

# An Approach of Methodology for Designing Serious Games within the Context of African Enterprises

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**Abstract** - Though the fact that it remains unknown, video games are in fact very specific software products, programs, mixing artistic and programming skills. A serious game or applied game is a game designed for a primary purpose other than pure entertainment.<sup>[1]</sup> The "serious" adjective is generally prepended to refer to video games used by industries like defense, education, scientific exploration, health care, emergency management, city planning, engineering, and politics.<sup>[2]</sup> It remains not easy for a Software Engineer to fit expectations of his clients for common Software products like accounting Software or even for a simple Website. Thus, the development of serious games (also designated by simulations) which are recent within the categories of software products designed, is not easy because it requires perfect knowledge of the learning domain to obtain the desired results<sup>[3]</sup>. In addition to that, the context of business in Africa is not always opened to new technologies. In this paper we discuss how the well-known processes of design and development in Software Engineering Users centered can be applied to serious games design to facilitate their integration in African Enterprise.

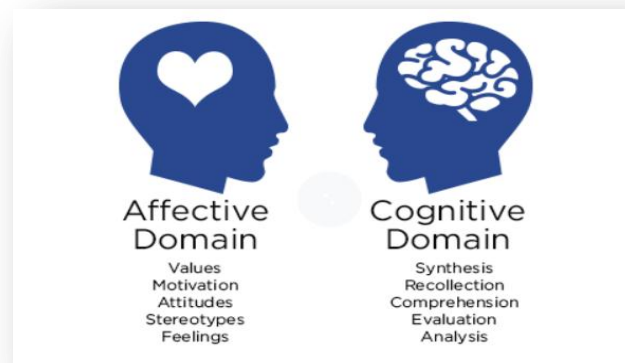
**Key Words:** Serious game, Simulation, Game design, Africa, Methodology, SGs, Domain expert.

## INTRODUCTION

In recent years there was a growing interest in serious games because they facilitate the learning process, by engaging the user and increasing his motivation. This growing is literally increasing with the advent of Virtual reality (an artificial environment which is experienced through sensory stimuli such as sights and sounds provided by a computer and in which one's actions partially determine what happens in the environment) <sup>[4]</sup>. The development of serious games, besides the game designers and developers, requires a tight collaboration with domain experts. Thus, the complexity in Serious Games design comes from the fact that there should be a good balance between fun, and pedagogic objectives. In a business context, the most important is the profit. The accuracy of serious game is then crucial because if it isn't enough, it becomes a waste of time and money. In Africa, more than elsewhere video games are likened to youth affair. The population of workers is much more likely to be older people. How to design serious games in a way to be easily integrated in this context? What methodology is more accurate to design them to better fit local expectations? After a brief review of the contribution of Serious Games to the business world, we will talk about the challenges faced during their development, discuss how mixing Agile method with game development could lead to best results, and finally we suggest on how to implement this in the specific African business context.

## SERIOUS GAMES IMPACT IN ENTERPRISES

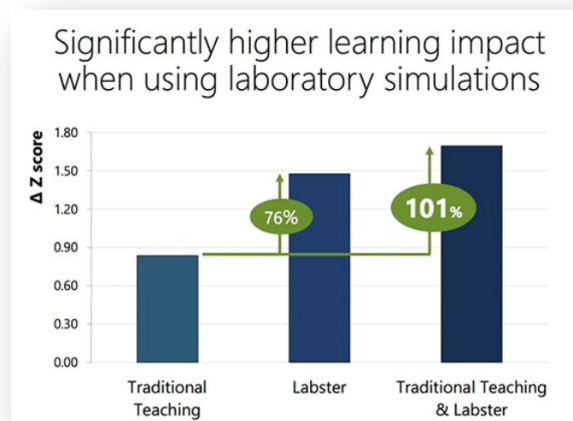
There are currently several research projects and literature about SGs in very diverse areas but we will restrain our focus on employees' training in enterprises.



(Source: <http://www.theknowledgeguru.com/serious-games-work-large-enterprise/>)

Figure1: Benefits of SGs in affective and cognitive domains

The positive effects of serious games in business is no more to prove. It takes experience for an employee to better deliver the behavior and work expected of him/her. Serious games allow precisely to acquire that experience and memories through virtual world, avoiding by the way to make professional mistakes. Serious games have 7 notable advantages in enterprises: 1) Put knowledge and skills into practice. 2) Engage and inspire employees. 3) Create an emotional connection with corporate learners. 4) Simplify complex tasks. 5) Build problem-solving skills. 6) Improve performance behaviors. 7) Provide a tactile online training experience<sup>[5]</sup>.



(Source: Nature Biotechnology 2014, statistically significant (p<0.001))

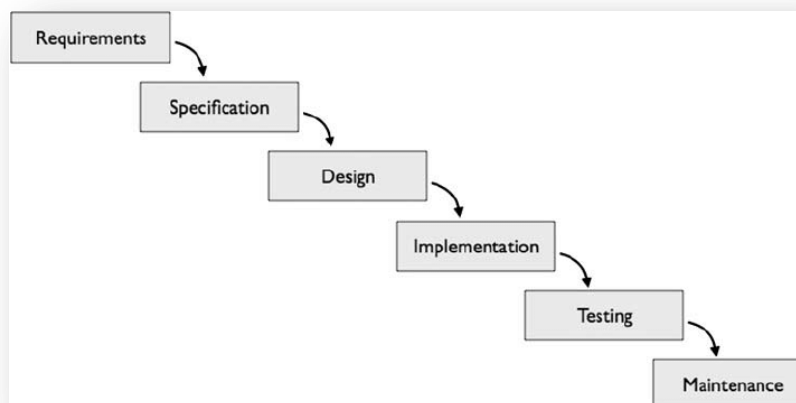
Figure 2: Comparing impact of traditional teaching with the use of simulations. Case of a laboratory simulation.

### THE CHALLENGES FACED IN THE PROCESS OF DESIGNING SERIOUS GAMES

The development of any Software always implies some challenges. In the case of SGs that are recent, some challenges have been identified. We will talk about three of them.

#### Overcome the disadvantage of general game design methodology.

Generally, video games are designed following the waterfall model. Famous ones (FIFA, PES, GTA...) are even discovered by customers during sells.



(source: [https://www.researchgate.net/figure/Diagram-of-the-waterfall-software-development-process-model\\_fig1\\_220169042](https://www.researchgate.net/figure/Diagram-of-the-waterfall-software-development-process-model_fig1_220169042))

Figure 3: The Waterfall model

Experts of Level design, Scenarios, sound, programing, drawing come together to work, evaluate and test the game by their own before releasing it. Thus, clients (gamers) discover their product at the very end of the process. In the case of an enterprise's Software, it is limit to fit expectations of clients. Designing a Serious game requires to choose a user cantered approach. This leads us to the second challenge.

**Set a good Collaboration between Software engineers’ team and domain experts.**

Without the knowledge of domain experts, it is not possible to fulfill a SG project. As a matter of fact, it is crucial for developers to use Agile method, and to develop iteratively, to capture domain experts’ feedback frequently. Metrics are provided to allow an assessment of SGs by experts along dimensions such as learning effectiveness, efficiency, fun level, etc<sup>[6]</sup>. It is also important to have a collaborative team of domain experts. This is why we talk about the third challenge.

**Stakeholders involvement.**

The key stakeholders are the one who stimulate work dynamic. They define the great lines and aims of the project. Their involvement in such a project impacts either on domain experts team interest (which are the key of a successful design), either employees’ motivation.

**SUGGESTIONS TO FIT AFRICAN CONTEXT**

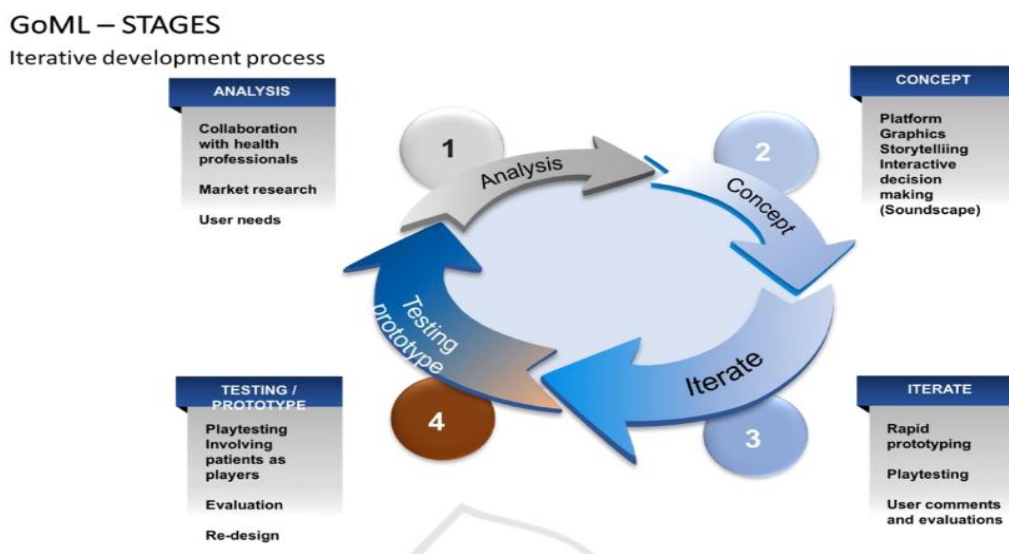
In addition to exceeding the challenges outlined above, it is necessary to take some actions in the African context.

**Prove the profit of the SG project.**

In most of African countries, games are still assimilated as youth affair. Benefits of serious games are still unknown from the public. An African enterprise will not see the interest of acquiring a new technology if it doesn’t *immediately* include profit. Thus, in the line with the third challenge discussed above, for the success of development and implementation of an SG, it is crucial to clearly present the technology which remains infamous in Africa, and *convince* the management that the real purpose of the project is not entertainment, and define figures that show the financial, behavioral contribution in the short, medium and long term. Otherwise, the craze would decrease straight to the end of the project.

**Full time involvement of domain experts, iterative development and a test team including some employees.**

The Software Engineer’s goal is to propose a solution that fit needs of his clients. That implies a knowledge of his clients’ needs through meetings, specification sheet(s)... *What if the clients don’t know their needs?* As foretold, SGs are still unfamiliar in African business area. Thus, chances are unfortunately high that clients don’t know how to guide developers for the fulfillment of the project. It is then necessary to have a full time involvement of domain experts. They can then keep probing if this unfamiliar solution is in line with their expectations. To maximize collaboration with employees, frequent reminders sessions on what is the new project, it’s goals, the involvement necessary etc. Iterative development would be the best practice in this specific case, combining test team that includes employees to constantly evaluate the effectiveness of the Software at each process.



(Source: <https://pdfs.semanticscholar.org/35f4/5137565aa18078bf6d6def7a0c191f6cfd7c.pdf>)

Figure 4: Iterative development process

### Accurate choice of gaming Hardware

The sensitivity to video games is strongly related to age, in Africa more than elsewhere. Thus, the choice of hardware is important. Can this range of employees use gamepads, keyboard? Is this technology enough cheap to implement? How many controls should be set to easier uses of the game? These are the questions to answers before the choice of hardware. In the population of workers in Africa, some people didn't know games in their childhood, teenage years. Basic hardware, basic settings, simplicity would be better for a start.

### CONCLUSION

Expected to hit \$17 billion in 2023, serious games have now an important role in economy and in the accuracy of employees' skills all over the world<sup>[7]</sup>. If their importance is no more to doubt, their development and implementation remain a tricky exercise because they are recent and implies several constraints such as, unclassical way to develop a game, keep a balance between the pedagogical aims and fun, tight collaboration with domain experts. The coupling of Users centered methods like Agile, and clients' involvement are important to fulfill such a project. In Africa, Serious games remain infamous. They need to be introduced first, from their usefulness to their worth income. In the process of development, the full time involvement of main recipients would be preferable to make sure the design actually fits the needs of employees.

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