been taught for more than 20 years in total and has undergone considerable development during that period. In a nutshell, it has evolved from lecture-centric teaching that closely follows one of the standard IS textbooks to an experience-oriented approach where the connection to a real-world problem or project is much closer than what any textbook can provide. As is often the case with emerging fields – and IS is no exception – considerable amounts of time are (and need to be) spent on developing terminology and nomenclature; this is then cast into definitions, which students need to comprehend and reproduce. Whether the latter has been accomplished is then tested during one or more exams. The initial version of the course in question here also followed these lines.

Once the ground has been settled, additional goals can be set (and accomplished) in an introductory class, namely to survey a field, in our case to provide an overview of the IS area as far as it is represented by the various research groups in our department. The result is typically (and in our case certainly was) characterised by some degree of heterogeneity, which most of the time is all but reassuring for the participating students. Based on this experience, on discussions with colleagues from around the world as well as on observations of the evolution of the field of IS, we meanwhile feature a different approach where:

- We focus on providing each individual student with the ability to reflect his or her choice of studies, determine his or her interests and planning his or her academic or professional future.

- Students should have the opportunity to experience IS or IS work 'in action'.
- Participants should be enabled to decide whether IS is indeed the proper choice.
- After having taken the course, they should have an initial idea of what an IS graduate will eventually be doing in the workplace.
- At the same time, they should have an overview of IS in general and of the remainder of their Bachelor studies in particular.
- They should experience the course without the pressure of grades.

The remainder of this paper is organised as follows: Section 2 covers background material on IS as a discipline, IS courses in general, as well as the methodology guiding the course development. Section 3 describes the local understanding of IS education and the design of our course in detail while Section 4 provides a discussion of the approach both from a teacher's and from a student's perspective. Finally, Section 5 presents our conclusions as well as a brief outlook.

2 Background

This section covers background material in ISs as an academic and a professional discipline. Specifically, we start by looking at the field as such, review relevant literature, then discuss how it could be taught, and finally outline a methodology for course development in this area.

2.1 ISs as a discipline

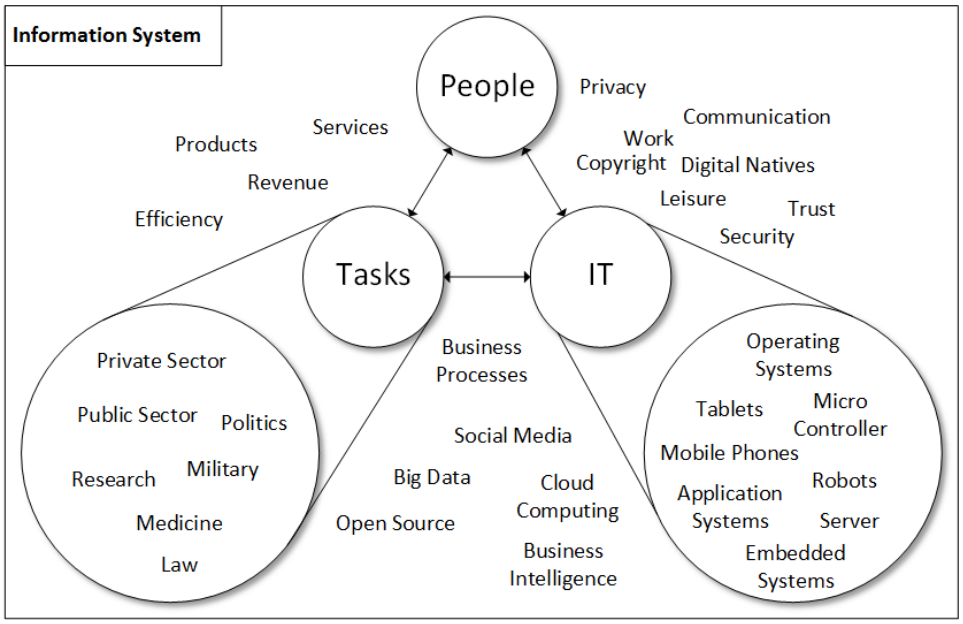
'Management information systems' (MIS), or 'ISs' in short (also business informatics, 'Wirtschaftsinformatik' in German), is the name of an academic discipline positioned at the intersection between various stakeholders (e.g., companies, governments, non-governmental organisations, individuals) having a certain information demand. It studies the potential of current information technology (IT) to provide means and solutions for fulfilling these demands (Hasenkamp and Stahlknecht, 2011; Laudon and Laudon, 2014; Rainer and Cegielski, 2011).

Particularly in Europe, ISs are understood as socio-technical systems comprised of people, tasks, technologies, and their relationships (cf. Figure 1). People have to fulfil tasks in an efficient way, working to bring a product or service to the market for an adequate revenue. They integrate IT solutions into their day-to-day life for their work and leisure, being – or not being – concerned about privacy or security issues, whether or not to trust the machine or the communication partner. The tasks are being defined, for example, by public or private bodies, by research or the judiciary. IT can come in the form of gadgets like tablets or mobile phones, but also as embedded systems like lane departure warning systems in cars. All of these hardware systems require operating systems and run application systems, providing the respective service. Connecting available IT solutions with tasks under consideration of the user spans the field of application for the IS discipline.

This inter-connection is prominently illustrated by current discussions and developments around 'big data'. Through the exhaustive usage of IT by people and the

vast amount of data being produced each day, 'big data' has quickly become one of the currently most relevant topics within the IS discipline. "Big data is high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization" (Laney, 2012). Conventional methods of analysing data of these characteristics will not work anymore and thus need re-consideration; in particular, the areas of business intelligence (BI) and data warehousing are affected. For this, IS experts need to have insights into other neighbouring disciplines: They need to understand how to work with huge amounts of digital data (CS), which methods to use for analysing it (mathematics), under which regulations analysis is permitted (law), and for which reason to analyse the data (business administration).

Figure 1 IS comprised of people, tasks and IT



2.2 Defining teaching and education guidelines

Over the past decades, there have been several initiatives to establish curricula and guidelines for undergraduate degree programs in ISs (Gorgone et al., 2003; Topi et al., 2010) in a very detailed and structured way, leading back to early curriculum recommendations in 1973 (Couger, 1973). In those proposals, introductory courses in ISs play an important role and are described concerning proposed learning objectives or learning goals. In addition, diverse handbooks for teaching introductory courses are supposed to give guidance on what to teach first-year ISs students (e.g., Laudon and Laudon, 2014; O'Brien and Marakas, 2012; Watson, 2012). Thus, it is not only about the content, it is also or even more about the approach, as there are several challenges when it comes to introductory courses in ISs: large class sizes, sustaining student's interest and motivation throughout an entire semester, and preparing students for the job market are

problems to deal with (Nelson and Hauck, 2008). As Gustafsson and Newman (2002) pointed out: "[…] the first-year course is very important in that it is among the very first pieces of the educational puzzle that is laid out." A well-designed introductory course can make a difference for the entire program.

ISs introductory courses are traditionally held as teacher-centred lectures with either individual or group assignments. However, several studies show that lectures that contain, for example, case studies, role-plays, group assignments, or other collaborative elements were evaluated better by students than traditional teacher-centre dones (Al-Shammari, 2005). In line with that, Gustafsson and Newman (2002) have identified teamwork as an important factor to increase student motivation. Furthermore, an active engagement helps students to understand better and internalise what they learn in class (Wakefield et al., 2012). This adheres to the results from Uno (1999) who classified the methods of learning: students (and people in general) learn 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see and hear, 60% of what they write, 70% of what is discussed, and 80% of what they experience. This classification is in line with Revans' (1972, 1982) principles of *action learning*. The method of action learning advocates that, within a group, work-based problems are discussed, and through sharing experiences, action is suggested and implemented. In this way, learning from shared experience provides new solutions and helps students to develop their skills. However, action learning is particularly challenging in large classes (Beatty, 2004; Bergtrom, 2006), and it requires students to engage actively instead of passive listening (Meyers and Jones, 1993).

Already two decades ago, Barr and Tagg (1995) have described a paradigm shift taking place in IS education: from the traditional and still dominant 'instruction paradigm', where instructions are provided, to a new 'learning paradigm'. To this end, Guskin (1994) pointed out that "the primary learning environment for undergraduate students, the fairly passive lecture-discussion format where faculty talk and most students listen, is contrary to almost every principle of optimal settings for student learning". In line with that, Landry et al. (2008) state seven key trends and issues dealing with the importance of the learner-centred paradigm in ISs education. Thus, a first objective when designing an IS introductory course is:

1 Actively engage students to sustain their interest and raise their satisfaction.

Besides the challenges of didactics while teaching ISs introductory courses, there are also topical challenges. Most undergraduate courses focus on traditional, disciplinary knowledge, although complex transformations and fast technological developments in the management discipline and today's business world require cross-disciplinary skills (Al-Shammari, 2005; Winter, 2002). Educational programs for IS students need to be able to meet these challenges by training and graduating students, who are well-equipped with holistic management as well as IT-skills that meet the market needs and the expectations of their employers (Al-Shammari, 2005). In particular, as organisation increasingly work process-oriented and business process management (BPM) tools and methods continue to evolve, the need for BPM expertise is increasing (Bandara et al., 2010). There is also a growing number of jobs, like, e.g., process analyst, process architect or BPM expert, where specialised BPM skills are required (Lederer Antonucci, 2010; Müller et al., 2014). Thus, a second objective when designing an IS introductory course is:

2 Let students experience their future working environment as IS graduates.

When designing an IS introductory course with these two objectives in mind, it becomes necessary to think about an appropriate grading scheme. Relying on a written exam at the end of the semester, where students reproduce facts and definitions, does not seem suitable. Thus, if students are supposed to work in groups during the course, group work should be the basis of grading. There have been several proposals in the literature on how to evaluate individual contributions in group work (Hansen, 2006; Hayes et al., 2003; Vik, 2001), e.g., with the help of detailed peer evaluations (McKendall, 2000), individual contributions files (Hansen, 2006; Page and Donelan, 2003), or interim reports (Brooks and Ammons, 2003; McKendall, 2000). However, those procedures can still be cumbersome in large classes. Therefore, IS introductory course designer has to think of an appropriate grading scheme. Thus, a third objective when designing an IS introductory course is:

3 Adopt the grading scheme to the course structure.

2.3 Methodology guiding the course development

A well-established research methodology in the field of ISs is design science research (DSR) (Hevner et al., 2004; Peffers et al., 2007). DSR is an iterative research process, yielding an innovative and evaluated artefact (a software, model, process, or implementation) after each cycle. The artefact is expected to address – and, in the best case – *solve* an(evidently) *relevant issue* in the field it is to be applied, and, therefore, contribute to the current knowledge base within the field.

Although many (especially graduate) courses exist that teach DSR, we are, to the best of our knowledge, the first ones to apply the methodology to the process of developing an undergraduate course.

In our case, the innovative artefact is our introductory IS course, which has been modified and evaluated up until its current form for several years. The necessity to adapt courses to a changing environment – especially in the IS and CS fields – becomes evident when analysing the declining numbers of students (Stefanidis and Fitzgerald, 2014; Wilson and Avison, 2007; Zhao et al., 2014). Besides attracting more students to the field, it becomes more and more important to retain students in our field. We, therefore, rate the development of an improved course design as being a relevant issue. The iterative character of DSR mirrors in the (forced by the curriculum) annual repetition of the course. The course and its respective changes are being evaluated via annual student evaluations. Regarding the results of the assessment, we assume the current version of the course superior to the previous iterations. By sharing our approach and findings, we hope to extend the current knowledge base of IS education.

3 Course design

The course ‘Introduction to ISs’ (taught in German as ‘Einführung in die Wirtschaftsinformatik’) is part of the undergraduate Bachelor IS program of the Münster School of Business and Economic. This six-semester program spans 180 credit points, three of which are earned by successfully passing this introductory course. The lectures

are offered one each by all IS professors and their staff, addressing various fields touched by the discipline. Some of the professors are core IS researchers, others have close links to CS, and again others are into quantitative topics like statistics and stochastics. This section provides an introduction to the perspective in IS education as perceived in Münster, a chronological perspective on the development of the design of this course by outlining its most recent developments, re-design objectives that were derived from an evaluation of the former, and the structure of the course after its reorganisation.

3.1 The Münster perspective on IS education

Considering IS as a discipline, IS education faces the challenge to not only provide graduates with an overall understanding of the linked disciplines but also to integrate these topics into an additional, integrative stream of thought. With this integrated education, IS graduates need to be able to understand the needs of the stakeholders and develop new or introduce existing (IT) solutions. Common stakeholders of ISs experts are companies or bodies using IT to collect, store, process, and analyse data for goal-oriented decision-making, and to identify, support, and improve their business processes through BPM. Business processes are traditionally understood as "[…] a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer" (Hammer and Champy, 2006). BPM in turn "[…] is a comprehensive system for managing and transforming organizational operations, based on what is arguably the first set of new ideas on organizational performance since the Industrial Revolution" (Hammer, 2011). vom Brocke and Rosemann (2014) introduce six fields (called the 'six core elements') to describe influences on BPM: strategic alignment, governance, methods, IT, people, and culture. Business processes have to be supported by methods and IT, have to adhere to the corporate governance, have to be aligned to and supported by the corporate strategy, and have to be adjusted to the organisational culture and the people working in the company. To make this happen, the expert has to find a common language for all stakeholders: The board, the management, the IT people, and the people working on value-creation. Conceptual models are the means and end for communicating complex issues between different participants (see e.g., Chen, 1976; Wand and Weber, 2002). Therefore, conceptual modelling is in the focus of the IS education at the University of Münster not only during the introductory course but also throughout the undergraduate studies.

Against this background, we want make sure that our graduates are able to communicate with the diverse stakeholders in an IT-related project, structure their thoughts, be able to deepen their knowledge according to the situations they might face, and as a result be able to make sound decisions. During our three-year undergraduate studies, we strengthen this by providing basic economical understanding and thinking, basic CS training and thinking (including the ability to program), basic legal understanding and thinking, as well as an overall integrative understanding and thinking.

3.2 Historical development

In the beginning, the introductory course was a purely lecturer-centred one, following the classic scheme of four hours of lecture per week and a final examination. The design principles of such a lecture are inherent to the course outline set by a single teacher. The lecturer, one of our core IS professors, used his own textbook, spanning the topics

relevant for IS introduction according to the curriculum. Although the lecturer provided a 'helicopter view' on the various topics, the students learned – efficiency-driven by the exam – several IS concepts by heart, yet failed to get an understanding of the interconnections between the various IS perspectives. The expected performance of the students was simply reproduction.

To provide a better overview about the variety of IS topics, this approach was changed from a one-lecturer to a many-lecturer course in 2009, including all senior faculty to present how their respective area (e.g., CS, logistics, statistics…) contributes to the field of IS. There was no single textbook anymore, but literature offered by each participating lecturer. Additionally, an overarching case study connected the different areas, making the students discuss how their learnings from the lecture could be adopted to a (fictional) real-world scenario. Although the overall understanding increased, the students complained about the exam. Without having a textbook, they did not feel like being able to prepare adequately for it. At this point, the lecture was restructured to its current form. A summary of the key aspects defining the way the lecture was carried out is provided in Table 1.

Table 1 Key aspects of the lecture from winter term 2009/10 to 2012/13

Term	*WT 09/10*	*WT 10/11*	*WT 11/12*	*WT 12/13*
Exam	Yes	Yes	Yes	Yes
Case study	No	No	Yes	Yes
Lecturers	Many	Many	Many	Many

As with any other course at the University of Münster, students have evaluated the Introduction to IS lecture annually, thereby providing lecturers with praise, criticism, and (not always realistic) suggestions for organisational changes and other improvements. Questions included in the evaluation address the structure of the lecture, the motivation of lecturers, the conveyance of lecture contents, a self-assessment of the learning outcomes, materials and media, and lastly an overall assessment of the course. Most questions are answered on a scale from 1 (best grade) to 5 (worst grade), corresponding to the most common grading scheme found in German education. Table 2 gives an overview of the numbers of participants in the three iterations of the lecture two years prior to its reorganisation. It must be noted that all quantitative evaluation results from the winter term 2012/13 are disregarded due to a temporary change in the design of the questionnaire and the scales that were employed, thus rendering the results incomparable. A detailed examination of the evaluation results over time reveals some important weaknesses that will be discussed in the subsequent paragraphs.

Table 2 Lecture evaluation facts from winter term 2009/10 to 2012/13

Term	*WT 09/10*	*WT 10/11*	*WT 11/12*
# Respondents	95	92	86

Some indicators collected during the evaluation that point towards the student's engagement and satisfaction are presented in Table 3. It can be seen that the average grade given to the lecture by students lies between 2.3 and 2.9, pointing towards moderate dissatisfaction. At the University of Münster, most popular lectures are

typically evaluated with an average grade of 2.0 or better. In contrast, the attractiveness of the lecture contents was commonly seen as rather high, but students were not motivated to engage with the lecture contents by themselves beyond the actual lectures, and believed that they have ultimately learned only very little. Clearly, this does not satisfy the goal of actively engaging students to increase their interest in the IS domain. Some reasons for this may be found in the textual comments of the evaluation. Owing to the organisation of the course, introduction to IS incidentally manages to paint a broad picture of the IS domain, but conversely has difficulties of establishing a clear golden thread due to the frequent changes of lecturers and topics. This was alleviated to a certain extent in the last two iterations, where this golden thread was partially established by a semester-filling, continuous case study. Discussing the contents of the lectures, most students agreed that they were able to gain a good overview of the IS discipline, but often also criticised that the course format did not allow lecturers to go into detail. As a result, many felt that the course contents were too superficial, theoretical, and intangible and that they did not learn the use of any concrete tools for future semesters. Among the parts of the lecture that were most well-received in all semesters were guest lectures given by former students and other individuals working in IS-related jobs. From this, it can be reasoned that simply giving students a 'big picture' of the IS domain might not be enough, but that it is also necessary to demonstrate to them in a very concrete and tangible fashion what their professional future might look like. As this was not the case, students only engaged with the lecture contents as much as required for exam preparation and were thus not satisfied with what they had ultimately learned.

Table 3 Student engagement and satisfaction facts from winter term 2009/10 to 2012/13

Term	*WT 09/10*	*WT 10/11*	*WT 11/12*
Avg. lecture grade	2.3	2.9	2.6
Interestingness of lecture contents	2.3	2.3	2.4
Motivation to engage with lecture contents	2.7	3.1	3.0
Amount learned	2.8	3.2	3.3

To ensure that students had met certain learning goals, an exam was employed in all past iterations of the lecture. As mentioned at the beginning of this section, the focus of this exam was on learning concepts, definitions, and terminology by heart and then reproducing this information. As shown in Table 4, this has resulted in average student grades between 2.83 and 3.09 and a percentage of students who have failed the course between 10.19% and 19.13%. It can be questioned whether such mediocre results are appropriate for a lecture whose primary purpose is to motivate students for the IS domain and future semesters. An examination of the textual comments provided by students reveals a strong focus on the exam across all of the observed iterations. Typical remarks included that the lecture did not properly prepare students for the exam, that they were unsure about which contents were most relevant for it, and that the contents and variety of the lecture were too extensive. Other students questioned the appropriateness of an exam for this type of lecture altogether. All in all, it seems that students strongly focused on the exam, which clearly conflicts with the goal of letting students experience their future working environment as IS graduates (see Section 2).

Table 4 Lecture exam facts from winter term 2009/10 to 2012/13

Term	*WT 09/10*	*WT 10/11*	*WT 11/12*	*WT 12/13*
# Students in exam	123	139	108	115
Avg. exam grade	2.88	3.09	2.83	3.09
% failed exams	11.38%	12.95%	10.19%	19.13%

3.3 Objectives redesign

Comparing the evaluation results discussed in the previous section with the goals outlined in Section 2, a clear divergence can be detected. To achieve an overlap between both, the structure and organisation of the course were adapted with the following aims (see also the objectives mentioned in Section 2.2).

3.3.1 Actively engage students and raise student satisfaction

As the evaluation had revealed, students were only moderately satisfied with the introduction to IS lecture, feeling that its contents were not tangible enough and that they did not learn enough, thus ultimately decreasing their motivation to engage with the lecture's contents. Therefore, in the latest iteration of the lecture, we attempted to address these problems to improve the overall satisfaction of the students. This was hypothesised to be desirable, as a higher satisfaction should lead to an increased interest, engagement, and motivation.

3.3.2 Indicate work experience

One of the primary goals of modifying the lecture was to let students experience the possible future work of an ISs graduate as closely to practice as possible. Such an orientation requires, for example, solving tangible, realistic problems by working with tools and techniques that can also be found in real-world scenarios, and giving students an idea of various job profiles in the IS domain. The primary intention behind this is to allow students to reflect critically on their choice of study program and to decide whether they want to pursue it further. Ultimately, experience orientation in an introductory lecture should allow reducing the number of students who change or even abort their studies in higher semesters.

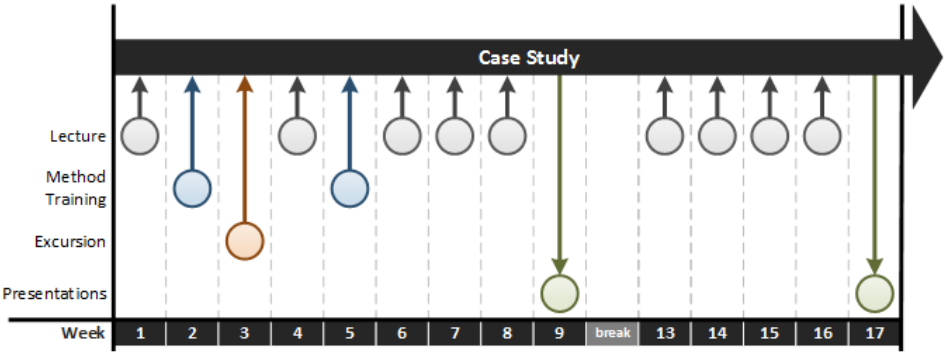
3.3.3 Adapt new grading scheme

The traditional final exam of the lecture focused on the reproduction of facts and definitions as a means for determining grades. Because of this, students were not engaged over the entire course of the semester but instead concentrated on learning these fragments by heart immediately prior to the exam. Adding to this, the rate of students who have failed the exam has constantly remained between 10% and 20%. It can be questioned whether such figures are acceptable for a lecture that should provide a motivating and engaging introduction into an entire discipline. As the newly introduced goal of experience-orientation requires constant student participation in all phases of the lecture, relying on an exam was considered obsolete, thereby a more suitable means of grading had to be found.

3.4 Current iteration: experience-orientation

In the winter term 2013/2014, the lecture Introduction to ISs ran from mid-October to early February and was attended by 162 students. Its schedule consisted of 14 weekly classroom meetings with a short break during the winter holidays. The lecture was accompanied by a semester-spanning case study. The overall chronology of the lecture can be seen in Figure 2. From a structural point of view, the lecture was dominated by the aforementioned case study, with all of the 14 classroom meetings either providing input for this group-based work or serving as a means for presenting (intermediate) results. The individual components shown in Figure 2will be elaborated upon in more detail next.

Figure 2 Chronology of the lecture in the winter term 2013/14 (see online version for colours)



3.4.1 Case study

As motivated above, the ISs curriculum at the University of Münster puts a strong focus on abstraction and modelling as one of the central tasks within the domain that graduates will have to perform in their future work life. Therefore, an important part of the revised lecture was a case study centred on the modelling of business processes. At the beginning of the semester, students were introduced to a fictitious car company and randomly sorted into different groups, each of which was concerned with one particular department of the firm, such as marketing, production, logistics, or accounting. The random sorting was intended to:

1 make the participants meet their fellow students

2 to provide the experience of working in ad hoc teams.

The first assignment for the students was to research independently the tasks and responsibilities of 'their' department and its interfaces to other parts of the company. Next, the groups had to model the business processes of their divisions over the course of the semester, starting out with rough drafts and revising and detailing them incrementally using the knowledge gained each week through the lectures. To do so, students used the *Horus Business Modeler*, which is based on Petri nets and allows the collaborative, cloud-based development of business process models (Schönthaler et al., 2012). It should be noted that students worked on the case study independently and only received

occasional technical support. At the end of the semester, each group generated and submitted a report from the work done during the semester, containing all created models and their documentation.

3.4.2 Lecture

The biggest part of the course, namely nine of the meetings, consisted of individual presentations by the professors of the Department of Information Systems. In this context, each lecturer introduced the students to another viewpoint on a specific area of the IS discipline, These viewpoints were process management, supply chain management, interorganisational systems, software engineering, statistics, data management, IT security, quantitative methods for logistics, and communication and collaboration management. Students received an overview of each area and its most important concepts, and an outlook on future lectures where these topics will be discussed again. Lastly, each of the lecturers provided the students with new input for the case study, as the newly learned ideas and concepts had to be integrated into the business processes of their divisions and the respective models.

3.4.3 Method training

Two lectures differed from the remaining schedule in that they did not focus on a specific area of the IS discipline but rather on enabling students to work with the Horus Method (Schönthaler et al., 2012) and the Horus Business Modeler. To that extent, an introduction to the fundamental concepts of business process modelling with Petri nets was given in a fashion omitting many of the theoretical considerations behind it and instead concentrating on its practical application. Among the topics discussed were the fundamentals of modelling and its significance for IS, basics of business processes how to manage them, the basic syntax of Petri nets and its execution semantics as well as the basics of control flow and process refinement. We completed this by a demonstration in which a small-scale case study was used to show the students how to transform textual specifications provided by process stakeholders into process models using all the tools and techniques previously discussed. The result of this demonstration was provided to the students afterwards as a technical reference for their work on the case study.

3.4.4 Excursion

To initiate the lecture in a motivating and engaging fashion, one of the first meetings was used for a day-long excursion to a factory of a car manufacturer in Cologne. In this context, students learned about their possible day-to-day work as future graduate directly from employees working in related management positions. Additionally, they were given first-hand insights into the structure of a large, global organisation that helped them to understand the role of their designated division in the case study.

3.4.5 Presentations

After the first half of the semester, all groups were required to prepare an intermediate presentation about the results of their case study work so far. For each possible division of the car manufacturer, one group was chosen to present their results based on whether

they had performed extremely well so far or made archetypal mistakes from which all students could learn. During these presentations, students were provided with valuable feedback and constructive criticism to integrate into their work. This process was repeated at the end of the semester in the final meeting of the lecture.

3.4.6 Grading

One of the most significant differences between the lecture as it took place in its most recent iteration and its previous structure was the elimination of a final exam. As mentioned earlier, this decision was made to support the focus on experience-orientation rather than the simple reproduction of knowledge. Instead, students had to participate in the excursion and prepare presentations for two meetings during the semester, with the chance (but not guarantee) to present in of these two instances. Furthermore, work on the case study was mandatory, as the final delivery of a report (the so-called process handbook) exported from the Horus Business Modeler was required to pass the class. However, these reports were not graded on a traditional scale, but instead on a binary scale consisting of 'pass' or 'fail' only. The decision to abstain from traditional grades was made due to the case study being based on independent, playful work, experimentation and making mistakes as stepping-stones for learning. Consequently, groups were given a passing grade if their reports satisfied a minimal set of formal criteria.

4 Evaluation of the adapted course design

The evaluation of the current realisation of the 'introduction to IS' lecture is based on detailed feedback received from 70 students using an anonymised online questionnaire. The structure and contents of the questionnaires were identical previous iterations of the lecture (except the winter term 2012/13), thus rendering the results comparable.

4.1 Overall

The average given to the lecture by students after its redesign is presented in Table 5 together with additional results relating to student satisfaction. As can be seen, within the considered timeframe the grades of the newest iteration of the lecture are at least as good as in the past. Most importantly, the motivation of students to autonomously engage with the lecture contents, as well as the amount of knowledge acquired, has significantly increased. Looking at the textual comments, an exceedingly large proportion of students indicated that the lecture has allowed them to gain an overview of the various areas of the IS domain, as well as of the different topics that they can expect in future semesters. Compared to previous iterations, only a small amount of students stated that they found the lecture contents too superficial and intangible. It is reasonable to assume that these positive changes can be attributed to the modifications made to the lecture described in Section 3.4.

Table 5 Student engagement and satisfaction facts from winter term 2009/10 to 2013/14

Term	*09/10*	*10/11*	*11/12*	*WT 13/14*
Avg. lecture grade	2.3	2.9	2.6	*2.2*
Interestingness of lecture contents	2.3	2.3	2.4	*2.3*
Motivation to engage with lecture contents	2.7	3.1	3.0	*2.7*
Amount learned	2.8	3.2	3.3	*2.8*

4.2 Grading

As mentioned above, students did not receive a grade for the lecture but could only pass or fail based on their attendance during three mandatory meetings and the case study report handed in at the end of the semester. This has led to a significant reduction of the rate of students who failed the course from 19% in 2012/2013 to 4% in 2013/2014. However, due to the paradigm shift in the grading method, these results may not be entirely comparable. In total, 80% of the students positively responded to the omission of an exam, while in turn about 7% would have desired an exam instead of the case study. Therefore, it can be argued that the course redesign was successful with respect to its goals concerning the adaption of the grading scheme.

4.3 Case study

Students generally exhibited a positive attitude towards the case study, with 77% expressing that they do favour it over an exam. Looking at the textual comments, aspects of the case study that were positively highlighted include the independence and autonomy that it enforced, its perceived relevance for practice, the work in groups that allowed getting acquainted with fellow freshmen, and lastly the fact that it replaced the written exam. On the negative side, some students found working independently problematic, some thought that the difficulty level was not identical for all groups, in some cases the groups did not work together well, and lastly some would have wished for more frequent feedback during the semester. Almost all of the participants (i.e., 97%) participated in case study work, with about half of the groups working individually in separate places and the other half working together in a single location. About 87% of the students indicated that they had gotten a good understanding of the tasks of ‘their’ company division and 76% felt able to create process models, with only 13% having prior process modelling experience. Regarding the choice of software, about 70% of all participants found the Horus Business Modeler to be perfectly suited for the task and the same amount of students would use it again for this lecture. However, about two thirds would also like to get to know other tools for the same purpose and about one third would have required more preparation regarding Horus. Overall, 63% of the students stated that the case study and the use of Horus have allowed them to learn a valuable skill, 61% felt that it will help them in the rest of their studies and 65% believe that it is relevant for practice.

4.4 Excursion

Overall, the excursion was perceived as an interesting and engaging part of the lecture that should be repeated in the future. For instance, one student described it as a very positive and instructive experience. However, many students stated that the excursion did not fully meet their expectations, as it did not include a guided tour of the car manufacturer's production site. Another critique arose from the fact that the excursion was not perfectly aligned with the case study, meaning that additional research by the students was required before they could work on the latter. However, this was an intended part of the course design, and thus should not be considered a shortcoming despite being perceived as such.

5 Discussion

Before starting to redesign the introduction to IS lecture, we encountered several problems with the existing lecture and with the study process of our students in general. First, the lecture was a real 'lecture', meaning that no interactive parts were provided, and the students were mere 'information consumers'. They learned primarily towards an exam, i.e., the focus was more on learning and reproducing concepts and definitions. Second, students only got to know a few selected professors from the institute during their first semester. Third, they lacked an overview of what to expect from the rest of their studies and, therefore, a basis on how to decide whether IS was the right course of studies. To improve the quality of the lecture, we decided to change several parameters and let the students evaluate the lecture afterwards. As has been discussed above, those parameters were:

- Ongoing group work instead of an exam at the end (addressing principles:
  1 actively engaging students
  2 experience of future working environment
  3 adapted grading)
- An ongoing case study that runs like a common thread through the entire lecture and an excursion to exemplify the case study and make it more feasible (addressing principles 1 and 2)
- The distribution of the lecture slots between all IS professors at the institute in order to get a broad insight into the discipline at a very early stage in the course of studies (addressing principle 2 ad in mind when restructuring the course were the following:

After analysing the evaluation, several of our assumptions could be confirmed, while other activities had to be adapted for the next iteration of the lecture. Based on that, a set of 'lessons learned' will be presented at the end of this section.

Concerning the overall acceptance of the new structure, the data indicates that student satisfaction is already at an acceptable level and may even reach better levels in succeeding iterations if the criticism provided in the evaluation is addressed. Students were quite content with the new form of grading, i.e., that they were graded just on the results from their ongoing group work with either 'pass' or 'fail'. Most students liked the idea of not having to write an exam. This led to a lower number of students failing the

course. Thus, two of our objectives, namely 'raise student satisfaction' and 'improve grading' could be achieved by changing this parameter.

Concerning the case study, the learning results of the lecture are very promising. After looking through the process model documentations submitted, it became apparent that the student groups actually dealt with their topic and their task to continuously model the business processes related to the case study. As most students indicated that they got a good understanding about business process modelling, this confirms our assumption that action learning, as reflected upon in Section 2, seems to be an appropriate approach for teaching business process modelling. It must be noted, however, that the actual results of the case study were only examined to determine whether individual groups should pass or fail the course, and, thus, no quantitative indicators regarding process model quality can be provided. However, we were able to change the lecture from mere information consumption to 'learning by doing' and, thus, achieved our objective 'experience-orientation' by introducing the ongoing case study.

Some criticism of the case study remains and should be addressed in future iterations of the class. Indeed, a large number of students has expressed that they found working independently and without precise instructions directly at the beginning of their studies very challenging. An equally large number of students noted that some lectures did not serve as a proper basis for advancing the case study work due to missing connections between the both. Clearly, this is one of the points that should be addressed with high priority. Furthermore, some would have liked to receive ongoing feedback during the semester rather than just two particular points in time, an issue that we might be able to tackle through an electronic discussion board. Additionally, a few students noted an imbalance of the difficulty of the case study depending on the division that a group was assigned to. Some of these problems are typical problems occurring in group work. Those problems will most probably arise during future iterations as well. However, one problem will be addressed in the next iteration of the lecture: First, the professors will link their individual lecture even more closely to the case study, in order to provide students with better information about what to do in their group work. The other problems (missing ongoing feedback and a perceived imbalance of difficulty) will be kept in mind for the analysis of the next evaluation feedback.

The excursion was evaluated as helpful for an in-depth understanding of the case study. Hence, such an excursion should also be a part of future iterations of the course.

The evaluation of the course has also revealed some additional insights that cannot directly be connected to one of our original parameters. First, the lecture enabled some of the students to reflect their choice of study and come to the conclusion that ISs does not suit them. However, as mentioned earlier, this was one of the goals of the redesign, reflected in the objective 'experience-orientation'. If students realise at a very early point in their studies that it is not what they wanted to do or expected, it is easier to change and start over. Second, the organisation of the lecture created some controversy. On the one hand, many students liked the fact that each lecture was held by a different professor, as this allowed them to get to know all professors at the department at a very early stage. On the other hand, some students noted that this created some confusion, as the presentations were of varying focus and level of detail.

In summary, the key lessons that we learned from the current iteration of our introductory lecture are as follows: First, a case study will allow students to experience their possible professional futures first-hand and may, therefore, help them to reflect their

choice of studies. Second, letting students work on the case study independently and in groups allows them to train related soft skills but may also pose difficulties for some that can be anticipated. Third, by complementing case study work with traditional lectures, students also gain an overview of the ISs discipline and acquire foundational knowledge. Fourth, a close link between the contents of individual lectures and the case study ensures that students always have the required information to continue their group work. Fifth, a well-aligned excursion can serve as a palpable introduction into the contents of the course and the forthcoming work on the case study. Sixth and last, alternative approaches to grading (e.g., written reports or presentations) may be more appropriate for experience-oriented lectures built around a case study. The building blocks that can be derived from these lessons are summarised in Table 6.

Table 6 Building blocks of the lecture derived from the lessons learned

#	*Description*
1	Experience-oriented case study
2	Independent group work
3	Complement case study with traditional lectures
4	Close link between lecture and case study
5	Well-aligned excursion
6	Alternative approaches to grading

6 Conclusions and outlook

During the previous semesters, we have gradually changed our IS introductory course from a lecture-centred to an interactive layout. Moving away from textbook-oriented lectures in favour of a case study that is aligned with an exemplifying excursion provides the students with a hands-on experience on what they have to expect from their studies and their job after graduation. Making them think about how to communicate with conceptual models in the various shades of IS provides them already in their first term with a mode of thought we expect them to have. We believe that this setting supports them in deciding early in their studies whether their choice was the right one, and to have a common thread throughout their undergraduate studies.

Besides minor changes, we expect the course layout to remain stable for several terms to come. Student feedback about wrong expectations regarding the excursion and the case study will be addressed by including an additional informal introduction before the start of the lecture. Taking into consideration that lecturers leave the university – and with them a certain topic – and new ones join the department, we will have to include new and exclude or change old topics. We are, however, confident that all of the various facets of IS can be mapped to a case like the one we use.

Regarding the case, we would like to evaluate whether companies from other domains than car manufacturing would also be suitable candidates for the exemplifying excursion and the case study. We are confident that the case study can be transferred to any company that fulfils a certain set of criteria, like its size (medium to large), the coverage of all departments like human resources, finance, marketing, etc., and a strong need for ICT.

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