
On the importance of agile communication skills in BPM education: Design principles for international seminars

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Abstract: Business Process Management (BPM) has evolved as an integrated management discipline that aims to enable organizations to continuously innovate and improve their operations. BPM experts are exposed to communication processes involving people from various backgrounds (e.g., various business areas, fields of expertise, and cultures). Research in applied linguistics has shown that it is difficult to plan for constellations of such communication processes; thus, agile communication skills are vital for successful business communication. Teaching programs for BPM, however, do not account for these skills. Rather, they mainly address methods for the analysis, implementation, and management of business processes. As a result, graduates—though they may be technically and methodologically apt—face unexpected challenges due to communication deficiencies in BPM projects. BPM research has shown that deficiencies in communication are in fact among the most frequent reasons for project failure. In this paper, we present a course setting to teach agile communication skills in BPM education. The approach is informed by literature on BPM education as well as theories from virtual collaboration education. We have evaluated it in an international virtual seminar involving seven European universities. We argue for the importance of agile communication skills in BPM education. In addition, we present design

principles for courses to teach agile communication skills that can be applied by fellow academics.

Keywords: Business process management (BPM); BPM education; Agile communication skills; Virtual collaboration; International collaboration; Intercultural communication; Higher education

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1. Introduction

Business Process Management (BPM) is a core element of both Information Systems and Management education. However, standards in teaching BPM have yet to be developed (Bandara, Rosemann, Davies, & Cherri, 2007). Recently, investigations have been carried out to foster discourse on BPM curriculum design (Bandara et al., 2010; Antonucci, 2010). With this paper, we intend to contribute to this discussion. While we understand that a plethora of elements are needed to accumulate the diverse knowledge required for BPM (e.g., Kokkonen & Bandara, 2010; Melenovsky & Hill, 2006), our study focuses on the aspect of communication skills. Expanding on earlier work (Lind & Seigerroth, 2010; Niehaves & Plattfaut, 2011; vom Brocke & Thomas, 2006; vom Brocke, 2011), we argue that BPM is a collaborative endeavor and that particularly agile communication skills are needed to interact and negotiate successfully with people from various contextual backgrounds. Those agile communication skills are abilities in communication that respond to the challenges of working in international virtual project teams (vom Brocke, 2011). Both on the work level (conducting business processes) and the build system level (management of processes), tools for virtual collaboration are increasingly used that enable the involvement of people around the globe. Indeed, skills for mastering virtual collaboration in global heterogeneous teams are an essential core competence in BPM because the challenge of cross-organizational business processes is prevalent in today's working environment.

Based on an investigation of current BPM curricula (Antonucci, 2010; Recker, 2012), we suggest strengthening the aspect of agile communication skills in BPM education. Most BPM curricula focus on technical elements of BPM related to the design of business process models and the implementation of process-aware information systems. Governance structures, roll-out strategies, and methods of process performance evaluation are also part of such curricula. While technical and methodological competences seem to be well represented, little attention is paid to the development of social competences and communication skills in particular. To fill this gap, we follow up on recent contributions in the field of virtual collaboration education. Garrison and Cleveland-Innes (2005), for instance, demonstrated the vital role of social skills in virtual communication. It has been proposed that building agile communication skills in a classroom setting creates special pedagogical challenges, e. g., in terms of authenticity of the learning experience.

In this paper, we study design principles for a course developing agile communication skills in BPM education. The principles are informed by the literature on BPM education as well as theories from virtual collaboration education. In addition, the design principles considered have been evaluated and further developed within the scope of an international virtual course involving seven European universities in the winter term of 2011–2012.

The remainder of this paper is structured as follows. First, we present the state of the art of both BPM education and virtual collaboration education. Second, we outline our methodological approach to deriving and evaluating the design principles. Third, we describe the design of the course we studied, including the organizational background, and present the corresponding preliminary design principles (PDPs) that we derived. Fourth, we report on the evaluation of the course from both the student's and the teacher's perspective, and we derive a final set of design principles, including lessons learned from our first course experience. We conclude with a short summary, a discussion of limitations, and a look forward to future research steps.

2. Related work

2.1. State of the art of BPM education

We have reviewed the literature on current BPM curricula in higher education institutions (HEIs) with respect to both content and teaching methods. To identify relevant literature, we combined the search words “Business Process Management” and “BPM” with “course,” “education,” “curriculum,” and “curricula” in searching the literature database EBSCO host (vom Brocke et al., 2009). The keyword search was followed by a forward and backward search to achieve higher-quality search results (Webster & Watson, 2002). Based on the number of publications, it appears that most research on BPM education has been conducted in the Asian Pacific area and in Australia in particular. Looking at different course outlines, a great diversity is apparent. It has also been reported by fellow researchers that it remains a challenge to define the scope and content of BPM education (Delavari, Bandara, Marjanovic, & Mathiesen, 2010; Kokkonen & Bandara, 2010; Antonucci, 2010). Apart from different understandings of BPM, it has been stated that the high dynamics of innovation in BPM make it difficult to develop appropriate teaching practices and to keep pace with the development of BPM outside the classroom (Delavari et al., 2010). For example, Delavari et al. (2010) analyzed the course outlines of all BPM courses at Australian universities. They found that courses labeled “BPM” actually covered a wide range of content areas.

Most courses on BPM education apply teacher-centered lectures as well as course assignments and interactive elements (Bandara et al., 2010). Al-Shammari (2005) assessed different didactic concepts of a business process reengineering course at the University of Bahrain. He found, for instance, that in addition to traditional teacher-centered teaching, the courses included web-based collaboration (whereby, however, the participants still meet physically in class), case studies, role-playing, and group assignments. When the students were asked to assess the didactic concepts, they evaluated role-playing as the best way of teaching. Role-playing provides students with personal experiences, which have been reported to be important in learning. Uno (1999), for instance, used case-study research methods to classify 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 is in line with Revans’ principles of action learning (Revans, 1972, 1982). 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.

While there is a high level of diversity regarding the content of BPM courses, most BPM courses are similar in that they mainly focus on BPM methods and tools as well as the management perspective. The graduate course at Bentley University, for instance, states the following learning objectives and topics, among others (Bandara et al., 2010): “understand how [different types of processes] relate to the organization’s competitive strategy,” “managing the supply chain,” “employing [...] tools for analyzing, measuring, and evaluating business processes,” “defining, modeling, and analyzing IT-enabled business processes,” and “understanding people and organizational issues involved in BPM.”

Studying BPM courses in HEIs, we found that courses concentrate on teaching “hard” skills such as methods and tools, whereas “soft skills” such as communication and intercultural competencies rarely find their way into BPM curricula. For example, Delavari et al. (2010) found that both at the undergraduate and graduate levels, hardly any courses dealt with cultural issues. Instead, according to their study, the focus is mainly on process modeling. They showed that universities mostly teach business process modeling notation (BPMN), event-driven process chains (EPC), and united modeling language (UML) as modeling languages and ARIS and WebSphere as modeling tools. Both HEI and industry courses do not cover culture- and people-related capabilities but rather focus on technical capabilities such as modeling, process analysis, process management, and process improvement (Delavari et al., 2010).

Nevertheless, people-related factors, such as skills and culture, are core elements of BPM maturity in organizations (Rosemann, DeBruin, & Power, 2006; Rosemann & vom Brocke, 2010; Schmiedel, Brocke, & Recker, 2013). These factors have been identified as critical success factors (Bandara, Alibabaei & Aghdasi, 2009): “The people issue rather than the technology issue is seen as important to be dealt with and managed in order to make the change effort a success” (Ahmad, Francis, & Zairi, 2007). Antonucci (2010), who developed an exemplary curriculum for business analysts, sees a shift from BPM, consisting of tools and methods, towards a broader spectrum that encompasses organizational practices as well. Although BPM education has remained rather isolated to date, a need for a stronger interdisciplinary outline of BPM courses has been reported (Seethamraju, 2012).

As a result of our review, we conclude that education in BPM does not systematically consider the development of communication skills. We would therefore like to contribute to BPM education by suggesting principles for how to teach communication skills in HEI BPM education. Given the nature of communication scenarios in BPM, as elaborated above, we focus in particular on the development of agile communication skills (vom Brocke et al., 2011). We intend to prepare graduates to successfully communicate in situations in which the communicative context is unknown to a certain extent. In the next chapter, we elaborate on these challenges.

2.2. State of the art of virtual collaboration education

In today’s business, virtual collaboration, i.e., the work that is carried out by virtual teams, plays an important role (Watson-Manheim & Bélanger, 2002). According to Townsend, DeMarie, and Hendrickson (1998), virtual teams are geographically and/or organizationally dispersed groups that are linked by telecommunication and information technology and that rarely, if ever, meet face to face. Furthermore, they are characterized as self-managed work teams formed to carry out certain tasks within certain periods of time (Kossler & Prestridge, 1996; Kristof, Brown, Sims, & Smith, 1995). Some researchers refer to a team as a virtual team if the members communicate and collaborate solely using IT-based tools; others include occasional face-to-face meetings (Bouas & Arrow, 1995; Davison & Ward, 1999). Most scholars, however, refer to “virtual teams” if most of the communication takes place via electronic media (Jarvenpaa & Leidner, 1998). Information systems supporting interaction and teamwork are called collaborative technologies (Marjanovic, 1999). Synchronous systems allow partners to collaborate between different locations at the same time. Asynchronous systems allow for different-time and different-place settings (Liu, 2007).

Although there is general agreement about the importance of virtual collaboration skills in business-related studies (DeSanctis & Monge, 1998), studies on the integration of virtual teamwork in education is rare. Marjanovic (1999) proposed a methodology for interactive learning in synchronous electronic environments using group support systems. According to this methodology, collaborative technologies, which are chosen by the lecturer, are used during in-class lectures to support “various active learning activities” (Marjanovic, 1999, p. 2). Such electronic sessions include interactive learning, a group dictionary, collaborative problem-based learning, collaborative writing, collaborative exercises, and feedback from the students, as well as the students’ evaluation of the collaborative learning. It has been reported that this didactic approach is likely to change the self-conception of the teacher, who will no longer be the “information-delivery specialist” but rather a person guiding the students in their acquisition of knowledge. The evaluation of the methodology proposed by Marjanovic (1999) showed that the levels of interaction and participation rose and students’ results improved in comparison to the years before. The students themselves reported that although their workload increased, the new form of the course was much more motivating. Jaeger, Rudra, Aitken, Chang, and Helgheim (2011) conducted role-playing with students from Norway and Australia collaboratively running processes in an ERP system. Each student played a predefined business role in the course. The communication took place only via email and the ERP system. Later, they were assigned a different role and had to repeat the process. After the course, the students were asked to evaluate their perception of how much they had learned during the experience using a standardized questionnaire with a seven-point Likert scale. The results revealed that the students perceived a significant increase in knowledge. Role-playing was also used by Börner, Moormann, and Wang (2012) in training bank employees in Six Sigma. This study supported the idea that role-playing is an effective means of enhancing training by social and communicative skills. A third study, conducted in a higher education history course, revealed that students develop a higher level of understanding of complex relations by teaching active learning through role-playing (Wakefield, Warren, Rankin, Mills, & Gratch, 2012).

In a number of studies, vom Brocke (2011), focused on the phenomenon of emerging cooperations. She conceptualized communication scenarios, which are characterized by the following: (a) a joint target (e.g., writing a project proposal); (b) a project-like organization (especially a limited time frame or a highly novel task); (c) a diversity of actors (with respect to knowledge or culture, for example); and (d) the use of virtual collaboration tools (e.g., video conferencing, instant messaging). Vom Brocke conducted a two-year longitudinal study with students from universities in Europe, the US, and New Zealand and observed the emergence of so-called agile communication skills. She describes the ability of collaboration partners to gradually adjust their communication strategy to an emerging communication context. These competences comprise the following: (a) an interdisciplinary agility (the capability to communicate on a certain topic with different collaboration partners despite their different professional backgrounds); (b) an intercontextual agility (the ability to be aware of the different contexts that the team members bring to the collaboration); (c) an interpersonal agility (the ability to get along with people of different cultures, character traits, emotions, etc., in a virtual collaboration); (d) an interintentional agility (the skill of aligning one’s own goals with the targets of the whole team); and (e) a linguistic agility (language competences and how well one is able to express thoughts and ideas and communicate them to the other team members). In her research, vom Brocke (2011) derived guidelines for teaching agile communication skills via collaborative virtual seminars in HEIs.

In our research, we intend to leverage the body of knowledge of virtual collaboration education for the purposes of BPM education. Our objective is to build on

theories and solutions that are established and to learn how to transfer these to the area of BPM education. We intend to contribute to BPM curricula and course design by adding elements for developing agile communication skills. We consider this important because communication skills have been proven to be essential for BPM success, even though communication skills are not currently systematically considered in contributions to BPM education. In the next section, we outline the research method we applied to make this contribution.

3. Research method

The aim of our study is to identify design principles for teaching agile communication skills in BPM education at HEIs. To derive and evaluate these principles, we follow a design-oriented approach, as suggested and illustrated by (Hevner, March, Park, & Ram, 2004; March & Smith, 1995; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2008). In general, design science research addresses the construction of scientific artifacts (such as methods, languages, models, and implementations) that are useful in a specific context. We consider this approach appropriate for our study because aiming at the design principles we are seeking for a solution to an unsolved domain problem. Design science research provides us with guidelines that contribute to the rigor of our work. In particular, the following requirements have been considered: (1) the research addresses a relevant problem; (2) the artifacts to be constructed represent an innovative contribution to the existing knowledge base of the actual research discipline; (3) similar or identical solutions must not be already available; (4) the artifacts designed need to be evaluated; and (5) the construction and evaluation of the artifacts should be performed iteratively to ensure constant advancement.

In our study, the design principles are considered the scientific artifact. This artifact (1) aims to solve the relevant problem that agile communication skills need to be developed within BPM education, although (2) principles concerning how to design pertinent courses are lacking. Hence, (3) the design principles presented here make an innovative contribution to BPM education. (4) We evaluated the course design from both the students' and the teacher's perspective and thus derived a final set of design principles that have to be tested in an upcoming iteration of the course. Hence, we (5) iteratively develop the design of the course. The course of our study is illustrated in Fig. 1.

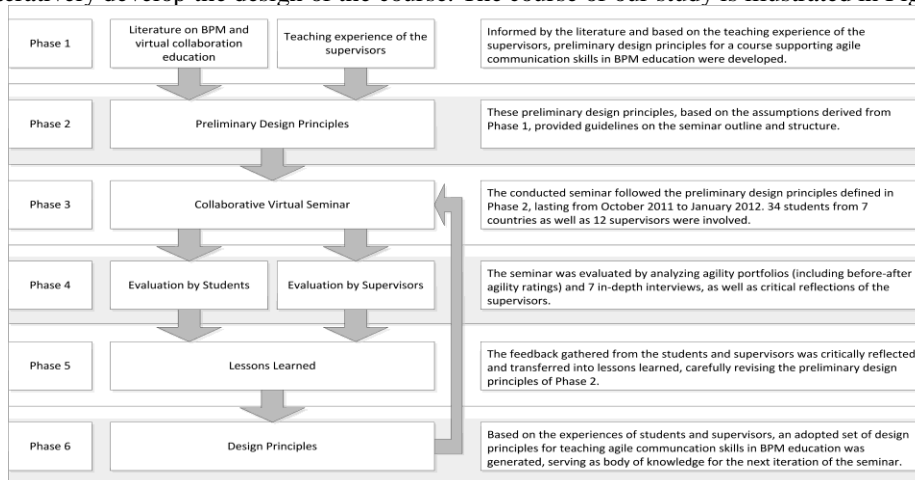


Fig. 1. Research process according to design science research

First, we developed a preliminary set of design principles, informed by both the literature and experience (Fig. 1, phases 1 and 2). To test and further develop these design principles, we conducted a virtual seminar (phase 3) that implemented the design principles. We then evaluated the course design (phase 4) to investigate how well the design principles support the development of agile communication skills. The course was conducted during the winter term of 2011–2012 at seven European universities. The evaluation made use of multiple methods to gain a rich and detailed insight from multiple perspectives (Dubé & Paré, 2003). The methods included self-assessments (so-called agility portfolios) from the students, in-depth interviews, and critical reflections of the supervisors. In phase 4, we conducted group discussions of the supervisors to integrate the evaluation results, derive lessons learned (phase 5), and revise the design principles (phase 6).

4. Preliminary design principles

We began the design science process with a set of preliminary design principles (PDPs). We derived these PDPs from our literature review and our own practical experience in HEI education. The input was consolidated during a workshop, and the following list of PDPs was defined. For each PDP, the expected impact (EI) on the objective of teaching agile communication skills in BPM education was specified:

PDP-1: The seminar should be organized as an international virtual seminar.

EI-1: A scenario such as this can be expected to take place in international business collaborations. The students learn to deal with border-spanning communication without meeting face to face. Thus, this PDP seeks to foster *interpersonal* and *linguistic agilities*.

PDP-2: The teams should be set up from students in different countries. No students from the same university should be in the same group.

EI-2: Again, with respect to international BPM project settings, the students have to deal with different cultures and different languages and thus raise their level of intercultural competence. Thus, this PDP seeks to foster *interpersonal*, *intercontextual*, and *linguistic agilities*.

PDP-3: The students should never have met or communicated with each other before.

EI-3: The students learn to deal with the common business situation of being put into a foreign project group. This is in contrast to existing team seminars, where students can choose their partners. Thus, this PDP seeks to foster *interdisciplinary* and *intercontextual agilities*.

PDP-4: The students should choose their own methods of communication, collaboration, and socialization. They are only given each other's email addresses, names, and joint task descriptions.

EI-4: Even though companies provide collaboration infrastructures such as Groupware systems, workers often have to independently decide on the most appropriate form of communication. Starting with email communication, students are expected to develop their own paths for using different media. Together with PDP-3, students experience "real virtuality," in contrast to "fake virtuality," where the partners are geographically close. Virtual communication

is the only reasonable way to collaborate in this setting. Thus, this PDP seeks to foster *interpersonal, interdisciplinary, and interintentional agilities*.

PDP-5: There should be no 1-n-communication controlled by the lecturer but rather peer-to-peer-communication by the students.

EI-5: During their studies, most of the students used e-learning platforms. However, such platforms are often used as 1-n-communication means for the lecturers to reach their students. Forced peer-to-peer communication of the students without the influence of supervisors strengthens the “real virtual teamwork.” Thus, this PDP seeks to foster *interintentional* and *intercontextual agilities*.

PDP-6: The supervisors should be geographically distributed. The students have to include them in their communication and collaboration solution.

EI-6: Adding to the two aforementioned principles, the students learn to deal with the fact that their supervisor is not necessarily located close by. Thus, this PDP seeks to foster *interpersonal* and *intercontextual agilities*.

PDP-7: The seminar should provide clear deadlines for mid-term presentations, handing in papers, and giving final presentations. Time slots during presentations are strict.

EI-7: BPM projects are commonly deadline-driven and time-critical. Although students have a multitude of opportunities to learn to deal with deadlines during their studies, the time schedule of the whole seminar was intentionally kept short and sharp, requiring careful time management. Additionally, the virtual presentations serve as a means for team-building and as a control mechanism for the supervisors. Furthermore, the time for presentation was intentionally kept short to force the students to concentrate on the most important issues. Thus, this PDP seeks to foster *interintentional* and *intercontextual agilities*.

PDP-8: The topic area of the work should be new to the students and reasonably complex.

EI-8: As far as possible, no student should have any more expertise than others in the topic. Consequently, students learn to engage in a completely new topic and work in a completely unfamiliar virtual setting. Thus, this PDP seeks to foster *interdisciplinary* and *intercontextual agilities*.

PDP-9: The students should be obliged to do a regular written self-assessment (a so-called agility portfolio).

EI-9: The students learn to reflect on their own performance, their expectations, and their judgment of the collaboration and communication with others. In this way, students learn to recognize communication disruptions early enough and learn to take appropriate actions. Thus, this PDP seeks to foster *all agile communication skills*.

To study the effect of the design principles, we conducted a course to implement the principles. In the following section, we briefly present the specific outline of the course and subsequently report on the course evaluation from the perspectives of the different stakeholders.

5. A course outline to evaluate the design principles

We designed a course following our design principles to evaluate the estimated impact of the principles. The course was organized to be taught in seven different institutions in different countries: (1) the University of Münster in Germany; (2) LUISS Guido Carli University in Italy; (3) the University of Liechtenstein in Liechtenstein; (4) the University of Twente in the Netherlands; (5) the Higher School of Economics in Russia; (6) the University of St. Gallen in Switzerland; and (7) the University of Manchester in the United Kingdom. The course was set up as a seminar at the participating HEIs according to their respective curricula in Information Systems and Management studies. In total, 34 students joined the seminar. At the University of Liechtenstein, the course was part of the integrated BPM Master program, while at the other universities the seminar was organized as an elective (or extracurricular) course of 5 ECTS (European Credit Transfer System). Four students joined the course on a voluntary basis (without receiving credits for it). The requirements for the course were the following: (a) writing a scientific paper in the style of an ECIS (European Conference for Information Systems) conference paper; (b) giving a 20-minute presentation about the work at the end of the course; and (c) documenting the learning experience in a so-called agility portfolio.

The agility portfolios were introduced as a means of self-reflection for the students. They had two specific functions: on the one hand, the students could control their own agility development progress, and on the other hand, the portfolios were an important data source for the subsequent course evaluation. An agility portfolio consists of five parts: the pre-collaboration data (part I), the collaboration start (part II), the reflection (part III), the description of others (part IV), and the agility development (part V). Part I had to be filled out by the students before the start of the virtual collaboration. Part II had to be filled out after receiving the information about the other team members. The reflection sheet (part III) was edited after every virtual meeting with a brief content description and a reflection of the meeting. Part IV had to be filled out after a few meetings had taken place, to evaluate the other team members and their agilities. The last part (part V) had to be filled out in the middle of the cooperation and again at the end, or whenever changes seemed to occur in the means of communication. All questions in the agility portfolios were open-ended questions or statements on which the students had to comment. Open-ended questions were used to grasp the richness of the student's views, written down in their own words.

In part I, the students had to describe themselves, i.e., their background and their collaboration experience, and they had to rate their agilities (interdisciplinary, intercontextual, interintentional, interpersonal, linguistic) and their agility goals, i.e., which agilities they would like to strengthen in the course of the collaboration. In part II, the students had to describe their expectations at the beginning of the project and present a detailed project plan with respect to time, content, and collaboration. The reflection sheet (part III) provides information about the progress of each group and reveals possible problems within the collaboration. In the reflection sheet, each student had to give a short content description and a short reflection on each virtual meeting. Part IV gives detailed information about the mutual assessment of the students during their collaboration and Part V sheds light on the students' assessment of their own agility development over time. Here again, the students had to rate their agilities from a retrospective.

All of the seminar papers of the students pertained to the overall theme of "Global Challenges" as described in the 2011 State of the Future book published by the millennium project (Glenn, Gordon, & Florescu, 2011). Each group of students had to

address one of the fifteen global challenges and how IS could contribute to solving related problems. Here is the exact list of topics: (1) How can sustainable development be achieved for all while addressing global climate change? (2) How can everyone have sufficient clean water without conflict? (3) How can population growth and resources be brought into balance? (4) How can genuine democracy emerge from authoritarian regimes? (5) How can policymaking be made more sensitive to global long-term perspectives? (6) How can the global convergence of information and communications technologies work for everyone? (7) How can ethical market economies be encouraged to help reduce the gap between rich and poor? (8) How can the threat of new and reemerging diseases and immune micro-organisms be reduced? (9) How can the capacity to decide be improved as the nature of work and institutions change? (10) How can shared values and new security strategies reduce ethnic conflicts, terrorism, and the use of weapons of mass destruction? (11) How can the changing status of women help improve the human condition? (12) How can transnational organized crime networks be stopped from becoming more powerful and sophisticated global enterprises? (13) How can growing energy demands be met safely and efficiently? (14) How can scientific and technological breakthroughs be accelerated to improve the human condition? (15) How can ethical considerations become more routinely incorporated into global decisions? Following the design principles (PDP-8), we chose topics with which students would not be familiar from their earlier studies. At the same time, we expected the students to be able to jointly research these topics over the course of the semester.

The students were supervised by twelve staff members from Germany, Italy, Liechtenstein, and Russia. The supervisors were full professors in IS (two), postdocs (five), and PhD students in the final stage of their studies (five). The two full professors had more than ten years of BPM education experience each, having taught several courses and seminars in international and distributed settings. The five postdocs had worked as senior lectures in the field of BPM for at least five years, and also possessed experience in both lecturing and conducting seminars on BPM. Fig. 2 provides an overview of the allocation of students and supervisors to topics:

Topic	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Supervisor	DE	DE	DE	DE	RU	DE	DE	RU	LI	LI	LI	IT	LI	IT	LI
Partner I	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI
Partner II	DE	DE	DE	IT	DE	DE	UK	IT	CH	CH	DE	IT	RU	IT	DE
Partner III	NL	IT					IT				IT				

Fig. 2. Distribution of topics, students, and supervisors

6. Evaluation of the course

We evaluated the course outlined above from both a learner’s perspective and a teacher's perspective to learn about the effects our design principles might have. In this section, we report on the evaluation results before we summarize lessons learned and conclude with a revised set of design principles.

The evaluation of the course from a student’s perspective made use of multiple data sources: the agility portfolios, including before-and-after self-ratings of the students’ agilities, as well as interviews. Based on the data on the students’ knowledge and students’ perception of the aspects of the course design, the effectiveness of the course, particularly with regard to the development of their agile communication skills, was analyzed.

As a first source, we analyzed the students' self-assessment in part I and part V of the agility portfolios, where the students rated their agilities before and after the collaboration. Of the total of 34 participating students, 31 completed the agility portfolios, and of those 31 students, 24 completed the self-assessment regarding their agile communication skills in parts I and V. The data indicate that the majority of the students felt that throughout the course, their agile communication skills improved. More specifically, 21 students reported improvements in their interdisciplinary agility skills, 20 students reported improvements in their intercontextual skills, 21 students reported improvements in their linguistic skills, 17 students reported improvements in their interpersonal skills, and 17 students reported improvements in their interintentional skills.

Further analysis was conducted on the qualitative reflections of the students and the interview transcripts. In particular, we analyzed the data to find indications of the effects of single PDPs. We discuss how well the data supported each PDP below.

The PDP that an international virtual seminar would foster the development of agile communication skills (PDP-1) was acknowledged several times. "This was the first time I was participating in an online collaboration, and I was quite enthusiastic about the whole idea as well as ready to learn" (a student from Twente, Netherlands). "I knew the theory of virtual collaboration tools, video conferencing etc. but had never had the experience and this Master seminar enabled me to experience the benefits and challenges of online collaboration" (a student from Twente, Netherlands).

Bringing in students from different countries (PDP-2) can be considered a major element in the building of agilities. "During the project work, I think we also got a feeling of the work and the behavior of the other one" (a student from Vaduz, Liechtenstein). One student from Münster, Germany, reflected on the project work, "I think that at this point I am able to understand my partner tacitly and to get thoughts between the lines." Students also experienced that international collaboration can be quite easygoing. "My partner had similar characteristics as me, like he was open to talk and very communicative. Therefore, we had a lot of fun and it was a really good experience" (a student from Vaduz, Liechtenstein).

The openness to choose the means of communication individually (PDP-4) was perceived positively and fostered the authenticity of the collaboration. "Overall I would say that we did an excellent job in collaborating. [...] From my point of view, this was a really nice experience" (a student from Münster, Germany). Another student from Germany stated, "I think that both of us developed ourselves in terms of virtual collaboration and communication," and a third student from Germany reflected at the end of the project, "My partner and I adjusted our ways of communicating only in a minor extend since we had very compatible views on communication and collaboration from the very start."

As in "real" project work, students faced the challenge of having to organize their time around other projects and commitments and having to act according to strict deadlines and time restrictions (PDP-7). Thus, students were able to work on their time management skills: "Although this [the time constraints] is a little hindering, we always achieve our aim of finding suiting and several meeting times" (a student from Münster, Germany).

The choice of topics with which none of the students were familiar beforehand (PDP-8) supported learning on how to be organized in complex collaborative tasks. A student from Russia reported, "It was particularly challenging since no one was an expert in the field. So we all had to orient ourselves, which required much more communication

than reading.” At the same time, students had the impression that even if the topics were not directly related to BPM, the collaboration greatly improved their BPM capabilities. According to a student from Rome, Italy, “My personal goals in this project are to improve my knowledge on BPM and develop eventual skills to write best scientific papers. Now I understand that I also learned a lot in applying BPM in practice and to collaborate with partners accordingly.”

Students acknowledged the benefit of keeping track of the collaboration progress and their personal agility development (PDP-9). At the beginning of the course, one student from Vaduz, Liechtenstein, stated, “I would like to [...] carefully manage this portfolio and thus keep track on my development in this team work,” and one student from Twente, Netherlands, reflected on the seminar, “The agility portfolio helped me to understand my group mates better, and learn how to work with each other.” This is particularly remarkable because we expected more resistance from the students in filling out the portfolios.

Statements related to PDP-3, PDP-5, or PDP-6 were not found in the data. There are several possible explanations for this. First, it may be that the intention behind those design principles did not challenge the students, and thus they did not have any particular comments. Second, they could have taken those aspects for granted and thus did not comment on them. Third, those aspects just did not affect the students. For example, the fact that the topic supervisors were geographically distributed (PDP-6) was not commented on by the students. They acknowledged the fact that there was a supervisor whom they could contact in case of problems. “We have agreed to initiate contact with our supervisor to obtain critical feedback” (a student from Münster, Germany). However, there were no statements concerning the fact that this supervisor was not available for face-to-face contact.

As part of the evaluation, we also conducted interviews with the supervisors teaching the course at the different HEIs. Given the novelty and the international outreach of the course, including 34 students and twelve staff members from seven European universities, the course outline also came with specific requirements on the teachers’ side.

First, we could observe specific organizational work related to the course. Before conducting the course for the first time in the winter term of 2011–2012, we conducted a preparatory phase of approximately six months. We identified the PDPs and set up the course design accordingly. We found that despite intensive planning, unforeseen situations need to be handled on a case-by-case basis. This occurred, for example, when one university withdrew participation at the last minute. At this stage, we needed to respond quickly in recruiting new partners and re-allocating students and supervisors already assigned to specific topics.

Second, teachers reported that the shift from a teacher-centered to a student-centered paradigm (PDP-5) was a new experience for them. It was a new role for teachers, being coaches rather than lecturers. Teachers functioned as both experts in communication and supervisors of topics but they only provided assistance to the students on demand. In this respect, the data did not show any indication that it mattered that the supervisors were geographically distributed (PDP-6). We did not set specific email office hours, as proposed by (Markel, 1998), but the students could contact their supervisors whenever they had problems. However, this did not lead to a large number of questions. Apart from content-related problems, the students also contacted the supervisors in case they had difficulties in the teams. This was the case, for example, when some team members did not respond to emails sent by other team members or ignored scheduled virtual meetings. In such cases, the supervisors were expected to play

a coaching role, so social and communicative skills were required on the teacher's side, too. In addition, apart from such incidents, good management skills were generally needed because there was a constant coordination effort required, in light of the different nationalities, curricula, and semester term structures involved.

7. Lessons learned and revised design principles

This new course design expands teaching beyond merely teaching technical and methodological competencies to teaching agile communication skills in an international virtual setting. Both students and teachers reported being content with the PDPs, and based on our evaluation, the course design has proven to facilitate the development of agile communication skills.

Nevertheless, the data did not provide support for each PDP. In our evaluation, PDP-3 was not referred to at all. The fact that the students may have never communicated before did not seem to strike them in a way that motivated them to mention this, either in the self-reflection or in the interviews. One interpretation could be that the students were expecting the organizational setting of collaborating with unknown partners. Another explanation could be that students were actually accustomed to collaborating with unknown partners, e.g., from private use of social networks. In any case, we argue that even if this design principle was not demonstrated in the data, it is still important to consider. This is because if the students would have been familiar with each other, the seminar would not match the pattern of an evolving cooperation and the students would not have been challenged with unknown communication contexts at all.

Furthermore, we learned that it is very important for the success of a student group that all participating students obtain credits for the course and that the number of credits reflects similar expectations in terms of commitment and workload; otherwise, students do not feel obliged to put as much effort in the course as their team members. We observed that such constellations are perceived as frustrating and restrict students from working on their agile communication skills because no real group development and cohesiveness takes place. One student from Liechtenstein, who was grouped with a student from Russia, stated, "It seemed as if my partner did not have any goals with this project and that he was not doing this voluntarily. Therefore, it came to a break of our collaboration. [...] It turned to that fact that it was just another paper to submit instead of writing on a highly relevant topic with a cool guy where the collaboration part is the biggest fun." On the other hand, if the grading is comparable, students rely on the fact that the other group members will contribute with the same level of commitment: "As the grading was similar than mine, my partner had the same incentives as me to contribute" (a student from Vaduz, Liechtenstein). These are two examples of conscious reflection of interintentional, intercontextual and interpersonal agilities. We further observed that participating in this course on a voluntary basis did not prove practical because the course was perceived as time-consuming. Thus, students with no credits and grading related to their work showed a higher tendency to drop out and let the other team members down. Thus, we add the following design principle:

DP-10: The grading for the students from different universities should be comparable.

EI-10: The students will be obliged to put the same amount of effort into the teamwork. Thus, this DP seeks to foster *interintentional*, *intercontextual*, and *interpersonal agilities*.

Another observation from the course was that students would have appreciated a detailed listing of course expectations, participation requirements, and evaluation criteria beforehand. We had fixed the requirements in that we clarified that the final grade depended on the following: (a) writing a scientific paper on the assigned topic; (b) giving a 20-minute presentation about the work at the end of the course; and (c) documenting the experience in a self-assessment portfolio. However, we only disclosed our evaluation scheme, i.e., the weighting of the three parts, on demand after the first third of the course (50% paper, 30% agility portfolio, 20% presentation). Several students were surprised that the agility portfolio was worth 30% of their final mark, and stated that if they had known this from the beginning they would have put more effort in it. They thought that the presentation of the results was more important than their self-assessment. However, because we wanted to teach agile communication skills, we wanted the students to focus not only on the content but also on reflecting continuously on the development of their communication skills. Hence, for the next iteration of the course, we added the following design principle:

DP-11: The supervisors should list course expectations, participation requirements, and the detailed evaluation scheme beforehand.

EI-11: The students know from the beginning how the final grade is composed and can decide how to distribute their workload on the three assignments (paper, presentation, agility portfolio). Thus, this DP seeks to foster *interintentional* agilities.

Furthermore, we learned that the social component is an important part of the course. Constant communication and trust (as noted by Jarvenpaa & Leidner, 1998 in a study with global virtual teams) between the students in their teams and between the supervisors coordinating the whole seminar is a crucial success factor. In our course, we were able to observe this because some partners were members of a joint research network and thus had already built up social capital, while others were not. With the former, we were able to react much more quickly to new situations, such as shifting group and supervisor distributions or communicating promptly with the students when problems occurred on their teams. Drawing from this experience, we add the following design principle:

DP-12: There should be strong interpersonal ties between the participating higher education institutions.

EI-12: Strong interpersonal relationships help to address unforeseen situations and the coordination effort that comes along with such a huge endeavor. Thus, this DP seeks to foster *all agile communication skills* of students as well as supervisors.

However, we also experienced that strong interpersonal relationships were not enough to organize a course such as this successfully. Although there are different supervisors at different universities, there needs to be a clear consensus concerning questions or problems that students may raise. Otherwise, there is a danger of confusing students if the supervisors are not aligned in their communication, e.g., on a deadline or paper style sheets. Thus, we decided that although the supervisors are not directly involved in the progress of the students' group work, they should also have regular virtual meetings to ensure optimal management of the seminar. Hence, as a further design principle we can conclude the following:

DP-13: Supervisors should meet (virtually) regularly to ensure a clear consensus and optimal management of the course.

EI-13: The supervisors can regularly update each other and discuss problems they encounter in the teams they are supervising. Furthermore, they can decide on aspects that come up on short notice and ensure a clear consensus that gives students certainty. Thus, this DP seeks to *all agile communication skills* of the supervisors.

To sum up, eight of the nine PDPs were explicitly supported by the evaluation. Drawing from the data, we can therefore conclude that these design principles have proven suitable for developing agile communication skills (i.e., intercontextual, interdisciplinary, interpersonal, interintentional, and linguistic agilities). The expected impact of PDP-3 could not be found in the data. We did, however, value PDP-3 as a prerequisite of the course design. In addition, we derived four new design principles from our experience in running and teaching the course. Table 1 shows the final list of design principles (DPs) resulting from our study (DP-3 is marked with an asterisk to indicate that it was not supported by the data).

Table 1
Final set of design principles

#	Design Principle	Impact on...
DP-1	The seminar should be organized as an international virtual seminar.	interpersonal and linguistic agilities.
DP-2	The teams should be set up from students in different countries. No students from the same university should be in the same group.	interpersonal, intercontextual, and linguistic agilities.
DP-3*	The students should never have met or communicated with each other before.	interdisciplinary and intercontextual agilities.
DP-4	The students should choose their own methods of communication, collaboration, and socialization. They are only given each other's email addresses, names, and joint task descriptions.	interpersonal, interdisciplinary, and interintentional agilities.
DP-5	There should be no 1-n-communication controlled by the lecturer but rather peer-to-peer-communication by the students.	interintentional and intercontextual agilities.
DP-6	The supervisors should be geographically distributed. The students have to include them in their communication and collaboration solution.	interpersonal and intercontextual agilities.
DP-7	The seminar should provide clear deadlines for mid-term presentations, handing in papers, and giving final presentations. Time slots during presentations are strict.	interintentional and intercontextual agilities.
DP-8	The topic area of the work should be new to the students and reasonably complex.	interdisciplinary and intercontextual agilities.
DP-9	The students should be obliged to do a regular written self-assessment (a so-called agility portfolio).	all agile communication skills.
DP-10 (new)	The grading for the students from different universities should be comparable.	interintentional, intercontextual, and interpersonal agilities.

DP-11 (new)	The supervisors should list course expectations, participation requirements, and the detailed evaluation scheme beforehand.	interintentional agilities.
DP-12 (new)	There should be strong interpersonal ties between the participating higher education institutions.	all agile communication skills.
DP13 (new)	Supervisors should meet (virtually) regularly to ensure a clear consensus and optimal management of the course.	all agile communication skills (of the supervisors).

8. Conclusions, limitations, and outlook

In this paper, we suggest design principles for teaching agile communication skills in BPM education at HEIs. We deem this an important contribution because communication competences are underrepresented in research on BPM education and specific BPM curricula taught at HEIs. Considering the global scope of most contemporary BPM initiatives, however, we found that particularly agile communication skills are a major success factor in BPM projects and programs.

We applied the design science research approach and started off with a preliminary set of design principles informed by both theory and practice. We evaluated these principles by means of an international virtual seminar conducted between October 2011 and January 2012 involving seven European universities. The evaluation results suggested a revision of the preliminary list of design principles and the addition of four more design principles on aspects we learned about in the course of the seminar. This led to a revised set of design principles to be evaluated during the next iteration of the seminar. Our evaluation showed that the agile communication skills of the students improved over the course of the seminar. Analyzing the qualitative data, we could also relate the effects back to specific design principles we had suggested.

We are aware that our study is limited to a certain extent. First, we evaluated the design principles in a specific organizational setting; thus, the conclusions are restricted to this setting. For instance, following PDP-2, we involved students from different cultural backgrounds. Still this choice resulted in a specific set of backgrounds involved, i.e., students from Switzerland, Germany, Liechtenstein, Russia, the UK, Italy, and the Netherlands. Involving a different set of students might have led to different results. Second, our setting did not provide the challenge of working in time zones that are further apart than two hours. This definitely simplified communication and collaboration for the students. In global BPM projects, larger time differences might be expected.

Third, another important issue in day-to-day business is the evaluation of the performance of individuals and teams (Anseel, Lievens, & Schollaert, 2009; Ellis & Davidi, 2005; Prue & Fairbank, 1981). The students did not receive any feedback on their virtual collaboration performance. They only received feedback on the content they had to deliver. It is our plan to include ideas related to 360-degree feedback (Garavan, Morley, & Flynn, 1997; Overeem et al., 2009) as an elementary part of the course. However, this could lead to other consequences because the students providing feedback to each other would not necessarily be the ones giving final grades (Li, Liu, & Steckelberg, 2010). We have decided to address those three aspects (time differences, cultural differences, and feedback on communication and collaboration skills) in the next iteration of the seminar.

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