A FRAMEWORK FOR MULTIDISCIPLINARY BUSINESS SIMULATIONS

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Abstract: In this paper, the design and introduction of a framework for multidisciplinary business simulations at the School of Public Administration of Kehl University will be presented. Within Kehl's Public Administration study program, various subjects like organization, law, human resources, computer sciences, finance, psychology and economics are supported in an interdisciplinary way. Both theoretical and scientific skills as well as soft skills such as teamwork, project management and coordination will be further developed by using an interdisciplinary approach. A framework for multidisciplinary business simulations has been developed to support this interdisciplinary approach. The framework integrates realistic and practical simulations of interdisciplinary case studies into the study program of Public administration at Kehl University. In order to reduce costs for case study development, the framework offers a generic case study pattern. This pattern was purposefully developed and covers very different disciplines in the best possible way so that the students can conduct simulations that are realistic and possible during their studies. Further, two different simulation implementations of the case studies were designed within the framework for multidisciplinary business simulations. A short-term simulation intends to check the ongoing learning success. A long-term simulation aims for giving students feedback concerning their skills just before graduating. The case studies based on the generic case study pattern come from a wide variety of public administration tasks. Examples of currently conceived case studies include e-invoicing, IT-infrastructure for schools and IT-office workplaces. The case studies were developed together with practitioners from municipalities and local agencies in order to create realistic simulations. This addresses the actual complexity of the future working environment of students. The comprehensive application of knowledge learnt in different subjects motivates students to work on these case studies.

Keywords: Business simulation software; multidisciplinary lectures; public administration

JEC Classification: I23; C88

Introduction

The University of Applied Sciences in Kehl was founded in 1971 and since then, it has been educating administrative specialists and future executives in public administration. In Germany, public administration includes all institutions, facilities and enterprises, which carry out the tasks set down by the government and the legislature. German public administration embraces, among other tasks, the matters of security, traffic, education and culture, social services and health care as well as finance and economy. Upon successful completion of the program, one qualifies for entry into the German Civil Service and is granted a Bachelor of Arts degree. Graduates work after their training either in one of the over 1,100 municipalities in Baden-Wuerttemberg or in one of the 35 regional districts or in the state administration of Baden-Wuerttemberg. But former students can be found in the entire Federal Republic as well. Kehl University also offers three master's degree programs: European 'Public Management', 'Cluster Management' and 'Public Management'.

In general, study programs in public administration have to combine multiple disciplines in order to address the needs of modern states: law, management, human resources, psychology, economics, finance & budget, organization, computer sciences and project management. Soft skills like teamwork and conflict resolutions are not only assets but basic requirements to work as a successful civil servant.

In addition, studies in public administration should not only provide for a sound theoretical knowledge, but have to be related to practice as well (Lynn 1996; Shafritz et al. 2003).

The need for practical solutions is also proved when looking at the four intellectual traditions to the study of and the discourse about government (Raadschelders 2008):

- − A study for the development of practical wisdom
- − A study for the development of practical experience
- − A study for the development of scientific knowledge
- − A study of relativist perspectives

Only one tradition is exclusively related to theory and science. New emerging trends, for example, adaptive public management (Mitchell, Mitchell 2016) are combining those traditions at a horizontal layer with an emphasis on practical solutions.

Education institutions face rapid changes. Advances in information technology have transformed both the way students retrieve and exchange information and how they communicate with one another and their instructors. Learning skills and building knowledge are changed by the use of information technology as well (Davidson, Coldberg 2009). Though traditional teaching styles are still at work, traditional 'internal' civil service training seems to have given way to more academic and 'open' programs (Reinhard 2018). Educators in public administration have to regularly explore innovative tools and approaches to exploit its potential for public administration education in order to provide students with an up-to-date learning experience.

All in all, study programs in public administration have to face very complex and changing requirements and educational changes. The implementation of E-learning systems might be one way to cope with these changes (Umek 2017). Using interactive computer simulations as an innovative tool for education might be a further sensible way to address modern public administration's multidisciplinarity and complexity. Interactive computer simulations provide an interactive learning environment. Students can apply what they just have just learned into dynamic scenarios and uses studies respectively. Advantages are instant feedback, reflections about failures and improvements through trial and error, and explorations of alternative outcomes (Kriz 2003, p. 505).

Within public administration study programs computer simulations are attracting more and more attention. For example, computer simulations have been used in helping to understand and improve, for example, emergency management (Barrett et al. 2011; Desouza, Lin 2011), accounting (Eckhaus 2017), traffic management (Kane 1999), urban planning (Borning et al. 2007), environmental management (Learmonth et al. 2011), and public service delivery (Johnston et al. 2010; Kovacic, Pecek 2007). The increasing interest in computer simulations is due to the fact that they help preparing public administrators to cope with complex challenges like uncertainty in politics and legal regulations, lacking acceptance, stakeholder interdependencies, budget cuts and slow feedback cycles. The interactive and replicable collaborative government simulation (Merritt, Kelley 2018) based on the 'collaborative governance' framework (Ansell, Gash 2008) has been proven that such an approach is meaningful.

Brain research results suggest strongly that repetition, elaboration, pattern recognition and so on are important variables for learning success. Looking at a topic from different perspectives and studies, spaced out over multiple sessions and time, are crucial (Spitzer 2008). Hereby, the differences between long-term, short-term and working memory (Cowan 2008) have to be taken into account to provide for a sustainable learning success.

The objective of this paper is to propose a framework for multidisciplinary business simulations which implements the above mentioned research results – modern public administration's interdisciplinarity and complexity, rapid changes in education, brain research results emphasizing repetition, elaborations, pattern recognition and the positive effects of simulations in education.

The basic idea of the framework is the use of case studies for simulations. Case studies are generated on the basis of a generic pattern. This pattern is provided by the framework for multidisciplinary

business simulations. One and the same case study is used for short and long-term simulations. Only the focus of the simulations is different. Whereas in short-term simulations, only one discipline is considered, in long-term simulations, all disciplines addressed in the case study are taken up and combined by specific questions. The following figure gives an overview of the framework for multidisciplinary business simulations.

One and the same case study					
Short-term simulation Proactive guidance; 45-90 minutes Random assigned groups			Long-term simulation: Reactive guidance; 6-8 weeks Random assigned groups		
S E P A R A T E D	Law	D I S C I P L I N E S	Law	C O M B I N E D
	Organization		Organization	
	Human Resources		Human Resources	
	Psychology		Psychology	
	Economics		Economics	
	Finance & Budget		Finance & Budget	
	Computer Sciences etc.		Computer Sciences	
			etc.	
Objective: introducing one discipline			Objective: showing complex work world by combining several disciplines		
Objective: learning experience, competence and in depth understanding using repetition, elaboration and pattern recognition based on simulations					

Fig.1. Overview: framework for multidisciplinary business simulation (Source: author's representation)

The next chapter describes the framework's generic pattern for case studies and some derived case studies. A further chapter contains a detailed description of the framework itself and discusses short and long term simulations in more detail. A conclusion and outlook regarding further research activities and the framework's evaluation finalize the paper.

Case Study – A Generic Pattern and Examples

In order to provide for high-quality simulations, a generic pattern for case studies has been developed, which covers all disciplines of the public administration study program of Kehl University, though the main focus may vary case-by-case.

The pattern is designed such that students have to act as project managers within a project managing board. Three to five students are randomly allocated to the project managing board. This may lead to team conflicts. This is deliberate. Every case study starts with the description of the municipality. This description may vary by size of the city and political settings, for example, new elected mayor, new elected city council, approaching elections and so on. After describing the municipality settings, the mission and the objectives of the project are outlined. The objectives may vary from procurement and implementation of IT systems, implementation of new budget regulations to business process reengineering.

Though the topics are different, the structure is always two-tiered. Firstly, there is a pilot project with the duration of nine to twelve months. Based on the evaluation of the pilot project, the successive implementation within the municipality's organization has to be conducted within a time period of twelve to eighteen months. Parameters like awarding authority, for example, council, mayor, city

department and so on, members of the project's supervisory board, timeline, allocated budget and further members of the project team, for example, software developers, IT administrators, users, professionals in the field of application, business process reengineering experts and so on are outlined, if applicable specific information about the departments involved in the project is given.

The simulation starts six to nine month after the project's start and three months prior to when the evaluation of the pilot project is due. After a very encouraging start of the project, the members of the project management board have to face serious problems: uncertainty in legal regulations, for example, concerning procurement procedures or work council's right to have a say, lack of user acceptance or people having grave doubts about the objectives' reasonableness, for example, users, council members and so on. The task for the members of the project management board is to analyse the situation. In particular, they have to consider whether changes to the project parameters are necessary, for example, regarding members of the supervisory board, pilot departments, budget calculation, timeline and so on. The project management board has to question the objectives, for example, expectations on return of investment, juridical assumptions and so on. The results of this analysis have to be outlined in front of the (virtual) city council in a twenty to thirty minutes' presentation followed by a ten to fifteen minutes' discussion. In particular, it is expected that the students discuss the advantages and disadvantages of their propositions. In addition, the students have to write a draft proposal. Actually, there are no 100% perfect solutions for the problems the project has to face according to the case study's description. The skill to reason advantages and disadvantages of the proposed solution is one of the main outcomes of the case study from an educational point of view. The following figure shows the scheme of the generic pattern for case studies.

Case study name	• Budget
Description of the municipality	• Project members
Objectives of the proposal on hand	Simulation start
• Pilot project	• Just before evaluation
• Evaluation	• Description of arising problems
• Overall implementation	• Questions how to cope
Project parameters	Assignment
• Awarding authority	• Presentation at (virtual) city council
• Supervisory board	• Resolution for city council
• Timeline	

Fig.2. Scheme of the generic case study pattern (Source: author's representation)

The generic case study pattern addresses problems affecting several disciplines, though the intensity with which a discipline is looked at may vary depending on the concrete case study on hand. Recruitment, work council, procurement, SW licenses and municipal budget are examples that require sound knowledge in law. Dealing with a lack of user acceptance implies that change management methods have to be applied. Organizational and management skills in structural organization, process-oriented organization, leadership management and business process reengineering are addressed as well. Furthermore, conflict resolution and dealing with resistance belong to the psychology studies of Kehl's public administration program. This and management also play a role in the overall project management, for example, leadership, conflict resolution, teamwork, collaboration and so on. Cost benefit analysis, profitability calculation and risk analysis are addressing students' knowledge in economics. In addition, political circumstances have to be taken into account in order to propose an applicable solution, though it might not be the best one from a theoretical point of view.

More than fifteen case studies have been developed based on the generic case study pattern. Three of them are described shortly. They combine multiple disciplines and show similar but different characteristics: 'e-invoicing', 'IT-office workplaces' and 'Cloud-based IT-infrastructure for schools'.

The case study 'Cloud-based IT-infrastructure for schools' has two specific issues to be considered. Firstly, there is a lack of user involvement. The project's mission was decided on by a state agency using a top-down approach. Neither teachers nor pupils are involved in the design of the IT infrastructure or the selection of the IT learning tools. Some representatives of these groups should be at least members of the project team or even of the project's supervisory board. Secondly, the objective of the project focuses on technology. There's no work package aiming to develop the application processes. It is up to the users how they will or – what is more likely – will not use the IT learning tools. The reluctance to use the system is high. The application of change management methods is necessary. The project also has to face financial problems since the implementation of the IT infrastructure is funded by the state agency but no money for the maintenance of the IT infrastructure is provided either by state or municipality. Political and financial issues have to be handled in detail. Finally, reengineering of educational processes using IT implies legal issues regarding, for example, privacy and employees' right to have a say.

At first glance, the project 'IT-office workplaces' seems to be straightforward. However, one of the project's objectives is to save money for license fees, since the city council expects a return of investments within eighteen months. The members of the project managing board have to compare Microsoft Office versus Open Office. By doing so, the students have to realize that license fees are just one aspect of a sound cost-benefit analysis. Maintenance, user acceptance and providing interfaces to other applications are crucial for financial success as well. Using a cloud-based solution is also an option for the project 'IT-office workplaces'. In comparison to the case study 'Cloud-based IT-infrastructure for schools', this case study is more IT-related, although skills in economics are a prerequisite for developing reasonable cost-benefit and risk analyses. Nevertheless, sound knowledge in law – license contracts – and organization, management and psychology – change management, lack of user acceptance when introducing a new office tool and so on – are required to develop an adequate solution proposal.

The case study 'e-invoicing' focuses on two aspects: profitability calculation and business process reengineering. Nevertheless, change management and law are crucial for this project as well. In order to benefit most from an electronic billing system, all the departments of a municipality have to be involved. Checking for the technical correctness of bills is a decentralized task. In order to avoid paper and provide for the highest benefit of the system, checking for correctness has to be done within the electronic billing system. Since all the departments have to be incorporated, the risk of lacking user acceptance increases due to the number of involved employees. Employees' right to have a say affects strongly the business process reengineering task. Law knowledge is a prerequisite to develop a sound solution. Last but not least, retrieving sound data as a basis for a profitability calculation is often difficult. Assumption needed for the profitability calculation have to be well-founded. Though the political dimension is missing, this case study has its challenges in economics, business process reengineering and change management combining multiple disciplines of public administration studies as well.

Multidisciplinary Business Simulation

Simulation games are used to present a specific conflict situation from the everyday world or the world of work. They are based on case studies. Within a given case study, a certain portion of real life complexity is reduced. Simulation games are dynamic multi-period models. The actual course of the simulation consists of several succeeding cycles. Decisions in one cycle affect the course of the following cycle. Within each cycle, students have the task of operationally manipulating the case study's scenario. Certain predetermined goals have to be achieved. In order to achieve reasonable simulation's outcomes, the students have to plan their tactical approach and adapt it accordingly taking into account the results of each preceding cycle. Though students act reasonably on the one hand, the playful component should not be ignored on the other hand. A game has not only to address cognition but also emotions in order to be successful (Yu-Hui et al. 2009). Though motivation of students is especially high when real world problems have to be solved and team work is required, the later may lead to conflicts as well.

Basically, simulation games contain three consecutive phases: briefing, gaming and debriefing. At the briefing phase, the game master and lecturer respectively will describe the case study. If necessary, the students can decide on the roles and allocate tasks within the team. Further, the students need some time to read into the case study in more detail. In the gaming phase, the actual execution of the cycles of the simulation game takes place. The decisions to be made within the cycles are decided on by the student teams. The decisions influence the following phases. Positive as well as negative results are addressing the emotions of the teams. The final phase – the debriefing phase – is the most important phase, since it allows for reflecting of the entire game simulation. During the debriefing, each decision of the individual cycle are discussed and evaluated. This last phase also serves to transfer the learning outcomes into the future studies of the students (Ruohomäki 1994).

Case studies can be simulated in two different types of simulation games at Kehl University. The short-term simulation and the long-term simulation:

Short term simulation should be handled within one lesson by a maximum of five students. The simulation can be already used at the beginning of one's study to allow for checking the learning progress over time. The same scenario should always be considered from different perspectives in the various disciplines in order to allow for the best possible learning support to the students by repetition. In order to facilitate the students' work, a number of predefined solutions can be presented to the students for the selection in each cycle of a simulation game, but no grading takes place. Further, based on outlining a comprehensive, interdisciplinary case study from different perspectives, simulations should concentrate only on one discipline. This approach allows a massive reduction in complexity addressing two reasons: it is a short-term simulation of approximately one or two lessons, and secondly, students are at the beginning of their studies. Repetition and pattern recognition are supported by using one and the same case study in various short-term simulations in different disciplines.

While in short-time simulations, lecturers can influence the students' decisions heavily, the degree of freedom is significantly greater in long-time scenarios. The influence of the lecturer is dropping due to the simulations' longer time period. A group of three to five students will complete complex tasks within six weeks while doing the long-term simulation. At the beginning, the lecturer gives a detailed introduction. The case study is outlined and the concrete problem on hand is described and looked at in detail. The presentation of the case study by the lecturer should ideally stimulate the students' imagination and creativity. The students should come up with the first insights with which goals and objectives may have to be addressed within the simulation process. To do so, the group of students has to explore the used study's scenario in both scientific and situational context. In a first step of a long-term simulation, teams need some time to gather information creating a common team information base. Furthermore students have the task to organize themselves, allocate tasks and develop a timeline to perform the simulation.

Long-term simulations are especially useful when students are about to complete their study at Kehl University. The knowledge of various project management disciplines is required because of the simulations' long-term character. At the beginning of students' studies, this knowledge is missing. Project management skills have to be used for decision making in the various simulation cycles and team conflicts may have to be solved. Once the first planning phase is completed, the group can begin to execute, control and evaluate the succeeding simulation steps. Within these cycles, the team has the task to set up different solution alternatives, to compare them and to evaluate them. This should be done ideally in such a way that the student team can process their tasks almost independently without the lecturer's help. The lecturer may give assistance to the students throughout the simulation process, but he will stay in the background. If questions or problems arise, the student team has the task to ask for help actively. After evaluating various alternative solutions, a joint decision must be made by the student team as to which solution has to be used for the next simulation step. Of course, the lecturer is supportive and tries to facilitate the student's reflection process, though he will show no doubts concerning the students' decisions during the simulation process itself.

The didactic assessment of business simulations is that they are 'suitable both for the promotion of general competence in dealing with complex systems and for the support of knowledge and

competence acquisition in a sector-specific context' (Kriz 2003). Simulation games are useful in an action-oriented teaching. Above all, simulation games are suitable for the understanding of complex systems as they will occur in the future environment of the students.

However, the course of actions and the learning process must be an inductive one. A sensible starting point is crucial. The developers of a simulation must construct the underlying scenario carefully. A meaningful induction phase has to provide for a sound information basis. This is a prerequisite that students can complete a content-related decision-making process step by step within the simulation aiming at addressing all the objectives and goals outlined in the case study's scenario. Especially in the case of long-term simulations, it is important that the underlying case study is practice-oriented and realistic. The generic pattern for case studies supports the development of meaningful scenarios for simulations, which allow students to solve the simulations' objectives by applying scientific theories and models. The underlying case study should be relevant to future professional situations of students and should enable role identification as well. It will be best if a case study addresses existing problems of the students' future working environment. However, the complexities of the real world of work have to be reduced adequately. The outlined problems have to be solvable with respect to the limits of a simulation as, for example, the students' time and work capacity.

During the last phase of the simulation, both a debriefing and a detailed reflection concerning the students' decisions should be conducted. These activities support both the transfer of acquired skills and knowledge into professional practice and the vocational competence of the students.

Simulations are tools to prepare students for their future world of work. In case simulations are prepared meaningfully and are based on realistic case studies, they offer students the opportunity of being able to try out their skills and knowledge in a safe setting. The students can test themselves by making bold decisions and exploring respective consequences. Since there is no real harm, the students can work experimentally. Students can use and consolidate expertise, but also test social and methodological competence and interact and reflect within the team. All team members are required to participate in the decision making process of each cycle. Ideally, decisions may be made democratically. However, it may be necessary to resolve conflicts within the team. Therefore the ability to work in a team and the competence to deal with conflicts are trained practically during the simulation process.

The fun factor also plays a significant role in motivating the participating students. The game character of simulations allows for a multi-dimensional learning situation, which is both effective and intellectually appealing for the students. Thus, within the social system of a group, students can undertake a creative learning process using the knowledge acquired during their studies. Using long-term simulations studies' learning results can be deepened since not only the intellect but also the emotions of the students are addressed. However, simulations should not be used too often in the classroom or in the study process since those effects may be reduced potentially.

Learning experience is supported by both short-time and long-term simulations. Whereas short-term simulations are especially meaningful at the beginning of studies to introduce several disciplines on their own, within a more comprehensive case study, long-term simulations aiming to combine the different disciplines later in a multidisciplinary approach to prepare students for their professional life.

Conclusions

In this paper, a framework for multidisciplinary business simulation were proposed. The framework combines two basic possibilities of using the action-oriented method of simulations at the University of Kehl. On the one hand, short-term simulations can be carried out at the beginning of studies in order to be able to solve limited problems in different subject-specific disciplines. On the other hand, long-term simulations were presented, which are carried out at the end of the study shortly before starting professional work. Both simulations are based on the same comprehensive case study. Whereas short-term simulations focus on one discipline, long-term simulations combine several disciplines within the simulation process step by step. Student teams have to cope with several tasks and goals outlined using a multidisciplinary approach. It is important for students of Kehl University that the action-

oriented approach is close to the real world of work. The framework combines short- and long-term simulations of several disciplines using repetition, elaboration and pattern recognition by purpose to facilitate students' learning experience and to prepare for future work.

Preparation of simulations is very time-consuming and lecturers need to have a high methodological competence. In order to support the lecturers' work, the framework for multidisciplinary business simulations introduces a generic pattern for case studies.

Although fifteen case studies have already been developed within the framework, its implementation in the curriculum has only just begun. In addition, further research activities have to be carried out to evaluate the quality of the case studies and the usefulness of the framework. Studies on the success of simulations in academic studies are contradictory. On the one hand, successful implementations are reported (Eckhaus 2017; Ellahi et al. 2017; Merritt 2018). On the other hand, one meta-study finds no evidence of an improvement in learning success (Lamb et al. 2018). Regarding the success of study programs in the field of public administration, the long-term success perspective is important (Morton 2017). It should be evaluated to what extent the simulations within the study program have prepared students for the working world. For this purpose, surveys should be carried out within a period of 2–3 years after graduation. Although these surveys can provide some insights, no direct comparison is possible with the situation prior to the use of the framework for multidisciplinary business simulations.

However, this only applies to the perspective of the students. For more than twenty years now, the University of Kehl has been conducting surveys among employers to determine whether the graduates meet the needs of the labour market. The year-by-year comparison of these surveys may reveal changes in the future. However, employer satisfaction can be influenced by many factors. Hence, improvements may not be directly related to the framework. One task will be to adapt the survey of employers in such a way that the influence of the framework can be questioned as specifically as possible.

Acknowledgements

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