

# BRINGING FUN TO SERIOUS LEARNING – HOW BUSINESS SIMULATIONS CAN TAKE ADVANTAGE FROM VIDEO GAMES

Michal Jakubowski  
Kozminski University  
mjakubowski@kozminski.edu.pl

Jakub Ryfa  
Economical University  
jakub.ryfa.87@gmail.com

## ABSTRACT

*Video game design strongly relies on such combination of game mechanics that will at first gather players attention and then maintain it for a long time. There is no doubt that simulations can be engaging too, but that is different form of bond between user and software. Following paper focuses on means of evoking higher engagement for using learning tools such as business simulation games. Authors present post-mortem of design and production process of example game which uses their conceptual model that evokes fun by giving player more feedback and more possibilities to challenge their skills and knowledge.*

## INTRODUCTION

Serious games are a phenomenon that have existed as a learning tool for over a half of century if we will consider only digital ones. Starting from 1955 with the logistic simulation developed for the US Air Force by RAND corporation (Raghothama, Meijer, 2014) its efficiency of learning quickly transferred to business schools as for example, with Top Management Simulation and later to other areas of training of education (Woods 2004). Today serious games have broad meaning that includes many subgenres like advergaming, edutainment, edumarket game, diverted game and simulation game (Alvarez, Rampnoux, 2007). What is differentiating them from entertainment digital games is that primary purpose is other than pure entertainment (Chen, Michael, 2005), although it has video game structure (Djaouti, Alvarez, Jessel, 2011). That naturally influences design process of serious games and have its implication on the game and gameplay itself. There has to be right combination of educational values and video game design elements that are fun and engaging (Schell 2015).

What the authors observed from their practice with business simulation games is that a common feature is their lack of fun and entertainment such as that which can be found in video games. That lead the authors to the idea of developing a management simulation which will engage users because more effort has been put into creating experience similar to what can be found in off-the shelf productions of games. Authors put stress on good look and feel of the game, easy to understand navigation of the interface and engaging storyline. Following paper will describe how design science research was used during development of the game and game structure itself. Closing chapter of this paper will present conclusions of used methodology and state some open questions for further research.

## DESIGN SCIENCE RESEARCH IN SIMULATION DEVELOPMENT

Design science as a research methodology is oriented on problem solving and improvement of current solutions. Roots of the methodology are in classic work by Herbert Simon – *The Sciences of the Artificial* (1969). A characteristic of human beings is that we can create and use tools for tackling obstacles. By doing that we explore new areas and disciplines. Now almost the same process was restructured into generating new knowledge. Design science research has its base in already created knowledge and transfers that into construction of artifacts that serve people. Main difference between design science and analytical science is the characteristic of knowledge generated during research. In explanatory science the research is perceived as seeking of truth (van Aken 2005). Outcome of such research can be a theoretical model that describes rules, patterns and relations of observed phenomenon. Design science has a more pragmatic characteristic. In this context research is a search for understanding and improvement of performance in different contexts.

Design is also an inherent and important step in creating Information Systems (IS). It is treated as part of IS research cycle that creates and evaluates IT artifacts intended to solve identified problems (Hevner 2004). Hevner's framework of Information Systems Research describes how environment and knowledge base influences design and development of IS. When it comes to environment it has to be considered what people, organizations and technology will be taken under the scope. By doing that one can assure relevance of research. On the other side the upkeep of rigor when choosing applicable knowledge from overall knowledge base is crucial for appropriate research. Selecting and applying related foundations and methodologies influences quality of research. Next research step is to develop artifact (or theory) and assess it by evaluation in form of experiment, case study or simulation. That leads to refine of research development and working tool that is built on existing business needs with use of applicable knowledge. If needed – process of assessment and refinement can be repeated and later on can contribute to environment (by creation of proper solution) and knowledge base (by addition of new knowledge) (ibidem). Hevners' framework applies in building information systems. That process can be transferred to simulation games, which design base on practice experience and knowledge bases.

But how one can use design science research when it comes to simulations and gaming? Klabbers defines design as invention of courses of action aimed at changing existing situation into preferred ones. He describes two dimensions of

design: “design-in-the-small (DIS), referring to simulation game design as such, and design-in-the-large (DIL), referring to changing existing situations into preferred ones” (Klabbers 2003). Both DIS and DIL are in close relation and effects on one level influence everything on second one. DIS focuses on design, implementation, observation and improvement of examined game. Then DIL after observation of what happened during DIS will formulate conclusions, create generalisation and describe it as a knowledge contribution.

In his follow-up article from 2006 Klabbers constructs framework for linking the analytical science and design science to help with cooperation and understanding between practitioners of both research paradigms. Secondly it is a powerful tool for advanced research of information systems and simulation games as well. Analytical sciences (or community of observers) are presented here as obeying rules of their paradigms and those who pay attention to reconstruct the past. Design science (or community of practice) aims for shaping future. Using knowledge from community of observers is desired as long as it contributes to building the artifacts (Klabbers 2006).

### FOUNDATION OF THE ARTIFACT

The starting point for creation of Authors new game was maladjustment. Already known simulations and decision games that explains business concepts and problems are almost always tremendous systems of interrelated variables and functions that with guidance of arbiter can provide learning outcomes. Another thing is that it is hard or impossible to play decision games like total management simulation in solo mode – either just for fun of playing or to experiment with different set of decisions than in first attempt. Final problem that we identified is aversion for outdated user interfaces and user experience in general in most of business simulations. People used to fancy

smartphone GUI of modern operational systems are mostly disengaged when they have to work on something which is basically ugly and hard to operate.

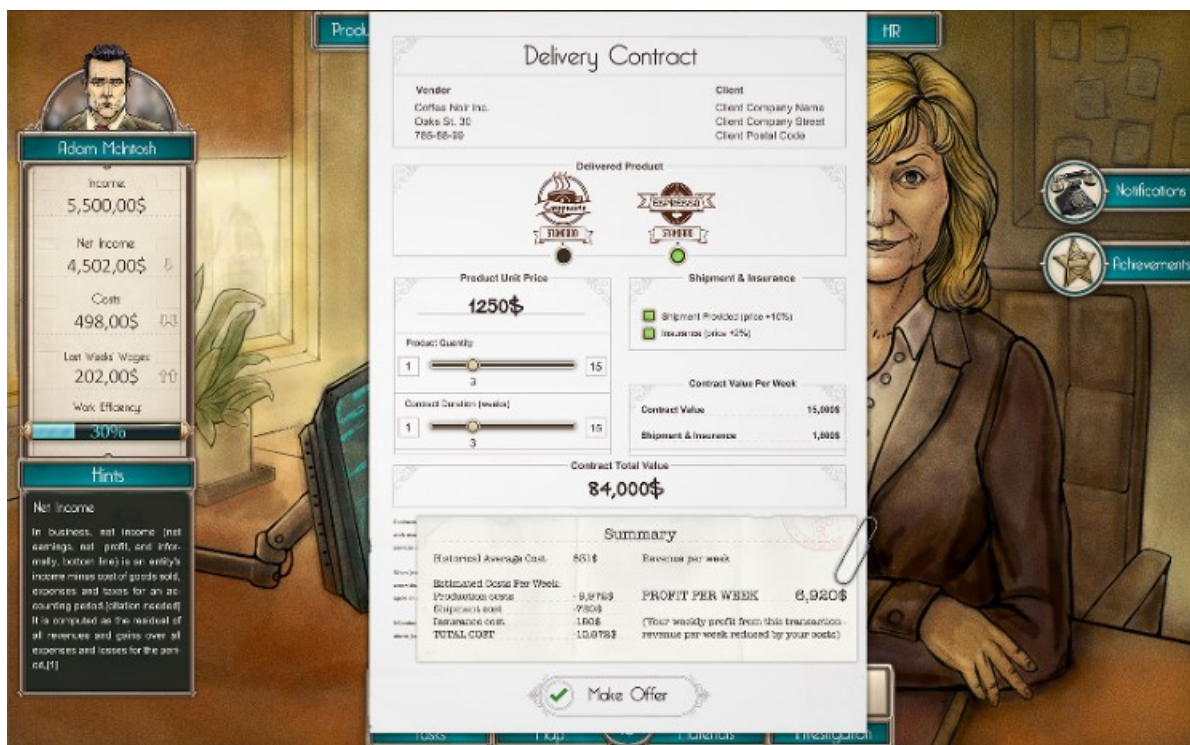
In 2014 one of the Authors started his work with new game that would deal with identified problems of business simulation games. Second Author joined him as a consultant in 2015. Game was part of bigger project financed by European Union which aimed for creation of internet platform for distribution training and educational games. Coffee Noir is first title available there. Direct inspiration for the game were computer strategy games of the genre called Tycoon, which can be synonymous to Total Enterprise Simulation. Innovative element of it is expanded narrative structure that have impact on overall gameplay.

Authors like to refer also to procedural rhetoric concept created by Ian Bogost. As he state it is “...a general name for the practice of authoring arguments through processes (...) Procedural rhetoric entails expression – to convey ideas effectively (...) its arguments are made not through the construction of words or images, but through the authourship of rules of behaviour, the construction of dynamic models” (Bogost, 2008). That concept grounded Authors idea to move forward with business simulation design and use more abstract representation of learning content. Who said that you can learn about business only by management of a serious companies.

Authors idea of moving out of the seriousness of serious games and achieve same learning goals with use of abstract representation.

Knowledge base and substantive layer (economical model, educational written content, decision-making logic, negotiations) was created during researchers done by researchers from Economical University in Poznan, Poland with cooperation of game designers, developers, players and testers. Whole written content was made by person with professional writing experience.

**FIGURE 1**  
**GAME SCREEN OF CONTRACT NEGOTIATIONS. COFFEE NOIR 2016**



Main goal of the project was to achieve higher engagement into learning by doing with use of educational computer game. Authors assumed that well-made narration and main story plot will influence growth of engagement. Second assumption was attractive and theme-stylized graphics layer with user friendly interface will add to engagement. All of that was aimed to make the business simulation as close to computer games as possible with keeping quality educational values at same time.

Achieving higher engagement with use of video games design lead authors to taxonomy of fun: theoretical model constructed upon analysis of player experience (Lazzaro, 2004). According to that research more emotions are evoked in players when more kinds of fun are situated within the game. Serious games like business simulation games are focused on hard fun, which is about emotions from meaningful challenges, strategies and puzzles. Basing on above research Authors decided to bring other forms of fun into players experience to achieve higher engagement into learning process through game.

## GAME DESCRIPTION

The game is situated in noir-like fictional retro-futuristic city of London 2021. Player is a private detective that got an assignment to find a businessman from coffee industry. To do that players task is to blend-in that specific business environment and look for clues. For camouflaging purposes player is ought to open new coffee distribution business, survive on the market and solve the case at once.

Coffee Noir is a single-player experience divided into 48 rounds. Overall gameplay time average is set to 18 hours when played for the first time and about 15 hours if the system, user interface and some of decision outcomes are familiar for user. Players task is to analyse market data and transfer that into proper business decisions to make the company running. Simultaneously player has to look for clues which is hidden under negotiation module. Players character talk with main suspect undercover by different goals (making new contracts for company). On the educational level we state that learning goal

for our game is to understand basics of business administration and business environment. Players objective is to run the company as good as possible with relation to its competition, game world events and market values and statistics.

Game has two main modules – enterprise simulation and conversation module. Both are closely interrelated (figure 2). What happens inside one of them have its outcomes in second. It is impossible to skip one of this modules – to progress player needs to make decisions in both. Hereby two learning objectives are fulfilled during gameplay session.

First module keeps player to manage different areas of company:

- Production optimization – setting volumes of production,
- Marketing campaigns – choice and calibration of promotional campaigns that increase demand for coffee,
- Managerial practice – task assignment for employees, mostly accounts that search for new clients,
- Finances – costs supervision, loans,
- Human Resources – employees competences development,
- Sales – creating offers, meeting customers.

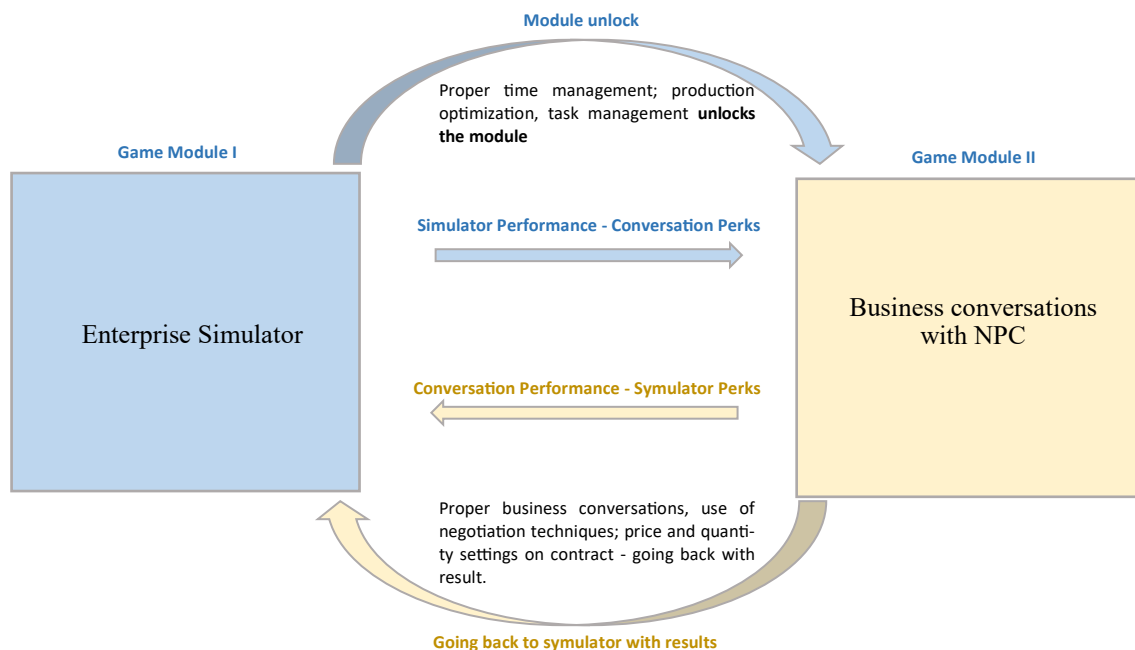
That module has also two other important elements:

- Narrative elements – overview of gathered clues and other elements needed to solve the case,
- Random events – additional challenges that influence players company.

By optimization of every area in the company player has opportunity to open conversation module, gather new contract and get more clues for the case. If company situation is better than expected then player have additional perks to use during the conversation.

Second module focuses on negotiations techniques. Player needs to discuss contracts and agreements conditions during simulated talk with Non Playable Character (NPC). The better

**FIGURE 2  
FORCE-FEEDBACK MODEL USED IN COFFEE NOIR**



shape the company is in – the better opportunities of conversation have player. Each conversation has three phases:

1. Entry talk (how to behave before showing offer)
2. Offer submission and set of details,
3. By using negotiation techniques player can influence talker to give better conditions of contract.

After successfully finishing negotiations player is back to first module with addition of new income from just signed contract, new client for future cooperation and probably new clues for case.

Two modules of the game could be separated and exist as separate games. What is used here is kind of force-feedback of input and output data between modules. That strengthens the idea of better performance within each of modules so it can be easier to go through next one. The player spends more time in the company simulator module and negotiation module can be treated as a reward for well-played rounds. It is also some diversity for players – whole simulation module takes 48 rounds to complete. Good performance in both modules gives player feeling of having control. If there is poor performance then player gets notifications about possible changes he can do.

## DESIGN AND DEVELOPMENT

According to Klabbers framework authors created an artifact that is focused on local knowledge and unique circumstances. The knowledge contains of theory behind negotiations, econometric model and video game design. Circumstances like new generation of students and rapid development of how we interact with modern software. That lead Authors to designing innovative simulation game which will bring new knowledge of how this specific design works in terms of learning outcomes and students engagement.

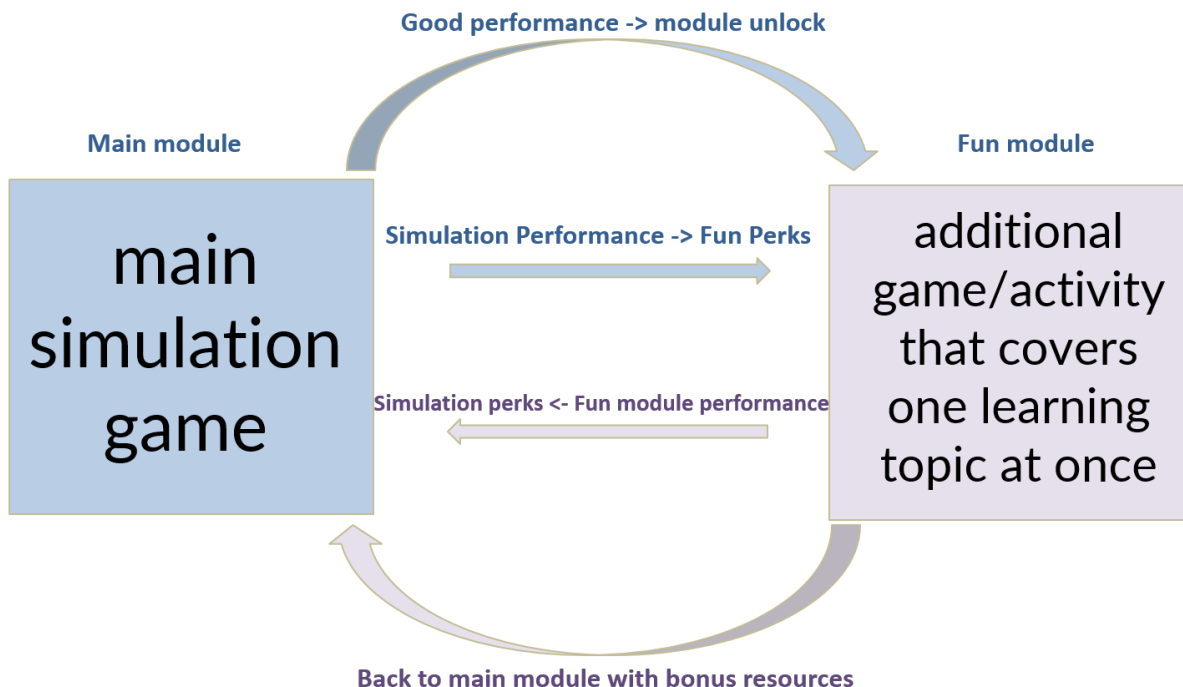
Following DIS and DIL relation of simulation design

Authors are now in third round of DIS cycle. First was done by themselves and it put stress on creating and combining two main modules of simulation. Then after evaluation of first simple tests of how works interrelation of them we made some adjustments which were mainly connected to econometric model. Second round, with revised game features, was conducted with external testers. That lead to outburst of identified insights and problems basically with every aspect of the game. After dealing with feedback from second round of tests and implementing that during second DIS Authors are right now before releasing Early Access of the game, open for everyone interested. Adjustment of game will be made on the go, which means many small iterations rather than releasing one big new version of the game.

Authors are treating their force-feedback model as side-effect of artefact development which can be perceived as a contribution to simulation and gaming knowledge base. Purpose of that model focuses on building additional activities to main simulation that will extend players engagement. The name is taken from system of gaming devices (joysticks) that allows user to feel physical attributes while playing video games (eg. vibrations of controller when racing car hits the wall). In Authors vision of the model the feedback of simulated reality is forced by additional feedbacks that are additional content of knowledge related to main topic. Below we describe its ‘clean’ version with description of its elements.

Main point of presented model starts on the left side with actions undertaken within simulation game. Core decisions that have influence on players final performance are all present in that part of the model implying that simulated scenario can work without any additions. According to Authors statement that making simulation more similar to video games is something that will create better experience of gameplay – second most module is here to bring fun. That part of the model is destined to show complementary learning topics to main simulation but with less serious attitude. It can be presented as

**FIGURE 3  
FORCE-FEEDBACK MODEL**



mini-games or small activities that will give player some rest from main simulation and will be a possibility to gain profits that can be used in main simulation module.

Force-feedback happens here between main module and fun module with two way course. First, starting from main module - it should deliver possibility to access additional interactive content, activity or mini game in fun module. That can happen only if certain score is achieved (eg. In term of player performance at the end of each round). Unlocked content should be somehow connected with the area that lead to its release. Later flow goes from fun module back to main module. Good practice here is to award that not obligatory activity with some perks that can be used back in main module. Beside of getting feeling of accomplishment player is more likely to come back later to fun module for more perks. It is strongly recommended to test fun module components upon its attractiveness for players – it is easy to fail here if additional content will be dull or too hard.

## CONCLUSIONS AND FUTURE RESEARCH

Using design science research methodology while creating Coffe Noir provided a logical structure for the overall project. With methodological approach Authors were more sure that final product will fulfil their assumptions of creating fun and engaging simulation. Force-feedback model is most explicit outcome of that research that can be used in later phases. The model itself is already in use in one of other game concepts made by Authors. First reactions of players after releasing the game to the broad public are very positive.

Further research will deal with answering the question if business simulators like Coffee Noir are better in generating knowledge transfer than games well known on educational field but without elements like strong narrative or force-feedback model of players engagement. Next step can be addition of interactions between players, how competitive elements like comparing best results of different players can influence engagement and gameplay.

## REFERENCES

- Alvarez J., Rampnoux O., (2007) Serious Game: Just a question of posture?, in Artificial & Ambient Intelligence, AISB'07, Newcastle, UK, April 2007
- Bogost, I. (2008) The Rhetoric of Video Games. In The Ecology of Games: Connecting Youth, Games, and Learning. K. Salen, eds. The MIT Press, Cambridge 2008
- Chen, S., & Michael, D. (2005). Serious Games: Games that Educate, Train and Inform. USA, Thomson Course Technology.
- Djaouti, Damien; Alvarez, Julian; Jessel, Jean-Pierre (2011) "Classifying Serious Games: the G/P/S model" [http://www.ludoscience.com/files/ressources/classifying\\_serious\\_games.pdf](http://www.ludoscience.com/files/ressources/classifying_serious_games.pdf) Retrieved 26 February 2016
- Lazzaro, N. (2004). Why we play games: Four keys to more emotion without story.
- Klabbers, JHG (2003) Gaming and simulation: Principles of a science of design. *Simulation & Gaming*
- Klabbers, JHG (2006) A framework for artifact assessment and theory testing." *Simulation & Gaming*
- Raghothama, J., Meijer, S.A. (2014) A review of Gaming Simulation in Transportation, in *Frontiers in Gaming Simulation: 44th International Simulation and Gaming Association Conference, ISAGA 2013 and 17th IFIP WG 5.7 Workshop on Experimental Interactive Learning in Industrial Management*, Stockholm, Sweden, June 24-28, 2013. Revised Selected Papers
- Schell, J. (2015) *The Art of Game Design. A Book of Lenses*. Second Edition. CRC Press.
- Woods, S. (2004) Loading the Dice: The Challenge of Serious Videogames. *Game Studies* volume 4, issue 1, <http://www.gamestudies.org/0401/woods/> retrieved 26 February 2016
- Wolfe, J. & Crookall, D. (1998) Developing a Scientific Knowledge of Simulation/Gaming. *Simulation and Gaming*, 29, 7-19