User Experience as a Crucial Element of Future Simulation and Gaming Design

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ABSTRACT

Simulations and games have been a perfect training tool for almost half a century. From board games to complex computer simulations – game designers try to make the most faithful representations of everyday issues and depict them as functioning models of wide range of problems that people encounter in everyday life. Creating such an experience ought to results with better understanding of given problem and prepare players for situations that can occur in their everyday work life. But do we – as game designers – focus on the perception of the activities tailored into game? Do players always experience our work as a pleasurable experience? How does that impact their learning outcomes? In this paper author would like to discuss the problem of weak user experience in great amount of computer simulations and its influence on learning process. Author presents new ways of attracting players into learning by doing and propose solutions to strengthen feeling of being a part of loyal simulation of any case study.

INTRODUCTION

During the first decade of 21st century we were witnesses of a rapid evolution of IT world in all of its regions. Web 2.0, social media, mobile internet, smartphones and more spheres of modern technology have changed from secondary tools that support our activities to primary and necessary elements of everyday life. Right now it is quite normal to use multiple screens during different activities, depending on a situation. One of the biggest challenges of that situation is how users of modern technology can interact with the device. That general question has got a lot of variables that will effect in different answers like: purpose of use, time of use, place of use etc. But what is most important with every aspect of human-computer interaction is the influence of a good user experience on the user productivity. Author would like to present why and how to take care of presenting best possible way to interact with software in case of using simulation and gaming.

WHAT IS WRONG WITH SIMULATION GAMES?

Simulation and gaming are very complex tools made for training people in various areas. The most important element is the core mechanic treated as mathematical model or whole software development kit (*engine)* that can be adjusted to a specific representation of reality. In case of business simulations designers often defend themselves that it is not necessary to create attractive interface and user friendly navigation because office software is not meant to be pretty. Assumption that it will be constant situation is the main threat for simulation designers.

Human-Computer Interaction (HCI) has grown up as a scientific area where best practices of that field are created. Either one thinks about graphic or text interactions another related term here is the user experience (UX). It can be defined as qualitative experience while interacting with a product (McCarthy, Wright 2004). By generating better user experience we can deliver much better interactions and – in case of simulation and gaming – better learning outcomes.

In the present day user experience is crucial for most of the developers. With the rise of mobile technologies it can be observed how designers try to deliver successful way of communicating with user. Starting from the first Graphical User Interfaces (GUI) like whole operating systems (Windows) through mobile phone menu navigation, website design (Aranyi, van Schaik 2014) up to whole infrastructure of Internet of Things (Gubbi, Buyya 2013) – the evolution of interface design is still on its way. Rapid growth (see Picture 1) of people who are using advanced technology in everyday life requires to make that contact painless and friendly.

Designers of commercial software, especially for mobile devices know that already as tech companies like Apple or Google release their own methodologies of creating easy-to-use applications. Apple's skeuomorphic approach to design was an attempt to present users a friendly-looking virtual objects – imitating functionality and behavior of real ones. Time passed and the opinion about this school of design among designers and users hasn't change: basing on the example of virtual bookshelf, imitating it in a software will not make the user feel that the experience is even similar to the real bookshelf. Bookshelf user can't pick a book by tapping it on the cover (Carr, 2012). Follower of skeuomorphic design is the flat design which was popularized by Microsoft's 'Metro' style up to 'Material design' by Google which is the main value of newest generation of Android system. Flat design is a minimalistic concept with clean graphics and presenting only the most important features of software: content and message behind using it (Turner 2014). Simultaneously the improvements of the visual side went together with functional one. Modern software has to be understandable immediately and instruction manual were replaced with inside tutorial that quickly demonstrate most important features. More advanced issues can be always explained on the way.

That leads the Author to the second insight about

improvements in HCI. Rising contribution of the generation Y (or millennials) on the job market and the trend of gamification. Research about generation Y and learning (Schofield, Honore 2010) proves that learning is already adapting to new ways of reasoning of younger people. As three most important (in the Authors opinion) of the characteristics of millennials researches presents 'visual, nonlinear and virtual learning', 'trial and error approach to problem' and 'low boredom threshold' which are strongly connected to growing up with video games as the main entertainment medium. On the other hand that preferences are core on another methodology of creating engaging user experience – the gamification. Although gamification is about the use of game design elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke 2011) it does not exclude context of user interface and experience within the game itself.

Rising trend of above phenomena occurrence in the modern software design brings the author to the conclusion that a trial of transferring some of that knowledge into design of modern digital simulations and business games should be conducted. It is a common experience in the Authors work as a lecturer that students are confused when their first reaction is an enthusiasm that they will learn by using game. Then comes disappointment with the look and feel of software that is barely understandable because of lacks in user interface, unintuitive navigation or just dull presentation. That feelings, particularly in comparison to other software available on the market, can produce frustration and insecurity which can result in weakening of the learning outcomes. Moreover, there is a strong belief that using good visualization of simulation output (results of decisions) helps non-experts (like students and training participants) in understanding complex systems and theories that are suited into software (Saw, Butler 2008).

HOW TO CHANGE THE CURRENT SITUATION?

Improving UX in any product must start from evaluation of effectiveness and level of convenience of chosen software. It can be done by observing and measuring how users interact with the simulation. Indicators like time taken on a decision or whole decision round, numbers of errors in answers, correct resource management etc. Time reduction appears to be crucial and there is the belief that good UX redesign eg. can cut training time in half (Hollis 2013).

Second part of evaluation should have more of a qualitative character. Based on ethnographic studies conducting an interview with old users or observation of fresh users would check correctness of qualitative indicators selection and will give more information about subjective experience and behavior (Rebelo, Noriega, Duarte, Soares 2012). Qualitative part can be supported with using persona creation. It is a method invented in 1999 (Cooper 1999) which presents an archetypes of actual users describing their goals, needs and ways of work. Gathering that information into similar groups will effect in few different personas that will represent most of the users. By doing that the design process will focus only on the most important elements for the end user (Williams, Brereton, Donovan et al. 2014).

Heuristics are another method which serves as design guidelines in software production. In the current research (Desurvire, Caplan, Toth 2004) we can distinguish four categories in case of game development: game play, game story, game mechanics and game usability. Each category contains heuristics that are a general description of category characteristic elements like: 'Player should be given controls that are basic enough to learn quickly yet expandable for advanced options' or 'provide immediate feedback for user actions'. During research each element was tested by various

PICTURE 1
EVOLUTION OF THE USER INTERFACE (IDA 2012)
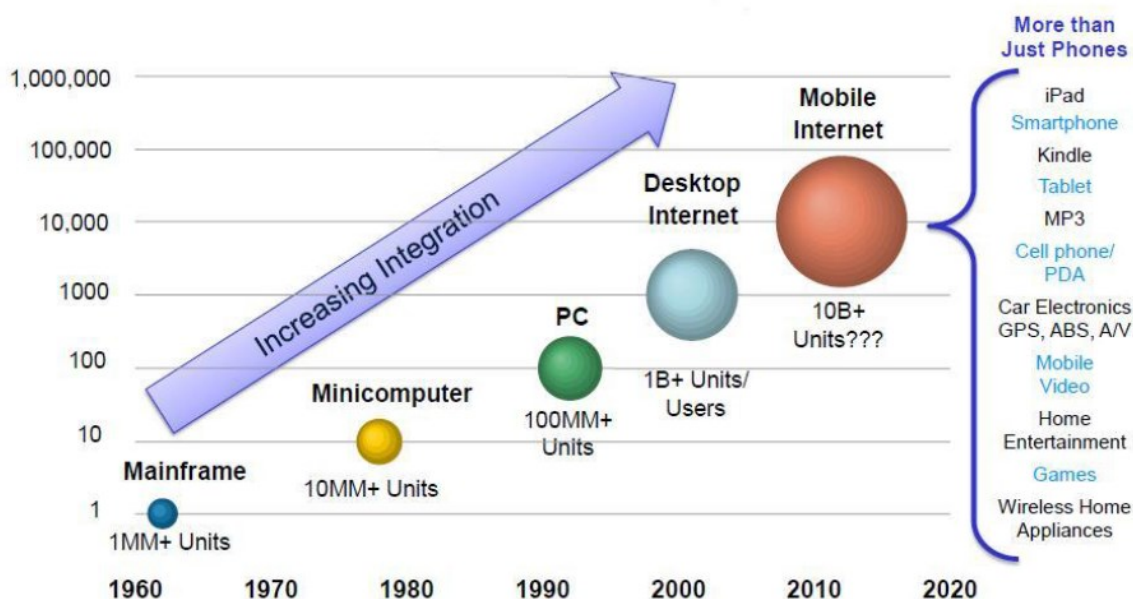
players which resulted with delivering more structured version of these player' point of view. Researchers used that with success in preliminary design phase, but it can be used as well during whole design and development process.

Last tool that the Author would like to present for design optimalisation is based on the flow theory by Csikszentmihalyi (1990). Flow is a state of concentration or complete absorption by an the activity at hand and the situation. It is a general observation that can be found in every kind of activity – main difference will concern intensity of flow. Flow Design Method (Mahnke, Hess 2014) is based on that theory and contains four steps: data collection, data analysis, information system design and information system evaluation. Each of them is conducted from the perspective of psychological flow theory which results in optimal user experience that strengthen motivation and engagement.

COMPARATIVE ANALYSIS

To legitimate the above statements, Author provides a comparative analysis of two business simulation games. Aim of the analysis was to find how user interface of the game influences learning quality. Chosen simulations were well known to Author in both: their design process and teaching aspects. The main difference between them was the time they were developed at. The first game, which is MANAGER, was created by professors Witold Bielecki and Oktawian Koczuba in 1990 (BASIC programming language) and was converted to newer operating systems in 2005 (with help of Marcin Wardaszko game was remade into Java). Second one – Hotel Stars – started the development process in 2012 with finish in 2014.

MANAGER

A simulation game made to teach process of commercialization of state-owned companies. The case and scenario were based on Polish economic situation in the early 90's. Designers of the game focused on transferring reality of a TV sets manufacturing company with lots of employees, strong trade unions and high production costs into the mathematical model. Each team of players had to take up to 33 decisions per round. The decisions were grouped into sections like: strategic investments, material purchase and production schedule, scale of employment, changes of salaries, R&D, market offer and marketing mix, finances and credits. Each round translates into six months in the game time. Players take role of new executive managers and they have access to crucial information such as financial reports and sets of decisions of their predecessors. After making decisions, by filling out decision form, players receive the simulation results printed out on paper (Bielecki, Wardaszko 2010).

The simulation process is quite complicated. Computer merely supports the process of calculation of the market situation – everything else, like decision results analysis is based on players mathematical skills. Picture 3. shows a player and arbiter interfaces of the game. It's simplicity is a result of the software origins, which is way back in 1990 and text based interaction between human and the application.

The only feedback element for the player/arbiter (in the means of software design) is the color of input fields – green means that it is value from previous decision round; white states that the specific input field was changed during current period. Making decisions was hardened by analyzing printed out results. That extended time of understanding situation of virtual company in a new period. Players had to calculate the numbers and try to forecast future development of the market. After that decisions were written down on paper sheets and handed out to the instructor who had to transfer it manually to the simulation.

PICTURE 2
SAP USER INTERFACES. UI EVOLUTION (SAP SE 2014)
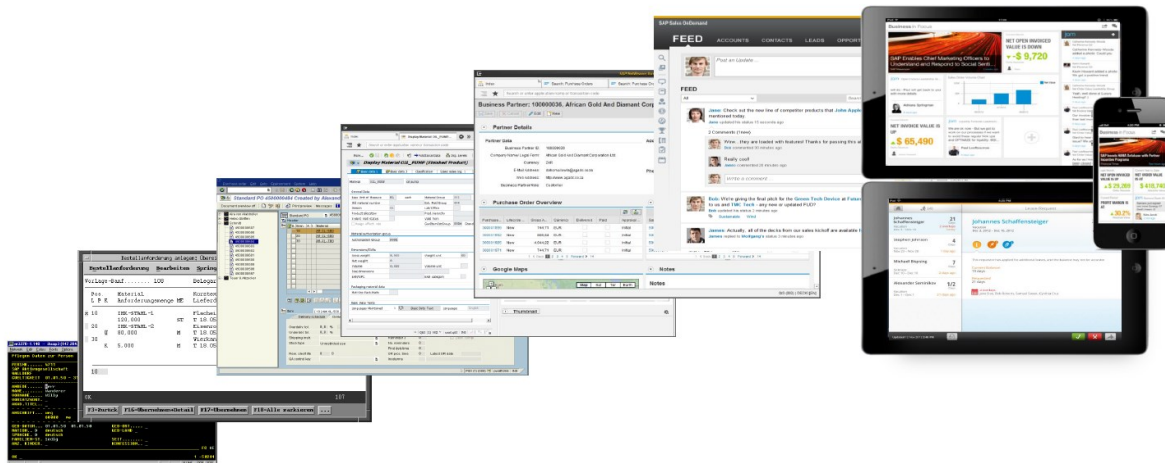
Again that way is time consuming and susceptible for mistakes (like adding one more zero to the value written by player) which can perturb whole simulation.

Author selected this case on purpose, being aware that many of contemporary games look slightly better in the visual way. But do they? Even one of the most popular business simulation in Europe – TOPSiM – is still mostly about inputting numbers and printing out results of computer calculation. Deficiency of feedback about players actions seems to be main flaw in business simulation games. What can be done is to learn from modern software and games design and implement it into existing or upcoming simulators. In Author's opinion that is the natural way of software evolution. Most of contemporary computer simulations descents are in text based environments. When developers are trying to update it to new requirements of operating system or just for next functionalities they neglect standards that are in force when it comes to look and feel of interface.

Story of development in simulation software on a worldwide known example – Marketplace (Innovative Learning Solutions, 2014) – shows how long and difficult is the road of delivering successful solution. Even with constant evolution and adding user friendly tools like chat, blog or virtual badges (badges are one of the newest update, probably because of the popularity of gamification trend (Jakubowski 2014)) Author meets various opinions from his students from recent years. These are people mostly born in 1990 – 1993, almost same age as Marketplace itself. However they often feel lost and confused during first rounds of the simulation, which affects taking decisions.

PICTURE 3
MANAGER: DECISION PANELS (IN POLISH)

PICTURE 4
HOTEL STARS: STORYBOARD OF CLIENT SERVICES
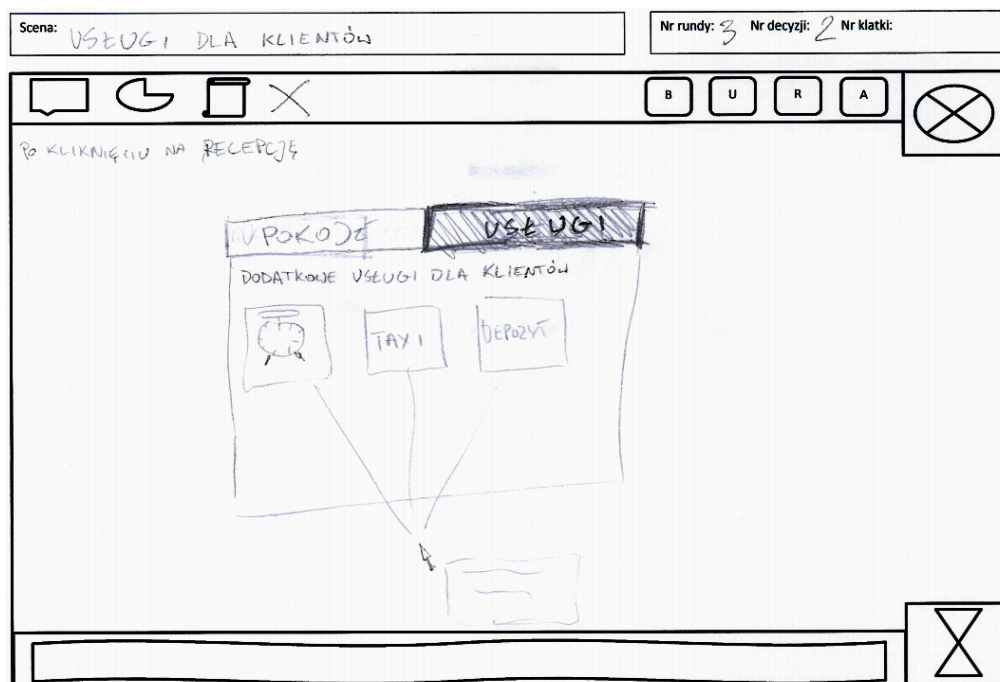
HOTEL STARS

The game was designed to support new course for high school students in Poland called "Economics in practice". Players are taking the role of hotel management team. During 16 decision rounds which transfers to 16 quarters (4 years in game time). Mathematical model is based strongly on hotel industry in Poland. Values like wages, room and service prices, administrative costs are taken straight from the market and adjusted into model requirements (Wardaszko, Jakubowski 2013).
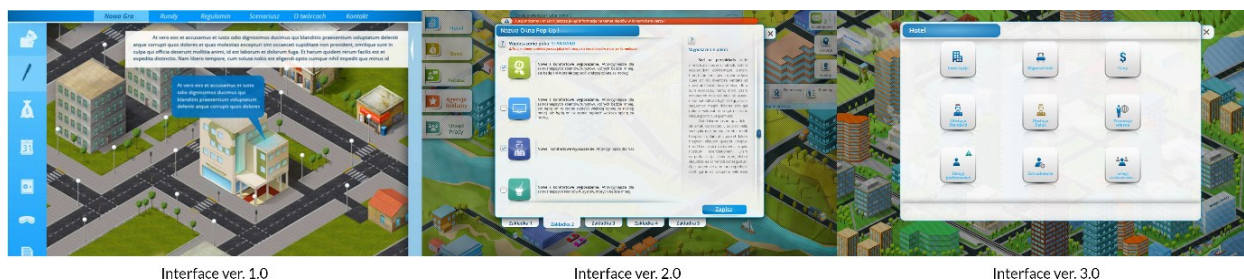
Author wants to treat this particular simulation game as a best-practice example of improving existing simulation software and/or designing a new one. Hotel Stars designers have used user centered design as a core methodology of game development (Pagulayan 2003). First, the identification of core users was conducted among 362 students of high schools. Each of them filled out a questionnaire which contained questions about students' demographic structure, game playing habits, preferences and opinions about learning with use of games.

Based on that research, designers of Hotel Stars started the main part of their game development. As for user interface the first phase of its design was creation of game scenario – each round was described step by step and decision by decision. After that, each member of the design team (4 people) received a task to create storyboards of the scenario. Using a template of screen with the first version of interface they sketched every

possible interaction and decision making process, like choosing available hotel services for clients (Picture 4.). Gathering every vision together and discussing it over was next big step in Hotel Stars design. By doing that the design team could choose possible best working and looking solution for final interaction design.

Completed scenario with storyboards was a starting point for software developers. In the meantime they were consulting the design team about such aspects as interaction schemes for making more complicated decisions, ways of representing progression and feedback etc. Another challenge for the designers and developers was that interaction within game had to be possible also on touchscreen devices, such as tablets and smartphones. Finally there were three versions of interface for the user (Picture 5.). Version 1.0 was most similar to the storyboards, but at the same time the look and feel of it turned out to be outdated. Poor palette of colors, lacks in visual indicators of company indexes and rather depressing map of hotel neighborhood were main reasons that this vision was not accepted. Version 2.0 presented itself much better. Users could distinguish decision areas not only by an icon but also with use of colors, status bar appeared at the bottom with such indicators as current state of cash, number of rented rooms and the number of the current round. Biggest problem was connected to excessive length of text messages inside popups in decision areas. Basing on these observations, game creators improved most important defects (eg. adding current demand and place in

PICTURE 5
HOTEL STARS: INTERFACE ITERATIONS

Interface ver. 1.0   Interface ver. 2.0   Interface ver. 3.0

PICTURE 6
HOTEL STARS: ADMINISTRATOR PANEL

ranking on the bottom status bar; moving text from popups to clickable icons with question mark on them) and that is how version 3.0 become the final iteration of the game.

Administrator panel is as well important in design process. In Hotel Stars the final version of it was consulted with more than ten high school teachers. Development team observed and noted down every issues and comments that appeared during focus group meetings with the teachers. Picture 6 presents final look of the panel. Colors were used to represent current state of player or game. Settings for games, teams and players were placed on separate screens to avoid misunderstood and confusion.

Last area that Author would like to focus on are the buttons and fields designed for different kinds of decision making. Due to the general assumption of technical game design – the possibility to play Hotel Stars on touch devices – every interactive area had to be big enough for average fingertip size. Picture 7. Represents set of every kind of decision making button/field in the game. They are described below.

A. Button with illustration: briefly describes output of the decision;
B. Value input field: numerical or alphabetical values chosen by player;
C. Fixed value selection: speeds up entering numerical values;
D. YES/NO buttons: agreed/decline decision;
E. Slider: speeds up entering numerical values;
F. Question mark: reveals detailed description of decision area.

What is more, two ways of navigation in the game were introduced. First – players got shortcuts to every decision area placed as context buttons on the screen borders. Second – it was possible to click onto special buildings on the map like city hall (decisions about taking part in social initiatives organized by city government), bank (credits, investments) or hotel building itself.

The amount of time that passed between creation of these two games is ages in terms of software development advancement and techniques, but it was Author's first assumption to better underline the research problem by operating on extreme examples. If a learning tool, as we treat business simulations, has got 'game' word in the category name it has to be closer to video games than to more sophisticated excel spreadsheets. If not – simulation designers risk of discourage and ill will of future users of their product. Second assumption is that with new methods of perceiving interactions between people and computers, there are new ways of data visualization and quantitative analysis. By implementing them into simulations designers can build huge advantage of users satisfaction. Final finding aims the role of observation and qualitative research in design process. With better understanding of user needs and behaviors, better simulations will be delivered.

FURTHER RESEARCH

The authors intention is to create an experiment that will test theoretical concepts and methodological tools presented above in a way that would clearly show effects of that methodology. Experiment will consist of Creating an optimization tool for a marketing resources distribution within a large FMCG corporation. Representatives of two research groups will work with help of one of two tools during the experiment. First one will be similar to spreadsheet with special macros that will wait for user to fill in exact fields in exact order to prepare optimal plan of a marketing campaign in a large geographic region. Second tool will have gamified interface with instant feedback elements like progress bar. That experience will be built on Flow Design Method so the representation and methods of completing task will be more game-like. Both tools will simulate the same process, but Author provides different results in indicators like number of errors, time spent on particular decision or level of user satisfaction. Described experiments are still in development, but Author hopes to present the results during the second half of 2015.

Biggest deal and challenge for all simulation and business game designers is now the rate at which changes occur in the software development. A lot of great productions are risking rejection from growing generations of students and training attendees. User experience is what modern technology put at stake and ignoring that attitude can effect an undesirable result.

PICTURE 7
HOTEL STARS: DECISION BUTTONS
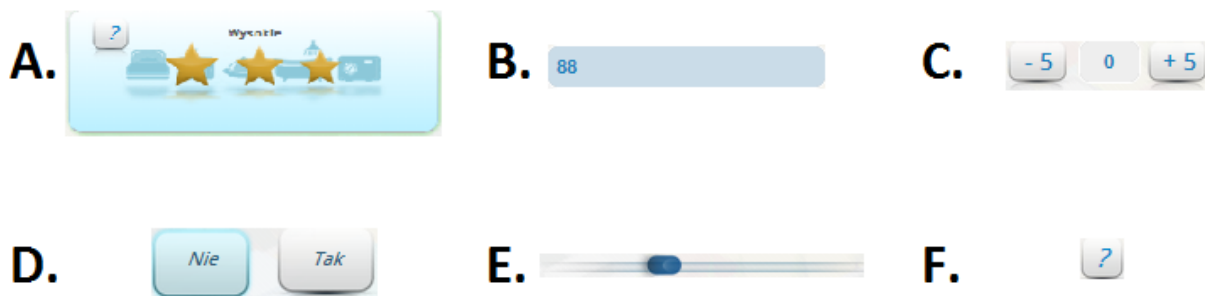
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