Developing Entrepreneurship Skills with a Serious Game

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Abstract. Rural areas in Europe still lack the ability to create high-quality and sustainable jobs. This situation can change if there is a clear promotion of the use of electronic commerce and digital entrepreneurship in those areas. As part of that effort, this article presents an initiative that intends to provide aspiring young entrepreneurs in the rural areas with the necessary tools to understand and to develop e-commerce to boost the economy in those places.

This initiative is supported by a serious game which allows players to learn while motivating them to become digital entrepreneurs. Players are transported to an online collaborative/competitive and dynamic environment where they must find the best strategies to negotiate with their opponents and push their business to a successful finish.

The game was tested with an initial group of students and the results allowed to conclude that it fulfills its purpose, showing that it can be used as a tool to support and encourage youngsters towards digital entrepreneurship.

Keywords: Serious games · Entrepreneurship · Competences

1 Introduction

More than 91% of the territory of the European Union (EU) can be classified as "rural" and these areas are home to about 56% of the EU's population [1]. And even if Europe's rural areas are diverse in terms of population, demography, economic structures and labor markets they face a common challenge: the ability to create high-quality and sustainable jobs [2]. Therefore, rural area development measures should be committed towards employment growth and job creation so that they match the numbers in urban areas. In that sense, the current "counter-urbanization" flow out of urban areas into accessible rural areas, made possible by new transport and technology infrastructures, should be exploited: electronic commerce and digital entrepreneurship, in particular, open the opportunity for very new and original businesses that can be an opportunity for the development of rural areas.

Transform@ is a European initiative, based on a serious game approach, that aims to provide the tools to foster entrepreneurship and online commerce skills to young

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people from rural areas [3]. More specifically, the initiative pursues the following main objectives:

- To enhance digital and e-commerce/e-business related skills;
- To develop an entrepreneurial spirit with an international dimension;
- To facilitate young people's transition from training/education to the work market;
- To increase employability and entrepreneurship in rural areas.

Supporting the initiative through a serious game allows users not only to learn but to apply their acquired knowledge by collaborating/competing in a motivating virtual environment with other players, thus transporting them to a dynamic environment where they have to find the best strategies to negotiate with their opponents.

The design of the game considered the need to strengthen a set of skills and competences identified as relevant for the young entrepreneurs [4–6], namely: Managing people; Developing people skills; Mobilizing others; Selling ideas, products or services to customers, investors or employees; Decisiveness and assertiveness; Self-efficacy; Initiative; Spotting and acting on opportunities; Resilience; Innovation and creativeness; Learning through experience and learning by doing; Self-reflection; Ability to prioritize; Tactical and strategical thinking; Coping with uncertainty, ambiguity and risk; Financial and economic literacy; Ethical and sustainable thinking.

The game has already been tested and evaluated by a large number of users in different European countries. A complete evaluation methodology supported by specific data collection tools allowed to identify the users' perception on the different aspects of the game, namely on its usability, gameplay and skill development. This article presents the game concept and design and the results from the evaluation methodology.

2 Transform@ as a Serious Game

Videogames are virtual entertainment environments which transport the player to new situations giving them the opportunity to develop skills, experience stories, make decisions, outline strategies, etc. Wattanasoontorn et al. present four elements that games must have [7]:

1. Gameplay and rules, that define how the game is structured, its mechanics, objectives, plot, etc.;
2. Challenges, that define the difficulty and rewards that the player can achieve by reaching a goal;
3. Interactivity, that represents how the player interacts with the game;
4. Purpose of the game.

Serious games were defined by Clark Abt as games with an educational purpose that do not have entertainment as the main goal [8]. They are thus developed with the objective of passing a serious message to the player, be it educationally focused, advertising, awareness raising, etc. Therefore, a serious game has explicit and implicit objectives where the explicit purpose is fun/entertainment and the implicit objective is related to skill, knowledge or experience development, that is, it has a personal

development component. This follows the definition given by Mike Zyda, who states that "…serious games are more than history, art and software, they have a pedagogical component that educates or instructs the user and that consequently increases knowledge and/or skills" [9].

The interest of using serious games therefore relates to the possibility of providing the user with an environment that will motivate him/her whence we know that motivation is a paramount factor in any learning or skill development process [10]. Serious games can be particularly effective with younger target groups as they are very close to their interests and habits [11].

According to Marc Prensky, motivation is directly related to the experienced fun and relaxation [12]. Relaxation allows the apprentice to complete goals more easily, because they strive naturally without feeling forced. People play games because they like to feel challenged in a relaxed environment. This motivation leads to the state of flow presented by Csikszentmihalyi [13]. A player is in a state of flow when he/she is completely immersed in the challenges because there is a balance between their difficulty and the player's ability to complete them. On the contrary, if a novice player finds himself in an environment where challenges are too difficult he/she will enter into a state of anxiety, interrupting the flow state and cutting the motivation. Likewise, if the difficulty is too small for the player's abilities, the player will feel bored as he/she can complete the challenges without any difficulty, causing him/her to lose his motivation. In serious games this component is very important because, as mentioned before, motivation is one of the essential factors in learning processes. If the state of flow is broken the player will have difficulties in withholding information and will lose interest in the game and in the skill development process.

The possibilities of application of serious games are widely varied. In 2008, Sawyer and Smith tried to classify these possibilities by creating a taxonomy that related the purpose of the games with their area of application in a 7×7 matrix with 49 different potential serious games use [14]. Later, in 2010, Breuer and Bente created a new classification, dividing serious games according to different aspects like the supporting platform, the subject matter, the learning goals, the learning principles, the target audience, the interaction mode, the application area, the controls and interfaces and common gaming labels [15]. Again what was demonstrated was the large gamma of potential application of serious games. Unfortunately, there are only a few serious games aimed at the development of entrepreneurship skills. On the other side, there are several games, primarily developed and distributed as an entertainment product, that use some form of business management as gameplay. These games, although meant to be used for fun purposes, can be repurposed for a serious objective, in a process that Djaouti et al. denominate as "serious gaming" [16]. A few examples are presented next:

- Monopoly: Monopoly is one of the most popular board games and one of the best-selling ones. The objective of this game is to be the richest player by owning the most properties. The game has now been converted to digital platforms as Monopoly Plus, developed by Ubisoft and released in 2015 for Xbox 360 and PS3 and relaunched in 2017 for PC, Xbox One, PS4 and Nintendo Switch. The game works in a 3D environment and the goal is the same as the physical game, where players move around a board trying to buy as many properties as they can. Throughout the

game players buy, rent and sell properties, negotiate, pay fees, borrow money and even get arrested. All players who are in bankruptcy are eliminated. The digital version also allows multiplayer matches, where the player can draw his/her own board, give names to the houses and choose their preferred symbols [17].

- Catan: Catan is a board game that transports players to a time of discovery. Players assume the role of settlers who have the goal of developing and building colonies, roads and cities, and collecting and obtaining the necessary raw materials. Each player earns points as their colonies grow and the goal of the game is to be the first to achieve 10 points. Trading is an important aspect of the game that, being ignored, will make winning more difficult. Players can also exchange resources to obtain the materials they need. Each of the elements requires different resources for their construction that can be obtained by negotiating with other players or through harvesting the lands that the players possess. Catan forces players to interact with the others, to learn how to negotiate to achieve their goals, as well as to have a sense of how to manage their resources, which will also influence how they spend and negotiate. Catan was released as a digital product in 2007 for Xbox 360. However, this version was discontinued and only ten years later a new version was released for various platforms, called Catan Universe. In this version players have the opportunity to play against others in the online mode, or they can enjoy the single-player mode where matches are made against AI [18].
- The Game of Life: The Game of Life is a board game where the player moves through the various stages of life until his retirement. Initially, each player has to choose whether to start through an academic career or to start immediately a professional life. The first option implies that the player will have to play more turns before he receives a salary, but then he/she will have more professional options. In the second case, a profession is randomly assigned to the player who starts immediately to receive a salary (that will be the same throughout the entire game). In addition, the player who selects the academic option will be burdened with a student loan that will have to be settled later on. Throughout the game, players will be exposed to different challenges and dilemmas related to real life, like buying properties, paying fees, loans … The goal is to reach retirement with the best quality of life. This game was released in 2015 by Marmalade Game Studio Ltd for PC [19].
- Biz Builder Delux: Biz Builder Delux is a simulation game produced by Kairosoft for mobile devices where the player tries to be the best and most successful entrepreneur in the city. The player starts a new business and must manage it to make it profitable, so that it can expand it and become a successful entrepreneur. The player has to choose what type of business he/she wants to start and then hire employees, train them, deal with their occupation and their productivity. The player has to outline a strategy, analyze the market and maintain the interest of its customers, as well as research and develop new products, compete with the rivals in order to evolve and expand the business [20].
- Capitalism II: Capitalism II is a business simulation game released developed by Enlight Software Limited. In this video game the player has the CEO role and is responsible for the creation, development and growth of his/her company. Throughout the game the player will come across various challenges similar to the

ones in a real business world. As he/she develops the company, the player decisions (in production, purchase, import, marketing, etc. …) will influence the results obtained, forcing him/her eventually to outline a new strategy [21].

- Rise of Industry: Rise of Industry is a business simulator game developed by Dapper Penguin Studios and released in February 2018. The player is an entrepreneur responsible for building an industrial empire so he/she has to create industries, transport lines, produce raw material resources, exchange of resources with other cities, etc. During the game the player has to manage his/her resources and products, being also attentive to his competitors. There are two game modes, career mode and sandbox. In the first mode the player will have to choose one of four specialties (gathering, farming, industry and logistic) which will provide more research and development points. As for the Sandbox mode, everything is unlocked and accessible and the player can build his empire without financial or research limitations [22].
- Factory Manager: Factory Manager is a strategy and business simulation game developed by StainlessHeart and released for PC in August 2018. Here the player has to develop a business, starting with a small financing. He/she has to hire employees and buy the materials and resources needed to build products. The commitment of the player will be reflected on the workers' productivity, taking advantage of their efficiency to get the best of them. The player must be prepared for unexpected events such as breakdowns or declines in sales and must take risks to be able to prevail in the industry and grow the business [23].

All these games, even if not considered as serious games, allow captivating players to perform certain entrepreneurship and management related actions and provide extremely interesting and enriching content for the player, leading him/her to perceive and learn some aspects related to business, product and resource management.

As for Transform@, the serious game was designed as a tool to learn and apply knowledge related to e-commerce and digital entrepreneurship. It includes mechanics similar to some of the games that have been presented here, implemented in such a way to make the game playful, but more important, educational. Transform@ falls into the genre of games like Monopoly and Catan as a board game with the exchange, purchase and sale of resources. However, it is intended that this application goes further and the theme gets closer to the one in Capitalism II or Factory Manager, where the player has a more active role in the company's activities.

Transform@ was finally designed as a turn-based board game with single and multiplayer modes. In the single player mode, the game manages Artificial Intelligence (AI) players that can adopt different strategical approaches, from a more easy-going attitude to an aggressive stance. It is up to the human player to identify who he/she is dealing with and adopt the right counter-measures. Transform@ can also be played in an online multiplayer mode against other (2–4) players.

The game is played by moving a pin along the board spots in order to gather the required resources (funds, staff and clients) to setup a company. Because the board has multiple paths it is up to the player to decide which approach to take. Some board spots correspond to quiz spots that expose the player to different challenges: their knowledge and skills can be tested and correct answers lead to rewards as wrong answers lead to

penalties. Other board spots provide casual events that can randomly provide a boost to the player or introduce difficulties in the path to create the company. Direct competition between players can arise if they fall in the same spot. In each turn, the player can also negotiate with the other players or external entities (banks, suppliers, business angels, etc.). Resources can be swapped or common business ventures established. Players can also take more aggressive measures against other players and try to take resources from them or simply buy them out. As already mentioned, the goal of the game is to reach the end point with the necessary resources to open a new business (currently a wine shop or a biological farm). Should a player reach the end without the necessary resources, he/she must continue to traverse the board until he obtains the minimum resources to win the match (Fig. 1).

Fig. 1. Transform@ board to setup a biological farm

Each turn consists of a set of steps that must be followed in this order:

1. Throw dice
2. Choose path to follow (and spot to land on)
3. Resolve spot (quiz or luck)
4. Negotiation with other players or external entities
5. Payments

At the beginning of each turn, players roll the dice to know how far they can move. Players then can choose which path to follow according to their strategy (some paths are shorter others are longer but provide more rewards at the expense of higher risk). When a player lands in a quiz spot, he/she must choose the difficulty level of the question. If the player answers correctly the question he receives the prize value associated with the difficulty level, if he/she fails, the player loses half of that amount. In each question the player has the opportunity to pass the challenge to another player, who is then required to answer the question. When a player lands in a luck spot he/she receives a card that can have a positive or a negative effect on his/her progress in the game (Fig. 2).

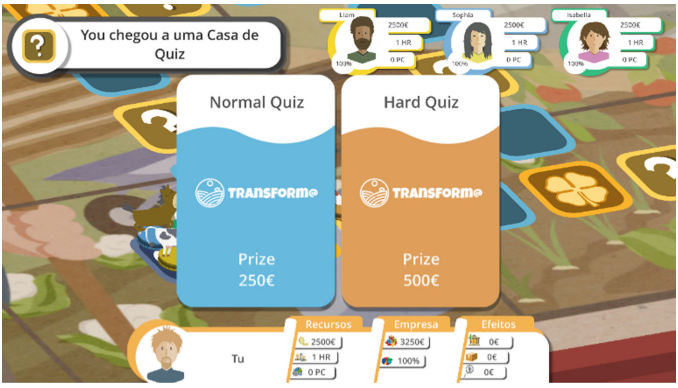

Fig. 2. Quiz spot option

Players can also collect resources through negotiation. After moving to a spot, the player will have a list of negotiation options (some options depend on the amount of resources that the player has) like negotiating with other players, entering job fairs, creating new products, searching for new niche markets, etc. Some of the options have a delayed effect, i.e. the player will have to wait a certain number of turns until he can select them again (Fig. 3).

Fig. 3. Negotiations screen

There is an option in the negotiations that allows the merging of companies. Here, the player launches a proposal to one of the players present and if he/she accepts both companies merge and their resources become the sum of the resources of both players, forming a new company.

In the single player mode, Artificial Intelligence players can have three types:

1. Easy Going
2. Entrepreneur
3. Tycoon

These three levels of difficulty are distinguished by their behavior in the game. For example, a "relaxed" (easy going) AI player will not have the same knowledge as a "tycoon" and therefore will make more mistakes in his actions, he will not be so rigid in negotiations and in the way he manages his resources. In contrast, an "entrepreneur" will be more thoughtful and wise in his choices, committing risks where he can get results. He/she will also be more keen to negotiate with other players while a "tycoon" will have a more aggressive stance (Fig. 4).

Fig. 4. Female avatars for tycoon level

3 Evaluation Results

The evaluation of the Transform@ initiative and serious game was done with a group of 53 students from rural areas. Students were gathered in a game presentation session where they were shown the game and introduced to its mechanics (Fig. 5).

Fig. 5. Transform@ game testing – presentation session

They were then able to play the game on their own for a month, either as single player or as multiplayer. In the end, they completed a questionnaire (25 questions) where aspects related to the Usability, Gameplay and Cognitive Development were assessed, following the proposal by Olsen et al. [24] and the one from Wiberg and Jegers [25]. One open question was provided to gather qualitative comments. Closed

questions used a Likert scale from 1 to 5 where 1 was the lowest score and 5 was the highest score. The set of closed questions used was the following:

Usability

1.1 Is the game intuitive?
1.2 Is the interface intuitive?
1.3 Is the design of the application consistent?
1.4 Is the interface simple and fast?
1.5 Are all the options easy to access?
1.6 Did you had any problem starting a game?
1.7 Does the game has many bugs?
1.8 Could you find other players for the multiplayer mode?
1.9 Would you recommend this application to another person?

Gameplay

2.1 Is the game fun?
2.2 Is the game frustrating?
2.3 Do you think interesting to allow the game to be customizable?
2.4 Was the meaning of each resource perceptible?
2.5 How do you rate the difficulty of the quizzes?
2.6 Did you notice how the negotiations work?
2.7 Do you consider the negotiations important?
2.8 Was the multiplayer mode interesting?
2.9 Would you use this game regularly?

Cognitive Development
Number of Questions Answers

3.1 Is the theme found in this game interesting?
3.2 Does the game encourage learning?
3.3 Do you find it useful to have access to the correct answer of the quizzes after being answered?
3.4 Do you agree that having feedback after one question is a positive point for learning?
3.5 Using this game increased your knowledge and skills?
3.6 The content of the game influenced my understanding of the problems related to e-commerce and entrepreneurship?

In relation to the game usability 39% of the testers considers that it was intuitive. However, 35% had difficulty understanding how the game was played and 26% felt that the game was more or less intuitive. These values made us realize that there is a need to create a tutorial level so that player are introduced to the game features. Regarding the interface, most considered it intuitive, with 52% making a positive evaluation and 13% considering that there were some flaws. The remaining 35% consider it to be more or less intuitive. Most of the players also agreed that the interface was consistent, simple, fluid and facilitated a quick access. Regarding the bugs found in the application, students reported that although they found some during use, they were

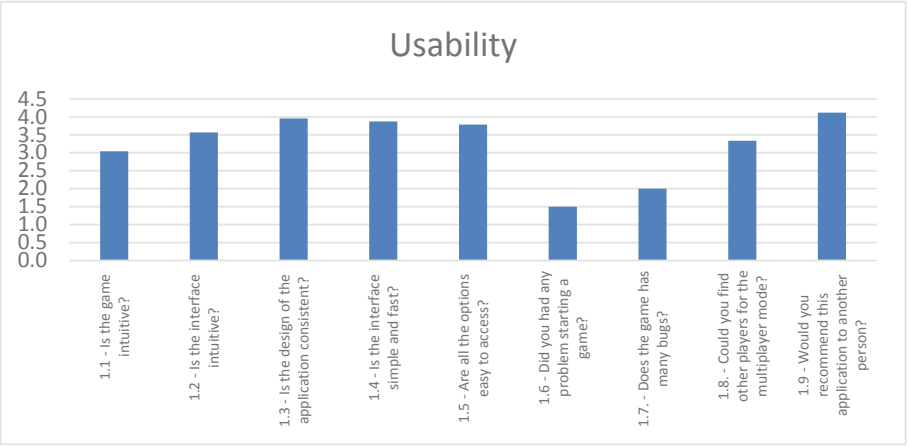

Fig. 6. Usability evaluation (average scores)

minimal things, like a flaw in the menus, or specific situations that happened when the connection failed when trying to connect to a game room.

17% of the testers said that they would probably use this game regularly and 65% were undecided. When asked if they would recommend Transform@ to other people, 43% said they would probably do so and only 9% responded negatively (Fig. 6).

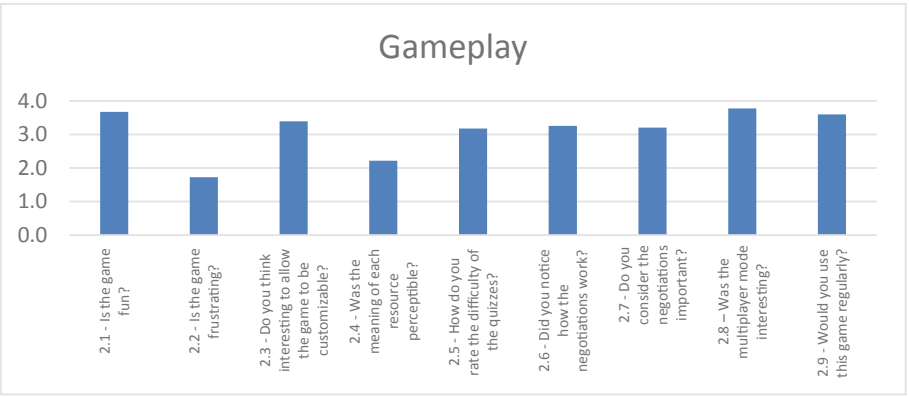

Fig. 7. Gameplay evaluation (average scores)

In terms of gameplay, the majority of the students found the game to be fun rather than frustrating (40% responded that they considered the game fun, 35% felt it was more or less fun, and only 13% responded that the game turned out to be frustrating). In any case, there are some aspects that need to be improved to lessen this level of frustration, like making artificial intelligence decisions more balanced. Another factor that can cause frustration is the content of the quizzes which can repeat quickly.

All the testers considered that customization would be useful (17%) or very useful (57%). Only 26% of people had difficulties in perceiving the meaning of each game feature in the interface. However, 44% of the players had difficulties in understanding how the negotiations worked during the game.

Transform @ has two game modes, a single player mode and a multiplayer mode. These two modes were present in the distributed build to the students who ran the application tests. They were free to choose which way they wanted to test. The multiplayer mode was evaluated very positively, considering that this mode is challenging. 80% had almost no difficulty in creating a room and 60% had no difficulty joining a match (Fig. 7).

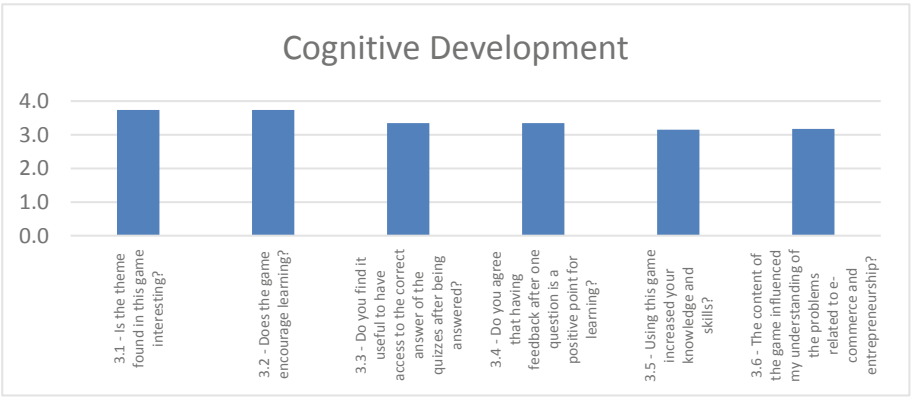

Fig. 8. Cognitive Development evaluation (average scores)

In terms of cognitive development, 57% of the testers considered that the theme of this game is interesting and 52% consider that this game encourages learning (Fig. 8). 26% of the testers agree that the game has helped in a way to increase their knowledge on the subject and 43% say they agree more or less and the remaining 31% believe that playing Transform @ did not deepen their knowledge. As for the content present in the game, this allowed 31% to better understand the theme, while 14% stated the opposite. The remaining 52% agreed that it had no major impact. As the purpose of this serious game was to provide tools that help users to acquire or add knowledge about the area of entrepreneurship and online commerce, this information was transmitted also through the quizzes. In the questionnaire there were three questions about the difficulty of the presented quizzes. The vast majority, 74%, considered that the difficulty is balanced. The testers considered that it was very useful to have access to the correct answers (57%), but also consider it very positive to have access to the explanation of the answer (61%).

In terms of qualitative evaluation, testers mentioned some technical issues and suggestions to improve the application, for example to develop more animations, sounds and to insert elements of humor. Another interesting suggestion was to ask for the movement of the player's pin to be autonomous and only need the intervention of the player when and only it is in a bifurcation, in order to make the matches faster and more fluid.

It has also been reported that the game can be more fun if played with friends in multiplayer mode.

4 Conclusions

Digital games are now very present in our lives. They are able to make the users stay focused and engaged in the gameplay for a long time. This immersion is very relevant for serious games, games that are not produced exclusively for the purpose of entertaining, but rather to pass an important message to the user.

In the case of the Transform@ initiative the objective was to create a product that could motivate and sensitize users to the theme of entrepreneurship and digital commerce in rural areas to foster the creation of new forms of business in those areas. In the scope of this work, a set of relevant products was analyzed and it was possible to verify that there is still a gap in this area, with very few serious games with a similar purpose. The most relevant cases ended up being video-games where business management was the gameplay focus. It is here that the Transform@ serious game distinguishes itself by representing some real business-related situations at the same time as the player is challenged with educational content.

An evaluation of the game was conducted with a group of students from rural areas and the usability, gameplay and cognitive development was assessed. The results were quite positive and participants were very helpful and gave constructive feedback. In conclusion, it was possible to validate that Transform@ can fulfill the purpose for which it was created, giving players a fun and stimulating experience with their educational content. Some of the collected suggestions are pertinent and will be taken into account in order to improve the game and make it more interesting. For instance, the lack of a tutorial level was the factor that most felt missing.

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