

# **The Added Value of Serious Games in Management Development Programs The Slowesa Case**

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## **Introduction**

For decades it has been common practice to use gaming principles, such as role-playing and simulation, in management development(MD)-programs. The last few years it has also become more common to use serious games in MD-programs. The objective of this article is to examine the use of serious games in this context. The central question is “What is the added value of serious games in MD-programs?”.

The article will first introduce the subject of serious games in order to create a common understanding of what a serious game is and what the key concepts of the serious games domain are. To that end, a definition of serious games is formulated that is relevant for management development.

Secondly the article will give insight in the theoretical learning effects of serious games. Based on a literature study, four hypotheses on the learning effects of serious games are formulated.

The hypotheses will be researched in practice, by analyzing a game designed and developed for and in collaboration with Capgemini, called *Gaining Leadership*. The addition of this practical case will give more insights in the added value of serious games in MD-programs, and help to assert the four hypotheses described in the previous paragraphs.

## **Defining the Subject - What is a Serious Game?**

A large variety of definitions and approaches to the serious games domain exists. This paragraph does not aim to come to a comprehensive and congruent definition of serious gaming, nor does it aim to come to a complete overview of approaches. This paragraph does aim to introduce a simple definition of serious games as well as the key concepts that might be relevant in the context of management development programs.

### **General Definitions of Serious Games**

In the last few years the attention for serious gaming has increased considerably. Although neither the term nor the phenomenon ‘serious games’ is new. One of the first times that the term was used, was as the title of a book by Clark Abt in 1970, well before the introduction of computers into mainstream entertainment.

A very simple and rather straightforward definition of the term serious games is “games that do not have entertainment, enjoyment, or fun as their primary purpose” (Michael & Chen, 2006, p. 21). Mike Zyda (2005, p. 26) adds to this “[a serious game is] a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.”. When combining the aspect of the “mental contest” with the non-entertaining purpose of a serious game one can conclude that the heart of a serious game consist of a mental contest that trains certain mental skills of a player that he needs in the world outside the game. Serious game developers speak in terms of ‘game rules’ that train specific mental skills in order to reach a specific ‘didactic goal’. Mastering the rule set of a serious game demands the exact same mental skills from the player/trainee as he needs in order to master the real life challenges of the (serious) topic that game is about.

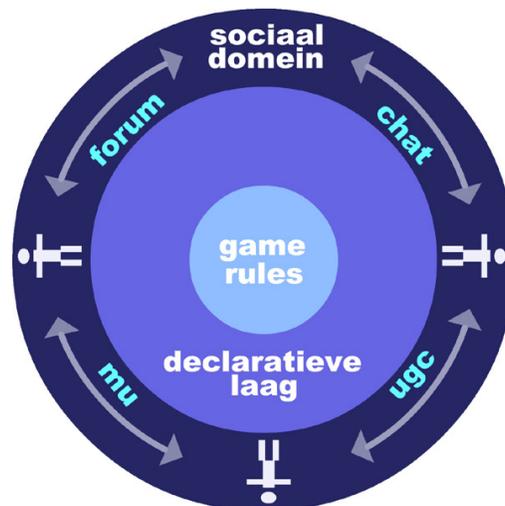
### **Key Concepts of Serious Games for Management Development**

#### **Layers of Information Transfer**

The first important concept to describe is the ‘stratification’ of information transfer in games, that is, the multiple layers on which a game transfers information to its players. Using his *Model of Information Transfer*, Van Mastrigt explains that a serious game transfers information on the ‘didactic goals’ of the game in three ways:

- The first layer on which a serious game transfers information is that of the ‘game rules’. The game rules dictate the behaviour of all the elements within the game and thus determine how the game as a whole works. The game rules are considered the defining element of a game.
- The second layer on which a serious game transfers information is that of its ‘declarative layer’. This shell of the game around the game rules consists of the graphical design, written and verbal information, sound and storyline. Note that it is possible to change the declarative layer of a game yet keep the game rules intact. In essence, it is still the same game yet players can experience it quite differently. This is actually how the localization and branding of games works in practice.
- The third layer on which information transfer takes place consists of the ‘social domain’ surrounding the serious game. This layer consists of players/trainees playing together and/or sharing information on the game. It is in this layer that a trainer can help players/trainees with the challenges they face. Formally, this layer is not part of the game itself, but it is still an important layer and one that game designers need to take into account when designing a game.

These layers can be visualized as three concentric circles, with the core layer consisting of the game rules, the middle layer consisting of the declarative information, and the surrounding, outermost layer composed of the social domain. (Exhibit 1)



*Exhibit 1 - Model of Information Transfer, Source: J. van Mastrigt - The Utrecht School of the Arts (HKU)*

### Experimentation and Feedback

As Abt puts it (Michael & Chen, 2006, pp. 25-26): “Games give “dramatic representations” of the subject or problem being studied, and [games] allow the players to “assume realistic roles, face problems, formulate strategies, make decisions, and get fast feedback on the consequences of their actions” – all without the cost of real world consequences or errors”. In other words, serious games provide a safe environment to experiment with things that are too hard, risky, or costly to experiment with in real life. This aspect is also relevant to experimentation within the context of MD-programs.

Furthermore, in order to stimulate the learning effect of the players/trainees experiments, direct feedback from the game on the actions of the players is essential. A game can give feedback in a variety of ways. For example, by awarding points, by increasing the rank, status, skills of the players avatar or by verbal/textual feedback from non-player characters.

### Immersion, Game Flow and Adaptability

A third important element of a serious game is the immersion of the player. A serious game stimulates that the attention and actions of the players/trainees remain focused on the didactic goals of the game. Game design theory refers to the ‘Flow Theory’ of psychologist Mihály Csíkszentmihályi (2002) when describing player immersion. Csíkszentmihályi describes flow as the ultimate state of immersion. According to this theory a player

will stay immersed (in the 'Flow channel') when he constantly experiences the right balance between the challenges of the game and the his own skills (Juul, 2009). For this reason a serious game has to be designed in such a way that it constantly adapts the challenge to the skills of the player. When the challenge gets relatively too high, anxiety is the result, whereas boredom results from the players skill level being much higher than needed to overcome the challenges of the game. (Exhibit 2)

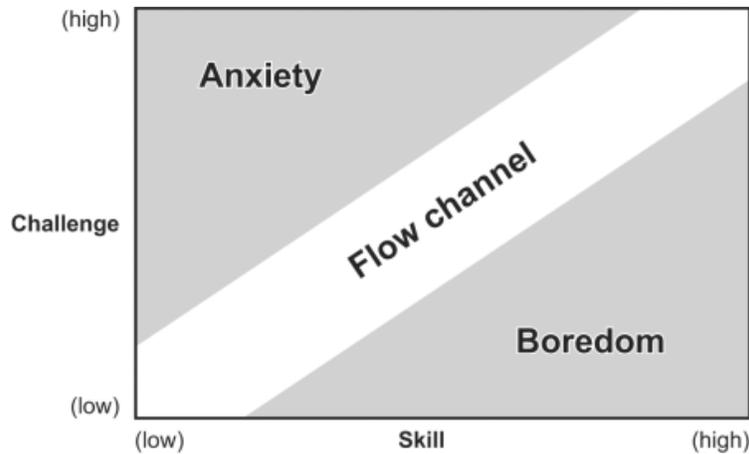


Exhibit 2 - The flow channel of Csikszentmihalyi (Juul, 2009)

### Serious Games vs. (Management) Simulation

Often (management) simulations are used synonymously for serious games. Admittedly these are overlapping phenomena. Although similar, simulations and serious games emphasise different aspects. According to Crawford (1984, p 8) the accent of a simulation is on accuracy, whereas the accent of a serious game is on clarity of the message/topic the game addresses. On one hand a serious game designer deliberately uses exaggeration and simplification to clarify matters. On the other hand serious game designers also use simulation techniques to attain the amount of realism in the game that is needed to fulfil didactic goals.

### Serious Gaming vs. Entertainment Gaming

As with simulations and serious games, the distinction between entertainment games and serious games is not very clear either. It is evident that it is the goal of the first to entertain, and of the latter to educate/train/inform the player. Nevertheless in some situations entertainment games are used for serious purposes as well. Above all serious game designers, researchers and educators argue that fun can be a crucial element to motivate a player to continue playing (Michael, Chen, 2006, p 20) a serious game.

## The Effectiveness of Serious Games – Why do People Learn from Games?

Based on a brief literature study, this paragraph gives an overview of the learning effects of serious games. The objective of the paragraph is to extract properties of serious games that could have added value for management development programs. Based on prior research, four hypotheses on the added value of serious gaming in MD-programs will be presented.

### Social Constructivism

Social constructivism has been one of the leading theories in modern education (see for example: Hmelo-Silver, Duncan & Chinn, 2006). The theory assumes that learning is mainly the effect of the effort of the individual to construct its own knowledge. A person learns by interpreting and restructuring new information and combining it with its existing views and mental models on reality. Constructivism puts emphasis on the interaction of the individuals with its surroundings. The world around him provides the individual with objects and occurrences that might provide new information to refine his existing views and models. A person thus, is a product of his or her environment (Bandura, 1997). Furthermore, social constructivism puts effort on the importance of social networks with respect to learning. People learn by constructing knowledge together.

Generally, the strong link between social constructivism and serious games is asserted by serious games professionals (Egenfeldt-Nielsen, 2006). As Egenfeldt-Nielsen puts it: “For some constructionist thinkers, video games are the lost paradise” (p. 198). Games provide the individual with a micro-world that is a simulation and simplification of the topic that a student has to study: “When interacting with objects in micro-worlds, we are learning about the object’s properties, connections, and applications.” (p. 198). The ‘social’ aspect of constructivism especially applies to games. During play people construct knowledge together. The drive of humans to construct refined mental models is explained by neuropsychologists with the concept of ‘closure’ (Holopainen & Meyers, 2000). This refers to the pleasure experienced by the brain when closing gaps in the (chaotic) information that is provided by the outside world. The micro-world of a serious game keeps on confronting the individual with new information gaps.

***Hypothesis 1 – A serious game provides trainees with a micro-world that stimulates them to construct their own knowledge on the MD-program subject.***

### **Learning by Doing**

“For the things we have to learn before we can do them, we learn by doing them.” (Aristotle, 1999, p. 21)

Paragraph two already explained the role of experimentation and feedback in serious games. This relates to the field of experiential learning. According to experiential learning theory people learn from reflection on concrete experiences (Kolb, 1984, p. 33). Serious games can provide trainees with a believable and relevant context to gain and evaluate concrete experiences.

***Hypothesis 2 – The relevant context of a serious game provides trainees with concrete and meaningful experiences that enables trainees to learn on the subject of the MD-program.***

### **Procedural Rhetoric and the Inside-Out Perspective**

The persuasive power of games has been explained extensively by Bogost (2007, pp. 28-29). According to Bogost, games are form of ‘procedural rhetoric’- the rhetorical power of the individual experiencing being part of a process. A serious game gives the player the ability to control a (complex) process. By reviewing the effects of his actions on the outcome of the process the player learns about the structure of that process. Trainees in MD-programs often have to manage complex processes as part of their daily work, and the notion of procedural rhetoric can be of added value to such programs.

In addition to this, on the 2006 Games developers conference Paul Gee, an influential scholar on games and learning, has argued that in a serious game, the player typically has to solve problems from an inside-out perspective (Dillon, 2006). In other words, the player itself is part of the problems that he/she has to solve. A game might enable a trainee to understand his own role in the things that happen around him in his daily work.

***Hypothesis 3 – The inside-out perspective of serious games helps trainees to understand and manage the complex processes they encounter in their daily work.***

### **Motivation and Fun**

Gaming is evidently associated with fun and fun is associated with motivation. Michael & Chen explain the relevance of fun in serious gaming. Fun is a result of the positive feedback somebody gets from a game. Deen and Schouten (2009) show that resistance of students to learn a new language can be decreased with a language training-game. In order to reach this effect, the game needs to stimulate students’ feeling of capability with respect to the studied topic. Furthermore, the game must show trainees that they make progress with respect to the subject. It is reasonable to assume that comparable effects apply in the context of MD-programs.

***Hypothesis 4 - By giving positive direct feedback on trainees’ capacities and progress, a serious game contributes to the motivation of trainees to study the subject of the MD-program.***

## Case: ‘Gaining Leadership – The Slowesa Pipeline Project’ (Capgemini)

This paragraph provides an analysis of the Capgemini case in relation to the effects of serious games as outlined in paragraph 3. The analysis is based on the results of evaluation questionnaires amongst trainees conducted by Capgemini, as well as interviews with the trainees, puppet masters (explained below), trainers and facilitators involved in the program. Furthermore, the results are based on hands on experiences, as we designed, developed and played the game ourselves.

The premise of the game is the request-for-proposal by the (fictional) Slowessa Line Group for the system integration of a natural gas pipeline planned between Odessa and the Slovakian border. Four companies (teams) are left in the race for this prestigious bid. Players have to work together in their team to overcome plot-based challenges and puzzles, with the acquisition of the system integration project as the final goal. The team with the best and most credible bid document and final presentation wins.

### Case Background

The Capgemini Gaining Leadership program is a management development program in which serious gaming and traditional training formats are fully interwoven. The course consists of a pre-learning period (3 weeks) followed by the actual training (1 week). The serious game aspect of the course consists of an interactive narrative that uses the real world as a stage, involving a wide variety of media channels (web-based, video, telephone, text messages, and so on), in which progression through the game is determined by the trainees themselves. During the actual training week the game continues 24 hours a day. Furthermore, during this week trainers also deliver traditional training elements in which they use experiences from the game. In the game the trainees interact directly with the non-player characters of the game. These non-player characters are actively controlled by human agents (called puppet masters).

Additional characteristics of the format:

- Trainees are divided in 4 teams, with approximately 10 players per team.
- Each team represents a fictional Capgemini-like company: Bhora SYS, StreamCrest Infotech, Lotus Valley Solutions and Eidolon Consultancy.
- Teams can make progress through the game by completing milestone missions. Each trainee has to lead at least one of these missions.
- The game / course takes place on two locations simultaneously: in Les Fontaines, Gouvieux, France, and Hyderabad, India. Trainees work together remotely.
- During the pre-learning phase, each trainee receives a dossier with essential documents, contacts, a set of personal business cards.



Exhibit 3 – Impression of game material, Source: Ranj Serious Games

## **Social Constructivism in Practice**

In the course of the game, the teams came up with a variety of solutions to the missions. Often, these solutions contained elements that were not present in the content of the game, but were valuable additions nonetheless. An example of how this works in practice is the Eidolon team that was the only team to add a section on the responsibilities of the Slowessa Line Group to their proposal, although this was never an explicit requirement. The members of the Eidolon team had, cooperatively but without outside interference, deemed it necessary not only to outline their own responsibilities but also to formalize the responsibilities of the customer, just as they would need to do in their daily working practice.

In one of the missions the teams had to review the unfinished master plan detailing the design, realization, and implementation of the pipeline, and report back what they thought were the major issues. The way the trainees approached this mission shows how predictive closure works in practice: the trainees took great pleasure in (cooperatively) filling the information gaps with elements from their own knowledge and experiences. The level of detail and imagination of some of the submissions for this mission are noteworthy. Not only did the teams go to great lengths to make their submissions as complete and consistent as possible, sometimes they came up with issues that were not foreseen by the designers of the game.

## **Learning by Doing in Practice**

The context created in the Gaining Leadership game was experienced as highly lifelike and relevant. This is exemplified by the following occurrence. One of the missions was designed around being able to think and act independently, even under pressure. The trainee leading this mission was put under tremendous pressure from various characters (controlled by the puppet masters) to follow a certain course of action. Even though the characters are fictional, the trainee in question experienced the pressure as being fully realistic. During the game, one of the trainees leading this particular mission nearly succumbed to the pressure, balancing between outrage and fear. This trainee was no longer acting out a role, but was being herself. This occurrence enabled the trainers on location to deliver a meaningful and valuable lesson to the trainee in question. Instead of having to employ highly abstract scenarios describing the topic, the trainers were able to draw upon a very real and recent incident to deliver the lesson (e.g. a first-hand experience). It therefore enabled the trainee to reflect first-hand on her own actions (and inactions), instead of passively consuming second-hand knowledge *on* the topic. So this experiential and lifelike context on the one hand provided the trainers with concrete and clear incidents to use in the training, and on the other hand magnified the impact of these lessons on the trainees because they had actually experienced the incidents themselves. In this way the game provided a relevant context for the explicit learning content, and it stimulated learning by active exploration of first-hand experiences. It made the combination of gaming and more ‘traditional’ training formats very powerful.

## **Procedural Rhetoric and the Inside-Out Perspective in Practice**

One of the trainees of the game admitted that he had always thought he thoroughly understood all the lessons he received during trainings. However, during the game he had to lead a team that, from the start, did not have much confidence in winning the game, due to the seemingly much stronger competition. Despite all his efforts, he was unable to motivate his team and ended up completely empty-handed. He later reflected that in former training programs he had attended, he had never really understood how his actions in team processes had a negative effect on the motivation of his team members. Becoming part of the problem itself enabled him to gain insight in the significance of the competencies ‘providing direction’ and ‘delegation’ and the way how to deploy these competencies in the right way. His reaction to this stated clear the relevance of the procedural rhetoric and the inside-out perspective: “This turned out to be a life changing event for me. I finally found out what people kept telling me for years.”

This shows how powerful procedural rhetoric can be, and how important the inside-out perspective is for the persuasiveness of the lesson. Due to their active involvement in the game, the trainees are no longer looking at a problem from a distance, but are made part of the problem. This makes them aware of how their own presence and actions shaped by the problem itself. It provides them with the necessary insights to be able to deal with these problems in real life.

## **Motivation and Fun in Practice**

The Gaining Leadership course showed significantly better results on student motivation. The separate milestone missions gave teams feedback on their absolute progress and performance in the game. Teams gave a lot of importance to completing these missions. According to course trainers the effect of the relative progress, teams competing against each other, was even stronger: teams would go to great lengths to outperform each other. A bright example of this was Streamcrest Infotech team, which circulated a fake CNN-article about the hostile take-over of the Lotus Valley Solutions team, in order to disrupt their team dynamics. The members of the targeted team were so worried by this ploy, that they forgot to focus on their regular responsibilities. In the end the puppet masters had to create a new article to counteract the rumours and get the team back on track. The team-based competition provided an atmosphere in which teams and their individual trainees were motivated to perform their utmost best.

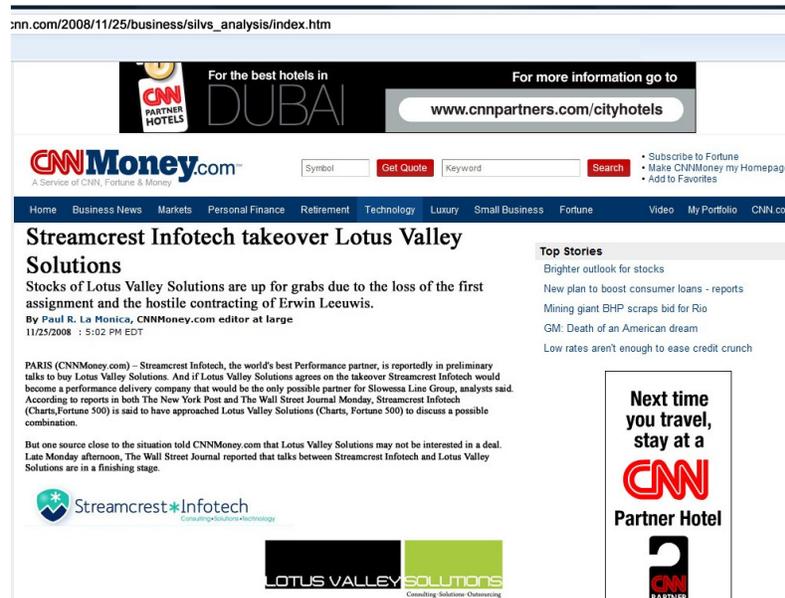


Exhibit 4 – Article Hostile Takeover Streamcrest Infotech, Source Ranj Serious Games

One of the effects of this strong trainee motivation, was seen in the use of the course materials. Not only did trainees thoroughly study the offered materials in advance, they also displayed a much better insight in the used materials during the course. Normally, pre-learning material is seldom read by the trainees, let alone applied constructively in the course of the training.

### Other Aspects of the Gaining Leadership Game

Three other aspects of the Gaining Leadership game are worth mentioning. The first is the powerful ability of the puppet masters and trainers to adjust to actions of the trainees. Because the puppet masters and trainers have the means to fine-tune the difficulty of the program on the fly, they can make sure the trainees are under just the right amount of pressure for an optimal learning experience. This is practical use of the concept of flow, as described in the second paragraph. By taking this concept into account during the design of the game, it became easier to adjust the game to the personal challenges of each trainee.

The second is the power of the ‘suspension of disbelief’ that helps to put trainees in an inside-out perspective and to be pushed into a new level of development (learning complete new unknown concepts instead of exploring known concepts). To realize this suspension of disbelief, the line between fact and fiction was deliberately blurred in the game. After a while, the trainees were no longer sure what was real and what was not, and as a result started to treat everything as *possibly* real – at that point they were truly immersed in the game world and saw everything from that perspective.

The third aspect is the emphasis on remote teamwork. The players work in teams and have to communicate and collaborate to make decisions. Team members are distributed over two locations/time zones, but have to operate

as a team and have to share information. Individual team members get access to different information sources. The game is a practical way to train remote (team) management skills.

## Conclusions

We examined the theoretical effectiveness of serious games by examining the potential learning effects, and the following four hypotheses were formulated:

***Hypothesis 1 – A serious game provides trainees with a micro-world that stimulates them to construct their own knowledge on the MD-program subject.***

***Hypothesis 2 – The relevant context of a serious game provides trainees with concrete and meaningful experiences that enables them to learn on the subject of the MD-program.***

***Hypothesis 3 – The inside-out perspective of serious games helps trainees to understand and manage the complex processes they encounter in their daily work.***

***Hypothesis 4 - By giving positive feedback on trainees' capacities and progress, a serious game contributes to the motivation of trainees to study the subject of the MD-program.***

Using the Gaining Leadership game as a practical case, the hypotheses were then put to the test in the context of management development programs. During the game the teams often came up with unique solutions that contained elements not prescribed anywhere, but were concerned relevant and even valuable nonetheless. This shows that the micro-world of the serious game stimulates the trainees to construct their own knowledge on the MD-program subject, supporting the first hypothesis.

Subsequently it was shown that a relevant and lifelike experiential context is crucial for the trainees to learn from their actions. Instead of having to use second-hand experiences or metaphors, the trainers were able to draw on the first-hand experiences of the trainees, enabling them to deliver meaningful lessons to the trainees. For the trainees, these lessons had significantly more impact because they had experienced them first-hand. This supports the second hypothesis.

The importance of the inside-out perspective on the persuasiveness of procedural rhetoric was made clear by the observations of trainees that had become an integral part of the problem they faced, as opposed to merely contemplating the problem from afar. This enabled them to learn more about how their own presence and actions shape the problem itself, supporting the third hypothesis.

The feedback from the game about the *absolute* progress of the teams certainly had a positive effect on the motivation of the trainees to complete the milestone missions. However, an even stronger effect can be attributed to the clear feedback on *relative* progress. This increase of motivation had very positive effects on the effectiveness of the entire course, which supports the final hypothesis.

From the point of view of a serious games developer, the learning effects as described in the third paragraph and put to the test in the Capgemini case study work best in synergy. In other words, learning can be optimized by providing a highly appealing micro-world in which trainees are stimulated to construct their own knowledge from an inside-out perspective and in a relevant context, in which they get clear and direct feedback on their capabilities and progress.

In the course of this article, it was shown that serious games can make a lasting and significant contribution to the management development programs, by providing ways to create clearer, more powerful lessons that have real impact on trainees' knowledge construction.

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