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Flexible Serious Game to Train Business Processes in Higher Education

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Flexible Serious Game to Train Business Processes in Higher Education

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Abstract

In the digital age, we have many technologies and methods from the field of game programming to develop serious games for the adult education. But adults associate learning in daily life with work and effort. They don't see, that new knowledge can be learned playfully. But people have a special characteristic, which has been used mainly by the entertainment industry, they like to play. The attention of the education sector has increasingly been drawn to this feature. Because skills and deep understanding knowledge are key factors in professional life because of the change from the industrial age to the information age and the foreseeable lack of specialists. (Unger, 2011, p. 7) So-called serious games for education and training are developed in growing numbers. They are based on the most important characteristics of games, their content, course and structure have to be pedagogically prepared and didactic concepts have to be fulfilled. (Seufert & Meier, 2003, p. 3) In a Serious Game the learner is in a protected learning environment which reflects the real working environment, he can generate knowledge from mistakes without fear of consequences and can transfer the knowledge in the real world. (Michael & Chen, 2006, pp. 25-26) A well-known Serious Game in the field of medicine is the "3D Virtual Operating Room"¹. But what about students who are at the beginning of their education and who don't have the necessary knowledge to successfully play a serious game? Would it not be useful if the trainer could configure the learning area itself and these people might have a learning success? These general findings have now been used to develop a first prototype of a serious game that includes a generator for flexible configuration of business processes. This generator is used to configure the learning area and to generate a coherent game in which the selected business processes are displayed visibly. The paper is intended to show how the technologies of the entertainment industry can be interlinked with the knowledge of the education industry in a serious game to allow playful learning of business processes. It is also intended to show how the trainer can configure the learning area using predefined rules to generate a coherent game.

Keywords: Serious Game, eLearning, training of business processes, higher education training, generator

¹ <http://3dvor.ktm-advance.com/en/>

Introduction

In the Business Informatics Study program at the Aalen University we teach business processes in the SAP^{®2} environment during a course. For teaching we use two different ways. On the one hand, the traditional lecture for the theoretical part and on the other hand a tutorial with a trainer to train these business processes in the SAP ERP³-System practically. But these business processes are very complex and for students in the third semester very difficult to understand. After this course, they can explain these processes and they can use the ERP-System, but they only know from the theory how these processes work in the real life.

To give students another way to learn these processes, we decided to develop a prototype of a serious game to train business processes. With the help of this serious game business processes are made experienceable, so that the students get playfully a deep understanding how the business processes work in the real life.

But if a Serious Game convey knowledge and skills in a defined area, we have to implement a story which contains all business processes in one game. Then the whole game must be played by the students. But at the beginning of the course, they haven't all knowledge and skills to play the game successfully. If the students get on a point during playing the game, where they need knowledge and skills, which they are at the moment not have, they are early frustrated and unmotivated to continue the game.

This problem can be transferred to other areas for example at the training of employees.

To solve the problem, we developed a first prototype of a serious game, where a trainer can configure his own business processes by predefined rules and generate coherent games. The main point of this solution is, that the new game, which is adapted to the current topic of a lecture, is created in real time in the main game. So that it is not necessary to compile a whole new game, if we want to change the learning area. With this new technique, we offer a new possibility to train business processes in higher education, because we are able to adapt the game to the needs of the students, so that they are not overwhelmed.

In this paper, we begin in the literature review with an overview about the existed paper about flexible serious game in higher education. In the main section of the paper the methodology we first explain the story of the game, then show which technology we are used and then we explain in different section, how the flexible serious game works, and which parts it includes. In the chapter finding/results, we show what our students say after testing the game. The paper ends with an conclusion and the further work, where we summarized the paper and show how we want expand the flexible serious game.

² SAP SE is the biggest german software company for ERP-Systems

³ ERP = Enterprise-Ressource-Planning

Literature Review

Sorensen (Sorensen, 2009) describes in his paper an educational concept for Serious Games which consists of the following six theoretical points: a didactic approach, communication and multimodality, the learning, different pedagogical approaches, the play theory and finally the game theory. The only noticed, that they are tested different games during the project “Serious Games on a Global Market Place (2007-2010)” (Sorensen, 2009). In the conclusion, he said that “The challenge to design serious games in such a way that not only the student, but also the teacher will be interested in using the game.” (Sorensen, 2009). But in the paper, he doesn’t explain how to implement such serious game.

Eaachak et. al. (Eaachak, et al., 2015) describe in their paper a web platform which contains a game generator that allows non-experts to generate new video games for their needs. To implement this generator, they used a combination of different web technologies, e.g. JavaScript APIs or WebGL. By the use of the generator different games with different stories, environments and learning topics can be generated. These games are hosted at the same server and are “accessible for the learners.” (Eaachak, et al., 2015, p. 343). But these generated games have no uniform story, environment or learning topic like e.g. the business process purchase to pay, which is used for all generated games. This aspect is visible by looking at the two implemented prototypes “sweetlands” and “Qiup”. The first prototype allows to teach young kids the use of the computer mouse in a pink 2D environment. The avatar is a bunny. The second prototype “Qiup” has the intention that “the user should guess the next geometry.” (Eaachak, et al., 2015) Here the user has only a 2D view without an avatar. He chooses only the correct figure on the window.

Herrler et.al. (Herrler, et al., 2016) describe in their paper a simple serious game editor in the medical sector for teachers, which was implemented by the use of e.g. HTML5, JavaScript and CSS. With this editor teachers can on the one hand create new serious games and on the other hand add new sequences to existing serious games. The created serious games are 2D puzzle-style games, where the student can drag and drop pieces in the correct tile. Each sequence includes a group of four pieces which are “related to each other in a logical manner” (Herrler, et al., 2016, p. 72) and only one logical matching solution are existed. But with this logic, it is not possible to learn less than four pieces in a sequence. Furthermore, the authors describe no rules to combine different sequence in one game. So, it seems to be possible to combine different learning topics in one game, without predefined rules.

Ribeiro et al. (Ribeiro, et al., 2012) show in their paper how the serious game ImPROVE can be used to teach business process modelling and simulation. To implement the serious game, they say they use the game engine Unity 3D. But they only show how the business process modelling tool works and was developed, but not how the main game works or if there is an dependency between the modelling tool and the real game.

Mayr et al. (Mayr, et al., kein Datum) describes the advantages of serious games in higher education. They are implemented a serious named brilliant

CRM as a web based game during different course in their university. They say that especially the students from the Business Informatics Study Program are suitable to implement serious games, because they have knowledge in the informatics and in the business.

Summarized you can see, that neither Eaachak et. al., Mayr et al. nor Herrler et.al. have used a game engine to implement their generator and game-editor. They all use web-Technologies like JavaScript. And in the cited paper named games don't allow to configure the story. There it is not possible to extract parts of the game, combine it new and create a coherent game, in the actual game.

Methodology

To give the students, the possibility to make business processes visible and experienceable, the characteristics of serious games are used. A Serious Game (strength games) is a computer game, which main purpose is to teach knowledge and skills in digital arranged learning environments (Unger, 2011, p. 7). Michael and Chen describe the main purpose of a Serious Game as the following: „A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment.“ (Michael & Chen, 2006, p. 17) In Addition “serious games encompass the same goals of edutainment, but extend far past teaching facts and role memorization to include all aspects of education: teaching, training and informing.” (Michael & Chen, 2006, p. XV) Feist and Franken-Wendelstorf describe that by the use of technical and multimedia elements Serious Games support the conventional learning process in the vocational education and training. (Feist & Franken-Wendelstorf, 2011, p. 69)

But serious games have a big advantage. To transfer knowledge, Serious Games use the intrinsic motivation which are also used in games from the entertainment industry to convey knowledge from the education industry with fun (Unger, et al., 2015, p. 161). With this method, they change the role from the learner from a passive learner to an active learner. A passive learner is typically a student which sit in a lecture and listen the professor. (Unger, et al., 2015, p. 161)

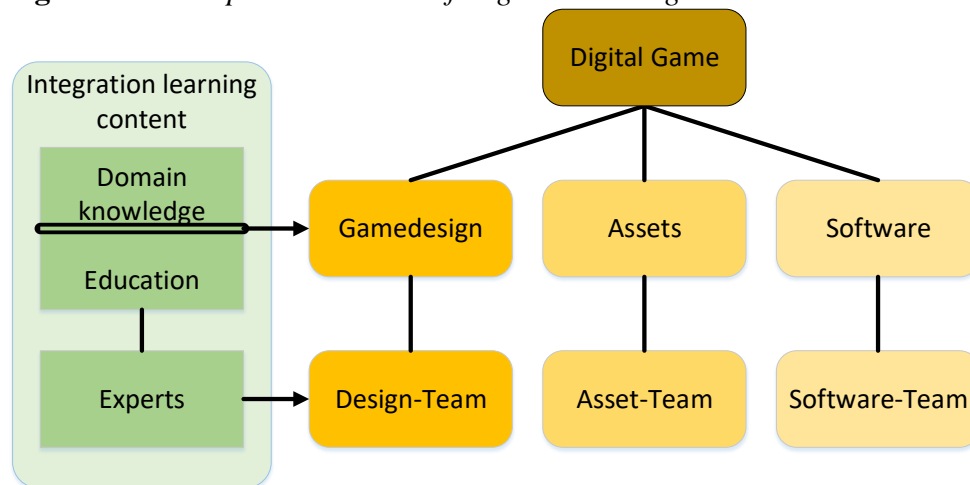
Another advantage by playing the game, is that the player (he/she) learns automatically and voluntarily new things without knowing it for example the game idea, some very difficult game rules, and the game controls. (Kerres, et al., 2009, p. 1) Further the player can experiment in a safe environment (Frick & Hitz, 2011, p. 162) and can try different decisions. These decisions will be answered by the game from a real-time feedback. So that the player can make mistakes, without fearing of consequences of the real world. He can generate new knowledge from the wrong decision. (Michael & Chen, 2006, pp. 25-26) Summarized we can say, that playing is the most important characteristic of the game in our context serious game, but their content and structure have to be pedagogically prepared and didactic concepts must be fulfilled (Seufert &

Meier, 2003, p. 3). Only then the player is able to transfer the knowledge to the real world, because the knowledge must be presented transparently (Unger, 2011, p. 7).

To develop a Serious Game, more than the classical development process from entertainment games is needed (

Figure 1). Masuch (et al., 2011, pp. 31-32) show that the development process of a digital learning game need on the one hand the classical elements from the digital games as the gamedesign, the asset, and the software. On the other hand the knowledge which should be transfered in the Game. Therefore, experts from the educational industry are needed, which create a didactic concept for the game. (Masuch, et al., 2011, pp. 31-32)

Figure 1. *Development Modules of Digital Learning Games*



Source: (Masuch, et al., 2011, p. 32) translated

These knowledges are used to develop our prototype of a serious game to train business processes. But in first time we had implemented a prototype, so that all development parts had been done itself and we had limited the processes to order-to-cash and purchase-to-pay processes. But we implemented all included process-steps.

Story of the Game

As we have seen, use serious games the intrinsic motivation from computer games, to transfer knowledge. The entertainment industry uses different mechanism to realize this in the games. (Unger, et al., 2015, p. 159)

Storytelling and Immersion

A huge advantage from games is the use of the immersion. This method allows that the students can deep dive into the virtual world. To use this methods in the context of the serious game, we had to be carefully that we are create an environment, which is specially prepared for the learning atmosphere (Unger, et al., 2015, p. 159). To train business processes in our course we decided to realize an 3D environment with a carpentry shop. Because in a

carpentry shop, different business processes can be demonstrated. From the simple purchase to pay process until complex integrated business processes. To make the story interesting, we decided to create a story where a woman named Tora wants to buy a chair in a carpentry shop. With this apparent simple story, the various business processes can be displayed. The goal of the game is that the women get her chair.

Tora is the avatar of the game, so that the student slip into this realistic role (Michael & Chen, 2006, pp. 25-26)during playing the game. This supports an active learning process, because he/she is learning by doing it (Frick & Hitz, 2011, p. 162). In the role of Tora, the student can go through various business processes and getting to know the procedures. The students can walk through the implemented environment with the avatar in the third-person perspective and have to do different user interactions. On the picture below you can see the avatar in front of the main building from the carpentry environment.

Figure 2. *The Avatar Tora in the Learning Environment of the Carpentry Shop (German: Schreinerei)*



Source: Author

Used Technology

To implement our Serious Game, we used different types of software from the gaming industry. The main software is the game engine Unity 3D⁴, a game development environment. It is current the “industry-leading-multiplatform” (Unity Technologies, 2017). So that it allows, to build the game once a time and to export it to different platforms like Windows or Mc OS X-Systems. (Unity Technologies, 2017) But with Unity it is not possible to create the different 3D assets, because it is no modelling software. It only contains different tools

⁴ <https://unity3d.com/>

to develop games, like a physic engine, tools for particle effects, to create landscape or to animate simple things. (Seifert, 2015, p. 2)

Therefore, we had used different software to create and animate the different assets. The assets, like e.g. the buildings or the office equipment, were created in the 3D modelling software 3ds Max 2016⁵. But about the time limitation we used different free assets, like trees or plants from the unity asset store.

To realize our story and to make the game realistic we need different people for example the avatar Tora and the carpenter. Therefore, we used the Autodesk “Character Generator⁶” to create different people. But these people are not rigged and have no animations. To solve this problem, we used Adobe “Mixamo⁷” to rig and animate every person. These different technologies, are also used in the commercial game industry to implement games. To simulate the speech between different characters the methods of the character facial animation are used, which allows, that the character looks like he/she is speaking immediately. This method had we also used for our characters.

To realize the flexible serious game, we used a SQLite⁸ database to store our data. This database has the advantage that it can be directly integrated in the game engine.

Presentation of Business Processes

To implement a flexible serious game, we have to split the business processes order-to-cash and purchase-to-pay in little parts, known as business process steps. For each business process step, we created an own icon to identify it later in the configuration menu. The table show an example of the chosen process steps of the order-to-cash business process in English and the German translation and the created icon. (to understand the different used process steps in the different pictures you can find a table with the German translation in the appendix)

⁵ <https://www.autodesk.de/products/3ds-max/overview>

⁶ <https://charactergenerator.autodesk.com/>

⁷ <https://www.mixamo.com/>

⁸ <https://www.sqlite.org/>

Table 1. *Process Steps of the order-to-cash Business Process in English and German*

English	German	Icon
Customer inquiry	Kundenanfrage	
Offer	Angebot	
Customer order	Kundenauftrag	
Delivery	Auslieferung	
Outgoing goods	Warenausgang	
invoice	Rechnung	
Receipt of payment	Zahlungseingang	

Source: Author

To teach the knowledge of each process step in the game, we need on the one hand a suitable story, which are part of the whole story of the game. And on the other hand, the characters which are communicate in the process steps with the avatar. By the use of different multimedia techniques, we are able to present the knowledge for different learning types and situations.

The action in the process step are displayed in steps. Only if a character or the avatar are speaking we display the action text in a box, so that the user can read the text and following the story, also if he doesn't can listen the audio sources. Each character in the game is animated with the facial and body animation, which is synchron to the text of the audio file. So that the characters react like a real person and look like. In Figure 6 you can see an example of a communication between the receptionist and the avatar Tora.

Figure 3. *Communication between the Receptionist and Tora*



Source: Author

The special effect of our serious game is, that in each process step, we are integrated practice videos of a carpentry shop from our environment. In this video, the player can see a part of the real process in the industry in the actual process step. This should make it easier to transfer the learned knowledge to the real world.

Logical Structure of the Game

The flexible serious game has been implemented on the basis of four different scene types: start scene, end scene, base scene, process step scenes. These different scenes can be combined by predefined rules into a coherent game. For each process step we develop a building blog called as process step scene which is a separate scene with the following information:

- Name of the process step
- Questions for the quiz (dependent from the process step name)
- Character which we need for this process step for example a receptionist
- The action and speech bubbles with the special text for the characters for this process step

Each process step scene ends with a quiz, in which the player has to check the knowledge they 've gained throughout the actual step. Only when the player has completed /quit the quiz, he/she can go to the next process step or go to the end scene.

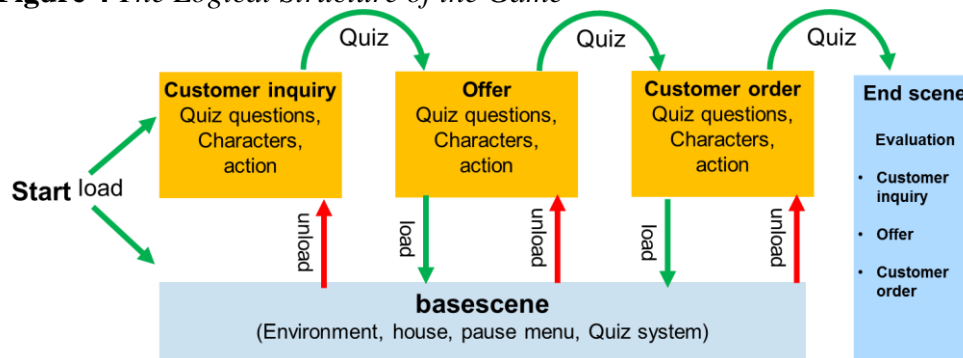
Important is, that we not created the environment for each process step, because the house and different assents from the environment like trees for

example are very detailed modeled and need long to load. Only the character and special assets, are loaded in the process step scene, because they have different text and animations in different process steps. This makes possible that we can later load the game faster. The system later loads the different process scene additive, so that the player doesn't see that only the process step is loaded.

Lets have a look at the

Figure 4. This shows an example of a generated game, which includes the process steps customer inquiry, offer and customer order.

Figure 4 *The Logical Structure of the Game*



Source: Author

When you start this generated game, the system loads from the database the generated game first and looks what is the first scene. And then he loads two scenes. The base scene which includes the environment, the house, the pause menu and the quiz system, will only be loaded once. And the first process step scene customer inquiry, which the components we have already defined. If you have finished the action of this process step and has also finished the quiz the next scene offer will be loaded in the configured arrangement by the help of an iterator. The system now unloads the actual scene customer inquiry und loads the next process step offer. If you have finished the last process step customer order including the quiz, the system unloads the last scene customer order and the base scene and loads the end scene, where you get an overview with the results of the quiz per process steps. In the example from the customer inquiry, the offer and customer order. That's the end of the generated game and you have finished the game.

Dependency Logic for the Process Steps

To guarantee that the trainer can only generate meaningful processes, we had implement a depend logic for the process steps. As an example, let's have a look at the dependency logic from the process steps customer order, offer and customer inquiry. We define the following table, that shows which previous process step is dependent from which next process step. The column next process step in the table means the actual process step. But when creating the table, care must be taken that the only meaningful process step combinations

are created. We also have to look, if it is possible that a process step has no previous process step. For example, the customer order or the customer inquiry. If a process step has a previous process step, we write the combination into the table. Later this table is the basis for creating the processes.

Table 2. *Dependency Logic for the Process Steps Customer Order, Order, Customer Inquiry*

Previous process step	Next process step
-	Customer order
-	Customer inquiry
Customer inquiry	Offer
Offer	Customer order
...	...

Source: Author

Through this table structure, it is not only possible to combine process steps of one business process, but also to integrate other business processes. For example, the combination of the order to cash and purchase to pay process.

The Configuration Menu of the Serious Game

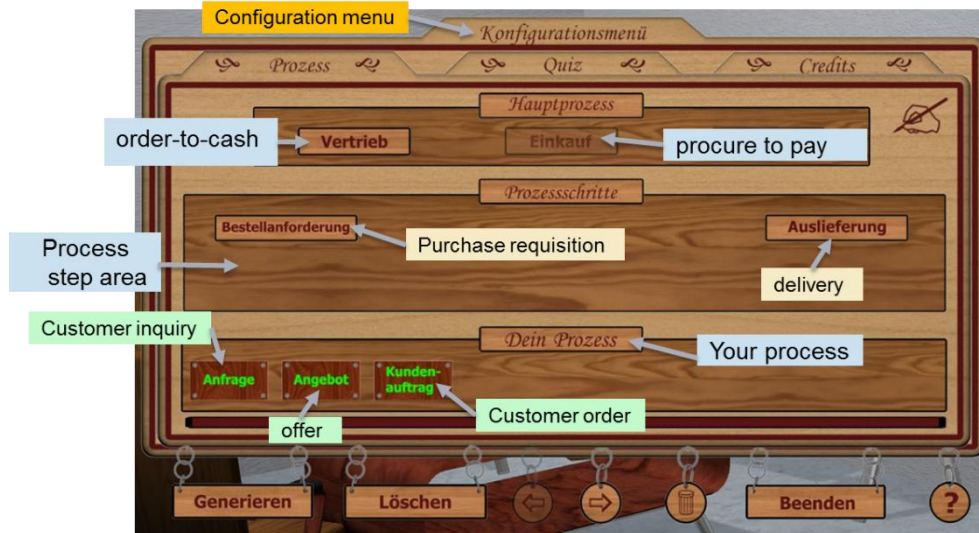
The heart of the game is the configuration menu, because with this menu the teacher can generate new coherent games for his learning purpose. This configuration menu is integrated in the main game and can be loaded over a special button in the start view of the main game. This button is only visible for the teacher. Over the start menu, the students and the teacher can load the generated games and the individual saved games. If a player saves the game, the system saves the generated process with the individual name of the player. The player can later load his process and continue the game.

The implemented and built main game contains all different (in the prototype the process steps from the purchase-to-pay and order-to-cash business process) process steps and all for the process steps necessary assets and questions. So, it is possible that the teacher can generate new coherent games in the actual game without implementation effort and building of new main games. This is a high advantage of the game, because that make the game high flexible.

To configure business processes, we implement a user interface with different functionalities. These user interface is named as configurations menu (german: Konfigurationsmenü) where the teacher has different possibilities. In the tab "Prozess" he can create his own business processes. In the tab "Quiz" he can edit, add or remove the questions from the different process steps, which will be integrated in all generated games, because the system load always the questions from the database. In the last tab "Credit" he can see which persons are implemented and created the serious game. To get the

teacher the best support, the configuration menu contains a help menu (in the picture the question mark in the bottom right corner). During this paper we only describe the process tab, because this is relevant to explain the technology of the flexible serious game.

Figure 5. *The Configuration Menu of the Game*



Source: Author

The Figure 5 shows the configuration menu of the game, where the teacher can configure individual business processes and generate coherent games. The configuration menu contains three sections: First the “main process step” section (German: Hauptprozess), in the middle the “process step area” (German: Prozessschritte) and the “your process area” (german: Dein Prozess) In the first section the implemented business processes order-to-cash and procure to pay are displayed. Dependent from the selection of the button the process steps in the second sections are displayed, but only once a time, if you have no process step selected and so the third section “your process” is empty. After selection of the first process step, the dependency logic which we have already explained are used from the system. The teacher has also the possibility to delete the whole process or to remove the last selected process step.

In the picture, an integrated business process are displayed. In this example, we have selected the order to cash process and the first process steps customer inquiry, offer, customer order. Now the system shows us in the „process step area”, only the process steps, which are actually allowed. Here uses the system the dependency logic which we have defined before. So, it shows now on the one hand the process step delivery and on the other hand purchase requisition (German: Bestellanforderung) from the purchase to pay process. We see that it is possible to integrate other processes. If we finished now the creation process and we want to generate the game, we have to push the button „Generieren “ (english: generate). Now the system will be asked how much question should be asked in the quiz. It is also possible to give no value, then the system takes a

default value and saves the new game in the database. Now the game is available for the students.

The Quiz

The flexible serious game contains a quiz system, it is integrated in the main game. At the end of a process step, the player has to do the quiz to check the gained knowledge. He/she can activate the quiz by clicking on the whiteboard with the texture “Quiz” in the background the system loads the number of questions, which are defined for this generated game. It selects the questions randomly. The quiz qui is displayed in the actual scene, which you can see in Figure 6.

Figure 6. Example of a Quiz at the End of the Inquiry Process Step



Source: Author

The quiz offers the learner not only the quiz questions and the possible answers, but also a visible feedback through coloring his answer. The system shows the user during this actual quiz how many question will be asked and how many did he answered wrong or right. If he/she answered a question wrong, or used the possibility to skip the question, he/she can answer these questions at the end of the actual quiz again. Plays the user the process step in another generated game again, it is possible that the quiz contains other questions and false answers, because on the one hand the database contains more questions than the quiz system has selected and on the other hand each question contains seven false answers, but only three are displayed.

For the quiz, we have created three different questions types. The first question type contains the knowledge which they have learned by playing a process step. This is intended to sensitize the player for the individual process step. The second question type contains knowledge from the ERP-system

tutorial course of our university for this process step. For example, a transaction code from the SAP®-System will be asked. The last question type contains knowledge from the lecturer of the course. These three questions type are good to use the serious game parallel to the course, because on the one hand they refresh knowledge and on the other hand they combine the old knowledge with new things.

Special Features of the Serious Game

A special feature of this flexible game is, that the user can always use the online SAP® help. We integrated it in the bookshelf, in the meeting room of the carpentry. Each book contains another link to an topic of a process step of the game.

Findings/Results

For testing the serious game in our course, we are only able to test the functionality of the game with the two implemented business processes purchase-to-pay and order-to-cash. These processes were implemented with different process steps. By the use of the configuration menu, we can not only generate normal business process, we can further create integrated business processes. Therefore, the system use predefined rules to support the user during the creation process.

We have tested our serious game with two different student groups during our ERP-course in the third-semester. Our course contains about 40 students. At the beginning of this course, the students have few or no knowledge in the field of the business processes. For evaluating this game, we defined an integrated business process which includes the typical process-steps from the order-to-cash and the purchase-to-pay business process. Both groups (each 20 persons) have played this business process in the game.

The first student group gets at the beginning of the course a coherent game, which includes the whole defined business process. After playing the game, without further knowledge about the business processes, we get the following negative main result:

- It is very difficult to play the whole game without the knowledge and skills. The students are overwhelmed and lost the motivation to play the game longer.

For the other group, we generated different coherent games during the course, which are coordinated on the one hand with the theoretical part of the course and on the other hand with the practical part on the SAP®-system. At the end of the course this group has also played the whole integrated business process like the first student group. From this group, we get the following results:

- By playing the integrated business process step by step, the students are not overwhelmed, because they can use their knowledge and skills, which they have recently learned in the course to play the coherent game successfully.
- Therefore, that the whole process was split in different parts and can be learned step by step, the students automatically repeat the further process step, and can interlink the old knowledge with the new knowledge from the next new process step. The playing of the new process step is so easier.

Both groups get the following positive results:

- The quiz after each process step are very useful to check the knowledge about these process step. Thanks, the real-time feedback the students can see which questions he/she answered wrong. The possibility to skip questions and to answer the false question at the end of the quiz again, was also be included in the positive feedbacks.
- By playing the same coherent game again, it can be possible that the students get other questions, and so more aspects about a process step are asked. And they have a higher motivation to play the game again. So, the game is more effective and the student could have a higher learning success, because he/she can answered more questions right.
- The choose of the story is good, because the story is simple and the students understand how you buy a chair, because they know how you buy a chair in a shop.
- After playing the game, the students are able to transfer the learned knowledge to other real world examples.

Summarized we can say that if we use this flexible serious game to train business processes during the course, we will get different positive aspects. On the one hand, the trainer can configure business processes any time, which the students can successfully play during the course. And the students can use the recently learned knowledge to generate a deeper knowledge about the functionality of business processes. During the quiz, they can check the knowledge from the theoretical and practical lesson and the knowledge, which they have learned by playing the game. So they can get a feedback after each process step and a summarized feedback at the end of each coherent game. With these feedbacks, they can see where they have knowledge gaps which they have to close.

Conclusion

In conclusion, we can say that our flexible serious game to train business processes in higher education has the following positives aspects:

- High flexibility with less development effort
By the fact, that the individual process steps are defined as building blocks and these can be combined with predefined rules it is possible to create different coherent games in the main game of our serious game. Every process step which we integrated in our serious game, have to be implemented and designed only once. To use these process step in the game, we have to integrated the new process step only in the dependency logic for the process steps and to edit the user interface to configure business processes. The main game logic has not to be changed. This method allows, to create quickly new coherent games, without change the logic of the system.
- Adapting the learning area to the current requirements
By using the generator and the user interface to configure business processes, it is possible to create customized coherent games for the learning needs. Which can be used parallel to the theoretical lessons. In addition, the questions for the individual process steps can be edited and new questions can be added. These changes are directly integrated in the whole game, because the quiz system load the different questions for the different process steps, in real time from the database.

Especially for the trainer and the students we can see the following advantages:

The trainer can configure the learning area itself and can create logically meaningful business processes with a user interface. During this he/she gets support from the system by defined rules. The system generates coherent games.

The students can learn business processes with fun and get learning success, because they are not overwhelmed and get real time feedback in every process step. At the end of the game they see a summary of their learning success and they are able to transfer the knowledge to the real world.

This technology of the generation process can also be used in other teaching areas, for example the teaching in the field of the mathematics or to teach programming.

Further Work

Through the success of the prototype of our flexible Serious Game, we have decided that we want to implement more business processes. At the first step, we want to implement the production process of a chair as the third big business process in an industry. During this business process the student can learn for example the meaning of a part list.

To make the game more interactive and exciting for the students we want to implement a configuration system for the chair, which are the avatar Tora want to buy during the game. But this configurator must be part of the coherent games, which are the trainer had configured. That means, that the whole

different process steps, which are implemented in the main game, should interlinked in a new way. So, it is possible that the students can influence the story.

The configuration system of the chair should contain different parts. On the one hand a user interface, where the different components of the chair will be shown with different possibilities, where the students can generate his own chair. On the other hand, a logic system, where for example the different prices per component and the selected components from the students are saved. Furthermore, the assets to the components of the different chair possibilities have to be integrated So that in the coherent game the individual chair of the student will be shown. If the production process is implemented and is a part of the game which the trainer had configured, this chair wants to be produced.

Nowadays virtual reality and augmented reality are indispensable. At the Serious Games Conference 2016 which was held at CeBIT 2016, Dr. Maximilian Schenk from “Bundesverband Interaktive Unterhaltungssoftware e.V.” tells that “Immersion and intuition will be helpful tools from the game industry for other markets” (normedia 2017, 2016) Alex Taube from EX-UP Luxemburg said that “through interaction immersion would be created, which can help to support the learning effect” (normedia 2017, 2016), which can be a big advantage for e-learning, especially for people who learn better by doing it.

Especially after the statement from Alex Taube, we decided that we will expand our flexible Serious Game with a Virtual Reality glass. This will be the advantage, that on basis of the different learning types of the students, we will give them a new possibility to learn the business processes and we want to give them the possibility to get an intensive deep dive into the story of the game. This will be a big advantage for the students which are better learn, by doing it with their own body.

The technology of the flexible Serious Game can be transferred to other areas outside the learning process. For example, to support a software manufacturer for ERP-Systems to sell an ERP-System. The vendor could show the customer live what components he/she needs from the ERP-System if he/she wants to illustrate his/her daily business process. Here, no serious game will be generated, but a document which includes all components of the ERP-System, which the customer needs for his individual process. Ideally, single or package prices are stored for the individual components, so that the total price can be presented the customer live. If the customer has special wishes, he/she can see what these wishes are cost additionally. At the same time, the generated document also serves as a request log, because the customer process is displayed in the document with the needed ERP-components. This process was generated together with the customer, and this will be the security for the software manufacturer.

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Appendix

Following you have the full overview about the uses business process steps from the business processes purchase-to-pay and order-to-cash

Table 3. *Process Steps of the Order-To-Cash Business Process*

English	German
Customer inquiry	Kundenanfrage
Offer	Angebot
Customer order	Kundenauftrag
Delivery	Auslieferung
Outgoing goods	Warenausgang
invoice	Rechnung
Receipt of payment	Zahlungseingang

Source: Author

Table 4. *Process Steps of the Purchase-to-Pay Business Process*

English	German
Purchase requisition	Bestellanforderung
Supplier selection	Lieferantenauswahl
Supplier inquiry	Anfrage
Supplier offer	Lieferantenangebot
Bestellung	Purchase order
Incoming goods	Wareneingang
Return	Retoure
Invoice auditing	Rechnungsprüfung
Outgoing payment	Zahlungsausgang

Source: Author