PREPARING MANAGEMENT SCIENCE STUDENTS FOR THE DIGITALIZATION ERA

A. Dannecker, R. Telesko, H. Knechtli

Fachhochschule Nordwestschweiz FHNW (SWITZERLAND)

Abstract

One of the big challenges today are innovative teaching concepts for business students in the area of digitalization. At the beginning of their study, students mostly understand only the basics of IT mainly related to their private (mobile) environment and not real business scenarios such as data management, outsourcing and/or business process management.

At the University of Applied Sciences Northwestern Switzerland (FHNW) there exists currently a module — entitled “IT as Business Enabler” — for undergraduate business students, which aims at optimally preparing students for the digital age. Moreover, the mission of the Business School of FHNW is: “We educate innovative and responsible managers for a networked and dynamic world.” The module is composed of different topics (e.g., Business Knowledge Management, Collaboration and Document Management with SharePoint etc.) which are adapted to cover the fast-changing IT and focus on embedding the solutions to strategy and mission of a business model. For each topic, the lecturers develop scenarios which slightly differ from team to team. Each team develops a concept for a scenario consisting of a project management outline, a summary of potential risks, and a plan for implementation.

Over the last terms we observed that the manner in which this module is designed and taught is well accepted by the students (as opposed to classical ex-cathedra teaching). Testimonials from students tell us, that the effort to create high quality documents in a short period of time is demanding, but the specific design of the module which enables to gain necessary skills for the digitalization era is highly appreciated.

Keywords: management science, IT as business enabler, digitalization, coaching, self-evaluation of students.

1 INTRODUCTION

This paper deals with teaching concepts which are suitable in order to optimally prepare management science students for the digitalization era. In future, every job will be affected by digitalization, therefore universities have to react quickly by changing their curricula. For integrating IT concepts into management science there are three basic approaches:

- Approach 1: This approach is related to using topics from computer science studies and adapting them for management science. Here we speak mainly about topics like software and hardware concepts, application programming and software engineering, algorithms etc. This approach is relatively cheap however can often be overwhelming for students because of insufficient pre-knowledge. Additionally, this approach is not sustainable because very often the “foreign” content is not well integrated with other subjects of the curriculum.

- Approach 2: This approach is based on teaching elementary topics from the Business Information Science discipline (in German “Wirtschaftsinformatik”). Very often, this approach focuses on concepts like information- and project management, ERP-systems, databases etc. This approach is more promising than approach 1 with the drawback that the concepts are very often taught in a way that the students cannot detect any concrete relationship to their workplace or tasks.

- Approach 3: This approach was followed when developing our module ITaBE (“IT as Business Enabler”). Topics are not taken at random but are carefully related to real scenarios management science students are facing in their job portfolio (e.g., optimizing the process “order fulfilment” => topic BPM, “Learning from senior consultants” => topic Knowledge Management).

By setting up an “IT-module” for management science students based on approach 3, students not only learn content from a “foreign” study, but also understand IT as medium to enable and optimize their business. Additionally, other important criteria for selecting relevant topics are the significance across management domains like production, marketing, accounting etc., easy access to software (e.g., by only
using a Web Browser) and a clear contribution to the learning goals of the program. The impressive
development of IT makes it necessary to continuously review the setting of the topics and to adapt them
if necessary.

2 THE “ITABE” MODULE

This section is concerned with details about the “ITaBE” module, namely the design, topics, and some
detailed examples from the last terms [1].

2.1 ITaBE design

The module has 5 ECTS points and runs in a two-term mode with the same lecturers. The assessment
in this module is solely done via project work (teams consist of 4 to 7 students). Application for this
module is mandatory, realizations are conducted with a maximum of 21 students, in order to guarantee
individual support. The final grades are calculated by taking into account the single grades for the topics.
A compulsory attendance (at least 80%) and active participation in the course units are required. There
are two evaluated, graded assignments per semester (must be passed on average), from which the final
semester grades result.

The students act as a company (entitled “My SME” with an innovative, pre-defined business model),
and have to implement current business requirements (problems/needs) from the perspectives of the
individual departments. The lecturers provide input for the individual topics in the form of "external
consulting services" (theory lessons), which are based on their concrete and current experiences in
advisory mandates. The students in turn transfer this theoretical input in the form of mini-projects
(adaptation, concept development, discussion, and possible implementation on the course’s own IT
platform) to their company.

The procedure over the whole term is as follows:

- Theory input and tasks (lecturers)
- Elaboration of the content (students)
- Coaching (both): Discussion with two teachers (four eyes principle) on a weekly basis
- Uploading the assignments (students): The assignment consists of a project management outline,
a summary of potential risks, and a plan for implementation.
- Presentation (students)
- Grading and feedback (lecturers)

The teams are allowed to improve their draft concepts based on the given feedback before finally
uploading them on Microsoft® SharePoint for grading. Specific attention is paid to assessing the quality
of the documents. Especially grammar, style, look and feel, referencing, traceability, consistency, and
rationale of arguments provided are relevant here.

An important aspect is how much specific help should teachers offer compared to which students are
aware that they need help [2]. For that reason, in addition to the concepts, the teachers requested a list
of open questions they wanted to discuss during the coaching sessions.

Due to [3] the instructional coaching combines the non-directive elements of a collaborative way of
working with some clearly directive elements. The coaching sessions should feel supportive and
motivational. The alignment of professional learning within a university can be the success of coaching.

In coaching sessions, students can reduce the time they must spend to put into practice what they have
learned earlier. They benefit in different areas such as focusing more on a specific task, obtaining more
control over their work, and increasing confidence in their work [5]. [6] showed that more time for group
tasks allowing more interaction between classmates together with the practical application of topics and
coaching of lectures indicates a high commitment to a course.

Teachers need to make this class worthwhile by ensuring that the classroom experience is productive
and meaningful [7]. Students want to do meaningful things instead of listening only to a lecture. They
expect to meet with discussion groups and project teams and work on assignments during class time
and want the results to be evaluated by experts [8].
Active learning in the classroom time allows the teaching team to circulate the class, listen to students as they discuss key concepts, prompt students to engage, and provide as much input and feedback as possible to students’ direct questions so that they can improve and become experts in the faced field [9].

The basic setup of the terms is based on a flipped classroom concept. Flipped classrooms change class time into workshop time where students can test their skills in applying knowledge and participating with others in interactive activities. During class time, lecturers function as coaches or advisors, encouraging students in individual and collaborative efforts [10].

For this reason, the teachers coached the students over two terms based on different scenarios. In each ITaBE realization a different business model (scenario) is focused (see Table 1 for an overview of the last years).

<table>
<thead>
<tr>
<th>Year</th>
<th>Business model</th>
<th>Real-world implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012/13</td>
<td>Configurable smartphone cases</td>
<td><a href="http://www.skinit.com">http://www.skinit.com</a> (since 2013 configurable)</td>
</tr>
<tr>
<td>2013/14</td>
<td>Customizable energy drink</td>
<td><a href="http://www.professionalgifting.com/custom-energydrinks">http://www.professionalgifting.com/custom-energydrinks</a> (since 2014)</td>
</tr>
<tr>
<td>2016/17</td>
<td>Making kids fit for the future</td>
<td>Implementation open</td>
</tr>
<tr>
<td>2018/19</td>
<td>R.F.Y (Robots.For.You)</td>
<td>Implementation open</td>
</tr>
</tbody>
</table>

2.2 ITaBE topics

The module is composed of different topics which are continuously adapted to cover the fast-changing IT. There is a core set of topics related to development of the My SME project work which is stable over the two terms (Project Management, Business Vision, Collaboration / Information Sharing). Additional topics for the two terms can be seen in Table 2.

<table>
<thead>
<tr>
<th>Term</th>
<th>Topic</th>
<th>Rationale for including the topic into ITaBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT as enabler for the Business</td>
<td>Students learn how IT can contribute to enable or optimize business.</td>
</tr>
<tr>
<td>1</td>
<td>Business Model Canvas (BMC)</td>
<td>Students learn that a BMC helps to visualize the business model and a start-up idea and to test whether this idea makes sense in business terms.</td>
</tr>
<tr>
<td>1</td>
<td>Business Process Management</td>
<td>Students learn that business processes are the “backbone” of every modern organization.</td>
</tr>
<tr>
<td>1</td>
<td>Identification of Target Groups, Search Engine Optimization</td>
<td>Students learn to identify target groups for a business model.</td>
</tr>
<tr>
<td>1</td>
<td>Social Media Marketing, Google Analytics</td>
<td>Students learn to market their idea with state-of-the-art technologies.</td>
</tr>
<tr>
<td>2</td>
<td>Practical Project Management</td>
<td>Students learn to deepen existing knowledge in project management.</td>
</tr>
<tr>
<td>2</td>
<td>Data Protection and Security</td>
<td>Students gain awareness about legal issues concerning data protection and -security.</td>
</tr>
<tr>
<td>2</td>
<td>Business Knowledge Management</td>
<td>Students learn methods and techniques to identify, share and develop knowledge.</td>
</tr>
</tbody>
</table>
For each topic, the teachers develop scenarios which slightly differ from team to team in order to avoid a copy & paste effect between the teams. Also, some of the scenarios have interfaces to other scenarios so that the teams must collaborate and work on the exchange not only within the team but also across the teams.

### 2.3 Detailed ITaBE example

In order to make the various concepts of ITaBE clearer, we discuss a specific business case together with a topic and the related scenarios.

#### 2.3.1 ITaBE business case: R.F.Y

The company R.F.Y (Robots.For.You) is a start-up company with three departments, which develops concepts and services for the use of robots in service activities. The clientele of R.F.Y are companies that want to have repetitive, everyday tasks performed by robots. Those can be services at the reception, foxtails for events or social tasks in care.

R.F.Y delivers a "package", which comprises all tasks, starting from the evaluation of the right robot to the fulfillment of the relevant programming tasks. It is important to always know exactly which new technologies are offered ("trend scouting"). For use of the robot in different domains R.F.Y develops the corresponding concepts.

R.F.Y is pursuing a growth strategy and intends to gain customers for a long-term cooperation. The customers should get the services at attractive prices (B2B business model) and be sure the solutions are based on the best possible technology. To keep the quality of the services high and at the same time offering them with competitive prices, the requirements for process efficiency are high for R.F.Y. The core competence is therefore the optimal use of IT for marketing and sales; the IT infrastructure and their operation are outsourced to an external service provider and operated with ASP (Application Service Providing) mode. R.F.Y is using standard software for order fulfilment, customer- and knowledge management.

#### 2.3.2 Topic and scenarios: Business Process Management (BPM)

For the BPM topic, we developed three different scenarios (= business processes) for the teams:

- Team 1: Supplier View (Purchasing, Trend Scouting)
- Team 2: Internal View (Product Management, Building Cases)
- Team 3: Customer View (Sales, Customer Care)

For BPM, the teams have to elaborate three tasks:

- **Task 1: Process identification**: This task is related to the understanding of the core tasks of R.F.Y. and the same for all teams. Based on the company profile and the business case, students have to create a process map (without details) with Microsoft® Visio or Microsoft® PowerPoint which shows core and support processes. Core processes result from value-added tasks (e.g., developing software for the robot), support processes enable the smooth running of the core processes (e.g., human resources, facility services etc.).

- **Task 2: Process modelling**: For each of the three processes above the teams have to create a BPMN diagram (with Microsoft® Visio or the Camunda Modeler) which shows the process details. In order to avoid misunderstandings and overlaps between processes, the process triggers and process ends are predefined.

- **Task 3: Performance**: Each team has to determine what critical success factors (CSF) are important to measure the performance of the process. Examples for CSF are time, cost, quality, knowledge etc. For each CSF the teams define 2 –3 Key Performance Indicators (KPI) which allow a measurement on an operational level (e.g., lead time, process costs per instance, number of complaints reported per period etc.).
2.3.3 Example results

We show exemplary results (two are in German) of a team concerned with the R.F.Y internal view (Product Management, Building Cases).

The team designed the R.F.Y process landscape (Figure 1) as follows:

![Exemplary process landscape](image1.png)

*Figure 1: Exemplary process landscape.*

The BPMN model for the process “showcase development” (no details of subprocesses shown) can be seen in Figure 2: For reasons of clarity, one of the less complex processes is depicted here.

![BPMN process for showcase development](image2.png)

*Figure 2: BPMN process for showcase development.*
The definition of KPI is shown in Table 3.

<table>
<thead>
<tr>
<th>KPI</th>
<th>For what CSF</th>
<th>Identification</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead time</td>
<td>Communication with Andrea (Persona)</td>
<td>Avg. duration till first feedback</td>
<td>&lt; 3 days</td>
</tr>
<tr>
<td>Costs / idea</td>
<td>Communication with Andrea (Persona)</td>
<td>Avg. costs per idea</td>
<td>&lt; 5000 CHF</td>
</tr>
<tr>
<td>Growth rates of ideas</td>
<td>Communication with Andrea (Persona)</td>
<td>(# ideas t - # ideas t-1) / # ideas t-1</td>
<td>&gt; 9% per year</td>
</tr>
<tr>
<td>Error rate</td>
<td>Quality control</td>
<td># errors after shipment / # errors total</td>
<td>&lt; 1%</td>
</tr>
</tbody>
</table>

### 3 PRINCIPLES OF TEACHING

Students have to apply for participation in the ITaBE module. Important criteria for selecting students are to consider students from different locations and different study modes (full-time and part-time).

The ITaBE module is based on group work (4 to 7 students), and there is no final exam. Theory is presented by internal and external lecturers in a focused manner, meaning only the theory which is necessary to fulfill the assignments. For example, in the BPM part, the lecturers only present the elements of BPMN which are relevant for the modelling. Improving practical skills in selected IT areas is the main idea of ITaBE.

One important pillar is the coaching part. The coaching is done by the two lecturers in common which are responsible for the whole module. Each team has a time slot of 45 minutes and must "register" the need for coaching in advance (including questions and content). During a coaching session, students may address and discuss everything (problems, current results, etc. on the basis of the documents already prepared for coaching, preparation, presentation). Each team is responsible for incorporating the results of coaching into the work.

In order to avoid the often-seen free rider effect and improving social competence, the team as a whole assigns the final grades (within the range 4.5 – 6.0) to single team mates based on their individual performance. For instance, if a team of 6 people achieved 5.5 in their final grade, then all of the team members get 4.0 and 6 times 1.5 to distribute freely over the whole team. This led to teams that evaluated themselves between 4.5 and 6.0 by reflecting their own performance within the team.

Changes in the ITaBE topics are continuously done to meet the requirements of a fast-changing IT and to consider the needs of the dean of the management science bachelor program (e.g., if a lecturer already discussed a topic in a different module). With this setting the ITaBE can be regarded as “light tower” in the whole curriculum. Recently developed modules, like the mandatory module Process and Project management, adopted important elements like the project work, the coaching style and the proportion between theory and practice.

### 4 RESULTS

Over the last terms we observed that the way this module is designed and taught is well accepted by the students (as opposed to classical ex-cathedra teaching). In discussions with lecturers, students confirmed that the module is more ambitious and stressful compared to classical exam-based lectures due to its agile and time-boxed nature. Testimonials from students tell us, that the effort to create high quality documents in a short period of time is demanding, but the specific design of the module which enables to gain necessary skills for the digitalization era is highly appreciated.

#### 4.1 Testimonial 1: Student Adrian Hottiger - "Pulling on the same rope"

I have been interested in computer science topics for quite some time. When the minor “IT as Business Enabler” was offered for the first time, I signed up. Some of my friends have an economic background and work e.g., in a bank. They confirmed that the know-how gained in the course is extremely valuable for work in the professional world: e.g., project management methods and tools, knowledge and process management. In addition, it is a gain to answer questions by looking at companies from different
perspectives and to have a networked view of a task. My main subject is Financial Management; there the aspects of the Minor are a wonderful addition. In the course of two semesters we will work on four project orders in a team. The project manager changes in each case so that the same people do not always bear the main responsibility. When working in a team, I consider it particularly important that all members are involved and pull the same rope. This is the only way forward. I recommend participation to those students who also see an added value for their future professional life in this course.

4.2 Testimonial 2: Student Vanessa Rolli - "Optimal entry into professional life"

The demands in the course are high. I was assigned the function of project manager in a team. Each of the three teams had a different task: one team had to look for and hire keynote speakers, another had to organize their support and accommodation. After all, it was a matter of overall coordination. It was not easy to bring the sub-projects together on schedule. Not all teams had the same idea of collaboration. Another assignment included knowledge management within the company. What knowledge is available where in the company? How can it be brought together, made accessible and usable? My main subject is marketing. Knowing how to approach something like this is very valuable to me. Customers also generate knowledge that a company should deal with. The goal of the Minor is to deal with realistic questions and I feel optimally prepared for the direct entry into professional life. I think that works: With this experience, you can make a good contribution to a company practically from the very beginning.

The opinions of lecturers who are active in all teaching formats confirm these statements. You also rate the quality of the results as very high. These are just as good as for students who are attending a Bachelor's or Master's degree course and who have been taught the contents over two complete semesters.

They like to teach in this meanwhile established event with a "lighthouse" character and are happy about the many positive feedbacks from students, but also from the companies to which we present the course. Our goal is to strengthen our relationship with the networking companies. We want them to recognize that those who complete this course have the unique selling proposition and the expertise to initiate innovative projects and to carry them out successfully in a team.

REFERENCES


